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Education and Training

Health Informatics at the University Of Victoria

Abstract: The University of Victoria has the only program in Canada offering a Bachelor of Science degree in Health Information Science. To meet the requirements of the degree, students must complete 60 units of course work (normally 40 courses) and 4 CO-OP work terms over 4.3 years. The School admits approximately 30 students each year. Seventy-five percent of the students come from British Columbia, ranging in age from 18 to 50 years with the average age being 26 years. In addition to recent high school graduates, over 40% have previous degrees or diplomas, and 65% have over 5 years of work experience. The School's teaching team consists of 4 full-time faculty, 2 professional staff, 2 clerical staff, 7 adjunct faculty and a variable number of sessional teaching staff. The majority of the faculty have health backgrounds, totalling 150 person-years of health care experience. As of November 1995, the School had 168 graduates 75% of whom are employed in British Columbia, 17% in other parts of Canada and 8% outside the country. Sixty-five percent of the graduates work in government departments including community health agencies; 10% work in hospitals, 20% work for management consulting firms, software houses, or computer hardware firms, and 5% are otherwise employed. Almost 100% of the graduates are gainfully employed in professional positions in which their health information science degree is valued. They work as systems analysts, system designers/developers, consultants, research assistants, health-care planners, information system-support staff/trainers and client-account representatives. Some are already in senior management positions.

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1. History

In the late seventies, Dr. William Gibson, then Chairman of the Universities Council of British Columbia, envisaged a need for a new type of professional who had the knowledge and skills to effectively introduce information technology into Canada's health-care system. His vision came to fruition in 1981 when the University of Victoria inaugurated a new four-year Bachelor of Science degree program in Health Information Science.

In the fall of 1982 the initial curriculum was implemented. It was based on the ACM's SIGBIO Group (1979) model curriculum for Ph.D. programs in the field of Health Computing and on the ACM's model curriculum for Management Information Systems, a curriculum which specifically distinguished the field from that of Computer Science. The Heidelberg/Heilbronn curriculum also had an influence on the design of the UVic curriculum.

In September 1983, the inaugural class of 17 students was admitted into the School at the same time that the economic recession began to affect British Columbia. The program's five-year, ear-marked funding was canceled and the budget frozen at the 1983 level. During the next three years, the Director and a dedicated group of sessional lecturers managed to teach all of the required courses despite cutbacks to university funding. The program survived due primarily to the pressures put on the University from the health-care community.

In 1986, the freeze on staff hiring was lifted and faculty were appointed to tenure track positions. The May 1986 convocation saw the first group of the Health Information Science students receive their degrees. In 1987, with the addition of another faculty position, the program was granted "School" status. In May 1989, the School hosted a highly successful international conference on Medical Informatics and Education. In 1991, the School's first two graduate students began their studies towards a Masters of Science degree. In Novem-

ber 1992 the School celebrated its 10th anniversary and as part of the convocation, the School nominated Dr. Roger Côté of the University of Sherbrooke, a renowned leader in the field of Medical Informatics, to receive an honorary Doctor of Science degree from the University.

2. Mission and Philosophy

The mission of the School is to support and improve health-care delivery systems by educating individuals to be effective designers, developers, users and managers of health-information systems; by advancing knowledge in health informatics through research; and by providing a consultative service to the health-care community.

The School's view of health information encompasses clinical, sociological, epidemiological, administrative, judicial, and economic perspectives. Health is seen from a community perspective and encompasses the full range of services including health promotion and disease prevention, home care, community health, occupational and environmental health, social and welfare services, physicians services, institutional acute care, rehabilitation, and extended care. As health information is increasingly being processed by computers and transmitted by communications technology, the School's programs have a significant information technology component. The critical role of people in information systems is acknowledged in all aspects of the School's didactic offerings, research, and community service endeavors.

3. Faculty

The School's team consists of 4 full-time faculty, 2 professional staff, 2 clerical staff, and 7 adjunct faculty and a variable number of sessional teaching staff. The majority of the School's full-time and part-time faculty have health backgrounds; the School's full-time personnel have over 150 person-years of health-care experience. In addition to its full-time and part-time faculty, the School makes extensive use of guest lecturers; over 300 professionals from organizations in Victoria, Vancouver and across Canada have come at their own expense to contribute to the School's classes since the program began. The School's faculty have published over 200 papers and given over 400 presentations to scientific and community groups. Two of the School's faculty were the first Canadians to be elected to the American College of Medical Informatics. Most of the School's faculty serve on national and international committees, professional and scientific associations.

4. Undergraduate Curriculum

The School offers a Bachelor of Science degree in Health Information Science using a mandatory co-operative education model. Students are prepared to be technologically competent and to be well versed in the application of theoretical principles. Although the B.Sc. provides a professional entry degree it is also designed to provide the foundation for further graduate studies as evidenced by the fact that many of the School's graduates have already completed or are enrolled in graduate programs ranging from Epidemiology, Medicine, Environmental Health to Health Services Administration and Business Administration.

The School admits students who have completed one year of university-based studies and have achieved a grade of B or higher. Applicants write a statement of intent and are interviewed prior to being admitted. To complete the degree a student must complete 60 units of course work (normally 40 courses) and 4 co-operative education work-terms over a 52-month period including the 1st, pre-program year of studies.

Seventy-five percent of the undergraduate students come from British Columbia, ranging in age from 18 to 50 years; the average age upon admission has been 26 years old. In addition to recent high-school graduates, over 40% have previous degrees or diplomas, and 60% have over 5 years of work experience. About 25% of the students come from disciplines such as nursing, dietary, medical imaging, health records, laboratory and physiotherapy. A number of foreign students from Brazil, Germany, Mexico, the USA and India have come to study in the School for periods of up to one year.

The School strives to provide a learning environment which encourages inquisitive, self-directed learning in which students are expected to be professional in their approach to problem-solving, ethical and courteous in their dealings with others. As future mediators and change agents they require good listening and communication skills. They are challenged to be innovative, non-linear global thinkers. Students are encouraged to critique and question the information they are receiving in the School. Feedback and dialogue are fostered through active class participation; techniques used to reinforce the critical importance of developing strong inter-personal and communications skills include group projects and role-playing. The students are regular visitors to local hospitals and health agencies. Many courses have laboratories to reinforce the practical application of information theory and principles.

As a foundation to the courses offered by the School, students take at least 10 courses from the departments

of English, Mathematics, and Computer Science. They also choose 11 elective courses to complete their 40 course degree. Of the School's 22 courses, thirteen are health-oriented with over 90% of their content related to health-care. The health-care system is studied and taught from a multi-professional perspective, and all health disciplines are introduced and discussed. The remaining courses are information-technology based, though each course has 10-70% of its content specifically related to health care. The courses currently offered by the School are listed in Table 1.

Keeping the School's program current and comprehensive is an ongoing challenge because information technology changes so rapidly and health-care systems around the world are currently changing at a rapid pace. For example, the introductory course was split into HINF 171 and HINF 172 to accommodate the expanding technological components of the curriculum while HINF 240, an introduction to the Canadian health-care system, has been changed to a course in health care governance with an international perspective.

Most notable among curriculum changes has been the development of laboratory components for many of the HINF courses. HINF 171, 172, 270, 300, 325, 380, 445 and 450 now have fully developed laboratory sections that significantly enhance the skill content of those courses. Laboratory curriculum development for other HINF courses is currently underway. The School is acutely aware that some of the advantages its graduates have over those from other technological programs are attributed to their communication skills. HINF 315, Human Communications and Relations in Health Care, has evolved so that it now focuses on the "meta skills" employers value: ethics and professional behavior, group skills, leadership, oral and written communication and more.

Health/Management Stream
HINF 170 Introduction to Health Information Science: I
HINF 220 Hospital Organization
HINF 240 Introduction to The Structure and Governance of Health Care
HINF 270 Medical Methodology
HINF 315 Human Communications & Relations in Health Care
HINF 325 Fiscal Management in Health Services
HINF 330 Legal Issues in Health Informatics
HINF 340 Principles of Community Health
HINF 380 Introductory Epidemiology
HINF 440 Health Care Systems
HINF 444 Issues in Community Health
HINF 460 Quality Assurance and Ethics
HINF 480 Epidemiology in Health Services Management

Informatics Stream
HINF 171 Introduction to Health Information Science: II
HINF 172 Introduction to Health Informatics Applications
HINF 300 Principles of Health Database Design
HINF 351 Hospital Information Systems
HINF 385 Nursing Informatics
HINF 410 Information Management and Technology
HINF 415 Patient Care Support Systems
HINF 445 Distributed Processing in Health Care
HINF 450 Principles of Health Information Systems Design

Table 1. Courses offered by the School of Health Information Science.

School faculty and teaching staff have increased their emphasis on communication in many other HINF courses. Formal class presentations and term papers are increasingly being judged on process as well as content.

As of November 1995, the School had 168 graduates. Based on the name and location of the organizations they are working for, 75% are employed in British Columbia, 17% are in other parts of Canada an d 8% are outside the country. Sixty-five percent of the graduates work in government departments including community health agencies; 10% work in hospitals, 20% work for management consulting firms, software houses, or computer hardware firms and 5% are otherwise employed. Almost 100% of the graduates are gainfully employed in professional positions in which their health information science degree is valued. They work as systems analysts, system designers/developers, consultants, research assistants, health care planners, information system support staff/trainers and client account representatives. Some are already in senior management positions.

5. Co-operative Education

Co-operative Education is a process of education which formally integrates academic studies on campus with related work experience in industry, business and government. As a result, co-op students have the opportunity to receive a superior, well-rounded education; employers have a cost-effective means of completing special projects and evaluating prospective permanent employees; and the University receives valuable feed-

back on the quality and relevance of its programs. It also provides students with an exposure to hardware and software which may not be a part of the academic program.

Health Information Science students currently complete four 4-month Co-operative Education work-terms where they are employed full-time in informatics positions in the public or private sector. Since 1983, over 150 different employers have hired Health Information Science students to fill over 800 work term positions across Canada and around the world. These work term placements have been in government ministries, community health agencies, hospitals, extended care facilities, computer hardware and software companies, management consulting firms, private laboratories and non-profit agencies. The students work on a wide range of projects from designing and implementing a hospital laboratory database system to identifying the computer system requirements for electronic reporting of communicable disease in British Columbia. Many of the School's co-operative education employers have standing agreements to take one or more students each term. Not surprisingly, a number of students find permanent employment with their co-op employers.

In addition, the School has had success placing students overseas. Australia, Denmark, Hungary, New Caledonia, England, Germany, India, New Guinea, Scotland, Sweden, Switzerland and the USA are countries where Health Information Science students have had co-operative work term experiences. This broad international recognition and support of the school is highly valued in providing quality learning experiences for students.

6. Graduate Curriculum

The School has graduated one Ph.D. and three M.Sc. by special arrangement in Health Information Science; two others are expected to defend their theses and graduate in 1996 and 1997. Given these successes and the increasing demand, the School plans to make formal application for a permanent graduate program by the end of 1996. The multi-disciplinary nature of the field will allow the School to draw on many existing graduate courses thereby mitigating the need for significant additions to the School's resources to accommodate the program.

7. Equipment

The Human and Social Development Building is equipped with two modern PC (IBM 486) and a RISC (IBM RS6000) classrooms for formal laboratory instruction and a large drop-in area (IBM 486; Macintosh II ci; IBM RS6000) for casual student use. The School's faculty, staff and students are some of the primary users of these facilities. These network are connected via the University backbone to the IBM mainframe (3090; VM/CMS) and to a variety of minicomputers (DEC VAX780; VMS) (Sun 3/280s; SunOS). Via the backbone the HSD labs are connected to the Internet thereby supplying students with indispensable TCP/IP connections (via e-mail, gopher, newsnet etc.), to international informatics community and to on-line databases (i.e., Medline) throughout the world. While there is still room for substantial growth in access to computing facilities the above provides the students with access to a variety of platforms and operating systems, experience with which enriches the students' potential to take their places in the modern informatics workplace.

The faculty, staff and graduate students are each equipped with a variety of PC's, running DOS and UNIX, that are connected to a Novell network that supports the Faculty of Human and Social Development. Like the student LAN, this LAN is connected to the university backbone thereby providing the faculty and staff with Internet connectivity and services (e.g. student records, library holdings).

The School also has two Sun IPX and 4 NCD X-windows terminals to provide a platform for the Oracle DBMS. These are now connected to the network of RS6000s in the student area and since most of the DBMS is located on the AIX file server the Sun is host to the CASE tools portion of Oracle used for software engineering instruction.

8. World Wide Web

The School has taken the initiative of developing a set of World Wide Web pages (http://www.hsd.uvic.ca/HIS/his.htm) that describe the School, its people, its research, its academic programs and other initiatives. This is already beginning to have the desired marketing effect. The School is stressing design and navigability as well as content in the development of its Internet presence. Many other Web sites are notorious for their poor design but the School's site has received compliments regarding ease of use and content. The web is now being introduced early in the curriculum. This relatively new Internet communication mechanism is continuing to grow in popularity because of its multimedia nature and hyperlink facility. Students in HINF 172 are learning html programming and creating their own home pages. HINF 270 and 445 students are producing pages related to their class projects and papers. These pages were demonstrated at "Tuning in the North" a conference and trade show done at UNBC early in 1995 and received with enthusiasm by the attending health care professionals. This initiative is paving the way for distance education using the Web on the Internet.

9. Institutional Collaborations

The School has recently started discussions to establish formal collaborative relations with The Toronto Hospital, St. Paul's Hospital, the Ontario Cancer Treatment and Research Foundation and the Greater Victoria Hospital Society (GVHS). With the exception of the GVHS these discussions were initiated by the other institutions. The School has had a fruitful but largely informal relationship with the GVHS which, in the light of other agreements being developed, the School now wishes to formalize. These collaborative agreements will cover research and education. These institutions have been employers of large numbers of our co-op students and graduates and have indicated a willingness to host and fund graduate student projects on an ongoing basis. Further, our relationships with these institutions are one of the ways in which the faculty are able to keep the curriculum current and to provide guest speakers for many of the School's courses.

The School continues to gain international prominence in the area of health information networks and in health informatics curricula. Faculty have participated, by invitation of the Pan American Health Organization (PAHO), at health informatics education workshops in Barbados and in Mexico. As a consequence, the School is represented on the PAHO committee charged with establishing a policy and developing curriculum for health informatics education in Latin America and the Spanish speaking Caribbean.

10. Future

The School has initiated the planning process for a formal graduate program and expects to have one in place in the next few years. A critical aspect of the planning is the determination of which type of graduate program best meets the needs of the community. There appears to be a need for a traditional thesis-oriented program to prepare the future health informatics researchers and teachers. While the School is already exercising the option of thesis/research based graduate studies through the Faculty of Graduate Studies program by special arrangement, there is also a known demand for a course-based professional program. Therefore, in the planning for a formal graduate program, a professional (non-thesis) degree as well as an academic degree is being contemplated.

The professional graduate degree (e.g., MHIS) could require the development of a two year graduate curriculum similar in approach to an MBA degree and would have different staffing and budgetary implications than the academic graduate degree. This part of the program would generate considerable interest within the professional health sector. It could be offered by distance education and could be done collaboratively with other universities.

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