

**AN EVALUATION  
OF  
THE WOMEN IN SCIENCE AND ENGINEERING  
SUMMER EMPLOYMENT PROGRAM**

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**ABSTRACT**

There are many factors influencing the career choices of young women. At present the combination of personal and societal issues leads both men and women into largely gender-stereotypical occupations. The WISE Summer Employment Program is one initiative designed to encourage girls to consider careers in the fields of science and engineering. Those accepted to the Program are offered positions as research assistants to work side by side with scientists and engineers for eight weeks at Memorial University of Newfoundland. Positive results from a formal evaluation could be beneficial to the WISE Program in determining the strengths of the Program and finding reliable sources of future funding.

Since the Women In Science and Engineering Student Employment Program is designed to encourage young women to consider careers in science, engineering and related disciplines, the research questions to be addressed by this project were as follows:

- (1) to determine whether the program affected the career choices of young women,
- (2) to determine whether the program influenced the students' selection of courses in high school, and
- (3) to determine whether there had been a change in students' attitudes regarding careers in science, engineering and related fields and various issues related to the subject of women in science.

The method of research planned for this study involved the interpretation of data obtained from questionnaires. In order to assess the short-term effects of the WISE Program a questionnaire was administered in person to all participants of the 1997 WISE Program on the first day of the program. A post-WISE questionnaire of the same format was administered on the final day of the program to assess any changes in educational and career plans, as well as the development of enhanced, positive attitudes towards

careers in science. The same questionnaire was administered to a comparison group of girls chosen by the program coordinator as alternates for the WISE Program. These students are selected each year to replace anyone who declines the offer of a WISE position and, as such, are very similar in terms of the characteristics that the program looks for in its research assistants.

The long-term effects of the program were evaluated by administering a questionnaire to students of the 1994 WISE Program. This probed the educational and career choices followed by these young women and looked for the presence of continued positive attitudes toward careers in science, engineering and related areas.

The results of the analysis revealed the many strengths and positive attitudes of the young women who participated in the WISE Summer Employment Program in 1997 and 1994. The experiences and information gained from the Program appear to have given some of the participants more to consider as they attempt to choose a future career.

All groups involved in this study showed very positive attitudes towards careers in science and engineering. Several of these attitudes were significantly enhanced after participation in the WISE Program, suggesting the value of the Program to the young women of our province.

## **INTRODUCTION TO THE PROBLEM**

In an era of high technology fuelled and driven by science, our nation is necessarily science dependent. The subsequent demand for scientists and engineers is high and can only be expected to grow. We can little afford the loss of talented young women from the sciences, yet the trend of women's under-representation in science and engineering continues. While today's young women aspire to successful career and lifestyle choices, they continue to need support and encouragement as they make one of the most important decisions of their lives - the choice of career. We must ensure that science and engineering is seen as a viable option for all of our young people and support must be provided to enable them to persist along their chosen career paths.

A Cappella is a study completed by the Canadian Teachers' Federation that reported on the lives of adolescent women in Canada. In discussion groups it became clear that teenage girls, who are in transition from childhood to adulthood, must make a significant number of important decisions about their future during their high school years (Canadian Teachers' Federation, 1990, p.12) not the least of which is the choice of a career. Careers ranked 5th out of 34 concerns listed in the participant questionnaire. This research suggests that girls are fully aware of the need to be goal-directed and economically self-sufficient, and that there is now a need to move on to the stage of helping them attain these goals (Canadian Teachers' Federation, 1990, p.20).

Meeting career goals is inextricably tied to educational attainment. There have been substantial increases in the educational attainment of women during the last two decades when the proportion of women aged 15 and over with a university degree rose from 3% to 10%. This, however, is still lower than that of the male population, although the gap is likely to close further in the future since women currently make up the majority (52%) of full-time students in Canadian universities (Statistics Canada, 1995, p.54).

While women make up the majority of full-time students in most university faculties, women still account for much smaller shares of enrolment in mathematics and science faculties. In 1992-93, only 28% of all university students in mathematics and physical sciences were women (Statistics Canada, 1995, p.54). The proportion of engineering and applied science students has increased but is still just 18% of the total in these areas (Statistics Canada, 1995, p.54).

Education levels for Newfoundland women have also increased. Females consistently graduate from high school at a higher rate than males and there is little difference in achievement levels (Women's Policy Office, 1996, p.4.1). University enrolment is higher for females than males; but males are more often found in science, business, engineering and physical education, while females dominate arts, education, nursing and social work (Women's Policy Office, 1996, p.4.1).

For those young women choosing science, performance also has an influence on career choice, but perhaps not in the expected manner. Female science students perform at least as well as, if not better than, their male counterparts (Nevitte et al., 1988, p.42). The very best female students are an important resource since they will be tomorrow's scientists and will lead the way for future women in science. Data from Nevitte et al., however, show that these very talented young women are much more likely than their average peers to defect from science (Nevitte et al., 1988, p.44). The best female science students are about five times more likely than average performers to seek nurturing careers. Academic ability alone is clearly not sufficient for propelling talented women towards science careers. Many of the most able female science students, who have overcome the many real or imagined obstacles to entering science, still do not see science careers as attractive options. Support and encouragement must continue throughout post-secondary institutions and into the workplace if these talented young women are to persevere in the sciences.

These statistics translate into similar trends for women in the labour force. Although decreasing since 1982, the majority of employed women continue to work in occupations where women have traditionally been concentrated. In 1994, 70% of all employed women were working in either teaching, nursing or health-related occupations, clerical positions or sales and service jobs. Women remain very much a minority among professionals in the natural sciences, engineering and mathematics. Just 19% of professionals in these areas in 1994 were women, a figure, which has changed little since 1982 (Statistics Canada, 1995, p.67). Newfoundland women have experienced growth in participation rates in the labour force over the last two decades, but the majority of this growth has been in clerical and service industries

with some increase in teaching and health as well (Women's Policy Office, 1996, p.3.2). No gains are reported for women in science, engineering and related fields.

In the summer of 1990 the Newfoundland Chapter of Women In Science and Engineering designed an innovative program to address the problem of the small number of women entering the fields of science and engineering. Funded by Canada Employment's Summer Employment/Experience Development (SEED) Program, thirty-three female high school students from the Avalon Region were offered positions as research assistants in the laboratories of various science and engineering disciplines. Tours, presentations and many group activities were planned to help make the summer a rich experience for these young women.

The program has received support from many groups and individuals. Funding comes from a variety of sources. Memorial University of Newfoundland provides administrative support since the program operates on campus each summer. University faculty, staff and graduate students are involved as supervisors for the students and in many cases have gone beyond the program's expectations in designing projects for the girls and in rehiring many of their WISE students in following summers. They have shown enormous confidence in the potential of these young women.

More than 200 young women applied for the 33 positions available in 1990 (Women In Science and Engineering, 1991, p.1) and the WISE Program has grown steadily ever since. The number of positions available fluctuates from year to year due to funding uncertainties but generally stays between 40-50 student positions. One indicator of the program's growing interest is the enormous number of student applications which has reached more than 500 in a single year from around the province. This is a clear indication of the acute need for the kind of encouragement and experience the program aims to provide.

Encouraging young women to consider and pursue careers in mathematics, science and engineering is necessary if we wish to have an equal representation of women in these fields. The WISE Program was designed in an attempt to address this need. The WISE Student Employment Program has been running for seven summers since its inception in 1990. Preliminary and informal results appear promising. Many WISE students continue to pursue science-related careers, some continue to work in the laboratories of their WISE supervisors and many receive awards and scholarships for their studies.

The WISE program clearly indicates young women's interest in science-related careers as evidenced by the large number of applicants each year. The program aims to support the growth of this interest into career goals. After seven years, however, it is time for a more formal evaluation, which may help to identify the strengths and weaknesses of the currently operating program.

## RESULTS AND DISCUSSION

The results of the analysis revealed the many strengths and positive attitudes of the young women who have participated in the WISE Summer Employment Program in 1997 and 1994. These girls are intelligent, confident students who have successfully completed many of the high school science courses available to them. They intended to continue their studies of science in their last year of high school and then study at a post-secondary institution. Most of these students had considered science as a major. Biology was cited most often as the major of choice. The life sciences and health related careers repeatedly demonstrated their attraction for these young women, but the WISE Program did result in an increase in the number of girls who aspired to engineering, as well as an increase in the number of girls who were undecided about their future career after participating in the WISE Program. The experiences and information gained from the Program appear to have given some of the participants more to consider as they attempt to choose a future career.

All groups in this study demonstrated a high correlation between their belief in the ability of women to have a career in science or engineering and a family and the ability of men to have the same. It is encouraging that the girls' beliefs on this issue were not based on gender. Although the correlation for the 1997 participants had increased after their participation in the Program, the 1997 alternates and the 1994 participants had a higher correlation than the 1997 participants. This seems to suggest that WISE showed the participants some of the challenges women face as they attempt to balance both a career and a family. Participation in the WISE Program also helped the participants to transfer their belief that science and engineering are accessible to women to a similar belief for themselves personally. The correlation had increased on these statements at the end of the Program. This effect was lower for the 1994 group. Although they still agree with the statements, their optimism seems to have been tempered by their experiences in the three years since they participated in the WISE Program.

All groups involved in this study showed very positive attitudes towards careers in science and engineering. They expressed agreement with the statements that science and engineering are accessible and attainable to women and to themselves personally. They expressed confidence in their futures. Significant differences were found in some areas for the 1997 participants. Their disagreement with the statement that they would have to work harder than their male peers to succeed in science or engineering increased significantly. They apparently experienced success in their laboratory work and gained confidence in their abilities from their experience. They also agreed significantly more, after the Program, with the statement that they had access to information about careers on science and engineering.

When compared to the alternates from 1997, the WISE participants again showed several significant differences. They disagreed significantly more with the statement that science does not welcome women and that they would have to work harder to be successful in science or engineering. They have gained much confidence from their experience and were made to feel welcome in the positions. They

also agreed significantly more with the statement that they had access to information about career in science and engineering. Both the confidence and the information they have gained may enable them to make informed decisions about their future.

Finally, the 1994 participants in the WISE Program expressed agreement with the statement that WISE encourages women to consider careers in science and engineering and provides information about these careers. They also agreed that the Program helped them to choose such a career for themselves. That these attitudes persisted in WISE participants after three years demonstrated a very positive effect of the Program.

The last question on all questionnaires used in this evaluation was a free response question. Students were asked to comment on their attitudes about the issue of women in science and engineering by referring to at least three of the statements presented in the Likert style question. Where applicable, the students were also asked to comment about their experience with the WISE Program and to provide any information they felt was important to the evaluation of the Program. Prior to participation in the WISE Program, the majority of girls from the 1997 group (69.4%) referred to their belief that careers in science and engineering are accessible to women and that women can succeed in these fields without having to work harder than their male peers. One quarter of the girls (25.0%), however, did state that there are barriers or obstacles facing women in science. At the conclusion of the Program some different responses emerged. Over half of the girls (51.7%) expressed their desire for a nurturing career or role, which was later reflected in their career goals. The same percentage (51.7%) expressed a greater feeling of confidence after participating in the WISE Program.

The responses of the alternates reflected attitudes similar to those of the 1997 participants. These girls (50.0%) also expressed a belief that science and engineering are accessible to women and 31.3% felt women can succeed in these fields without having to work harder than their male peers. Many (31.3%) do not perceive any difficulty for women when balancing a family and a career.

Finally, 41.7% of the 1994 WISE Participants reiterated the statement that careers in science and engineering are accessible to women. One quarter (25%) of them see no more barriers for women in science than there are for men. Several strong points of the Program are apparent in the responses from this group, since four years have passed since their involvement. They (83.3%) still feel more confident because of their participation in the WISE Program and many of them (50.0%) said that they have a better knowledge of science and engineering and are more familiar with Memorial University of Newfoundland due to the WISE Program.

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