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ABSTRACT

This paper provides three recommendations for the development of Canadian university science educators, based on the results of a survey of 125 faculty members identified as science educators. The first recommendation is to conduct a survey to ascertain the number of doctoral level graduates and current enrollments in the doctoral programs in science or science education. The second recommendation is to recruit qualified female science teachers into doctoral programs. The last recommendation is to make science educators a subgroup of the Canadian Association for Curriculum Studies (CACS). (YP)

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CANADIAN UNIVERSITY SCIENCE EDUCATORS - A PROFILE OF THE PROFESSION AND RECOMMENDATIONS FOR THE FUTURE

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Canadian University Science Educators - A Profile of the Profession and Recommendations for the Future

Based on characteristics shared by a majority of the profession, the "typical" Canadian university science educator is in his forties. After teaching less than five years at a secondary school, he has taught in a university department or faculty of education for the past fifteen years. He has a doctoral level degree in education and at least a bachelor's degree in science, most likely in a life science. His professional activity includes research in science education. the development of science curriculum, teaching instructional methods in science to both prospective elementary and secondary teachers, teaching graduate courses and supervising graduate student research. He is a member of the Canadian Society for Studies in Education, the science teachers association in his province and at least one other professional organization in the field of science education.

This is the "typical" Canadian university science educator, but of course very few members of this sub-species are completely typical. The profile is based on 89 responses (a 71% response rate) from 125 Canadian university education faculty members identified as science educators by their Deans or Heads of Departments. Inadvertently, one university, which subsequently identified 6 science educators on its staff, was omitted from the survey. Based on the response from faculty or department heads from 43 Canadian universities, there were, therefore, in the 1987/1988 academic year 131 Canadian university science educators.

Detailed results and discussion

Age

	N	%
Under 30	0	0
30 - 39	9	10
40 - 49	42	47
50 - 59	27	30
60 and over	11	12

Among the implications of this age distribution is a probable need for about 50 science educators to replace retiring members of the profession over the next decade. If new members are to be similarly qualified to current members, then Canadian universities should be graduating at least three Ph.D.s in science education per year. Given an average of four years to completion of the degree requirements, a success rate of 50% and an average enrolment of three years, the corresponding total enrolment at any one time should be nearly twenty Canadian science teachers in Ph.D. programs in education. For a variety of reasons, including a greater demand over the next twerty years for science teachers to replace a similarly aging science teacher populatior, the real need for preparing the educators of these teachers is likely to be greater than implied by this projection.

Recommendation 1. A survey be carried out to ascertain (1) the current number of Ph.D. level graduates among science educated school personnel (who constitute a pool from which university science educators might be drawn) and (2) current enrolment of Canadian science teachers in Ph.D. programs in education (likely the main source of new recruits) and (3) current enrolment of science teachers in Ph.D. programs in science (a possible source of recruits).

Sex

	N	%
Male	70	79
Female	19	21

The predominance of males in the preparation of teachers of science is clearly not a healthy situation for education. One implication is the need to actively recruit qualified female science teachers into doctoral programs in science education.

Recommendation 2. Affirmative action be taken by SSHRCC and the universities, including the establishment of designated fellowships, to recruit qualified female science teacher into doctoral programs in science education.

Teaching experience

Level	Number of Years 1-5	6-10	11-15	16-20	20+	TOTAL
Elementary (grades 1-6)	19	5	1	1	0	26 (29%)
Junior high (7-9)	38	8	5	2	1	54 (61%)
Senior high (10-13)	26	23	9	5	1	64 (72%)
No school teaching experience						2 (2%)
University	8	13	22	26	14	83*

(* 2 did not respond to this question and 4 responded under the column for 0 years of university teaching experience)

Nearly all of the respondents (98%) reported having school teaching experience. However, only 29% reported experience teaching at the elementary level. This figure should be compared to the percentage of respondents who teach instructional methods to pre-service elementary teachers (63%).

Education

	Doctoral	Masters	Bachelors	No Degree
Highest level completed	69 (78%)	18 (20%)	2 (2%)	0
Highest level completed in science	17 (19%)	26 (29%)	37 (42%)	8 (9%)
Highest level completed in education	50 (56%)	18 (20%)	5 (6%)	16 (18%)

Given the character of undergraduate education in science in Canada, it might be a matter of concern that only a minority of science teacher educators (48%) have research degrees in science. The distorted perception of science given by Canadian undergraduate science programs (which attempt to outdo their US counterparts in content coverage, but in only about 80% of the instructional time) may have been imparted to prospective teachers and their methods instructors alike. Neither may have had sufficient opportunity during their formal education in science to reflect on science as a creative endeavour.

Nevertheless, the total range of relevant educational and job-related experience of Canadian university science educators likely compares very favorably to that of other sectors of the university community. Nearly all Canadian university science educators (98% of those responding to the survey) have research degrees. Frequently this includes research degrees in science (48%) and education (76%) as well as school level science teaching experience (98%).

Major Subject or Field of Science-Related Education

Biology	40	(45%)
Chemistry	27	(30%)
Physics	19	(21%)
Earth Science	5	(6%)
Applied Science *	6	(7%)
None to the bachelors level	6	(7%)

*3 reported engineering and 3 reported agriculture

Most science teacher educators, like most science teachers, have received their basic science education in a Faculty of Science. Nevertheless, the majority of the practitioners of science work in the various fields of application, especially medicine and engineering. There is a built-in tendency, therefore, for school science to depart from real science and technology, to fail to reflect and foster the full range of children's interests in science and to provide for society's genuine needs in relation to science education.

Competitive salaries for science teachers and active recruitment policies are among the means that might be recommended to attract more applied science graduates into teaching. In turn, some of these teachers could be drawn into teacher education. At the present time and for the foreseeable future, the principal means of adjustment will have to be the conscious and deliberate activity of science teachers and science teacher educators, based on a recognition of the limitations of their education and experience. A prominent role in shaping curriculum and instruction in science should be given to those science educators with applied science experience.

A related imbalance within the university science education community is the relatively small proportion with a bachelor's degree or higher level of education in physics (21%). Given the importance of physics to all branches of science and applied science, the pool of people available to do research in Canada on improving school level physics curriculum and instruction is small.

Professional Activity

Educational Research	74 (83%)		
In science education		69 (78%)	
In other fields of education		33 (37%)	
Curriculum Development	65 (73%)		
In elementary science		32 (36%)	
In junior high science		37 (42%)	
In senior high science		37 (42%)	
Teacher Education	85 (86%)		
In preservice elementary		60 (67%)	
In content			28 (31%)
In methods			56 (63%)
In preservice secondary		61 (69%)	
In content			19 (21%)
In methods			59 (66%)
In graduate teacher ed		72 (81%)	
Inservice workshops			40 (45%)
Graduate courses			55 (62%)
Graduate student research supervision			58 (65%)

Professional Association

Canadian Society for Studies in Education (CSSE)	49 (55%)
Canadian Association for Curriculum Studies (CACS)	37 (42%)
Association of Educators of Teachers of Science (AETS)	24 (27%)
National Assn. for Research in Science Teaching (NARST)	30 (34%)
Provincial Science Teacher Associations	50 (56%)
National Science Teachers Association (NSTA)	40 (45%)
Canadian Association for Science Education (CASE)	20 (22%)
Int. Organization for Science & Technology Ed. (IOSTE)	9 (10%)

Preference for "an organization that would bring together Canadian university science educators"

Science educators sub-group of the Canadian Association for Curriculum Studies (CACS)	38 (43%)
A separate organization of Canadian University Science Educators	34 (38%)
No organization	2 (2%)
Both *	4 (4%)
No preference	11 (12%)

*Although respondents were asked to check one response only, 4 checked both, in 2 cases commenting on the desirability of combining these options. Those listed under "no preference" either did not respond or wrote in that they had no preference. This was not an option provided in the questionnaire.

The majority of those surveyed responded with an indication of interest in some form of organization that would bring together Canadian university science educators, 43% of respondents preferring a sub-group of CACS and 38%, a separate organization. Given that 45% of respondents do not belong to CSSE and that 58% do not belong to CACS, a restriction of membership to those that first belong to these organizations would exclude the majority of university science educators. At the same time a separate organization might weaken an important existing organization which many science educators profitably participate in. The write-in ballot for some combination of CACS sub-group and separate organization probably indicates the kind of direction that might be most helpful.

Recommendation 3. It is proposed to the existing science educators subgroup of CACS that it link university science educators through a newsletter, that this newsletter be used as a means of information exchange and as a vehicle for recruiting the participation of university science educators in the sub group meetings, which would continue to be held in conjunction with then CSSE meeting, under the informal auspices of CACS.