IT'S ALL ABOUT RETENTION

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ABSTRACT

A longitudinal study of young women's career decision making in science, engineering, and technology being conducted between 1997-2000 used focus groups to explore with students their experiences, identify critical elements, discuss strategies, outcomes, and students' suggestions for change. A total of twenty-six focus groups were completed at six post-secondary institutions in Alberta. Participants from 2 year technical diploma programs, 2 year college-based university transfer programs (rural and urban settings), 4 year undergraduate degree programs (rural and urban settings), and masters programs were included. Participants ranged in age and experience from those that had entered directly from high school and were in the first term of their first year to those completing their final year of study. Women who had returned to upgrade their qualifications or to re-train following company downsizing or privatization of government agencies were also represented. From the content analysis of the focus group transcripts the following issues emerged in relation to retention: 1) the importance of practical experience, 2) the influence of teachers, parents, professionals, 3) perception of the learning environment, 4) level of financial support, 5) interpersonal relationships, 6) educational policies. Each issue will be expanded upon and examples of participants' experiences will be used as illustration. Problem areas will be identified for discussion.

INTRODUCTION

Factors such as the environment, the influence of parents, teachers, and peers, sex-role socialization, and heredity shape young peoples attitudes toward certain occupational choices and the illumination of others. Young women's choices are also likely to be influenced by their perception of combining career and family roles (Fitzgerald, Fassinger, & Betz, 1995). For some women, the choice of a non-traditional field such as science confronts them with obstacles such as sexism (Kahle, 1996, Vetter, 1996). This study examined the factors affecting the career decision making of women who were primarily in undergraduate science, engineering, and technology programs.

"I liked science, but now what do I do?" was a common response as participants told their stories or recalled their experiences. Their knowledge of the world of work was limited and

although high schools invited local members from various occupational groups to talk to students they often could not see how that information applied to them.

The pressure to enter post-secondary education following Grade 12 was intense, but how an interest in some aspect of biology or chemistry could be applied in a working role or how the high school curricula was relevant to everyday life was often missing. Participants were afraid of transitions such as the move from high school to college, technical institute, and university, or a move from student to the working role. Perhaps given the lack of knowledge young participants expressed it is not surprising. "Information is not enough: Time perspective, a sense of autonomy, and other elements are essential to the proper use of information" (Super, 1994 p. 72).

Once success in post-secondary education had been achieved the feeling of accomplishment, level of confidence, and a sense of knowing where to go and how to get there was empowering. However, not all transition experiences were successful; the organization of educational programs and the dictates of educational policy were often perceived as adding to participants' difficulties. At times these elements were barriers to participants' ability to reach their goals.

The purpose of this study was to answer several questions that have implications for women's' ability to achieve success in science and science related post-secondary education programs:

1) What influences women's career decisions? What are the critical decision-making times for young women in relation to career decisions and what influences those decisions?
2) Are there factors, which aid and abet young women's progress within post-secondary education settings that can be differentiated from those that are external to it? What is the relative impact of policies from both sources?
3) Does the availability of financial resources facilitate or compromise attainment of career goals?
4) Do the limited number of female role models in science and engineering negatively affect young women's choices?
5) Do factors within science and engineering disciplines play a part?
6) What do non-science and professional fields have to offer that might make them more attractive alternatives?
7) What are some of the factors, which influence young women who start in science careers and opt out?

THEORETICAL APPROACH

Super's theory of vocational development and choice, used as the basis for this study, takes a life span approach to the implementation of the self-concept in an occupation. Within Super's life stages, 17 year olds are likely still in the exploration phase, tentatively reviewing needs, interests, competencies, values and opportunities and doing some initial field selection. They face a transition period between 18-21 years where reality is given greater weight in decision making. Individual competencies, strengths, and weaknesses are taken into account as education and labour market requirements are considered. A generalized field selection is converted to a specific career choice.

Getting started in a chosen field, during the educational process, and into the initial working role, the career choice likely remains tentative as establishment and commitment depends upon work related experiences and opportunities. "Effective choosing presupposes self-knowledge of the critical characteristics of the role being contemplated. Neither is easily attained." (Gouws, 1995 p. 29).

RESEARCH PLAN & METHODOLOGY

A longitudinal design was used in which 26 focus groups were conducted with 123 women enrolled in science and science related programs in Alberta colleges, technical institutes, and

universities. Participants were enrolled in one of six institutions situated in small towns, municipal districts, or cities (under 50,000 residents) and major metropolitan areas (over 100,000 residents). Each institution was visited at least twice within the three-year period between 1997-2000.

Participants were recruited through course instructors, course coordinators, and organizations for women in science and engineering. Their fields of study included: agriculture, astrophysics, biology, biochemistry, chemistry, computing science, engineering (chemical, material, mechanical), environmental science, forestry, general science, genetics and physics. The average group included 5 participants (range 1-10) and the majority were undergraduates in diploma or degree programs. Mature students were represented at all levels.

Two members of the research team (either a male and female or two females) using a written protocol based on literature and the findings from a previous study (Madill, Montgomerie, Armour, Fitzsimmons, & Stewin, 1997) conducted each Focus Group. Guiding questions from the protocol were shared with each participant. Participants were not limited to discussing the issues targeted by the guide questions; they were free to digress and discuss issues that were important to their own career development. The proceedings of each group were tape-recorded, transcribed, and subjected to content analysis.

Content analysis was conducted in two ways: 1) using Vaughn, Schumm, & Sinagub's (1996) procedure where they drew from two qualitative approaches, the Constant Comparative Method (Glasser & Strause, 1967) and naturalistic enquiry (Lincoln & Gubba, 1985), and 2) a review of each transcript with a view to categorizing the issues raised under the seven research questions. Triangulation was achieved by having at least two members of the research team review and code transcripts from the first thirteen focus groups and all members code one transcript randomly selected from the remaining transcripts. Results of this exercise produced acceptable levels of agreement.

RESULTS & DISCUSSION

Practical experience, teachers, parents and professionals, the learning environment, the level of financial support, interpersonal relationships, and educational policies were all issues that had an impact on retention. A summary of these issues along with examples of participant's comments is outlined below.

Work experience was particularly important and both positive and negative experiences were powerful influences in shaping participants' decisions. First hand exposure to a career through working and other life experiences was invaluable. Some technical programs use a career exploration or investigation exercise. Students from these programs who participated in this longitudinal study found this exercise particularly useful *"…I took my pre-tech because I thought I was going to go into respiratory therapy, when I did my career investigation … I realised that wasn't for me"* (1st year Chemistry Technology student).

Participants frequently spoke of family members, parents in particular, friends, people in the discipline/field as important influences in their initial choice of field *" My brother, when I was in Grade 6, chose to go into engineering, so that was my first visualization, understanding what engineering was all about. Also my other sister chose to go into engineering. So I saw a theme there. I thought, well they're related to me. I could do it if they could do it"* (2nd year Engineering student). In the situation that this participant described there should be plenty of reinforcement for this initial choice and a number of resources that are likely to be eager to help her along the way.

The ability to get a job at the end of post-secondary education was particularly important to participants who were in two-year technical programs. Participants in these groups presented a wider range of ages and experiences than others. The majority had entered the workforce directly from high school. Lay offs, down sizing, negative work experiences had led them to "return to school" after several years of full-time employment. These mature students were often returning to science as it was something they had always wanted to pursue. Unlike younger students, they described themselves as being focused, committed to successfully completing their program, and knowing where they were heading. A finding similar to that reported by the Canadian

Undergraduate Survey Consortium (Walker, 1999). *" I worked in offices for 4-5 years, and I didn't like it. There was missing something [sic], but I did not know what …[before working] I had already begun in sciences, but I had left school and went back to accounting because my father used to always think, "What are you going to do with sciences? You're just wasting your time. Business is what it's all about." So when I decided to go back in teaching, I had to choose what I want to go teach [sic]. I decided to go back to Sciences, because that was my initial love, so I'm back.*

Difficulty combining studying and working roles was a repeating theme, not simply for mature students with dependent children, but for young women in their second year and beyond. Honours programs are only available to full-time students, as are the limited number of scholarships and bursaries beyond the first year. Course loads in for honours science programs require students to handle the equivalent of 10 courses. Each course can have lecture, seminar and laboratory components, making a very heavy load when part-time work has to be included. Participants could see no academic reason for this timetabling other than tradition. The stress of unreasonable work loads, large classes in the early years, repetition of high school material in general science programs, an unreasonable number of mandatory or required courses in the early years, a lack of application to those practical issues that had initially attracted participants to science were all seen as elements which detracted from the university experience.

Participants from the two-year technical programs were also critical of the unreasonable workloads. There did not appear to be any relationship between on-the-job demands and the requirements of these educational programs. Funding envelopes and other government incentive programs most likely influenced program development and format. Students needs appeared to be secondary. Overall smaller classes, shorter courses, and participants' belief that they would be employed at the end of these program made it possible for them to endure the process.

Although participants in college programs consistently spoke of the advantages of small classes they expected to, or had encountered difficulty transferring credits from college to university. Students expressed their frustration about losing valuable time and money because of a lack of continuity among post-secondary programs. Wherever this problem arose, and whatever the reason given by a college or university, it was the student who ultimately suffered.

The negative effect of large classes and the perception of an impersonal atmosphere at Alberta's research-intensive universities had a powerful impact on participant's choice of institution. Participants consistently referred to the difference between the expectations at high school and post-secondary levels and the prospect of the transition from high school to university as overwhelming. Many spoke about feeling more comfortable attending a college or university college as a 'stepping stone' towards university. *" No, the Chemistry program here [college] is far better than the Chemistry at [university] because its more intimate. The one-to-one instruction is the class is really helpful. I understand the concepts better now. I understand why I'm doing things in the lab … it's hard to learn in classes of 400 students. If you don't get to know the instructor well you're just a number … you really struggle to get help … there's an open door policy here"* (2nd year Chemistry, college student).

Financial concerns were consistently reported as a problem regardless of the institution, level of student, or program. Provincial scholarships and bursaries at the completion of Grade 12 enabled participants to enter post-secondary education, but these did not continue in subsequent years and students found themselves forced to rely upon student loans. The student loan program was perceived to be inequitable. If funding was obtained the amount was unrealistically low when the market value of accommodation in all centres was combined with the high cost of tuition and books. In 1999, the mean debt load for Canadian university students with student loans was $13, 322, but the reported debt ranged from $0-$85,000 (SD $10,002) (Walker, 1999). A saga of problems with students loans, employment insurance, and retraining allowances were presented by participants throughout the province. Participants perceived that they were penalized for working in the summer when gross rather than net earnings were factored into their eligibility for a student loan in the following fall and winter sessions. Having to live on ones summer earnings during the summer was not taken into account.

With an over-supply of student labour in the summer and an under supply in the fall and winter employers and students would benefit from students being able to combine part-time working and part-time studying roles throughout their programs. As work experience was a

powerful factor in confirming field choice, the expectation that working and studying roles should be combined could go a long way to increasing students' knowledge of the world of work *"Oh yeah, I'm really glad I went to co-op … because I know kind of what I want. Although a lot of my experience has been more in labs, I've been able to see what people do and just know what I don't like working in certain environments"* (4th year Engineering student).

Mature students reported having to drop out mid-way through a course due to lack of funding, work in unrelated fields, and then try to return later to complete requirements. By the time they had been able to do so, those requirements had frequently changed. Employment and financial issues were the primary reasons students gave for interrupting their studies at Canadian universities (Walker, 1999). *"I have a degree from … Microbiology, and when I graduated there were no jobs, so I had to work in retail to get myself out of debt from the student loan I had. That took me two years"* (2nd year Chemistry Technology student).

Post-secondary education, regardless of the level or institution, appears to be stuck in a program delivery model reminiscent of the 60's and 70's when a full-time studying role was the norm. That is no longer the case and science programs must change to accommodate part-time studying and working roles at all levels.

Young participants at times appeared to resent being asked to address issues related to gender differences in science and science related programs. Their expectation was that women might have encountered difficulties in the past, but not now. Participants in technical programs and those at other levels, particularly where co-op programs or summer field work was part of the requirements, had frequently encountered gender inequity, issues bordering on harassment, and different expectations from instructors. Participants in technical programs were more likely to be concerned about how women would be treated in their field once they were employed.

It was apparent that young women enter post-secondary education with the expectation that they will be treated equally, it is once into their chosen field that they encountered gender inequity. *"I love the work outside, and I got a lot of work experience last summer … I qualified for a scholarship and then the scholarship amount went up [but having signed a contract initially, the additional money was then used to hire someone else] That happens a lot. They [profs] want you to get money for them. If your project qualifies, you're doing a good enough project. You qualify for funding and they want it. That's been my experience. That totally turned me off grad school"* (4th year Environmental Science student)

As noted previously, the need to pursue their studies as full-time students has created difficulties for participants regardless of level or institution. Participants were frequently concerned that their status as young female professionals would be detrimental to either securing a position, or a promotion, or being eligible for further training. Although participants considered the combination of a career and family the norm, they were not prepared to admit to any desire to marry or have children when it came to job interviews for fear that this would be seen as a handicap in science and engineering.

Young participants in science stressed their need to see the application of what they were learning in chemistry, physics, or biology. They could not understand why first and second year courses [some even mentioned high school courses] could not be applied to issues that were currently affecting everyday life. Remaining within science, but changing to fields such as environmental science, environmental biology, and genetics was common. Many students in pre-professional programs such as pharmacy and medicine indicated that they had been attracted to these careers through personal experience and wanting to help others. *"I found that one of the really appealing things about the geology course I took was that they had this field trip, and it does feel more like a program where you're going somewhere … hands-on … that was really neat, too, because you got to know a bunch of people, it was more of a networking thing. That was really useful, and I wish they had that in more of my other courses that I'm taking and also it gives you more of a feeling of where things lead. So I found that very useful"* (2nd year General Science student).

Finances again played a part in mature students having to drop out. Length of programs in science and medicine were often seen as a deterrent and more affordable, shorter alternatives such as those offered in technical or college programs were perceived as achievable. Being able to obtain a job after graduation, exposure to science related opportunities, poor initial levels of understanding about the field, and a lack of interest in the subject matter led to changing their

area of study. *"When I applied, I had every intention of going into Science. Philosophy and things like that, it was more of a side interest, but because of WISEST I ended up in Philosophy, which is good. It wasn't that the WISEST experience was a negative one, but I realized what about science that interested me was more the ideological sort of bigger picture, of which Science provided a part"* (4th year Philosophy student, WISEST Summer Research Program participant).

The results of this study suggest that practical experience, teachers, parents and professionals, the learning environment, the level of financial support and educational policies all impact on young women's career decisions. The critical decision making points for participants in this study included their final year of high school and their study related work experiences. Factors affecting participants' progress in post-secondary programs included the difficulty students' experienced combining the studying and working roles. This was not simply a problem for mature students with dependent children, but also for young women in their second year of study and beyond. Participants continually reported that the transition from high school to post-secondary education was difficult. Unreasonable work-loads, large classes and the number of mandatory or required courses in the early years, repetition of high school material in general science programs, and a lack of application of what was being learned were all seen as elements which detracted from the university experience. Advantages of two-year technical programs were smaller classes, shorter courses, and participants' belief that they would be employed at the end of the program. Financial concerns were consistently reported as a problem regardless of the institution, level of student or program. Competing interests and the ability to see the application of what is being learned make science-related, professional fields attractive alternatives at any time for students in general science.

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