THE NATURE OF LEARNING IN COOPERATIVE EDUCATION IN THE APPLIED SCIENCES

by

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Abstract

Co-operative education continues to gain popularity as an alternate mode of education, yet little is understood about the nature of the learning that occurs during the co-op work placements. This study seeks to better understand the nature of co-op learning by examining the experiences of three kinesiology co-op students completing a work placement with the Sunny Hill Health Science Centre for Children.

A qualitative case study approach is taken which includes video-taped observations of the students at work, informal discussions with them over the course of the workterm, and an in-depth interview session. The data are analyzed and interpreted with respect to some of the recent literature on employability and learning in practical contexts, with particular reference to the works of Schön, Lave and Wenger, and Vygotsky.

The co-op term presented many opportunities for learning, including the application of previous academic learning from the campus-based program in kinesiology. There was also much new learning that emerged, some of which can be described in terms of the "Employability Skills," such as developing effective teamwork and personal management skills, flexibility, etc. Other aspects of the learning that took place during the co-op term are best characterized as aspects of performance, or the "art" of practice, such as managing the unexpected, and focusing on and responding to key issues. Much of this learning occurred through the process of problem solving, which required students to identify and sometimes reframe problems through reflection on their practice. Through the students' interaction and dialogue in the work setting, problems emerged and various solutions were formulated.

General categories emerging from the analysis pertain to *what* was learned during the placement, and *how* this learning occurred. These are presented in the thesis as a series of "learning events," or interpretations of the stories told by the students as they reflected on their co-op workterm.

Dedication

This thesis is dedicated to my husband Joel who has been supportive and understanding when we have both, at times, been over committed and to my five year old daughter, Carling, who will no longer have to wake up Saturday mornings and ask "Mom do you *have* to work on your thesis today?"

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Chapter 1
Introduction and Purpose of the Study

Learning in the applied sciences assumes, by its very name, the application of basic science knowledge and skills to specific practices and problems. Co-operative education programs are seen as key ways of facilitating the connections between academic and "real world" applications. While a body of contemporary research exists in the area of "learning professional practice," as well as more recent work determining and defining "employability skills," learning in co-operative education experiences is not well understood. This study investigates the nature of learning in an applied science co-operative education practicum in kinesiology.

The broad purpose of this study is to better understand and articulate what and how learning occurs in co-operative education experiences. Accordingly, the theoretical framework of the study draws upon several perspectives regarding learning in practical contexts. These perspectives include ideas about reflective practice (Schön, 1983; 1987), situated cognition and legitimate peripheral participation (Lave & Wenger, 1991), and the zone of proximal development (Vygotsky, 1978). These theoretical "lenses" are used to examine a number of activities undertaken by three kinesiology co-op students in their work setting. The learning that takes place in this situation is analyzed in terms of the selected literature on learning practices. While my primary purpose in this study is to better understand the co-op student's learning, I also derive implications for improving the quality of the co-operative education curriculum and policies at Simon Fraser University, and thus for better articulating the nature of co-operative education within the framework of post secondary education.

Background

This study of co-operative education in the applied sciences takes place against a background of significant change, one in which the education system in general has been

encouraged to become more responsive to society's needs. Over the last few years, there has been considerable public debate regarding the role of universities in preparing students for the world of work. Pressures from society and the economy precipitated a call for reform within the educational system, and key among the concerns is the "adequacy of the university education for obtaining employment" (Smith, 1991).

Co-operative education (co-op) programs offer practical experiences in a variety of work environments bridging the gap between university and workplace learning. They have been steadily growing in Canada over the last decade. Co-op programs are currently seen as a beneficial mode of learning for both students and employers in terms of such desired outcomes as increased employment and earnings, informed career choices, opportunities for recruitment and enhanced academic curricula, and access to new technologies, ideas and skills (Human Resources Development Canada [HRDC], 1994, pp. 48–9). This mode of education has received much attention of late, with several recent government reports encouraging the integration of co-op terms into academic programs (HRDC, 1994, BC Labour Force Development Board, 1995). Despite these calls for growth, the nature of learning in co-operative education is not well understood (Ricks, Cutt, Branton, Loken, & van Gyn, 1993). Perhaps in acknowledgment of this is the added recommendation of the 1995 BC Labour Force Report that co-op growth needs to be "accompanied by stronger measures than currently exist to assure the content and quality of learning that takes place during co-op terms and work experience periods" (BC Labour Force Development Board, 1995, p. 46). The co-op research that exists does not focus on learning. In the absence of an understanding of the nature of co-op learning, assuring its quality and content is problematic.

> In empirical studies of co-operative education investigators have determined that "something happens" to students enrolled in a program called co-operative education. In these studies co-operative education is often undefined or inadequately defined, and how it works is not explained. This absence of operationalized concepts and operational models or frameworks for co-operative education means we are left with a half century of "black box" research. Typically this research examines students when they come out of the black box. (Ricks, *et al.*, 1993, p. 11)

Given the concerns regarding the content and quality of learning in co-op, the lack of "theoretically" based co-op research, and the projected growth of co-operative education, there is certainly a need to develop better understandings of the character of learning taking place in these work settings, and the role it may play in one's overall education.

Current Perspectives on Education and Employability

While the future economy and the vocational prospects of graduates may not be the major concerns of universities, they are essential issues of many stakeholders who influence the university through public policy and governance: students, taxpayers, governments, and employers (Evers, Krmpotic, Rush, & Duncan-Robinson, 1993). A portion of *The Smith Report* (Smith, 1991) focused on graduate and employer surveys in order to investigate educational and training experiences of university students and graduates in Canada. Chief among the findings was a "growing frustration in students and employers for the universities to become more practical" (Anisef & Baichman-Anisef, 1991, p. 45).

One response to a growing concern for relevant and practical public education has been the promotion of an *Employability Skills Profile* (ESP) developed in 1992 by the Corporate Council on Education (a program of the National Business and Education Centre of the Conference Board of Canada). The Council, comprised of educators and representatives from business and industry, serves as a catalyst to engage business and education in partnerships that foster learning excellence to ensure that Canada is competitive and successful in the global economy. ESP is a compilation of the "critical skills" required for the emerging Canadian workforce.

ESP advocates a way of thinking about fundamental skills for employability, including critical thinking, problem solving, responsibility, open-mindedness, flexibility—attributes that public education ought to develop in students. It is reasonable to expect that such skills are learned through co-operative education experiences. In fact, various critiques have suggested that it may be unwarranted to expect generic skills and dispositions to be acquired outside the

practice setting itself (Lave & Wenger, 1991; Schön, 1983). These critiques are discussed in detail in Chapter Three.

This discussion is particularly relevant to the applied sciences, which tend to be organized by the university in terms of their disciplinary knowledge in the basic sciences. Learning an applied science in the generalized, decontextualized and often abstract settings provided by traditional universities is considered by many researchers to be quite different from learning in professional practice (Layton, 1991). As Layton notes, "teaching the science *of* application is not the same as teaching the science *for* application" (p. 16).

In response to the issue of preparation for employability, recent themes in education policy documents and discussion papers in Saskatchewan, Ontario, New Brunswick, and British Columbia have focused on better education and training through vocational and technical education and workplace experience programs (Kozolanka, 1995). While schooling allows one to study practice, learning to practice must occur in places where the practice occurs (Yinger, 1990).

Perspectives on Education and Learning

Traditional university education is modeled after disciplines, both "pure" (e.g., biology, physics, mathematics) and "applied" (e.g., engineering, medicine, kinesiology). The role of the university has been generally perceived as one which is designed to enrich the minds, characters and dispositions of its students through the development of such attributes as respect for evidence and the pursuit of truth, critical analysis and reasoning, problem solving, creativity, initiative, responsibility, rationality, integrity and personal ethics. While the academic emphasis on the development of these attributes varies across the disciplines, these objectives are nonetheless often reflected in a university's overall "vision" or "mission" statement. According to Holmes (1990), "The central purpose of education in all societies at all times is to produce the kind of people most valued in that society" (Jackson, 1994, p. 53). Holmes sees education broadly serving six general purposes:

i) an intellectual/academic purpose

ii) a cultural (aesthetic) purpose

iii) a social purpose

iv) an expressive purpose

v) a moral and spiritual purpose

vi) a vocational and economic purpose

Holmes states that it is in the "blending and reconciling of the insights and truths" of these different, and often competing, goals that lies the deeper and richer understandings of education. This is the broad perspective on the role of post secondary education which is taken in this study, and within which the learning occurring through co-op education will be conceived.

The learning that is the focus of this study is thought of as being both a process (Schön, 1983) and a product (The Conference Board of Canada, 1992)—a phenomenon which is often difficult to see in progress or to recognize as an outcome. Within the traditional academic model, learning is more difficult to observe than is the teaching which invokes it, and content more readily articulated than the process. In contrast to the traditional academic experience, learning in less formal settings, such as the workplace, do not have a defined "curriculum" taught in a logical sequential order, but rather a series of opportunities for learning which emerge as learners become increasingly engaged in their work. It is therefore more difficult, if not impossible, to separate product from process and to measure the learning that occurs through engagement in various aspects of practice.

In most co-operative education placements students experience both a change in how they think about something as well as in their ability to do something. In this study, the students are engaged in anthropometry (the measurement of human physical dimensions including height, weight, girths, bone lengths, fat and lean body mass etc.). Their work also requires a host of other competencies, including the ability to work as a team, to work with children, to conduct applied research, to communicate effectively, to name a few. Even within

the single focus of the work experience studied here, it is clear that looking at the nature of learning in its broadest sense is challenging, and we are left with the question that drives this investigation: *What* is learned in a particular co-operative education experience, and *how* does this learning occur?

Framing the Research Problem

The context of the study would be incomplete without stating why such a question is of interest. With the growth of co-op education in recent years many practitioners have become interested in exploring ways of better facilitating and ensuring that a positive learning experience occurs for co-op students. As a co-op co-ordinator interested in the learning that occurs through co-op, I have been working with a small group of co-op directors from various BC institutions, formulating a grant request to support the design of a "bridging" curriculum to assist first-time co-op students entering the workplace.

At the start of our discussions, one of the directors had a clear vision of this curriculum that involved the development of a skills matrix comprised of generic employability skills as well as discipline-specific employability skills. These would be presented in a logical, sequential order and acquired as one progressed through the co-op work terms. The idea was that students and co-ordinators could then clearly see the skills needed to successfully complete co-op placements and would work towards having attained a specified level of mastery in each prior to completing co-op. This concept pre-supposes that one could identify all the relevant skills, then teach/learn them, and finally measure appropriate and acceptable mastery. In fact, these assumptions are highly problematic and, through the course of our discussions and a change in the composition of the grant proposal committee, the direction of this proposed curriculum has changed significantly.

When asked about the desired goals of this proposed curriculum, the practitioners in the group noted two main outcomes:

i) that students have broadened their understanding of the concept of learning beyond the dominant model presented by traditional education. (i.e., they see learning as more than the simple application of the general scientific principles they have been taught in school and appreciate that these are also valuable skills.)

ii) that students are more responsible for their own learning and become active participants in it. (i.e., they see the workplace as presenting endless opportunities for learning and actively seek to engage themselves in those).

Both of these outcomes require a new way of thinking about learning in the workplace. Perhaps preparation for employability involves more than identifying and labeling relevant "skills" that can be taught in advance of workplace experience. Perhaps there is an acknowledgment by practitioners that these skills cannot easily be separated from the situation in which they are practiced. Rather, what is critical is the ability to recognize the opportunities for learning these skills that are presented through engagement in various activities in the work setting itself. Further, the outcomes cited reflect a concern that experiential learning events need to be recognized and valued as part of the overall educational experience of the student.

My interest is in understanding the learning taking place in co-operative education. Yet, there is scant literature on the nature of learning in co-op placements that would be helpful in achieving this goal. Based upon my eight years of experience as a co-op co-ordinator, including many discussion with colleagues, I believe that university educators in the co-op area have often been left to administer a "student placement" process, with little understanding of how best to support or facilitate the learning taking place. With a better conceptualization of the learning in co-op, resulting practices, curriculum, and policies would support not only an administrative function but also an educative one. Practitioners would be better able to ensure the educational quality of the work experiences and appreciate the place of these experiences within the co-op student's overall university education.

The Problem and Research Questions

Much of the co-operative education research has been concerned with employability outcomes and other measures of the "success" of its graduates, including greater initial earning

potential, increased self-confidence, better academic performance, and greater satisfaction with education and work (Review of Post Secondary Co-operative Education in BC, 1992, pp. 3–8). However, little has been done to examine the nature of the learning experienced by co-op students that leads to these positive outcomes. The assumption is that through experience one learns what is needed to work effectively in a given environment, implying that it is obvious and unproblematic. "While there is an implicit acknowledgment that actions and performances can be learned through or by experience, there is little understanding of how this comes about" (Russell & Munby, 1991). There is also a question of exactly what is learned. Is it simply an opportunity for students to apply their formal learning in a work environment, or is there new learning occurring as well?

The Research Problem

The rapid growth of co-operative education programs, and our limited understanding of the nature of the learning experienced therein, pose important practical challenges. Although not all of these challenges are addressed in present study, there is a need to consider issues of effective co-op program delivery (including student preparation), transitions between school and work and vice versa, and liaison with business and industry. There is also a need to consider how co-op programs can be supported by appropriate policies regarding the positioning of co-op within the broader educational experience. At the root of these challenges—and central to this study—is the lack of a model or conceptualization of the learning that occurs in co-op education.

This study seeks to develop an authentic conceptualization of the learning which occurs in a particular co-op situation—the experience of three co-op students in an applied science placement in kinesiology. Observations of the students working, and subsequent discussions of their experience their supervisors and the investigator provides the events from which this conceptualization is developed. Concepts from the work of Schön (1983, 1987, 1990), Lave and Wenger (1991) and Vygotsky (1936) are used to describe and understand the

learning events taking place in this co-op setting. In particular, Donald Schön's (1983, 1987) ideas about reflective practice and professional education serve as a perspective on the way in which individuals "frame and re-frame" the messy, poorly defined problems of practice. Lave and Wenger's (1991) work on situated cognition and "legitimate peripheral participation" further explicates the dynamic of learning in action, and expand individualistic ideas of learning to considerations of "communities of practice." Finally, Vygotsky's (1978) concept of the "zone of proximal development" helps to understand the conditions for learning taking place between accomplished practitioners and novices. Research in the area of education and training for employability (e.g., Branton, 1991; Campbell, 1994; Evers, *et al.*, 1993; Porter, 1991; The Conference Board of Canada, 1992) will further inform the discussion. Consideration will also be given to the implications for research and practice that may be drawn from this understanding.

Significance of the Study

While most research involving co-operative education examines its economic value with respect to employability, repeated testimonials (from business, industry, and co-op graduates) praise co-op for its role in developing work-relevant attributes in students and creating linkages between the university and business communities. Few, if any, studies have focused specifically on the nature of the learning that occurs through these experiences, or examined the co-op curriculum, program, and pedagogy, as these relate to the broader educational experience. In fact, a "careful examination of the co-operative education literature reveals limited theorizing of co-operative education altogether" (Ricks, *et al.*, 1993, p. 7). This study moves the co-op research in three new directions. First, it utilizes a qualitative approach which has not been apparent in co-op research. Second, it exposes elements of co-op education to recent theoretical, operational, and research advances from the field of education. Finally, it also attempts to create a way of looking at the learning in co-op, a subject that has been left largely unexplored in co-op research.

Preview of Study

This study seeks to develop a conceptualization of the nature of the learning in co-op education in the applied sciences. It begins with the premise that important learning occurs through the co-operative mode of education and that a better understanding of this learning will enhance the ways in which the institution situates and supports these experiences. The challenge is to explore this in a way that is educationally significant and yet practicable in terms of the resulting interpretations and recommendations.

This study is presented in six chapters. Chapter One has introduced the background to and significance of the study by examining current trends in education and employment, and introducing relevant perspectives on education and learning. Chapter Two introduces current thinking related to co-operative education and employability. Chapter Three reviews a theoretical literature related to learning. The research method is described in Chapter Four. This is followed by an in-depth presentation of the research data and analysis in Chapter Five. Conclusions, limitations and implications for practice and research are drawn in Chapter Six.

Chapter 2

Current Thinking Regarding Co-operative Education and Employability

Chapter One established the significance of this exploratory study of learning in co-operative work placements. This chapter defines co-operative education in the post-secondary education context, introduces the *Employability Skills Profile*, and examines the research surrounding co-op and employability.

Co-operative Education Defined

> *A Co-operative Education Program is a program that formally integrates students' academic studies with work experience in co-operative employer organizations. The usual plan is for the student to alternate periods of experience in appropriate fields of business, industry, government, social services and the professions according to basic nationally articulated criteria.* (Canadian Association For Co-operative Education Directory, 1994)

Each work situation is developed and approved by the co-op institution (college or university) as a suitable learning situation. These judgments are institution specific and may be guided, as is the case at Simon Fraser University (SFU), by a set of expectations and responsibilities outlined in the Employer Handbook. The co-operative education student must be engaged in productive work rather than merely observing, and receives remuneration for the work performed. The student's progress on the job is monitored by the co-op education institution and is supervised by the employer. The student's performance on the job is evaluated by the employer and a student written work term report is submitted to the employer and institution for review at the completion of the placement term.

The total co-operative work experience is normally 50% of the time spent in academic study and in no circumstances less than 30%. Standard work terms are four or eight month periods of full time paid work, however in response to the increase in non-traditional work arrangements now prevalent in business and industry some variation exists (e.g., modified

workweeks, flex time, part-time and contract work, etc.). At Simon Fraser University students must complete a minimum of four co-op work terms (each usually equivalent to at least 13 full time weeks in duration), before the end of their final academic term in order to qualify for a co-op designation on their degree. Co-op terms must be taken during different semesters (i.e., students cannot elect to do only summer co-ops) and students usually do not spend more than eight months at any one placement.

A Brief History

The first North American co-operative education program was established at the University of Cincinnati in 1906. It was not until 1957 that Canada, through the University of Waterloo's engineering faculty, adopted this model. Only in the 1970's and 1980' s did co-op start to become a more prevalent educational strategy in Canada. Published research has largely focused on the effects of co-op on the personal and career development of students (Ricks, *et al.*, 1993) and it has been established that co-op programs have a significant positive influence in a wide range of areas including marketability, academic achievement, job satisfaction, transition from school to work, and earning potential after graduation (Branton, Cutt, Loken, Ney, Ricks, & van Gyn, 1991; HRDC, 1994; Petrysack & Toby, 1989; Porter, 1991).

There are about 50 years of co-op research, the most recent of which focuses on the economic value of co-operative education as it relates to employability (Branton, *et al.*, 1991). This research and repeated testimonials from business, industry, and co-op graduates have long acknowledged co-operative education for its role in developing skills relevant to employability in students. As stated, few studies, have focused on the nature of the learning that occurs through these experiences, or examined the co-op curriculum, program, and pedagogy, particularly as it relates to students' academic programs and conceptualizations of learning in professional practice (Ricks, *et al.*, 1993).

In the last ten years (1984/85 to present), co-operative education in Canada has experienced tremendous growth both in terms of the number of institutions involved and the number of participants. In 1983/84 a total of 43 colleges, universities and institutes had co-op programs. Recent Canadian statistics, (1992/93), show 141 institutions offering co-op programs. This represents over 230% growth in co-op institutional participation over the last nine years. Student enrollment similarly grew from nearly 26,000 in 1984/85 to approximately 53,000 in 1992/93.

In British Columbia, the growth in co-operative education is even more striking when the number of secondary schools involved in co-op type programs is considered. Currently, 30 hours of mandatory work experience are required for secondary school graduation in BC. SFU has the fourth largest co-operative education program in Canada (following the University of Waterloo, l'Université de Sherbrooke, and the University of Victoria) with some 1550 student placements per year. It is intended that the co-op program at SFU will continue to grow in both breadth and scope (President's Committee on University Planning [PCUP], 1996). Over 60% of the total SFU co-op placements are currently represented by the Faculties of Science and Applied Science, with the majority from the Faculty of Applied Science.

The Positioning of Co-operative Education at SFU

The co-operative education program at SFU is administratively responsible to the Vice-President Academic. It operates under a central administration and director, with each discipline area served by specific co-ordinators and support staff. Some co-ordinators and programs are physically located within the discipline areas they serve while others, usually due to lack of space within the department itself, are centrally located elsewhere in the university. As a result of their particular locations, the number of disciplines served by each, and individual work styles, the co-op co-ordinators have developed varying relationships with their faculty members and departments. Some co-ordinators have minimal contact with faculty

and their departments of reference, while others are active members of working committees and fully integrated into departmental activities (e.g., undergraduate curriculum committees). In the areas of applied sciences at SFU, the latter is more the case.

Co-op education at SFU grew out of an initial group of 16 students in the School of Computing Science who registered for practicum courses designed to integrate applied, real life experience with their studies. From this small group in the mid 1970's, the program grew and became formalized. It has gained increasing support from senior administration, and in recent documents produced by the PCUP, co-op education is seen as a "flagship" at SFU and has been cited as an area recommended for growth and development (PCUP, 1996).

Co-operative education at SFU is seen by practitioners as a complementary mode of education which provides students with opportunities to learn new skills and to operationalize and inform their academic knowledge in a variety of discipline-related work environments. In so doing it provides a transitional service to students with respect to preparation for the world of work.

Policies Governing Co-operative Education at SFU

Co-operative education programs are accredited nationally by a committee of the Canadian Association for Co-operative Education. This committee strives to assist in the creation of high quality co-operative education programs across Canada. Accredited programs demonstrate adequate levels of institutional commitment, appropriate co-op curriculum and student preparation, and policies and procedures consistent with national guidelines. Locally, co-operative education programs are guided by the policies and procedures of their institution as outlined in the university calendar and in student and employer handbooks.

Admission to the program is determined by program co-ordinators and normally requires the student to have completed between 30–60 credit hours and have a minimum GPA of 2.5 or greater (some Faculties require GPA's higher than 2.5). Students are also encouraged to complete an eight week career preparation course to develop their understanding

and skills in the areas of resume writing, interview skills, the current economy and work environment, workplace communications and behaviour, business writing, presentation skills, and business ethics. Co-op co-ordinators assist with further education and preparation in these areas as needed.

Once placed, co-op students must register for the appropriate practicum course, satisfactorily complete their work term, and submit an acceptable written work report (evaluated by the work supervisor and co-op co-ordinator) in order to pass the practicum course in which they have registered. All students must complete four work terms (five in Chartered Accountancy option) in order to qualify for their co-op designation. Students may be failed or withdrawn from the co-op program if they fail to report to the employer once placed, leave an employer without co-ordinator permission, are dismissed with cause, or receive an unsatisfactory performance evaluation (submitted by the employer). An employer will be withdrawn from the program for failure to provide appropriate work, training, or supervision, failure to provide pay for services as agreed, or failure to meet with co-ordinator/program expectations. Any student appeal regarding a practicum pass/fail grade may be exercised in accordance with the established academic appeals process outlined in the university calendar.

During their workterm students are considered an employee of the placement agency; however, they also retain their full-time student status while on a co-op placement. Students may, with the approval of their co-ordinator, register for limited academic coursework while on a workterm providing it does not interfere with their paid work. All co-op programs at SFU, with the exception of Engineering Sciences, are optional.

Employability and the Skills Profile

Most of the current literature related to employability speaks about developing "skills" or "skill sets" in particular areas of performance (Beck, 1991; Campbell, 1994; Canadian Chamber of Commerce, 1989; Handy, 1994; Green & Seymour, 1991). This tradition,

which is rooted in the notion that there exists a generically definable decontextualized set of "skills" that can be "taught" to enhance employability, may be limiting. However, it is nonetheless important to understand the language and thinking currently dominating the area of employability "training," and by extension, co-operative education.

The *Employability Skills Profile* (Appendix I) is a recent and visible example of this language and thinking. It was developed in 1992 by the Corporate Council on Education of the National Business and Education Centre of the Conference Board of Canada, to provide a framework for dialogue and action involving Canadian business and education leaders. The profile is intended to outline the academic, personal, and teamwork skills which form the foundation of a "high quality" Canadian workforce, both for the present and the future. These are described as the generic skills, attitudes and behaviours that employers look for in new recruits and which are developed through training programs of current employees.

The Council believes that "employability skills are developed in school and through a variety of life experiences outside school. The student, the family, and the education system, supported by the rest of society, share this responsibility" (The Conference Board of Canada, 1992, p. 1). They state that the skills listed in the profile are consistent with the general educational goal statements of the provinces and territories, and through the profile, hope that "drawing attention to skills necessary for employability can enhance a school's effort's to meet its other goals and objectives" (p. 1). The profile includes such things as communication skills, thinking skills, learning skills, positive attitudes and behaviours, responsibility, adaptability, and skill in working with others.

The *Employability Skill Profile* is an attempt at providing a way for people to "talk about" those content areas which are foundational to the workforce yet apparently less so to the formal education system. It attempts to constitute that "other" part of learning into "skills" that can also presumably be taught. The question to be examined through this investigation will necessarily look at whether this "skills" language and its implicit conceptualizations of learning adequately describe the learning that occurs in co-op workplace experiences. Many

recent discussions on co-op learning such as those referred to earlier regarding curriculum design, seem to point towards the need for a change away from the often quoted definition of co-op as simply "the opportunity for students to apply the skills and knowledge they learn in school in real life work situations". Co-op practitioners, students and employers have long known that the experience provides much more than that, but little has been done to articulate the "much more than that" beyond the notion of "employability skills."

Current Thinking and Research on Co-op Education and Employability

Much of the skills-based language utilized to talk about facilitating employability is also typically used to describe the learning seen in co-operative education. While the research and literature on employability provides a sense of the attributes that have been linked to success in the workplace, these employability skills, in their decontextualized form, tell us very little about how they are developed.

Evers *et al.* (1993) conducted a three-year longitudinal study investigating the education and training experiences of Canadian university students and graduates. They investigated "the skill development process" as a follow-up to an earlier phase of the research which investigated the adequacy of university education for corporate employment. This follow-up study focused on four base components of "skill competence" derived from their earlier work—those of mobilizing innovation and change (conceptualizing and initiating change), managing people and tasks (planning, organization, co-ordinating , and completing tasks), communicating (gathering, integrating and conveying information effectively), and managing self (developing practices and routines to maximize one's ability to deal with uncertainty and change). Included in the research was an examination of where respondents felt they had developed their skills as well as a comparison between co-op and regular students with respect to perceived competencies in the four base components.

Co-op students and graduates consistently gave themselves lower scores for all four components than did the students and graduates from regular programs. Interestingly the

industry managers of the co-op graduates did not rank these students lower. Evers *et al.* suspected that the differences are perceptual due to the exposure that the person in the co-op program has to the working environment. Additionally, they noted that some of this perception may be due to the "humbling" effect of the workplace. Perhaps the workplace was humbling because it valued contextualized understanding. The decontextualized skills and knowledge that students felt they had acquired through school needed re-construction in order to become useful or make sense in the new environment. Work placements may present co-op students with opportunities to play with and construct various skills and understandings that are valued in that environment. The students soon become very aware that their academic education and training needs work, while non-co-op students remain confident in their decontextualized, and yet to be tested *in situ*, knowledge and skills.

Feedback from graduates in the study indicated that "on the job experience" was the clear primary source of skill development for all four composites. "It is striking," the researchers note, "that a significant part of their portfolio of skills is being developed outside the formal education and training system" (p. 35). Because formal education received little acknowledgment from graduates regarding its usefulness in skill development, the researchers looked further into the type and amount of training the respondents had received. Even those who indicated they had training in school for the component areas, did not rate this contribution highly. Evers *et al.* explain that even training most closely related to the skill composites may not deal directly with skill development but be knowledge based. Again, there is a need to better understand how these skill composites are learned, or indeed *what* is acquired when confidence in performance is improved or put into perspective by co-op students. The importance of the context of the learning is clearly a key consideration.

Evers *et al.* also noted in their findings that the skills most in demand by managers were also those shortest in supply. In particular the skill composite "mobilizing and initiating change" illustrated the gap between supply and demand. Such skills as visioning, creativity and innovation, and leadership were cited as needing greater attention, as well as managing

conflict and taking risks. Again the researchers conclude that "we must encourage education that nurtures these skills...and enhance traditional university education with more practical experience and expanded job training" (p. 51). They see a need to focus more responsibility on the learner to take ownership to develop their skills and for educators and others to think of the learning space as much broader than the formal system. Perhaps too, one may need an expanded notion of what learning is, and how it occurs, beyond the formal system.

Evers *et al.* (1993) conclude that "skills development, as measured by the changes in the participant's self-perceptions of their competence, appears to be linked to the changing experiences which these participants faced" (p. 57). This is most evident, they note, between school and work when people leave the role of students for that of employee. They also find that the "hard," or technical skills are largely developed through university and on-the-job experience, but it is the "soft" skills cited in their four composites (as well as in the *Employability Skills Profile*) which are becoming increasingly valued, and which are "not being developed through university courses to any great degree" (p. 59). They call for an expanded notion of skills acquisition that acknowledges influences beyond formal education and training.

These findings, while supportive of the "skills talk" in general, begin to address little more closely the notion of skills and their acquisition. Evers *et al.* speak about two kinds of skills: the "hard," technical, knowledge-based skills we can learn from school, and the "softer," behaviours or attitudes that seem to be acquired through a variety of experiences, particularly in the workplace. They acknowledge the importance of on-the-job experience but do not describe what, why, or how it is that this experience seems to provide such a rich source of learning. Perhaps the most interesting observation these two researchers make is a comment regarding the sources of skill development as stated by graduates. The researchers note that the role of university courses diminishes in overall importance over time (in terms of their contribution to skill development) and once on the job, graduates appear to place increasing value on learning by doing. As well, in retrospect, participants indicated that

experiences prior to university also had a significant impact on the development of certain skills. Evers *et al.* comment that "this retrospective is illuminating but should be interpreted with caution....we know the 'sense making' that goes on when one is asked to reflect on things in the past. This sense making might *distort* reality" (p. 33). Perhaps in fact this sense making through reflection helps to construct a new reality.

The above delineation between "hard" and "soft" skills, and The Conference Board of Canada's articulation of "employability skills" is indicative of another challenge in interpreting the literature in this area. Much of it is confounded with differential meanings attributed to notion of "skills" or "skill sets," and it is often difficult to say exactly what a particular author means with respect to the term.

A 1994 federally sponsored study by Human Resources Development Canada, evaluated the economic value of co-operative education option in secondary and post-secondary schools in Canada. Findings again supported co-operative education at the post secondary level as having a positive effect on earnings and employment because co-op programs are more likely to have provided knowledge, skills, and information that will lead to a more successful career according to the perceptions of the graduates. Again there was little elaboration on the specific types of skills and knowledge to which they refer, and no information was provided as to how co-op facilitated this perception specifically. Reference was made to the fact that participation in co-op programs was perceived to help students gain experience, mature, develop skills, link theory with practice, and gain a sense of workplace reality. However, with little reference to what and how learning occurred, it is difficult to say whether these gains are evident in all co-op experiences, or what pre- and post-educational practices could enhance this learning.

More locally, a Review of Post Secondary Co-operative Education Funding in British Columbia (1992) stated that the costs and benefits of co-op education with respect to government funding were clea In BC, the provincial government allocates $3 million annually for post secondary co-op education while employers contribute approximately $40

million in wages to co-op education students (Co-op Education Funding Review Advisory Committee [CEFRAC], 1992). The report notes that reduced needs for financial aid and reduced student debt upon graduation are also direct benefits. It also cites continued government financial benefits as co-op graduates find employment three months sooner on average than their non-co-op counterparts. This results in a direct economic benefit of $10 million per year to the Province.

From an educational perspective, this report describes co-op as "creating a learning environment in which the (post secondary) curriculum is relevant to the real opportunity for placement in the working world" (CEFRAC, 1992, p. 3). Specifically the report cites studies that show that co-op students perceived clarification of both educational and career goals (Wilson & Lyons, 1961), co-op graduates felt that they had received adequate career education during their academic careers (Brown, 1984), and co-op students were more confident of career choices, more motivated and more satisfied both during and after work terms (Petrysack & Toby, 1989; Rowe, 1989; Weinstein, 1980). Several other studies link experience in co-operative education with personal growth and change, particularly in the areas of self-esteem, confidence, autonomy, and interpersonal relations. (Cohen, 1978; Fletcher, 1989; Rowe, 1989; Wilson, 1974). Recent Canadian studies found improved job search, communication, and life-skills development as well as direct academic benefits including improved study skills, academic achievement, and student retention rates (Austin, 1988; Branton, *et al.*, 1991). Beyond these benefits to students, this report also cites co-op education as being "an excellent mechanism through which feedback is given directly to the educational delivery system from its full range of client groups" (CEFRAC, 1992, p. 7). Porter (1991) sums up co-operative education as an "excellent vehicle for linking education to the workplace and for facilitating the transition from school to the labour force," yet again little is said about how or why.

Challenging the Dominant Paradigm of Technical Rationality

Common to much of the research in co-operative education is language of "skills" or sets of skills, of overall "benefits" gained through "real world" experience, and the broadly accepted notion that by putting someone in a workplace they will "link theory and practice." The latter assumes that theory and practice, when joined in one environment such as a co-op workterm, and in the presence of the learner, somehow result in the development of specific skills or attributes in that learner. Much of this thinking stems from co-operative education's origins, and continued strong base, in engineering. The dominant epistemology of practice in schools of engineering — and indeed most professional schools — follows a model based on a hierarchical relationship between "basic" science and "applied" practice. Schön (1983,1987) refers to this model as "Technical Rationality"—the view that "practitioners are instrumental problem solvers who select technical means best suited to particular purposes...they solve well-formed instrumental problems by applying theory and technique derived from systematic, preferably scientific knowledge" (Schön, 1987, pp. 4–5). Schön questions the prevailing thinking that a scientific body of knowledge is the driving force behind practice, thereby also challenging the idea that application is historically and ontologically dependent upon the "underlying" science (i.e., one cannot learn technology without first knowing the science). Further, Schön questions Edgar Schein's (1973) notion of a "normative professional curriculum which presents first the relevant basic science, then the relevant applied science, and finally a practicum in which students are presumed to learn to apply research-based knowledge to the problems of everyday practice" (Schön, 1987, p. 8). Edgar Schein (1972) describes the dominant curricular pattern as follows:

> Most professional school curricula can be analyzed in terms of the form and timing of these three elements of professional knowledge (first the relevant basic science, then the applied science, and finally the skills of application to real world problems of practice). Usually the professional curriculum starts with a common science core followed by the applied science elements. The attitudinal and skill components are usually labeled "practicum" or "clinical work" and may be provided simultaneously with the applied science components or they may occur even later in the professional education. (Schein, 1972, p. 44)

It is from this "epistemology of practice" (Schön, 1983) that co-operative education arose. Implicitly one can see that the "skills" component referred to by Schein is something that comes after the real knowledge of science and applied science has been learned. It assumes that one cannot learn the skills of application until one has learned the relevant "underlying" knowledge. There is a clear division made between these elements of professional knowledge — a clear separation of theory and practice. This is readily evident in medical schools, for example, where academics teach the important underlying basic science, and later practising medical doctors deal with the more practical aspects of training (Schön, 1983). It is also evident in universities where the applied sciences are seen to rest on a base of pure sciences, and where basic research has traditionally occupied a higher status than applied research. A technical rational approach to professional knowledge would give rise to the expectation that proficiency in coursework ensures competent practice.

There are, however, clear limitations to professional education based on Technical Rationality. Problem-solving within the well-defined, controlled, academic environment does not reflect the complexities, uncertainties, instabilities, uniqueness, and value conflicts of much of actual practice (Schön, 1983). Technical Rationality focuses on professional practice as problem-solving; choosing a problem and solving it through selection of the best available means. For example, a physician would diagnose a problem then select the best treatment for that problem based upon the best available treatment options as noted in the research. However, we are becoming increasingly aware that problems do not "present themselves" as givens. In fact, many professionals see the ability to set or detect a problem from an apparent "mess," and then to frame it in the appropriate context for attention, as being central to effective practice. Not all illnesses or medical problems, for example, appear as they do in the texts. Many such problems defy traditional diagnosis and therefore, traditional treatment (or the application of the best available means). Effective professionals in these cases have developed a type of disciplined inquiry, selecting particular aspects of a problem situation and attending to these thoughtfully. It is the wisdom of experience and the art of *seeing* situations

and *setting* problems in particular ways which distinguishes exceptional professionals from others.

A technical rational approach to problem-solving is less effective when a problem or situation is unique or unstable. The application of science demands some fixed end to which general theories can be attached. While some professional practice lends itself nicely to Technical Rationality, (e.g., a general physician who deals largely with known medical conditions and refers all other conditions elsewhere), other professional practices that present a series of "confusing messes" cannot be managed in this same way. Professionals who engage in messy challenges speak of their use of experience, trial and error, intuition or just muddling through the gap between professional knowledge and the demands of real world practice. These "other" ways of dealing with practice can be described neither as theory nor technique, and as such do not fit into the hierarchical model of Technical Rationality. They are, however, central to much of today's professional practice and, in turn, to many of the learning environments presented through co-operative education placements. In such cases, Schein's model of professional practice does not adequately describe the learning that occurs in a practicum or co-op experience. It fails to account for the practical competencies which develop from practice in a world where problems are not presented as givens, but rather must be constructed from situations which are confusing and uncertain (1983, p. 40). It is clear that thinking and acting only within the technical, rational paradigm that currently dominates universities and co-operative education itself, limits our ability to fully understand the learning of professional practice.

Summary

Co-operative education in Canada is becoming an increasingly popular mode of education and has been cited by many as an effective way of bridging the "skill development" gap between academia and the needs of business and industry. Much of the research in co-operative education has focused on outcomes such as the development of attributes related to

employability in students and other indicators of the economic cost effectiveness. Less has been done to examine the nature of this learning and little is known about what exactly goes on in co-operative education. Much of the current literature related to co-operative education portrays learning in terms of the development of "employability skills" and "components of skill competence" (Evers, *et al.*, 1993; The Conference Board of Canada, 1992), which imply an approach to professional education based upon Technical Rationality. What is needed are understandings of co-op learning that go beyond dominant thinking in the applied sciences—ones that are faithful to what actually occurs in learning a practice, and which inform policy and practice surrounding co-op. The theoretical framework presented in Chapter Three lays the groundwork for such analysis.

Chapter 3

Broadening Traditional Views of Learning Professional Practice

Chapter Two indroduced the work of Donald Schön (1983, 1987), whose notion of "knowledge-in-action" has challenged the traditional school of thought underlying most of formal education. This chapter extends the critique by reviewing alternative ways in which learning in practice has been described by theorists. In particular, the chapter focuses on learning through "reflective practice," through "legitimate peripheral participation in communities of practice," and within "zones of proximal development."

Reflection In and On Practice

> *Discovering your intelligences is one thing, applying them is another. We need to be able to recognize and identify problems and opportunities. We need to be able to organize ourselves and other people to do something about them, and we need to be able to sit back and reflect on what was done in order that we can do it all better the next time around.* (Handy, 1994, pp. 206–207)

Ideas about reflection date back to the work of Dewey in the early part of this century. Hullfish and Smith (1961) offered an analysis of reflective thinking as a part of the learning of practice. In the main, these ideas move toward a view of the participant creating an understanding of problems and solutions through direct interaction with practice. They note several distinct phases of the process of reflection:

1. The presence and recognition of a problem situation.
2. Clarification of the problem.
3. Hypotheses formed, tested and modified. (Hypotheses may also be called hunches, ideas, insights—anything that creates an "if—then" proposition.) These propositions explain some of the facts already observed and direct further observation or fact finding.
4. Action is taken based on the best supported hypothesis.(pp. 43–44)

While Schön and other more recent authors (Erickson & MacKinnon, 1991; MacKinnon, 1987, 1989; MacKinnon & Erickson, 1988; 1991) would challenge the reduction

of this complex and interactive process to "distinct phases" as represented above, Hullfish and Smith provided an early model of reflective practice that attempts to bridge the theory and practice dichotomy. They speak of needing some theoretical base from which to draw hunches or insights (formal academic coursework), the ability to follow a clear process of questioning (experience with scientific method, critical thinking, and logic), the creativity to re-frame and explore, and the opportunity to find oneself in an environment where real problems are present, waiting to be recognized and framed (co-op practicum). The latter opportunities cannot be simulated. In traditional university settings, "problems" are often determined by the professor (as are the correct solutions) and "delivered" to the students. Students need to learn how to recognize problems in their natural state as opposed to simply being handed them in assignments, laboratory protocols, and exams.

Schön conceives of "reflection-in-action" as the way that professional knowledge is learned and exhibited, both in terms of problem-setting and problem-solving. Problems do not present themselves to practitioners as givens, he says, which breaks down the idea of professional practice as instrumental problem-solving through the application of science-like knowledge. According to Schön, the practitioner engages in a "reflective conversation" with the practice situation. To each situation then, the practitioner brings a repertoire of experience and conceptual frameworks which mediates the "conversation," and ultimately performance in that situation. Simultaneously, the situation "talks back" to the practitioner, sometimes causing a re-framing of the problem and a shift in subsequent actions. Often, these changes are subtle and not recognized at a conscious level by the practitioner. Practitioners will act uniquely in a given environment, as they construct and re-construct their perceptions of a situation in an ongoing and highly personal manner:

> In this reflective conversation, the practitioner's effort to solve the problem yields new discoveries which call for new reflections in action. The process spirals through stages of appreciation, action, and reappreciation. The unique and uncertain situation comes to be understood through the attempt to change it, and changed through the attempt to understand it. (Schön, 1983, p. 132)

This represents a distinctly different view of professional education and knowledge. The dominant model of technical rationality separates means from ends, practice from theory, and knowledge from action. Reflection-in-action brings together processes and products as interdependent constructs which play off each other through the senses and sense-making of the practitioner. The notion of a linear, scientifically predictable model of professional practice is incompatible with one described by continual feedback loops, constantly influencing both perception and performance. The art of the practice is in the playing, and the degree to which practitioners hone the subtle nuances of their art distinguishes their performance. This process, or "emsemble" of problem framing, on-the-spot experimenting, detecting consequences and implications, and responding to the back talk, constitutes the "artistry of professional practice."

Some professional schools quietly acknowledge that this "parallel" curriculum is at play in their practica. For example, it is implicitly understood that medical students work as interns and residents alongside senior clinicians not only to apply the research based models of diagnosis and treatment they have learned but also to learn the "art" of clinical practice (Schön, 1987, p. 16). Application of their university studies cannot be put to effective use without the development of a cluster of "other" skills including such loosely defined abilities as "bedside manner," listening for underlying cues, effective emotional distancing, intuition, etc. Simply put, the practitioner must develop intuitive and artistic aspects of practice in a "real world" of complications, uncertainties, hidden agendas, and changing expectations and boundaries. This parallel curriculum must be experienced to be learned, and practiced to become internalized. The ongoing process of inquiry in practice, as articulated by Schön, provides a valuable and more holistic view of learning in co-op.

While several of the "reflection-in-action" features are *learnable* and *coachable*, Schön argues that the process itself is not *teachable* by classroom methods—it must be experienced, played with, and constructed by the practitioner. Schön believes that there are several reasons

why professional practice cannot be conveyed to students "wholly or mainly by classroom teaching" (Schön, 1987, p. 162):

- The gap between a description of [the practice] and the knowing-in-action that corresponds to it must be filled in by reflection in action.
- [A practice] must be grasped as a whole, by experiencing it in action.
- [Practice] depends on recognition of key qualities, which must be learned by doing.
- Descriptions [of practice] are likely to be perceived initially as confusing, vague, ambiguous, or incomplete; their clarification depends on a dialogue in which understanding and misunderstanding are revealed through action.
- Because [much professional practice] is a creative process in which the [practitioner] comes to see and do things in new ways, no prior description of it can take the place of learning by doing.

Richardson (1990) also comments on the need for learning opportunities that fully involve the practitioner. Richardson notes that Schön's theory, unlike others before (e.g., Dewey's concept of reflection) "does not rely on a series of conscious steps in a decision making process. The knowledge is inherent in the action; it is based in part on the past experience of the practitioner interacting with a particular situation" (Grimmett, MacKinnon, Erickson & Riechen, 1990, p. 11).

Practica such as those in co-operative education afford a "real life" educational venue for problem detection, framing and re-framing, analysis, and experimentation by providing opportunities for putting a theory into practice and constructing a theory of action from practice.

Skills and Theories in Use

> *Not many years ago I began to play the cello. Most people would say that what I am doing is "learning to play" the cello. But these words carry into our minds the strange idea that there exists two very different processes: (1) learning to play the cello; and (2) playing the cello. They imply that I will do the first until I have completed it, at which point I will stop the first process and begin the second. In short, I will go on "learning to play" and then I will begin to play. Of course this is nonsense. There are not two processes, but one. We learn to do something by doing it. There is no other way.* (John Holt, cited in Canfield and Hansen, 1993, p. 132)

Argyris and Schön (1974) refer to the fact that learning and practicing a skill are often considered entirely different activities when compared to learning and applying a theory. Such a notion suggests that theory learning and skill learning are different activities which may best take place in different environments (e.g., theory learning in school and skill learning at work). However, Argyris and Schön describe skills as "dimensions of the ability to behave effectively in situations of action" and they state that skills require both a "property of concrete behaviour and a property of theories of action."

In bicycle-riding, learning to put a theory of action into practice and learning a skill involve similar processes. Being able to describe the program of "how to ride a bicycle" on a written test, does not ensure new riders that they will in fact have the skill to ride a bicycle. Similarly, completing a university course on interpersonal communications does not ensure that students will demonstrate good communication skills on a co-op term. Argyris and Schön probe further and consider why repeating the elements, or program, of a theory of use does not constitute the learning of a skill:

1. There is an information gap between the program and the concrete performance of riding a bicycle—the program never gives the complete description of the concrete performance.

2. Riding a bike requires smooth uninterrupted sequences of responses. Learning to ride involves both learning the program and learning to internalize the program. Knowledge of the program must be made tacit in order to respond to other cues. One cannot replace tacit with explicit knowledge.

3. Some of the performances indicated by the program may require changes in sensory competence, muscular strength, physical dexterity, or feeling, none of which is achieved through learning the program for riding a bicycle.

Further, practicing a skill is required to progressively familiarize riders with the performance situation so that they internalize it, allowing them to gain confidence and ability to deal with new cues, such as a bump on the road. These comments about learning a new skill, apply equally to learning to behave according to a new theory of action. "In both cases," state Argyris and Schön, "it is essential to practice, to develop and draw on tacit knowledge, and to be in a learning situation that permits a reinforcing cycle of feeling and performance to begin"

(p. 14). Learning a skill and learning a theory of action need not be preceded by learning a program or explicit verbal formulation. This learning can also take place through imitation, or by watching someone criticize the performance of another, telling them what changes to make as they proceed. Most of us did not read a manual before hopping on a bicycle for the first time, but through a variety a means (experience riding a bike, teaching others to ride, reading manuals, etc.), have subsequently formulated a theory of action about riding a bicycle and could verbalize it at some length if needed. This notion of skill development as it relates to theories of action places the practice environment or co-op workplace in direct partnership with the educational institution, both being venues where skills and competencies can be effectively developed through interdependent learning experiences reinforced by both environments.

Learning and Situated Learning

> *The skills involved (in learning) are conceptualizing, co-ordinating, and consolodating—the three C's. They are the "verbs" of education as opposed to the "nouns", the "doing" words, not the facts. We don't learn to use these verbs by sitting in rows in a classroom, but by practice.* (Handy, 1994, pp. 206–207)

Much of the early work on learning looked to psychology for explanations of the underlying mechanisms and functions. Often, in an attempt to follow the scientific procedures of the physical sciences, much of this research separated out interrelated variables which were later seen as critical to the processes examined (e.g., trying to look at memory without the "distorting" effects of previous knowledge). Out of some of Skinner's behaviour shaping work on learning grew a whole educational philosophy which promoted the importance of presenting knowledge in small, sequential blocks and rewarding the resultant behaviour. Knowledge could thus be assembled from its component parts. Much of this early work on learning has been of limited value with regards to its applicability to people and the acquisition of information, and consequently is of limited value to the educational system.

More recently learning has been described as the "construction of meaning," a very individualized process where "abstract concepts are built up from a set of experiences which are only partially shared with others" (Marton, Hounsell, & Entwistle, 1984, p. 8). Carl Rogers (1969) focuses very much on the personal motivation of the learner and criticizes much of traditional education as "the futile attempt to (have students) learn material which has no personal meaning" (p. 4). He looks to establish a "community of learners" free to pursue the ideas which excite them and have intense personal meaning. In this way learners develop their personality (curiosity, self confidence, initiative) as well as intellect. This constructivist approach to learning provides a way of understanding the co-op placement which may be seen to present opportunities for the student to both construct meaning, and develop personal management skills. While the distinction between learning as the acquisition of packages of knowledge, and as the construction of learners' understanding of self and the world around them recurs in the research literature, it is the latter interpretation which is of greatest interest and which will be considered in the context of this study.

> If changes in knowledge and actions are central to what we mean by "learning," and situated activity always involves changes in knowledge and action, then describing and analyzing people's involvement in practical action in the world, is in fact analyzing learning in progress. Conventional theories of learning and schooling appeal to the decontextualized character of some knowledge and forms of knowledge transmission, whereas in a theory of situated activity "decontextualized learning activity" is a contradiction in terms. (Chaiklin & Lave, 1993, p. 6)

While this may represent an extreme view of learning, it is true that much of the world has been divided into contextualized and decontextualized phenomena, and in no institution more so than higher education. Traditional cognitive theory is "distanced from experience" and divides the learning mind from the world. This is problematic if the learner is "taught" in one context (the classroom) and expected to "be knowledgeable" in another (the co-op workplace). Situated Learning theory does not separate the person from world in which they participate. Important premises underlying this theory include:

1. Learning is an integral aspect of activity in and with the world at all times.

2. Knowledge always undergoes construction and transformation *in use*.

3. Acquisition of knowledge is not a simple matter of taking in knowledge; rather things assumed to be natural categories such as "bodies of knowledge," and "learners" require re-conceptualization as cultural, social products. (Chaiklin & Lave, p. 8)

These premises are useful in describing some of the unique features of the co-op environment such as providing a context for and of practice which traditional academia cannot.

Chaiklin and Lave believe that to decontextualize knowledge is to formalize it at a more inclusive level. The abstraction from, and generalizations across, contexts which follow, are mechanisms that are supposed to produce decontextulalized (valuable, general) knowledge (p. 23). This follows very much the positivist driven model of Technical Rationality as described by Schön. These three researchers would argue that the movement towards this "more powerful" or "valued" knowledge is one that disengages it from the real world in order to create the distance to "free" the knowers from specifics or details of time, place, ongoing activity, etc. This distancing takes the knowledge further and further from a context of practice often rendering it inert beyond its generalizability and the scope of the teaching institution's needs. This at once empowers the privileged keepers of knowledge in schools and institutions to produce and deliver knowledge independent of, and not affected by, the circumstances where it is produced or will need to be used and understood (formalist views). Further, it is assumes that what is learned is of a general nature and powerful *because* it is not embedded in the particularities of specific practices. The challenge for many co-op students is to put their generalized school-based knowledge to effective use within the specific practices of their co-op practicum. Chaiklin and Lave (1993) raise several issues regarding this cognitive theory as it relates to the nature of learning:

- it assumes division between learning and other activity.
- both invention and re-invention of knowledge are difficult if cognitive theory views learning as acquiring existing knowledge.
- it assumes universal processes of learning and a large degree of homogeneity within both the knowledge and learners.

These assumptions reflect how co-op is currently seen by many; learning occurs in the academic setting first and the co-op term simply provides a place for its application through "other activity." Participants in co-op however know that new learning occurs during the workterm. The division between learning and the rest of life seems artificial and inadequate in terms of explaining the changes seen in what people know and what they can do as a result of a practicum experience. There is limited room in this theory for explaining the "aha!" experiences that many students have during practice, when suddenly a new understanding is constructed. There is also limited room for understanding differences in learning that may result among students who share a similar practicum exposure, or for appreciating how learning changes as one becomes more engaged the workplace.

Epistemologically, there is also a big gap between cognitive learning theory and situated learning theory. Cognitive theory suggests that knowledge is a collection of real things that can be located in the heads of the learners who internalize them, while situated learning views knowing and learning as a process of engaging in the dynamic practices of human activity. In the latter case, it is "knowledge" that becomes a complex and problematic concept whereas in the first case it is the "learning" that is more problematic. Fully understanding the co-op experience, which integrates the theoretical and practical aspects of learning, has undoubtedly suffered from both the "learning" and the "knowledge" being seen at times as problematic. Fundamental to the challenge of understanding the learning of skills or skill sets, for example, is that they are difficult to define and demonstrate, and therefore almost impossible to measure. Consequently in co-op we talk about them as discreet entities that we assume can be learned, but have done little by way of operationalizing this rhetoric. Sometimes, what has come to be known as the McNamara Fallacy, seems to be at play in the co-op research on learning:

> The first step is to measure whatever can be easily measured. This is OK as far as it goes. The second step is to disregard that which can't be easily measured or to assign it an arbitrary quantitative value. This is artificial and misleading. The third step is to presume that what can't be measured easily

> really isn't that important. This is blindness. The fourth is to say that what can't be easily measured really doesn't exist. (Handy, 1994, p. 221)

Lave and Wenger (1991) state that new learning and understandings are produced by an interaction of experiencing and knowing an immediate circumstance ("interpretive thinking") and processes of thinking beyond and about the immediate situation in more general terms (comprehensive thinking). These are similar to Schön's notions of reflection in and reflection on action. Further, Lave (1993) comments that "doing and knowing are open ended processes of improvisation with the social, material and experiential resources at hand" (pp. 6–7). She reiterates the inventiveness inherent in Schön's model of learning in practice and underscores the interplay between the participant or learner and the social world. "Without a theoretical conception of the social world one cannot analyze activity *in situ.* A more promising alternative lies in treating relations among person, activity and situation as they are *given* in social practice, itself viewed as a single encompassing theory" (p. 7).

Theories of situated, everyday practice "insist that persons acting and the social world of activity cannot be separated." Historically, much of the research on practice, typically focused on the person acting and little, if at all, on the "relations" between the person acting and the "social world." Little has been done with respect to conceptualizing "context" (Chaiklin & Lave, 1993, p. 5) even though many people believe that real life problem solving, such as that experienced in co-op workterms, is critical to learning effective practice. Lave and Wenger (1991) believe that the situated nature of learning, remembering, and understanding is a central fact. They state that it is obvious that human minds develop in social situations yet the dominant cognitive theories of knowledge and educational practice have not sufficiently incorporated this notion, and so increasingly educational achievement fails to translate into effective use of knowledge. Lave believes that the context of practice is critical to the learning and performance embedded therein: "Traditionally researchers have looked at learning as if it were a process contained in the mind of the learner and have ignored the lived in world" (Lave, 1993, p. 7). She states that learners and newcomers inevitably

participate in communities of practitioners and the mastery of knowledge and skill requires newcomers to move forward towards full participation in the socio-cultural practices of the community. Lave and Wenger refer to this process as "legitimate peripheral participation," whereby newcomers slowly become part of a community of practice.

In contrast to learning by internalization alone, learning by increased participation in communities of practice such as co-op, and as described by the notion of legitimate peripheral participation, involves the whole person interacting with and in the world. Following this theory of social practice, what can be seen is the interdependency of agent and world, activity, meaning, cognition, learning and knowing. Some implications from their work looking at practice from the perspective of legitimate peripheral participation include:

- in most cases there is little formal teaching—the more basic phenomenon observed was learning.
- the community creates the potential "curriculum." In the broadest sense this refers to that which may be learned by newcomers with legitimate peripheral access (co-op students).
- There are strong goals for learning as learners get a "big picture" of what there is to be learned.
- the learning "curriculum" unfolds in opportunities for engagement in practice. (Lave & Wenger, 1991, p. 50)

In the past we have believed that apprentices are supposed to acquire the knowledge-in-practice through "observation and imitation." Lave and Wenger argue that within their concept of legitimate peripheral participation, newcomers (i.e. co-op students) are more than mere observers, they are in fact participating by absorbing and being absorbed in the culture of practice. After some time, the participants begin to make those cultural practices theirs and gain a general understanding of what constitutes the community including who is involved, what they do, day to day routines, how the "masters" walk, talk, and work; how outsiders interact with the community of practice; what other learners are doing; and what learners need to learn to become full practitioners. It is a reciprocal relationship between persons and practices and thus communities of practice are dynamic and constantly changing. This notion

of "legitimate peripheral participation" may provide a useful way of looking at the nature of the learning of co-op students on their work terms and the resultant changes to the "communities" in which they are placed.

Lave and Wenger, through the concept of legitimate peripheral participation, attempt to provide a way of examining learning practice that includes the "social world"—and all the interconnections between activity and activity systems, systems and communities, culture and political economy. Urs Fuhrer ((Lave, 1993) also looks at the interplay between person and situation, specifically as it affects new learners. This is of particular interest as co-op students essentially find themselves as newcomers at the start of each work term, regardless of previous experience, as they enter a new work environment with all its political, social and cultural dimensions. Fuhrer's work on "newcomers" examines how people adapt to novel, unfamiliar and coercive settings. Part of the work was done in studying university career planning and placement centres and the users. Practically, this is interesting work as modern workplaces are increasingly exposing their people to new, unfamiliar situations (frequently due to technological, economic, and management change) such that many current workers are also experiencing feeling like newcomers, much like the co-op students. Theoretically, this is important work because answers to these questions on how newcomers learn advance the understanding of individual and collective action within various environments for different participants.

A general theme underlying Fuhrer's research is that learning is situated — it takes place in real life settings, under real performance requirements on actual individuals and is vulnerable therefore to the social influences that may arise at any time. Such too, is the nature of a co-op work term. Lave (1993) commented on the open-ended process of improvisation inherent in learning, and Fuhrer (1993) further notes that "newcomers actions are improvised insofar as they are designed to cope with surprise, uncertainties and unforeseeable contingencies for their actions" (p. 197). This is reminiscent of Schön's conceptualization of reflection in action as a means by which professional action is "put into play in terms of both

'problem setting' and problem solving" (MacKinnon, 1987). Schön (1983) notes that problems are constructed "from the materials and problematic situations that are puzzling, troubling and uncertain" (Schön, 1983, p. 40). This notion of the interplay between person and situation, and uncertainty and improvisation, as it relates to learning, runs through the works of Fuhrer, Lave, Mackinnon, and Schön.

Fuhrer theorizes that newcomers bring with them to each new environment, a collection of internal knowledge in the form of cognitive schemata. These are brought to a setting that itself has external knowledge such as resource materials, and other individuals, that is often available to the collective. "The other setting participants' competence facilitates the newcomers goal attainment in at least two ways: first, setting participants occupying responsible positions usually know the setting program (how the place works) and second they may know at least certain portions of the setting's entire program, which can be used to try to make sense out of each others cognitive schemata" (Chaiklin & Lave, 1993, p. 197). Again the interdependence between learner and situation is critical such that the resultant learning is highly personal—a product of the sense-making of the environment and each other's schemata. However, in the case of the newcomer, learning the "program" may not be uppermost in the newcomers mind:

> Typically, the newcomers' learning activities are not totally directed on carrying out the setting programs. They often attain a variety of other goals , such as engaging in various impression management tactics or developing interpersonal relationships to other setting inhabitants. (Lave & Wenger, 1991, p. 104)

The newcomer, or co-op student, then has to pursue several goals simultaneously which gives rise to issues of managing and co-ordinating the various cognitive, social, and environmental demands. Some of the attributes noted in the *Employability Skills Profile* such as "personal management skills," may well be implicitly developed through this process of newcomer co-op student "fitting in."

Many social psychological and social anthropological theories assume that "people are highly sensitive to the social significance of their conduct and are motivated to create desired

impressions on others" (Chaiklin & Lave, p. 198). In *Detecting Reflection in Action Among Preservice Elementary Science Teachers*, MacKinnon (1987) uses Fuller and Bown's (1975) conceptualization of the changing concerns of the new teacher to help establish a context for his work on beginning science teachers. The Fuller and Bown framework, though specifically constructed around teacher education, has some interesting potential applications for describing the changing concerns of newcomers in general, and co-op students specifically. Referring back to Fuhrer's comments regarding the newcomer's concern for "impression management" and "developing interpersonal relationships," it may well be that much of the initial learning of co-op students revolves around very different motivations (self-identification, fear of failure, etc.), than what experienced practitioners, or professors, articulate as essential to the "program" or work. A review of Fuller and Bown's developmental conceptualization will elaborate on these shifting concerns and may provide a useful framework for analyzing or testing in what ways these concerns inform the learning that occurs with newcomer co-op students on their work terms.

1. Pre-practice concerns:

- concern focuses on self.
- learner has limited experience with the new role.
- much previous coursework seems irrelevant.
- learners identify as a pupil versus worker, potentially leading to critical or unsympathetic views of managers, supervisors.

2. Early concerns about survival:

- after initial experience with practice, idealized concerns change dramatically to those of survival, mastery of performance (and performance evaluation), feeling in control in new environment—this stage is stressful and many wonder if they can manage.

3. Work situation (teaching) concerns:

- concerns turn to the expectations and demands made, given the limitations and frustration of the environment that they are coming to know.

- learners may have learned the content needed for the job in school, and were able to reproduce it on an exam, but putting it into action in a new and uncontrolled environment is a challenge.

4. Concern about clients/colleagues (pupils).

- newcomer is concerned about relating effectively to clients and colleagues (or pupils in Fuller & Bown's conceptualization).
- flooded by feelings of inadequacy, situational demands and conflicts, learners may be unable to act on these concerns and put them aside while they deal with the more concrete or urgent tasks of the job (e.g., finishing by deadline, controlling a class).

Fuller (1975), suggests these early concerns in fact distract the pre-service teacher from the theoretical perspectives of their instructors. She suggests that a fundamental goal would be to create practical contexts, such as co-op, to serve as foundations from which students might better understand the theoretical perspectives relating to practice. This reflects back to Schön's idea of turning the dominant model for the teaching of professional practice "on its head," having the practical exposure first, or early on, in order that the theory has an experiential basis to build upon.

Situated learning provides a lens through which we can view the co-op experience. This theory should help describe how learning is the joint product of processing cognitive, social, emotional and environmental influences (Chaiklin & Lave, p. 207). Understanding some of the human motivations at various points in the learning process also assists in analyzing what is occurring during co-operative education placements. This perspective also generates implications for the pre- and post-"classroom" work that surrounds these practical experiences.

The Zone of Proximal Development

Many explanations of learning describe a process in which learners internalize knowledge they have discovered on their own, or have been told by others. Lave and Wenger (1991), who emphasize the importance of the social setting in learning, find such a view limited as it "establishes a sharp dichotomy between inside and outside" (Lave & Wenger,

1991, p. 47). Other perpsectives on learning, such as that of Vygotsky (1978), provides a way of conceptualizing learning that includes both social and individual processes. Vygotsky views "internalization" of knowledge as a central construct which is initiated through interaction with more knowledgeable individuals in a social context. In co-op, this could describe some of the learning which results from interactions with oldtimers such as colleagues and supervisors. Vygotsky sees learning and development as interrelated and describes "good learning" as that which occurs in the "zone of proximal development." He describes this zone as the "distance between actual developmental level as determined by independent problem solving, and the level of potential development, as determined through problem solving under guidance from those more capable" (Vygotsky, 1978, p. 86). Vygotsky believed that the zone of proximal development provides a better way of looking at learning as it is a better index of the learner's performance potential:

> The zone of proximal development defines those functions that have not yet matured but are in the process of maturation, functions that will mature tommorow but are currently in the embryonic stage. These functions could be termed the "buds" or "flowers" of development rather than the "fruits" of development. The actual developmental level characterizes mental development retrospectively, while the zone of proximal development characterizes mental development prospectively. (1978, pp. 86–87)

Here, learning is seen as that which, with a little assistance from someone more capable, can be grasped and internalized for later use. What is reflected on a test of knowledge for example, would be seen as a learner's actual developmental level, while what could be potentially learned with help, is in the zone of proximal development. In this context, one could see the co-op term as providing opportunities to extend students' learning beyond what may have been reflected on an academic exam, and into their zone of proximal development.

An interpretation of Vygotsky's work on the "zone of proximal development" describes it as "the distance between understood knowledge, as provided by instruction, and active knowledge, as owned by individuals" (Lave & Wenger, 1991, p. 48). This is not unlike Schön's notion that a gap exists between the description of a practice and tacit knowing

in action. Schön believes that the gap, which could interpreted as part of the zone of proximal development suggested by Vygotsky, must be filled by processes of reflection in and on action. These processes of reflection, Vygotsky would argue, must be initially assisted by a more capable adult or peer. He views learning as a profoundly social process and emphasizes the role that language and dialogue play in instruction and mediated cognitive growth. Movement through the zone of proximal development is mediated by exposure of the learner to dialogue with a more capable individual.

Vygotsky believed that "all higher (mental) functions originate as actual relations between human individuals" (1978, p. 57). He feels that one must experience development as an "interpersonal" process, at a social level, *before* one can internalize it—first between people, then within a person. He argues therefore that learning and subsequent development is rooted in social activity. Because of this Vygotsky believes "that the mere exposure of students to new materials through oral lectures (in the traditional academic mode) neither allows for adult guidance nor for collaboration with peers" (1978, p. 131), and is therefore limited in its ability to facilitate the "good learning" which he defines as being within the zone of proximal development.

Vygotsky provides a view of the learner and learning that acknowledges the interdependence of the individual and the social setting, informing what happens to newcomers as they become increasingly engaged in their community of practice. One could use the notion of a zone of proximal development when looking at the co-op work term and the associated interactions with professionals and more experienced or capable peers. Through relationships with colleagues and supervisors, constantly stretching and assisting the student to master those skills which they are capable of mastering given the appropriate stimulation and support, learners are facilitated through their zone of proximal development. The extent to which a given work placement provides this type of environment may help explain the variable amounts and types of learning and development that occur across work terms and students. The difference between a poor and good co-op work placement, in

Vygotskian terms, might be described as the distance between an environment whose demands and support are at the student's actual developmental level and one whose demands and support are at the student's level of potential development. Placements that appear to provide little learning for one student may provide rich learning opportunities for another depending upon the students' accomplishments or zones of proximal development (for the particular item being learned) and the ability of the "more capable" supervisor and co-workers to nurture them. Co-op terms that don't appear to be successful at all may be a result of inappropriate environmental support or students' failure to engage effectively in their community of practice.

Vygotsky proposed that learning begets learning. It creates a zone of proximal development by "awakening a variety of internal developmental processes that are able to operate only when the (learner) is interacting with people in his environment and in co-operation with his peers" (1978, p. 90). Viewing the co-operative education placement in this context may be useful in determining how co-op students, their co-workers, supervisors, and co-ordinators can interact in ways that ensure ongoing opportunities for "good learning."

Schön provides a view of professional education which helps in the understanding of co-op by proposing an alternative to the dominant model of technical rationality and providing a way of looking at learning in terms of reflection in and on action. Lave and Wenger, and the concept of legitimate peripheral participation, allow us to envision how the "newcomer" co-op students might become increasingly absorbed by their community of practice through social relationships and increasing engagement in that community's affairs. Vygotsky, while not focusing on the social-political nature of the learning environment, or on the specific processes of professional problem solving, provides a way of understanding what might happen to the learner at the level of the individual. The zone of proximal development describes a way of explaining what may be happening to learners as they become more and more a part of their community of practice, engage in the problem solving therein, and begin to internalize understandings that have been socially initiated and constructed.

Summary

Outstanding computer programmers or rehabilitation specialists are not ensured by degrees in computing science or kinesiology. The real competence of these people lies in their ability to effectively interact with other members of their professional teams, anticipate and deal with problems on-the-spot, be flexible, embrace change, take leadership roles and communicate effectively with clients, collaborators, and colleagues (Evers, *et al.*, 1994). Effective practitioners must *know* the workplace, the people and the appropriate ways of thinking, behaving and communicating therein. They must be able to detect and frame problems from the often "messy" world of practice and resolve these issues through an ongoing process of reflection in and on practice. This way of viewing professional practice is not authentically captured in a technical, rational approach, characteristic of earlier views on professional education, and which continues to be the dominant model in universities. Schön speaks of the "art" of practice, acknowledging and valuing new skills and knowledge that are not solely based on the application of scientific principles to problems of practice but rather on a dynamic interplay between the practitioner and the problematic situation.

In co-op education, the ongoing interplay between person and place, learner and environment, implies that each of these entities brings with it knowledge or intelligence to the process of learning. When someone engages in an activity for example, this inherent "system" knowledge helps them make sense and bring structure to the experience—making it "working knowledge" (Grimmett & MacKinnon, 1992). This is also reflected in Lave and Wenger's accounts of situated learning which propose that meaning is negotiated between individuals and "communities of practice," thus taking into account the broader social, political, and cultural context of the learning environment. In particular the process of "legitimate peripheral participation" provides a way of understanding how newcomers (co-op students) and old-timers (supervisors/co-workers) interact so that the learners are eventually absorbed into a community of practice (workplace). Further, Vygotsky's "zone of proximal

development" provides a way of understanding what happens to individual learners when they are taken in by a "community of practice." Dialogue between the learner and a more capable colleague or supervisor becomes key to initiating the process of internalization or re-construction necessary for the learning and development of higher cognitive functions.

These conceptualizations of "learning by doing," while differing in their orientation and specific detail, all provide complementary perspectives on the nature of learning in practice. And while each conceptualization focuses differently on the nature of learning, there is agreement on the notion that some of the richest learning occurs *in situ:*

> Instruction can sensitize a beginner to aspects of practice, but the real learning is in the doing. Too often the language of schooling, including schooling for practice, is specialized, generalized, or abstract. When the practitioner's schooling includes experiences with practice in place, like co-ops, internships, practica, learners attribute more learning to these experiences than to those in the classroom. Schooling allows one to *study* practice but learning to practice must be done in place. (Yinger, 1990, p. 91)

Chapter 4
Research Design and Methodology

Many theories have been formulated to describe various aspects of learning and the learning process. Merriam and Carefella (1991) have summarized these into four major groupings which reflect particular research perspectives: "behaviourism" is concerned largely with a view of learning as an observable change in behaviour, whereas "cognitivism" focuses more on the internal processes of learning such as information processing, storage, and retrieval. "Humanism" integrates aspects of human nature, emotions, motivation, etc., with behavioural changes and cognitive processes. And "social learning" focuses more on social setting or context, and the notion that learning is a function of the interplay between the person and the environment. While looking at learning as a change in both behaviour and cognition, this study takes a social learning perspective in terms of examining, describing, and explaining the learning in the particular context of co-operative education.

A qualitative research approach is appropriate for this study, which seeks to describe and explain, rather than make predictions based on cause and effect (Merriam, 1991). Qualitative case study research has been described as being ideal for understanding and interpreting observation of educational phenomena (Roberts, 1982). It allows for the observation and analysis of particular education programs and processes in order to generate new hypotheses based upon discovery, insight and understanding, and ultimately contributes to "the knowledge base and practice of education" (Merriam, 1991).

This investigation requires a research method that speaks to the quality and meaning of events, as these relate to the nature of learning in this applied science co-operative education placement.

Quantitative versus Qualitative

Roberts (1982) classifies science education research into qualitative and quantitative approaches, based upon the distinct sets of metaphysical presuppositions which underlie each orientation. He utilizes Stephen Pepper's (1942) work on world hypotheses to argue that quantitative research is "formistic" and "mechanistic" in its metaphysical preoccupation, while qualitative research is "contextualistic" and "organic." These different ways of constructing reality often reflect the problem being studied and the questions that drive a study. As their name implies, formists focus on the form of things—how they are similar to some idealized form (e.g., taxonomic botany). Related to this is mechanistic thinking which reflects question about causes, influences and correlates (e.g., Newtonian mechanics)—the mechanisms by which things operate.

Qualitative research is based more on contextualism, a "system of thought that focuses on the event in its context" (Roberts, 1982). This perspective acknowledges that one cannot make sense of events in their context simply by counting things or knowing their form and generating correlations. It seeks to find out what the event is all about. This is consistent with the above noted social learning research perspective. Related to this thinking is the world hypothesis of organicism, which reflects a metaphysical pre-occupation with "integrated wholeness." It, like contextualism, relies upon qualitative data, but goes further by taking many alternative interpretations and attempting to resolve or select the best with respect to the fit, integrativeness, and coherence of the "whole" that is sought (e.g., ecological theory).

This study focuses on a particular situation and seeks to understand what it is all about with respect to learning. It clearly draws on contextualism and organicism in making claims about the events of learning in the work setting. The case study approach has been selected for its ability to concentrate on the significant factors that influence the phenomena of interest (Merriam, 1991). Case study research is well-suited to situations where it is difficult, and not desirable, to separate these phenomena from the context in which they occur.

Merriam (1991) suggests that qualitative research studies share four essential characteristics: they are particularistic, descriptive, heuristic and inductive—characteristics inherent in the goals of this study, which focus on detecting, informing, and understanding learning. However, the qualitative approach taken raises questions about the extent to which the insights and findings emanating from this work can speak to situations beyond the one immediately studied. Many writers in the field of educational and social science research have dealt with the idea of "reconceptualizing generalizability" (Eisner & Peshkin, 1990, p. 206). For example, Guba and Lincoln (1982) write:

> The aim of (naturalistic) [qualitative] inquiry is to develop an ideographic body of knowledge. This knowledge is best encapsulated in a series of "working hypotheses" that describe the individual case. Generalizations are impossible since phenomena are neither time- nor context-free (although some transferability of these hypotheses may be possible from situation to situation, depending on the degree of temporal and contextual similarity). (p. 238)

Guba and Lincoln suggest that qualitative researchers need to consider the concept of "fittingness": the degree to which the situation studied matches other situations in which one is interested, the provision for a more realistic and workable way of thinking about phenomena of interest, and the extent to which new understandings can lead to new practices. This notion was later described by these researchers as "naturalistic generalization" (Lincoln & Guba, 1985), a view of transferability which I believe is appropriate for the present study. Such studies gain their potential for transferability by providing clear and detailed descriptions,

> including the units of analysis, concepts generated, population characteristics, and settings—[that] are sufficiently well described and defined that other researchers can use the results of the study as a basis for comparison. (Goetz and LeCompte, 1984, p. 228)

Research Design and Activities

This study focuses on the experiences of three kinesiology co-op students on a workterm as kinanthropometrists for a research project headed up by the Sunny Hill Health Sciences Centre for Children. A case study approach was taken which included observation of the students at two measurement sites, informal discussions with them over the course of

the term and two in-depth sessions from which the primary "data" were obtained. The first in-depth session was approximately two hours in length and involved observation and videotaped recording of the entire measurement session involving the three co-op students measuring seven children between the ages of one and five years. This occurred toward the end of the co-op students' workterm. The second major data collection session took place eight months later when the co-op students and their supervisors were invited to a session to view and comment on the first taped session and discuss in general the work term itself. This 90 minute session was transcribed in its entirety. Between the major data collection sessions I met informally with the participants and sponsored a celebration of their data gathering phase.

Researcher Role and Stance

My entry as the researcher into this co-op environment was natural (as i would have been visiting this site in my role as co-ordinator anyway) and facilitated by seven years of experience as a co-op co-ordinator at SFU. Motivated by my own interest in knowing more about the learning that occurs in co-op, I engaged, through informal discussions with them, colleagues and students who were similarly intrinsically motivated to better understand this learning component. Formal access was approved by the Director of Co-op Education at SFU. At all times it was made clear to the students that participation in my research, while appreciated, was not expected or required, and was in no way related to co-op performance evaluations. Potential participant concerns around trust (such as how the data would be used, employer and student evaluations, etc.) were known to the researcher in advance through experience in the setting and talking with the employer, students, faculty members and the director of co-op. These were minimized to as great an extent as possible in advance by way of open dialogue about these issues with the participants.

The extensive experience I have with conducting interview and resume workshops, speaking about trends in the workplace, developing jobs, liaising with faculty ad industry, overseeing student placements etc., and with co-operative education in general (as a former

student and employer, and currently as a co-ordinator) facilitated some aspects of the management of the researcher's role due to the thorough understanding I have of the program and the people, their routines, and the environment. While the transition from the role of co-ordinator to researcher was challenging, experience with on-site workplace visits and interviews facilitated some of the observation and discussion sessions. One of the challenges has been to consistently view the data through the eyes of a researcher, when the problems and implications of practice distract the practitioner in me. Further, I became aware of the need to recognize that my observations and conclusions were influenced by years of experience as a co-op co-ordinator, which led me to be cautious about the validity and generalizability of the "findings" in this case study. I was also challenged to recognize my biases with respect to *seeing* events in particular ways, given the influences of my experience in co-op, the readings I had done, and my discussions with thesis committee members.

Participants

The study participants consist of co-op students, their workplace supervisor, and a project technical supervisor from the School of Kinesiology in the Faculty of Applied Science at SFU. As the co-op co-ordinator responsible for student preparation, marketing, and monitoring work placements, I too was part of the study. This particular placement was chosen for study because of the interest shown by the employer, and the fact that the technical supervisor was interested and willing to engage in the study. Further, unlike many other kinesiology co-op employers who hire one student per term, this placement involved three students who varied in their experiences and who presented different perspectives. Finally, this placement involved an interesting and unique project which involved the students in a critical capacity from beginning to end, allowing for the opportunity for reflection on the project/term in its entirety.

This co-op placement was itself a research project involving measuring the physical dimensions (height, weight, girths, bone lengths, etc.) of some 500 children between the ages

of one and five. This project was headed by the Sunny Hill Health Science Centre for Children's Department of Nutrition, in consultation with a faculty member from the School of Kinesiology at SFU. The Sunny Hill Anthropometry Pediatric Evaluation project, or SHAPE, was designed to collect data from healthy children in order to develop norms which did not previously exist for this age group. The intent is to use this normative data as a basis for evaluating children with special needs with respect to their growth and development. In particular, the SHAPE researchers are interested in monitoring changes in growth that may result from various nutritional interventions. This study on co-op education in the applied sciences is therefore a research project on learning within a kinanthropometry and nutrition research project on growth and development.

Two teams of three students were hired to collect the measurements and enter this data into a specially designed computer program over the course of a four month long work term (September 1 to December 31, 1994). One of these two teams was selected for this study after discussion with the employer based upon our perception of which group of students would interview better and be least distracted by this study occurring during the work term. In my role as the co-op co-ordinator, I was also somewhat familiar with the personalities involved and wanted to select motivated students who would provide rich feedback. As well, there was consideration given to selecting students who would be accessible after the co-op workterm for debriefing and further discussion. Two of the three students on the team not selected for the study were leaving for Australia as soon as the work term was over, which would have made follow-up impossible.

Monica, Catherine, and Minda: The Students

As it turned out, all of the measurers hired for the SHAPE project were female, consideration being given to the fact that the small children they would be working closely with might be more receptive to a woman touching them, moving and removing their clothes, and performing the various body measurements. The team selected for this study consisted of

two first time co-op students and one, Minda, who was completing her third workterm. Each was completing a B.Sc. majoring in kinesiology with ambitions to graduate and work within the health and fitness areas. One of the students, Monica, was a third year student in the process of applying to chiropractic college, where she was ultimately accepted and therefore unable to join in the last videotaped session. The other, Catherine, had just completed her second year of university coursework and was just beginning to explore career opportunities through co-op. The team leader, Minda, had approximately one year of academic course work remaining and one more placement in order to obtain her co-op designation. While remembering each other in passsing from classes taken together, the students were not well acquainted when they were first brought together at the start of the workterm.

Minda was hired as the team leader, responsible for the co-ordination of the other two team members and the measurements sites. She acted as the liaison with Sunny Hill as well as the measurement sites where data were collected. She performed some of the measuring but primarily recorded data as the other two students measured the subjects and co-ordinated the flow of children through the process. She was very well suited to this type of position, given her outgoing personality and excellent management capabilities. She had also demonstrated good abilities during previous placements dealing with people, multi-tasking, and demonstrating leadership.

Although Monica was also a senior student, she had not completed any previous co-op placements. She was hoping to gain entry into chiropractic college the following fall and was seeking experience interacting with clients, measuring and conducting research. She was more reserved than Catherine and Minda, with a quiet competence and gentleness that the children warmed to. Though unfamiliar with the age group, her personality and sense of humour contributed to her success with the children.

Catherine, the youngest of the three, had just completed most of her first and second year requirements for her major in kinesiology and was entering her first co-op placement. She had yet to take the undergraduate course in kinanthropometry (KIN 303) and had the least

direct knowledge about anatomical measurement of the group. She was, however, quite in tune with children because of having brothers and sisters, nieces and nephews in the one to five year age range. Catherine was eager, although anxious, to learn the anthropometric techniques she would be using with the children. She too was gentle in her approach, had a great sense of humour about herself and circumstances and was keen about the project. For example, she had gone to the library to take out books on children's songs and games as a way of preparing for the term and often picked up ideas from home regarding ways of distracting the little ones, or things that they seemed to like. Catherine also voluntarily developed promotional posters on various aspects of the project as it proceeded and remained on contract to the Project after the work term was over in order to tie up loose ends and complete the final data entry.

Janet, Richard and Susan: The Supervisors

The primary project supervisor was Janet, the Head of the Nutrition and Dietetics Department at Sunny Hill Health Sciences Centre for Children. She had initiated the grant that funded the project and approached the SFU School of Kinesiology for their technical expertise in the measurement aspects. Janet's background was in Nutritional Sciences and her current work found her looking at ways of evaluating specific dietary interventions used with special needs patients (spina bifida, cerebral palsy, etc.). In particular she wanted to measure any changes (growth, weight loss, etc.) that resulted from particular diets given to these children. At the root of this challenge was the fact that there did not exist any normative data for children in the age range of one to five years of age, so it was difficult to evaluate how a patient was progressing in the absence of able bodied norms. Her project sought to develop these norms by measuring 500 one-to five-year-olds using techniques that could be applied to non-able bodied subjects as well. She then contacted Dr. Richard Ward at the School of Kinesiology to provide the technical expertise needed to devise the measurements and oversee the anthropometric aspects of the project.

Richard assisted in the development of the grant application and upon its success set out to design appropriate measures, equipment and protocols for the project. He also designed the computer program into which data were entered and from which reports were generated. Richard's wife, also a research scientist working at Vancouver Hospital, had previously hired co-op students to work with her and due to her success with them, and Richard's appreciation of co-operative education's goals, he contacted the Kinesiology Co-op Program regarding potential involvement in the SHAPE project. Beyond facilitating the hiring of the students through this contact, Richard was responsible for the initial anthropometirc training of the students and acted as an ongoing consultant for any technical issues. Richard teaches several courses for the School of Kinesiology, , including Kinanthropometry and Computer Applications in Kinesiology. He is consistently a top-rated teacher, and is known as an approachable, caring and good natured individual who is honest in his opinions.

On a day-to-day basis the students had little direct supervision. Once the students were trained and initial equipment problems were worked out, the students rarely saw Richard, whose primary focus during the data collection phase was the final development of the computer program. As well, Janet had her full-time job to attend to while overseeing the project . She had hired a project co-ordinator, Susan, who the students primarily dealt with on issues of scheduling, paperwork, etc. The team leaders co-ordinated the measurement sites and the students would meet at those sites ready to measure. Only on a few occasions did either Janet or Susan attend as well. For the most part the students worked on their own in terms of the actual data collection. Periodically, Janet would call team meetings where both teams would get together to review progress and any problems there might be. The back up support and supervision was present, but largely at a distance from the daily measuring sessions.

Data Collection Sites

There were two sessions which served as primary sources of the data for this study. The first was the videotaped measurement session that took place in the last month of the students' term, where seven subjects were measured at a home site. The second was also videotaped and took place eight months later at SFU. This session involved both students and supervisors who came together specifically to view the tape of the measurement session, comment on it, and discuss the co-op term in general. This session took place at the university and was attended by all except Monica, who had left for chiropractic college in Ontario.

The measurement or "at work" session which was taped took place in my home. At the point in the workterm when the videotaping was planned, the team needed children from the one- and five-year-old age groups in order to fill their subject quotas and this demand could be met by me gathering neighborhood children and co-ordinating the session in my home. This also permitted us to videotape and observe the event without the disruption of a pre-existing routine (such as a daycare might have). The subjects were familiar with me in that environment and I was therefore less intrusive than I might have been coming into another setting where I did not know the subjects and was not usually present. The nature of the co-op students' work was to come to a site and perform their duties there. They had conducted several "drop-ins" at other sites including shopping malls, daycares, and homes and so this setting was completely consistent with past experiences and presented no special differences from their regular "work environments." The site selection was therefore determined primarily by ease of co-ordination, access, entry and the ability for me to have a continued presence during the observation time. The site of the interview sessions (the celebration and the review of the video) were at the call and convenience of the participants, and both sessions took place at the Burnaby campus of SFU.

Participant Interaction and Data Collection

The first data collection session was a video recording of the measurement session conducted in my home involving the three students and seven children. The second major data collection session consisted of an in-depth interview with the students and supervisors held some eight months after the work term was over during which time we viewed and discussed the videotape of their measurement session as well as the reflected on the work term in general. I facilitated this session and was guided by a series of questions I had developed (see Appendix II for a complete transcript of the interview) from my previous observations of the participants and from several viewings of the videotaped measurement session. These questions examined *what* and *how* learning occurred, and were used to initiate discussion on various aspects of the co-op work experience. Minda and Catherine were asked to describe concerns they had as newcomers, how they determined problems and devised and implemented strategies, how they operated as a team, their roles in the workplace, what skills were learned and how, the influence of experience on their thinking, how this experience affected their subsequent coursework, and their views of learning. Janet and Richard were invited to comment on any of the above as well as to reflect upon specific aspects of the orientation, training and supervision in this work placement. Both supervisors were also asked to comment on the learning they felt was afforded by co-op work terms and Richard, who was also a professor, was asked whether he noticed a difference between his co-op and non-co-op students as learners in the classroom.

Unlike experimental, historical and survey research, case studies do not claim a particular method of data collection or analysis. As this study's problem is interested in insight, discovery and interpretation versus hypothesis testing, I drew primarily from the basic qualitative techniques of in-depth interviews/discussion and participant observations (in person and videotaped). Because of the rapport I had developed with employers and students in the field, and my ready appreciation of the subject and the environment, it was anticipated, (and was in fact the case) that participants would be co-operative and that trust would be

evident. Both students and supervisors were eager participants and very giving of their time and feedback. I, as the co-op co-ordinator for kinesiology, was also familiar with current issues and language of the field, and this served to make the interviews easier and reduce misunderstandings due to faulty assumptions. It was natural that I visit students at their place of work and dealt with their supervisors. What differed was the extent to which we discussed and reflected upon their learning and the amount of information I would be collecting by way of video recording. As well, the follow up interview some eight months after the term was completed was also another time and energy commitment that was beyond the ordinary commitment to co-op. I have appreciated the ease with which my requests for both were fulfilled.

Because of my familiarity with the students and workplace (and theirs with me in my role as co-ordinator), entry to the site was relatively easy. This facilitated access to the site, however, also challenged me to think in new ways about what I was seeing, to override the dominant practitioner's eyes whose interest lay in implications for practice, with a researcher's perspective and interests that were more theoretically based. Moving back and forth between practitioner and researcher was perhaps the most difficult challenge I encountered, not only during the data collection phase but also the analysis. For me it was important to have implications for practice from this study (as this has been my dominant perspective for years), however this practical "eye" often tended to dominate and in fact obscure the research perspective. The two distinct sets of implications in the final chapter (one for research and one for practice) reflect this struggle and provide me with a good way of ensuring that both perspectives, while very different, are honoured.

In the analysis, all of the data were filtered through me, carrying an inherent perspective or bias based upon years of informal observation, personal experience and discussions of this subject area with colleagues. I have endeavored to keep my familiarity with the subject area an asset by using it effectively to gain access, entry and trust, while remaining open to new ways of seeing and understanding "familiar" phenomena. These

issues are addressed aptly by Blumenfeld-Jones (1995) in his notion of "fidelity" in qualitative research as consisting of a set of emerging criteria for evaluating the quality of a piece of narrative inquiry:

> ...the quality of a piece of narrative inquiry has a two-fold character. First, the inquiry should address a sense of "betweenness," acknowledging and making explicit the bond between the inquirer and the subject *and* between the story and the story's context (with all the complexities the term "context" suggests). Second, there should be "believabiltiy" of the work in the story as both a reasonable portrayal of the specific story and as the story "resonates" with the audiences' experiences. In addition, the process of both decoding and recoding of the narrative must be included in the account. (p. 33)

Throughout this study, I have reflected upon the relationships between the participants and myself, between the "learning events" described and the context out of which they emerged, and between my own reflexive understandings of concepts and the phenomena they have rendered. The data analysis engaged me in a process of interpreting and re-interpreting the events that took place in this co-op placement. I recall thinking at the end of the "reflective session," that there was little evidence of learning. I was only able to recognize the more obvious stories and comments about learning as being pertinent, and saw the rest of the session as ordinary conversation about experience. Through viewing and transcribing the videotape and reflecting upon my readings, however, I began to think about learning and the data differently. I began to *see* learning *as* reflective problem-solving and engagement in a community of practice. I could detect the learning of "employability skills," stimulated by dialogue and mediated action with more knowledgeable others. Themes began to emerge as I recognized commonalities in *what* was learned as well as *how* it was learned. It became clear that there was learning occurring in terms of such dimensions as working effectively as a team, managing the unexpected, detecting and responding to key issues, developing technical and personal management skills, etc.

The data were not "objective" in the usual sense, but rather resulted from a reflexive relationship between my understanding of key concepts in the literature and events described in this co-op work placement. I return to this notion of reflexivity in Chapter Six, where I discuss the limitations of the study.

Conclusion

This study focuses on the experiences of three kinesiology co-op students who worked on a kinanthropometry and nutrition research project headed up by the Sunny Hill Health Science Centre for Children. A qualitative case study approach has been described as an appropriate method for the research problem of the study; that is, to observe, describe, and inform the nature of learning in a co-op placement. In this chapter, I have presented ideas exploring the metaphysical basis for qualitative versus quantitative approaches to research in education, and justified my choice of the former in addressing the problem for this study of co-op education. In addition, I have raised issues pertaining to data collection, interpretation and analysis, and discussed criteria for assessing qualitative research. Next, Chapter Five presents the analysis of learning occurring in this co-operative education placement.

Chapter 5
Analysis and Findings

Overview

As discussed in Chapter Four, this analysis of learning involved moving back and forth between literature about learning professional practice and events examined in the kinesiology placement. The process is one of examining events and dialogue in light of various concepts and perspectives drawn from the literature, reading and re-reading the co-op students' stories, and emerging with new understandings and representations of their learning. This chapter first presents examples of *what* was learned within the following categories which emerged from the data: appreciating the difference between theory and practice; managing the unexpected; working effectively as a team and performing multiple tasks; focusing on, prioritizing, and responding to key issues; developing community-specific technical and interpersonal skills; understanding the "big picture" and connecting with it; and learning to learn differently.

The analysis then turns to *how* learning arose with specific attention to such processes as problem detection and recognition; problem framing and re-framing; and problem solving through reflection in and on practice. Selected "learning events" described by the participants are reviewed and explained using concepts proposed by Schön, Lave and Wenger, and Vygotsky. Other observations which I believe are integral to better understanding the nature of the co-op education environment and learning are woven into the stories of *what* and *how* the students learned, and include the changing concerns of co-op students as they move through the work term, the "situatedness" of co-op learning, and the importance of learning through mediated activity (by seeing, doing, and being shown).

Moving back and forth between memory, dialogue, videotape, transcription, emerging categories of learning events, and the literature allowed new understandings and claims about the nature of the learning in this co-op experience to emerge.

Learning Events as a Unit of Analysis

Throughout the final participant interview/review session, many stories were told and comments made with respect to events that occurred over the workterm. Some of these were in direct response to questions and others flowed from the discussion. They provided wonderfully rich information about how students felt, what they perceived, how they faltered and how they thrived over the course of their co-op term. The supervisors too provided insights as to how they felt in their role, the challenges of working on the project, their perceptions of the student learning experience, and observations of their own learning. Several stories or events were evident that illustrated a particular moment where something changed for the participants—they learned *about* something (including themselves) or *how to do* something new or differently.

I have come to see these stories as "learning events" in the sense described earlier in Chapter 1—things that occurred which presented the participants with opportunities for learning, for growth. These events were not part of a formal curriculum as one would find in academia but rather emerged or unfolded as the participants became more engaged in the community of practice. Each participant experienced a very personal learning curriculum, dependent upon her particular experiences and readiness to develop. The growth that resulted from this learning was evident as the participants reflected upon the term and readily articulated examples of what they had learned and gains they had made in their confidence, skills, and abilities.

Near the conclusion of the interview session, the supervisors expressed the feeling that the students probably learned "a lot more than that" (which they had been taught or trained to

do, or could describe). This in fact seemed to be the case as I visited and re-visited the data. I began to examine these "learning" events for similarities so that I might group them in manageable and sensible ways. It was clear that the participants spoke about what they had learned in couple of ways. One was to list things they had learned, usually articulated in the "skills" based language dominant in the Technical Rationality model, and usually in response to a direct question about their learning. For example, when asked what they had learned over the course of the term, one student quickly responded "measurement skills and interpersonal skills."

The second type of reference to learning was less direct, often in the form of a story about one of the workterm experiences, and often requiring linkages and interpretation by me to determine whether learning was central to the event(s) and, if so, what it was like and in what ways it occurred. I looked for evidence that learning had occurred, namely, a change in knowledge, or the ability to do something. For example, at different times in the discussion the students referred to how they had felt about being unable to complete the measurements on various children. Reflecting on their earlier experiences, one student noted how she was discouraged at the beginning, and would go home "exhausted feeling as though she hadn't accomplished anything." At another point in the discussion the students noted that later in the term, if they did not complete a set of measurements they would try various strategies then "let it go." At the same time their completion rate improved from 40% to nearly 100%. I would link these sorts of separate but related "facts" and look for evidence of what, if anything, was learned. In this example, given the change in attitude described between the early experiences and later ones (anxiety changed to acceptance) along with a change in performance (improved completion rate) I concluded that learning had occurred in at least two ways. The students had clearly developed some problem solving strategies around obtaining various measures (their completions were up, and some strategies were found in related stories) as well as gaining a

different perspective about those instances that they were not able to collect complete data sets (they didn't go home frustrated but rather learned to let it go).

From both of these methods (direct and deduced indications of learning), I developed a list of what may have been learned by the participants in this co-op experience. Similarities within this list allowed some categorization. While *what* the students had learned during their co-op term was interesting, the question of *how* they had done so was even more so to me. Using the above example regarding measurement-taking, once I had accepted it as a "learning event," I took a closer look at how the learning may have evolved; what processes may have been at play. For example, the students developed new ways of looking at the problem of obtaining certain measurements (framing and re-framing) through repeated experiences in many different environments over time and by chatting among themselves, with the project co-ordinator, and the other team of measurers about these challenges (reflecting in and on practice). With the aid of the theoretical framework I began to see several ways in which the students learned, and again several similarities emerged across the various events. Much of the learning encompassed the processes of problem detection and recognition, problem framing and re-framing, and problem solving through reflection in and on practice. As well, it was clear that the students learned through a combination of seeing, doing, and being shown. Their changing concerns over the course of the term allowed for a breadth of learning to take place, and as the students became further engaged in their community of practice, new opportunities for learning unfolded for them. While some of the learning appeared to be the application of skills and knowledge gained in school or the training sessions, much of the learning observed in this study appeared to be new, situated in the experience itself, or re-constructed in the context of this placement.

Not all of the "what was learned" events have corresponding "how it was learned" processes and vice versa. Sometimes the students would clearly outline a way in which they had learned but would be much less definitive regarding what it was that they learned. For

example, some of the daycare measurement sites had non-English speaking parents and children. The team devised a way of dealing with what they described as a language problem by finding out the key questions these people had and composing a letter in Chinese that would address these issues on future visits. This process of problem detection, framing, and solving was well detailed in the story yet little or nothing was said of this event when students were asked what was learned. This event was not perceived as a learning opportunity per se although in fact it is a good example of "what" was learned: the ability to focus on and respond to a relevant issue in the setting. Conversely, there was often great clarity provided about what was learned but little as to how it was learned. For example the students said: "we worked very well as a team...efficient, fast" or "our measurements techniques got really good," but when asked how this came about there was pause for thought and finally "well, I think it just happened..." or "as time went on things just kind of came natural." In a couple of instances the students were unable to remember how they had learned particular things, often assuming it had been learned in the training session only to work backwards and find out it was a problem that had arisen after that session and was therefore solved through various combinations of reflection in and on practice.

Slowly, as I viewed and re-viewed the tapes in order to transcribe each word and note nuances, I began to see a wealth of learning emerge from the many stories and events described by the students and supervisors. Some of it was obvious such as the confidence the students' gained in their measurement skills, and some much less so. This learning was hidden among the responses, woven throughout the stories—learning that required a step back in order to be seen, like the proverbial forest for the trees, then a step back in for a closer look from a different perspective. It appeared to be a rich combination of product and process; the difficult to see yet obviously occurring, hard to articulate but clearly felt changes in the knowledge, skills, and abilities of the participants. The challenge lay in taking a closer look at

this co-op learning to gain a little more insight and understanding as to what it involves and how it occurs.

Examples of "What" the Participants Learned

The examples noted below were drawn from the participants' responses to direct questions about what they had learned as well as my interpretation of various stories as learning events. For management purposes and clarity, similar examples have been grouped together under each heading. One can see a breadth in the nature of what was learned in this co-op experience. Learning ranged from the more traditional employability type skills such as interpersonal and team work skills through to a type of artistry that was developed as the students improved their ability to practice in the midst of the unexpected, often competently performing several tasks at once. The categories provide an important framework for the analysis as learning events will be selected from them for a more in depth review when the analysis turns to the question of how this learning occurred.

Appreciating the Difference Between Theory and Practice, and Managing the Unexpected

One of the first lessons learned by these students was that theory and the reality of practice can be worlds apart. Many examples of this could be found throughout the discussion, with the first reference early on as the students recalled their first day in the field. While they had received training in mock measurement sessions, their first *real* measurement experience as they said, "really broke us in." It was then that the day-to-day realities of working with people in uncontrolled environments showed themselves. Children arrived with improper or no letters of consent for the measuring; proper documentation for others who were absent or sick; reluctant and screaming children and only a few hours allotted for their data collection. They completed about 40% of the measures they sought to collect and learned very early on that the abdominal skinfold measure was going to be a challenge. They also

realized that this job was very different from what they expected in the sense that it wasn't a 9 to 5 affair but rather one where they accommodated their subjects' schedules. There was also, as the term progressed, the realization that each daycare and drop-in site was differently prepared for them. Some had the children ready and framed the visit as a special event while at others staff scrambled to get the children together for something they knew little about and were unaware of in advance.

Another thing that varied from the expected were the anatomical differences and subtleties that made landmarking (finding the correct location on the body from which to take the measurements) a challenge. Here Catherine described her experience in trying to landmark the malleolus or ankle bone on some subjects:

Catherine: *What are you thinking about...landmarks?*

Minda: *Yeah. If you were feeling it and the bone just wasn't standard or something. (jumbled chatter)*

Catherine: *A lot of kids, I find that, that bone there, it doesn't nicely.*

Minda: *The knee.*

Catherine: *The knee was OK but then the ankle, it's not always a nice little sharp thing that kind of comes around...it's not. Some don't have it (the bone in question), I swear! (chuckles)*

Minda: *Yeah.*

Catherine: *Yeah. Like ah, some are really nice and you can see it right there but some it just...*

Janet: *Or if they turn their foot in a little bit it disappears too...*

Minda: *Or if they're heavier.*

Again the difference between course-based knowledge and learning in the work setting is obvious in an area (anatomy) where one might not expect it, or even be aware of it in a decontextualized setting. Very quickly, the participants outline three cases (if the foot inverts, the subject is overweight, or the bone is not prominent) where landmarking using this bone as a reference is difficult. As such, we see an example of "problem-setting" (Schön, 1983),

where the co-op students have identified an aspect of practice that requires considerable restructuring of their "book knowledge." This realization, or problem identification stage is the first step towards the development of solutions. Other examples of problem setting were readily apparent and indicative of much learning.

In a final example, the students learn that unlike their experiences in school, in the "real world" there is often no "right" answer. In particular, they learned that their second set of measurements (which was averaged with the first) was not going to be identical to the first, and in fact was sometimes very different. They learned to accept variability in the face of wanting "to get the right answer," (matching their first measurements), the assumption being that the first measurements were the valid ones! This understanding was explicitly addressed when one of the students described her later experiences back at university, working with other non-co-op students in a class which focused on anthropometry (human measurement). She described her observations of their difficulty with the variability of repeat measurements. She had learned that this deviation was expected and allowable in the field because "error was calculated into the formula and was within an acceptable tolerance" however she was unable to persuade her fellow students of this by merely "telling them."

A second area of learning related to the "realities" of the workplace was dealing with the unexpected. These were events which emerged spontaneously in given situations and not in others, and which were based upon a variety of context specific factors that were largely unpredictable. Examples of this learning were evident at several points in the discussion with the students and included everything from realizing their schedules were not predictable (but were dependent on their subjects availability), that not all the children would be as co-operative as the practice subjects (who were at the practice session with their parents), and that there may be difficulty obtaining subjects from specific age groups. While some of these were not entirely unpredictable, they were not part of their academic preparation, and were surprising to the students upon first realization:

Catherine: At the beginning I felt kind of discouraged because, you know, it felt like a challenge, that you kind of want it, you know. But then after a while you just say "oh well, if we get it we get it, we don't we don't "so like you know. Because like I said, after I went home I felt so exhausted playing with these kids right you know, it seems like we hardly accomplished anything. And uhm, so after a while you just say you know, that they have their own minds and, and if they don't co-operate then that's, let it be.

As the work term progressed the students learned to deal with this and understand it in new ways as evidenced in the follow up comments by Minda:

Minda: And you can't take it personally (a child not wanting to be measured), we found that (out). For instance, one, I mean maybe, not in those case but in other cases, say Catherine would try to measure someone and it wouldn't work and then Monica would measure them and it would work, or vice versa, or you know waiting 10 minutes and it would work. And it was nothing you did wrong,...just for whatever reason somebody else was able to take to it better.

Other examples of the unexpected include dealing with situations that arose on the spot when measuring, such as children wearing body suits, children fearing the skinfold calipers, or a host of non-compliant behaviours which interfered with the measurements. The students appeared to improve in their ability to deal with these surprises as the term progressed, thereby enhancing some of the personal management skills articulated in the *Employability Skills Profile*. Later in this Chapter I will look at *how* this learning may have taken place as the students gained increasing practice at framing and re-framing their experiences as well as becoming further absorbed into their community of practice.

Working Effectively as a Team and Multi-tasking

Effective teamwork was definitely one of the skills that this team of students felt they had developed over the term, commenting several times throughout the discussion about how "surprised" they were that they worked together so well. They noted their speed and efficiency in particular as well as their sensitivity to the skills and needs of the other team members:

Minda: It clicked one day.

Catherine: *Yeah. (chuckle)*

Minda: *I don't know when but it clicked one day.*

Catherine: *And when we would kind of make it out of order she'd say "What?" (laugh)*

Minda: *Just like "you missed!"; "you did this!"*

Nancy: *Without it having been decided you just kind of worked into that?*

Catherine: *Yeah, we just went, its funny because the other group did the other way like they started with legs first. Yeah and then uhm, and then ah, .. we just started with arms first for some reason, yeah, it was a routine that we just went on and it was fine.*

Minda: *And I think we were all, very much, we were very interactive, and as a group we were we were very interactive—as a group everybody knew where the other person was. I mean I knew where they each were (in the recordings) and I got the sense that they each knew where each other was. If one were heading over to do a head, the other would speed up so they could get over there so they could help—it all worked out.*

While the students themselves were unclear as to how this may have occurred, Lave and Wenger (1991) note that "the social relations of apprentices within a community change through their direct involvement in activities; in the process, the apprentices' understandings and knowledgeable skills develop" (p. 94). This process, as it relates to the students' learning, is examined in more detail later this chapter.

Also evident in the videotapes were the students' considerable abilities to multi-task. While most university students have developed this skill to some degree (through juggling several courses with outside commitments such as part time jobs, recreation, family, volunteer work, physical activity etc.), there is no doubt that the students in this co-op placement had ample opportunity to hone their skills in this area:

Nancy: *(Aside as they watch the tape on fast forward): There's Minda doing five million things at once!...How 'd you get to be good at that Minda?*

Minda: *Practice (laughs)*

Catherine: *She's a natural! (chuckles)*

Minda's initial response speaks strongly to the notion of learning by doing, whereas Catherine sees Minda's skill as being more innate. Because of the lack of clarity on *exactly* what we mean by many of the skills we talk about, how they may be demonstrated, and how we can evaluate their acquisition they are difficult to understand. Consequently we tend to ignore the messy issues and assume that some people are just more capable than others when it comes to such competencies. Minda continues her thoughts regarding what has contributed to her skill development.

Minda: *Jobs I've been in before...a lot of things.*

Her comment regarding previous jobs having been formative is consistent with the findings of Evers and Rush (1993) which saw university graduates attribute "on the job experience" as the clear primary source of their development in the four employability skill composites outline in that study.

Nancy: *Could you explain everything you did in your role Minda? How would you describe it?*

Minda: *Oh, huh, Catherine may have helped too. I mean, basi-, I did some measuring so I did have a part in that, and supervising the measuring so I did have to know where they all were to make sure that, and double-checking, the paperwork, and contacting Janet and Susan and making sure that everything was on schedule and I organized some sessions and co-ordinated/talked with the daycares, problem solving that's keeping other kids happy while they were measuring—did a bit of that—and just generally keeping it all flowing—which was one of the toughest things that I found. Just making sure that the kids that were coming up were happy and that the daycare wasn't sending them up too fast, that they were happy and that you were in the right spot. There was a lot of different things to worry about.*

Minda reflects upon the diversity in her work, acknowledging that effectively managing several tasks at once may have been one of the most challenging aspects of the job.

Nancy: *And when that went well ...?*

Minda: *It felt really good. And you could tell that it was going well—they were quite efficient and everybody was happy. That's generally what we were aiming for—accurate measurements and having everybody—kids included-happy.*

Focusing, Prioritizing, and Responding to Key Issues

The students also improved their ability to focus and respond to the relevant variables in a given situation over the course of the workterm. Students initially recounted "doing the best they could" in response to the several problematic issues at their first session (where they reported getting only 40% of their measurements) then gradually improving on their success (at the end of their term they routinely completed 90–100% of measurements) solving key problems such as obtaining the abdominal skinfold.

Changes in the way the students were able to focus on relevant variables were also noted at several other points in the discussion. In one story about weighing a little boy who was holding a large plastic dinosaur the students describe how their focus changed from an original concern of total "accuracy," which would necessitate taking away the toy, to one of recognizing the key issues and taking action only when the results were of significance:

Nancy: *Later on when we watch this, I don't know if you guys remember this but uhm, you were doing the weight measurements on David, the little guy that is being measured there (points to the screen). And he stepped on the scale once with the dinosaur and once without and. Can you explain to me when you see those kinds of things what would usually go on, and if you can remember what happened, then we'll watch it.*

Minda: *Well, when we see someone step on with something like that, first of all you kind of go "OK is it heavy enough?"*

The student's initial reaction is concern about the impact the toy might have on the accuracy of the data, but soon other realities of the situation take priority.

Minda: *Is the kid going to scream, will the kid let us even measure them if we take it away from them? So everything runs through your mind at once. And I think with him we saw that and went "Ahhhh," and felt he would be able to handle it so we took it off and then measured either way and we make a game of it: "Let's measure your dinosaur!"*

Chuckling.

Minda: *Try to make it as fun as possible, so those are the little things you worry about.*

Nancy: *When that first happened you were probably more thinking about accuracy were you?*

Minda: *Yeah.*

Nancy: *Than to try and remedy the problem, then you've got yourself a new problem! (chuckling)*

Minda: *Yeah! Well we found that it hardly ever affected the scale. It would take a lot to switch it the extra .5 kg.*

The final assessment was that over time the students learned that their scale was not sensitive to variations of less than .5kg and recognized that issues of subject compliance were of greater priority than perceived issues of accuracy. Their ability to focus on key issues and prioritize improved as they gained greater exposure to the community of practice. In such cases, states Schon (1987):

> the pratitioner experiences a surprise that leads her to rethink her knowing-in-action in ways that go beyond available rules, facts, theories and operations. She responds to the unexpected or anomalous by restructuring some of her strategies of action, theories of phenomena, or ways of framing the problem; and she invents on-the-spot experiments to put her new understandings to the test. (p. 35)

In a final reflection, the students comment on the change that occurred:

Catherine: *Yup, you just learn that (over the four months of exposure)—the measurements...it's important to be consistent in your measurement but, ah it's like you don't have to be super duper accurate reading it too because things change from measurement to measurement. Yeah and then, like I said, near the beginning we weren't sure if we got the right landmark, or if we were measuring it properly, and how we held the tape and as time went on things just kind of came natural ...in your measurements.*

Minda: *You* ***weigh your priorities—you've got to figure out what's more important.*** *Is it to be fast, to be efficient, to be accurate? You've got to find a half way point I guess.*

Developing Community Specific Research, Technical, and People Skills

Perhaps the most obvious "learning" noted was that of specific skills. Students were asked to comment on what they had gained from the work experience and chief among the responses were the measurement and interpersonal skills the students practiced each work day.

Nancy: ***What about skills or things that you learned along the way?***

Catherine: *Measurement.*

Minda: *Yup, the measurements, interpersonal skills,...and it opened my eyes to the ethics—I think of the whole situation with children, all the hoops and all sort of things that you have to do and the importance of having everything exactly right on forms, and absolutely everything exactly the way it's supposed to be.*

Interestingly, the conversation related to what they had learned was relatively short and needed to be prompted by my questioning in several ways ("What did you gain from this experience?", "What about the skills and things that you learned along the way?", "How did you learn that?"). In general, the students did not seem to initiate much reflection upon their learning, tended to see learning in a very narrow academic sense, and often didn't know what they had learned or had difficulty expressing it.

In addition to noting measurement and interpersonal skills, the students appreciated aspects of the broader project such as some of the many considerations in conducting this type of research (e.g., ethics). Another such consideration involved becoming familiar and comfortable with the children and their "culture." When asked whether knowing the "kid's scene" was important Minda and Catherine responded:

Minda: *Yeah, well not necessar,...well, Barney was important and different things like that were...but no so so much. You didn't need to know the name brands so much, you didn't need to know too too much about that although they did catch on to Power Rangers and different things.*

Catherine: *Yeah, like you need to uh...to keep a conversation going you kind of need to talk (about) what they're interested in. And if it's like you don't know anything you kind of have to be stuck with like "what did you do at school?" or "what did you do today?" or you know like that. But if you know that much more then they say "wow, this person knows Power Rangers or Barney!" (laughter)*

Nancy: *Instant credibility!*

The students initially became familiar with the likes and dislikes of children in this age range by going to the library and taking out books and tapes or by observing nieces and nephews, brothers and sisters. They learned over the course of the work term that in order to work most effectively with their subjects they needed to understand their "culture."

As noted earlier, the students also gained a better understanding of the overall research process, including ethical issues, data manipulation, the various roles played by researchers:

Minda: *One of the most important things I think I gained was just basically being at the ground level of a research project.*

Nancy: *Uhum.*

Minda: *Seeing what actually happens, seeing how everyone interacts, and what goes on with the data and everything, the whole process. I really enjoyed that part of it.*

Nancy: *Did it change some of your original thinking?*

Minda: *Well of course at school you're always taught to be skeptical of what you read and I think it made me more so (laughs) in a lot of ways. You realize what really goes into it and the chances we had, I mean you know, when you do have a problem in the measuring whose to say, who was there to say you don't just change it. You rely a lot on the honesty of the researcher.*

The students also noted that they had learned a lot by being brought in "at the ground level of a research project." The realization of how easy (and perhaps tempting) it might be to "fudge" the data became very clear to Minda having been responsible herself for data collection and recording. While one can study ethics in school, a personal exposure such as this co-op placement brought a level of understanding to the issue that is not possible in the absence of personal experience. As noted by Argyris and Schön (1974), "learning a theory of action so as to become competent in professional practice does not consist of learning to recite the theory; the theory of action has not been learned in the most important sense unless it can be put into practice" (p. 12). This co-op placement afforded Minda the opportunity to put her theory of research ethics into practice. Minda also commented on enjoying having the ability to see what actually happens, how people interact, what happens to the data, etc.—essentially, as she put it, "the whole process." This appreciation of the "whole" is noted in the next category of learning events presented in this study.

Understanding the "Big Picture" and Connecting With It

Throughout our discussions there were several comments made indicating that the students had gained an understanding of the "bigger picture" as it pertained to the SHAPE research project. Initially, this awareness was at a basic level of understanding the various institutions they represented and behaving in accordance with those cultures:

Nancy: *Good. So now backstepping again, when you went out in the field, who were you representing? Did you have a sense of how you were to carry yourselves and how did you base that?*

Minda: *Well, we felt we could be quite professional about it because we had two large institutions behind us. We felt we could always kind of throw out the Sunny Hill and SFU (names) and it would be fine. I mean when you have anything "university" it usually works reasonably well. So you did feel that you had a lot to back you up and you went in presenting yourselves as such—as best you could.*

Students were then asked to go beyond this representational stage and think back to when they first gained a sense of project as a whole.

Nancy: *When did you feel you got the big picture sense of all of what you were doing? Or have you yet? (chuckle)*

Minda: *The BIG picture?*

Nancy: *Yes.*

Minda: *The biggest picture I got just recently when we went to the session (a celebration they held four weeks previous)...but uhm, we were introduced to it right at the very beginning.*

Here Minda notes that even though it was explained early on in her term, it was only once she had been away from the project and had seen some of the outcomes presented in the "follow up" session she refers to, that she could fully appreciate the "big picture." This "follow up" session, as well as their celebration session, took place several months after the end of the term and this raises the question of the value of "wait time," or time needed for digestion (internalization) of the experience, in order for reflection to be most effective.

There is also evidence that the students became increasingly involved in their community of practice, when mid-way through the term they begin to assume some of the

goals of the larger organization (not specific to their job descriptions) such as recruiting measurement sites, promoting the project, completing data entry, etc. This is evident in the following dialogue regarding site recruitment:

Janet: *Yeah when we first started out I think our biggest problem was just finding enough kids.*

Nancy: *Uhum.*

Janet: *Initially, and trying to keep a steady flow in order to...*

Richard: *(at same time as Janet completes her thought) Keeping them in flow.*

The supervisors, Janet and Richard, talk about some of their challenges early on in the project. Specifically, recruitment of subjects was an issue.

Nancy: *(directed at students) And part of that became your challenge?*

Minda: *We did some of that, most of it was Susan's (project co-ordinator) challenge. But then we started looking for our own measurement sessions.*

Catherine: *Minda was really helpful in that...the Place des Arts kids...(chuckle)*

In fact, the students organized measurement sessions on their own initiative as well as producing posters and other promotional material for recruitment purposes. They laughed about being unable to go shopping at the mall without looking at every child in that age range as a potential subject. Catherine remained on contract to the project after her work term to assist with final data entry and generation of the profiles. Clearly the students had become more and more a part of the community they worked in. Lave and Wenger (1991) discuss the "crucial nature of *participation* as a way of learning—of both absorbing and being absorbed in the 'culture of practice'" (p. 95). This notion of "participation" is elaborated upon later in the analysis as the process of learning is examined in more detail.

As a result of both understanding the bigger picture and becoming a more integral part of it, the students increased their appreciation of networking as well as their actual networks:

Nancy: *...there's this sort of presumed knowledge that it's (a co-op placement's just a place to go and apply skills you already learned.*

Minda: *Uhum. With a lot of co-ops you realize that you have to go into a lot more research than what you know and you know, you learn where to look for it and you learn who to talk to...*

While much of this "sense of the big picture" did not come until near the end of their term, it appeared to be significant to the students who both stated the value they felt in having a clear sense of the larger project and in being able to see how the data they collected was used to create the profiles that would ultimately be used in the hospital setting.

Learning to Learn Differently

In gaining a sense of the "big picture" the students also began to see their learning differently. As Minda stated in the last quotation, one outcome of her co-op experiences was the realization that "you need to know more than you know, and you learn where to look for it and who to talk to." It would appear that her understanding of learning has expanded beyond that which occurs in the classroom with a professor, and that she appreciates that learning can occur from many experiences in a variety of contexts. I believe this appreciation, or recognition, may be the first step in expanding the ways in which co-op students learn.

Nancy: *...I think the party line (regarding co-op) is: You learn skills in school, you learn some application, then you go out (on co-op) and you practice all that out in the workplace and ah...(turning to students) Is that what you think you did?*

Minda: *(pause) To a certain...yeah, pretty much.*

Minda wrestles with how to define her learning in co-op. She settles for the technical rational description proposed (and with which she is most familiar), even though earlier she talked about developing interpersonal skills and appreciating the big picture, neither of which is represented adequately by the notion of co-op learning as simply the "application" of school learning. While the students were less able to articulate this, the supervisors, who have had more "life" experience and the opportunity to observe several students, made some interesting observations. Richard, the technical supervisor and professor, notes the inadequacy of this "application" oriented description in his experiences with the students:

Richard: *I suspect they learnt a lot more out there than we gave them actually.*

Janet: *'Cause you had to do a lot of on the spot adapting, and that's something you really grow from.*

Janet reinforces the notion of learning through reflection in practice and re-framing problems in response to each environment (adapting), acknowledging that in her experience this is how "real" growth occurs.

Richard, in his role as professor, was asked to consider the question of whether he finds a difference between his co-op and non-co-op students and concluded:

Richard: *I think that they (the co-op students) find in the practical situation that there's a lot of information they can find to use, it's how do they use it. Whereas our system seems very predominantly "tell me the facts I have to remember" and the exams are set up that way. I do it in 142 (a course he teaches), they have to learn a tremendous amount of information...*

Nancy: *Uhum.*

Richard: *...and there's little about using...thinking about how to use it. It's just this is the way it is, learn this, understand, you say understand...understand the concept, but you're still learning this thing. You're not using some skill you've learned over here and then sort of saying "well that's similar if I apply it over here." And that's where you find very different abilities in people...They (co-op students) tend to have become less of the memorizer and "everything has to be known" (type of person) to more of the try to* ***understand*** *everything.*

Catherine, who took the university course in kinanthropometry *after* having completed her practicum with the Sunny Hill project made these observations:

Nancy: *You took (Kin) 303 after having had the experience. How do you think that was different for you?*

Catherine: *Uhm, ..I think that I've already had the outside experience so I didn't take it as uhm, I sort of went in there and I understood how the measurements were supposed to be taken and, and not to worry if, if the second measurement came out really off from the first. Like the group I worked with uhm, they kept asking me "well, what did I get last time or something?" and I said "uhm, don't worry about it" you know and, and then they couldn't understand they said "oh come on tell me " right and I said "well, it's closer " you know, right and then it's hard to convince them that it doesn't really matter that much.*

While difficult to articulate, Catherine is relating a knowledge of the practice that her fellow students cannot comprehend not having shared her experience in the field. As well as

having difficulty describing this knowledge of practice, she is also at a loss as to how to explain it in a way that will make sense to her classmates. She has become the "competent practitioner" referred to by Schön (1983) who "usually know more than they can say. They exhibit a kind of knowing-in-practice most of which is tacit" (p. viii). She is a different learner now, focusing on different issues than her classmates because of her experience, though is unable to describe why beyond the notion that it is because she experienced it.

Here, situated learning creates an opposing paradigm to traditional learning i.e., one knows that there is learning going on, but what exactly is learned is difficult to define. In traditional educational delivery at universities, one tends to we know exactly what is being learned or being taught (as it is clearly outlined in the curriculum), however, the question that is wrestled with in this environment is how it is best learned or taught. In the two environments (the classroom and the workplace), different aspects of learning are seen as problematic. Situated learning, and the concepts of legitimate peripheral participation and knowing-in-action, provide useful ways of understanding what is often seen in practicum situations; the learner is enriched by the experience but has difficulty defining the precise nature of the knowledge gained.

Summary

The examples above provide some evidence of the kinds of learning that occurred in this particular co-op experience. Minda and Catherine exhibited significant changes in what they knew about many things as well as improved their ability to do many things. They were aware of some of this learning and able to articulate portions of it such as improved technical (measurement, research) and personal management (teamwork, adaptability) skills. However, the majority of what the students learned (managing the unexpected; multi-tasking; appreciating the difference between theory and practice; focusing on, prioritizing, and responding to issues; understanding and connecting with the big picture, etc.) needed to be

discovered, teased from the stories and events discussed in the tapes. The learning did not appear to be explicit to the learner, nor immediately to me, and was therefore not discussed and most likely not fully appreciated as "learning." Only by reflecting on the events of the co-op work term as they related to the notion of learning used in this study, was I able see more of what had been learned by both the students and supervisors. With evidence that learning had occurred, I became extremely interested in looking at the question of *how*.

A Look at "How" the Participants Learned

Earlier in this chapter, the students spoke about having demonstrated effective teamwork skills. They were sure that they had developed these skills but were far less clear as to *how* they were developed. It is interesting to note that the students seldom linked product to process and often had difficulty in explaining the latter. This trend is illustrated below as the students are probed to consider how these teamwork skills may have evolved:

Nancy: *Now is that (referring to their ability to work as a team) something that you practiced?*

Minda: *No.*

Nancy: *Was it something important to help...*

Minda: *It made us much faster.*

Catherine: *More efficient.*

Minda: *Definitely.*

Nancy: *Any thoughts on how that happened?*

Catherine: *Well I think it just happened. Because you know in our practice sessions we had play strategy with Diane a couple of times we had, we just, she didn't know what to expect too, so she gave us a few hints but of course it's never the same when you're out there! Right? You have to really experience it yourself and she gave us a few uhm play strategies and we tried a few of those out and I only got the experience of knowing my niece and nephew so I see what they like and then I went to the library to borrow some kids tapes to listen to 'cause I didn't know what was in or what was out sort of thing. Then you learn their "in thing" pretty fast"! You know...yeah.*

Minda: *And I think it was also a lot to do with our personalities.*

Catherine: *Yeah.*

Minda: *We were all very similar in a lot of ways. And I think we were all the type of people that pay attention to what other people are doing and concentrate on that and so I think that's why it "clicked" in that way.*

Catherine acknowledges the importance of the hints received in training as well as understanding the client group, but again refers strongly to the experience "when you're out there." Minda looked more at the group composition in terms of personalities that became increasingly sensitive to each other and grew together. This notion of selecting complementary personalities was also referred to by the supervisor, Janet, who noted that during the interviews she and Richard were looking for personalities that fit best with others. She noted, however, that this team worked much better than the other based on their selections, leaving the impression that chance was as much at work in the final analysis than anything else. Much of the students' learning of "teamwork skills," and indeed much of the learning discussed in the reflective session as a whole, seemed to have occurred at an unconscious level. The challenge, for me, was to detect the underlying processes by which this learning may have occurred.

While each learning event had unique elements and each learner experienced the learning in an unique way, several processes became recognizable to me in forms that reflected my readings and thinking pertaining to this study. These learning processes (problem detection and recognition, problem framing and re-framing, reflection in and on practice, learning by seeing, doing and being shown) provide a way of talking about the learning events that follow. In addition to these problem solving processes, there was evidence of the community creating the "curriculum" as the learners became further involved in their practice (LPP), and the students' changing concerns over the course of the placement (Fuller & Bown, 1975).

Problem Detection and Recognition

Throughout the transcript there were several examples of the students learning through a process of engaging in problem detection and recognition. While this may not seem to be a traditional way of learning, it is in fact key to effective performance. In many instances in the workplace newcomers falter as they are unable to sort through the apparent "messiness" of the situation and see the issues that are relevant. They become lost in the confusion, unable to "take initiative" or "prioritize" in order to act. Often graduates of post-secondary institutions are criticized for their lack of problem solving (finding) skills once they enter the workforce, while at the same time many academics believe they are focusing precisely on such skills in post secondary education. Schön (1983) talks about professional practice having "at least as much to do with finding the problem as with solving the problem found" (p. 18) and regards problem *setting*, something not often taught in universities, as being key to professional problem solving.

Problems, in most students' formal educational experiences, are well defined entities that are distributed in assignments or exams, posed by the instructor vs. sought out by the student. They have clearly defined variables, and in the majority of cases, a correct answer. In professional practice, the "art" of solving problems begins with the ability to detect or recognize a problem or issue from the seemingly chaotic environment and to discern the relevant variables associated with it in that particular context. This is a very different skill than previously practiced in most academic problem solving exercises, however one which is in evidence at several points throughout the discussions of this co-op placement.

Some of the examples of problem detection in this study were of a basic nature such as identifying a piece of equipment not performing as required or a particular protocol as ineffective. While these may seem obvious to many, there are individuals who continue with an assigned protocol or tool even when it is problematic. As the co-op term progressed Minda

and Catherine became better at detecting problems for themselves, however initially they needed assistance. The students describe such a situation at the start of the work placement:

Nancy: *Now you guys had some problems prior, not so much in this session although a little later, but with the markings (landmarking sites on the body for measuring) Can you tell me about sort of how those evolved and ideas you came up with?*

Minda: *Well we had been, in the training sessions, we had been told basically to use the marking pens and had been writing on them (the kids). It had worked for the most part quite well, and we hadn't noticed really any particular problem with the pens but I think Susan (project co-ordinator) came out to a couple of sessions and she felt we had been losing some kids because they were scared that they (the pens) were possibly needles. As well as some kids didn't like to be written on, so they were complaining too right? And you say, well it will wash off but that's not always good enough, they don't always want to wait until you take them to the sink later. So she suggested that we use little stickers. She had used them before I guess at Sunny Hill or something, so she had used those. So we tried using those for a bit and we thought it worked for the little ones. So we probably ended up being able to measure more kids than we would have otherwise.*

The training the students had received had directed them to mark the measurement landmarks on the subject's body with felt tipped pens. Here the students recall how this strategy was good for "the most part" but also recognize, once pointed out to them by a supervisor who had dropped in, that perhaps they had been unable to measure some children because the pens were perceived as needles. From their schooling, the students were used to having the potential problems outlined in advance and proceeding with the appropriate strategies. This pattern was interrupted by the project co-ordinator who detected a different problem, enabling the students to determine alternate strategies and better accomplish their task. The potential problem was recognized and a strategy, using stickers, was described by the students. Later in the discussion we also found out that this strategy had some problems ("the kids sometimes removed them, or ate them"). An alternate strategy was also described later in the discussion which involved a change in protocol so that the measurers began measuring, and marking, the legs (vs. arms) of the children first to minimize the potential

association with inoculations. This process of framing and re-framing for problem solving is detailed later in this Chapter.

The students also identified and set problems on their own:

Nancy: *So that's an example of "someone else sees a problem, brings it to your attention, and then discusses it." Did that happen a lot? Like did you interact with Janet, or Richard, or Susan.(the supervisors)*

Minda: *Uhuh, yeah. At the very beginning one of the problems was the height board, measuring our height. And that was something we noticed right away and I think that Richard (technical researcher) was probably aware of it at the beginning anyhow, but we went out and practiced and we found that we couldn't do it. By sticking the tape up it wasn't very accurate and you couldn't have the same situation every center so that was something we went to Richard and Janet right away and sorted that one out.*

Here the students detect a problem early on and identify the contextually relevant variables necessary to begin forming solutions (e.g. the inadequacy of the tape and the variability between measurement sites). Several of these "detection" instances were cited, beginning with the obvious reality shock of the first measurement session undertaken in the field:

> *"We were introduced to the problem of not getting the forms back, not having all the kids there, kids sick, a screaming child. It was a short session but it broke us in...We had pretty much everything on the first day!"*

They also discovered specific problems around obtaining certain measures ("we found that they weren't too hot on the [abdominal] skinfolds"). In each case the students engaged in the essential act of detecting and recognizing the problem amidst significant environmental "noise," before engaging in various problem solving techniques.

Other examples of problem detection and recognition were less "obvious" and required the student to examine a situation to determine the *underlying* needs. This is seen in the following excerpt describing how the students, about mid-way through their term, intuited a problem in the Chinese community (noted earlier in the Chapter) and resolved it based upon recognizing an issue not encountered in their technical training or university-based preparation:

Catherine: ***...Another thing is that uhm, uhm, I found that it was really hard to, like a lot of, some of them they don't know English, so like a lot of centers we***

went to they had like Chinese so they got my Chinese (laughs) which is not that great actually! So uhm, but, but I think sometimes it helped because they, they say "hey, this person knows my language."

The student recognized an issue that seemed fairly obvious, that of language, and attempted to improvise in her delivery through the use of her broken Chinese.

Minda: *Uhum.*

Catherine: *So, and then it got to the point where we, I forget which one, that we had to do up a Chinese letter...*

Here the student described and implemented an idea after reflection in and on practice at the first site in a Chinese community.

Janet: *Oh yeah, we got some Chinese lady at ...*

Catherine: *I forget, it was a drop-in type center...*

Nancy: *Uhum.*

Catherine: *And then, and then, a lot of, a lot of parents come and ask me in Chinese and I found it really difficult to explain and then one day my dad and I got together and I said "well this is really what I kind of want to say, so can you write up a letter saying this." And then my dad helped me write up a little thing so (when they would ask) I would just kind of go "here, read it!." Sort of like, yeah.*

The students provided more specifics on the strategy and implementation.

Nancy: *Uhuh.*

Catherine: *Yeah. Because I think a different culture, they expect different things you know, so uhm, so it really helped in that sense.*

The final reflection is that the more obvious language issue, while problematic, may have been secondary to the recognition of the underlying issue of differing cultural expectations regarding the nature of the information and its presentation. This re-framing through reflection in and on practice is critical to effective resolution of the issue. Many novice practitioners continue to identify and treat the obvious symptoms unable to understand that the underlying problem has not been addressed. The skill and artistry of exceptional practitioners lies in their ability to get to the root of the issue through problem detection and to

see a problem in a variety of ways through framing and re-framing, skills which are most often exercised at an unconscious level.

Framing and Re-framing

The art of framing and re-framing a problem is critical to devising effective strategies and solutions. Again, this may not be a skill or practice that students have developed in their formal education as often the problem and relevant variables have been presented to them and the context within which they are manipulated is relatively constant or static e.g., assumptions outlined on an exam question. These competencies may be learned best in situated activities as seen in the above example of the Chinese language/cultural issue. Schön and MacKinnon (1989) talk about the early stages of a practicum being about "learning the competence of framing the problems of practice." That is, knowing what to look for and what significance to ascribe to it. This stage, states Mackinnon (1989), can be quite "mysterious" since this skill or ability cannot be taught or communicated in a form that the students understand at the time. This helps explain comments made in the early stages of our discussion by the students when they were asked at what point in the term did they gain a full appreciation of the project they were hired for. Minda responded in a way that underscores the notion that one cannot "communicate" this understanding in advance of experiencing it:

Minda: *...Janet did an intro.and I understood what was happening but you didn't really understand the scope of it I don't think until you really got into it and understood once you'd had all the contacts with what was going on.*

Much of the students' problem framing and experimenting with solutions came through reflection on their difficulty getting the abdominal measurements from several children. In discussions with each other, the other team of students, and the project supervisors, this problem was framed and re-framed:

Catherine: *Yeah, we found out that they weren't too hot on the skinfolds, I think one person, most of the kids they...especially the abdominals because you're getting more into their privacy sort of like you know ...and uhm, the kids are...they're...they have their own minds like (laughs) you know some*

kids you can play with them and they will get attached to you and let you do your measurements and some kids just stay away and...(laughs)

Minda: *Well, it was still a trial very much, I mean learning about the stomach skinfold. It never was extremely easy but we became much better at getting it by the end. So that was the one that we noticed at the very beginning right away that we would have the problem with.*

Minda and Catherine detected this problem of getting the abdominal measures early on in their experiences, noting that the children appeared sensitive to exposing their tummies. Minda also noted that while the abdominal measures were challenging, the students "learned more about " the problem and performed more successfully as a result. But what did that learning look like, how did it happen?

Nancy: *So, how did you ...how did you deal with that?*

Minda: *In the end? (talking at same time, difficult to distinguish). At the time I remember, we had one list with everything but that,and just screamed ...so at the time I think...oh (recalling) the other group was there too so we threw ideas off each other and just went with that. But gradually we learned that you just didn't make a big deal out of it. You kinda just go "OK now, we're going to do the tummy" and then you go for it but at that time I think we were hesitant a bit probably, like we knew it was going to be a problem. What we did was (in a hesitating voice) "OK we're going to do the tummy" ...and we looked unsure I think and the kids picked up on that.*

The first reaction Minda cited was frustration, perhaps as a result of detecting the problem but being unable to frame it in such as way that they could attend to it. In order to gain clarity, Minda, Monica, and Catherine discussed the problem with the other group of students who were also measuring that day. These conversations with others, as Vygotsky (1978) underscores, appear to be critical. The students needed to engage each other in dialogue before they could fully understand the issue and proceed in their problem solving. Wertsch (1979), in his interpretive work on Vygotsky's theories, writes about the importance of speech and dialogue with respect to bringing the learner to the next stage of problem solving:

> While still not functioning as an independent problem solver, [the learner] is beginning to develop a definition of the situation that will provide the underpinnings for independent activity. (p. 15)

They must first interpret the knowledge at a social level, in order to then internalize it for later use. After the discussion the students decided upon a strategy that reflected a re-framing of the problem; away from the early notion of the problem being seen as an invasion of a child's privacy to seeing it as the measurer's problem of projecting fear or timidity, which some children seemed to pick up on. Through reflection on the problem in a social setting which allowed dialogue with peers, the students re-framed the problem and created strategies to attempt to deal with the new sense of the problem. I was curious as to whether the students were aware of the value of this dialogue and if it became an ongoing strategy.

Nancy: *Was there a time, after that first session, or at anytime after sessions that you would kind of yack about what went on, the problems, or did you deal with it mostly on the fly?...How did you deal with those things?*

Minda: *Well we deal with a lot of it on the fly but then we did have a lot of times, I mean driving to and from we yacked about the kids all the time and ah, problems. And we talked to Susan about the things too and she had suggestions.*

Minda indicated that much of the problem solving seemed to occur through reflection in practice, or on the fly, as they learned to become increasingly effective in responding to surprises. However she also noted the ongoing, yet informal nature, of talking about the children and the problems "all the time." For the first time, there is also mention of the influence of one of the project supervisors.

Minda: *She (Susan) came out to a few sessions and saw.*

Nancy: *And Susan was your project leader?*

Janet: *Well she was the recruitment co-ordinator. So she was recruiting a lot of the kids so she actually had a lot of contact with the centers too, so it was really helpful for her working directly with each of the teams and then working with the centers, and trying to sort out what would be best in both cases too.*

Janet, the overall project co-ordinator, clarifies Susan's position and explains how she may have had a greater understanding of some of the issues because of her role. The students seemed to learn incrementally through both the discussions with each other, and those with a more knowledgeable supervisor. Vygotsky's (1978) notion of the zone of proximal

development is useful here in understanding the nature of this learning. Each of the students had different levels of actual development on the various skill and knowledge challenges presented to them. Vygotsky described movement through one's zone of proximal development as being activated by discussion with a more capable individual. It may be theorized that at different times the students "pulled" each other along in their learning, taking small but incremental steps advancing their actual developmental level. This was reflected indirectly at several points in the conversation when students remarked on each other's abilities around particular issues with comments such as "she's a natural," or "she knows because she has nieces and nephews that age at home." Schön (1987) talks about the role of coaches in teaching through reflection-in-action. He notes that many practica involve supervisors who "sometimes teach in the conventional sense but more often function as coaches whose main activities are demonstrating, advising, questionning, and criticizing" (p. 38). Other practica involve several students who are often as important to one another as the coach:

> Sometimes they play the coach's role. And it is through this medium of the group that a student can immerse himself in the world of the practicum—learning new habits of thought and action. Learning by exposure and immersion, *background* learning, often proceeds without conscious awareness, although a student may become aware of it later on, as he moves into a different setting. (p. 38)

This process appears to be evident throughout the learning observed in this study and also informs the notion that the students may have benefitted from the "wait time" they experienced between the end of the work placement and the reflective session in terms of being able to recognize some of their learning. The supervisors presumably facilitated learning for the students by acting as coaches in areas where their capabilities and understandings were more advanced, as Susan did with her input based upon her more global experiences.

Later in the discussion, following some talk about how they came to approach the abdominal measures "in the end," the videographer, Allan, asked about their perception of the process again:

Allan: *So you're, you're pretty confident that the approach that you developed was a better one...Yeah.*

Minda: *It seemed.*

Allan: *Yeah. Is it, I'm curious, how did that happen?*

Minda: *Some of it I think we did talk over as. Definitely the "asking" part I think that we found that out right away at the very beginning people were saying. I think Diane, maybe it, was it?...*

Catherine: *Was it Diane?*

The students discussed how they determined to use a strategy which was more affirmative than questioning, one where they would tell the children what they were about to do versus ask permission. This was another strategy aimed at reducing the tentativeness of their approach, now that the problem had been re-framed as an approach issue. They wonder whether it was the woman from the Sunny Hill daycare (Diane) who had suggested this during their training.

Janet: *Yeah, I think she said don't ask.*

Minda: *Yeah, Diane said "you don't, you can't ask. You just have to start doing it and tell them that that's, you're going to do it." And it worked. So that was one we discussed right away and I think the tummy we did, almost right after that first session. I seem to remember we, when we had that problem with the first child and we started to talk about it and tried to develop other strategies and I think—I can't remember if we came back to Susan with that or not, or just started, we just changed it on our own. But it seemed to improve.*

Allan: *Ah.*

Minda: *We still did, with a lot of kids, we still did say "oh, you know, it's not going to hurt" and certain kids we did use that approach but not as much as we did at the beginning.*

This process of problem detection and framing, discussion and re-framing, and solution finding and implementation is nicely outlined as one of the ways in which the

students learned to become more proficient at developing their "client" skills. The social nature of the learning environment with the three students interacting daily with each other, at times with the other team of students, and at other times with the supervisors created, many opportunities for the individuals to learn through coaching and being coached. Through engaging in dialogue around problem solving issues the students stimulated movement through their zone of proximal development. The students, to a great extent, relied upon each other to lead, where each had the capacity, in the challenging situations they faced. The discussion regarding problem solving continued with particular reference to how the students had interacted with the other team of student measurers involved in the project.

Nancy: *So did you interact with the other team? You guys would sort of yack about things that you'd done? Was that, did you get a lot of ideas from that?*

Minda: *Well it was generally when we got, we didn't get together that often, there was a couple of joint measurement sessions and that's when we'd sort of compare ideas.*

Nancy: *Right.*

Minda: *Or we'd get feedback through Susan as to what worked maybe for another group...*

Nancy: *Right.*

Minda: *...but generally we didn't phone each other and discuss our problems or anything. And it did help when we were together, but it was difficult too because we didn't measure the same kids and so it was tough sometimes but we did get some feedback. It was hard though too because often you felt that you knew your situation better and that they knew their situation better so that when they were offering suggestions, you kind of—half the time I think we kind of went: "Hey, this is working for us—don't criticize" and I'm sure they felt the same way. So it was tough that way because we were separate units that measured differently.*

While the interaction with the other students was useful, it was informal and intermittent. Minda notes an aspect of it that was also frustrating. Even though they were doing essentially the same job, she felt the experiences of each team were very situationally unique and that sometimes the other team's direct suggestions appeared less than useful. While many factors may have influenced this (e.g., tone in which these were expressed,

potential competition between the two teams, etc.) it may also reflect Lave & Wenger's (1987) claim that all knowledge is situated and, once removed from its specific context, becomes more generalized and therefore less powerful in terms of its usefulness in a different context. Perhaps the *process* of talking about these problems was as important as the *content* discussed in allowing each team to return to their particular environment and re-construct their knowledge in ways that were most useful to them.

It appears that the learnability of problem framing and re-framing is contingent upon the opportunity to experience it in context. Schön (1983) speaks of this learning as not being possible within the traditional school system but rather needing to be experienced in practice and this is echoed in Catherine's experience upon returning to school a 1 taking the Kinanthropometry course *after* her experiences with anthropometry in the field:

> *Catherine: After doing this one (co-op) I took the [illegible]3 course (Kinanthropometry) and I can tell that people were being really careful in their measures, taking a long time to read the measurement right? And then, then the minute you read, some adults even, and they take a long time, then they do one and (say) "Oh that one's off, and that one's off." And here I am thinking "just , just do it and read it!" right?...and don't spend so much time putting those points right on the points (gestures with hands) right? Cause you're doing it three times anyways right?, yeah. And they want to get everything exactly, and which you can't because we're human and we move and you can't stand still for that long or sit still for that long right, you know.*

Catherine noticed the problems her classmates were experiencing were the result of a difference between the description of the practice they were given in class and the reality she had experienced. This gap, as Schön described it, was filled for her by the extensive opportunities her practicum had provided for reflection in (she talked about "reading" the children and proceeding in her measurements based on this) and on (the team discussed many issues relating to the measurement portion of their work) practice in a dynamic environment.

> *Nancy: And you learned that mainly by doing it for four months or?*
>
> *Catherine: Yup, you just learn that, the measurements...it's important to be consistent in your measurement but ,ah it's like you don't have to be super-duper accurate reading it too because things vary from measurement to measurement. Yeah, and then, like I said, near the beginning we weren't sure if we got the right landmark, or if we were measuring it properly, and*

how we held the tape and as time went on things just kind of came natural ...in your measurements.

Her comments reflect the changes she experienced as a practitioner that resulted from practice. Perhaps without conscious awareness of the learning value of this process, or due to difficulty describing it in words, she talks about how, with time, "things just came natural." This constant process of framing and re-framing the issue, improvising in practice, and reflecting on practice that was experienced in repeated measurement sessions eventually filled the gap between the description of the activity, as experienced by her classmates, and the practice skills which she gained and described as having "just come natural."

Reflection In and On Practice

Problems solving is a creative process where improvisation is key. Things need to be seen in new ways, usually by stepping back from the problem and reflecting on it, or changing strategies midstream because spontaneous or intuitive actions, or what Schön (1983) called tacit knowing in action. Both depend upon experience and no description can take the place of "doing." The students talked about many instances where they tried various strategies depending upon the situation and reaction of the children. They referred to having several "options" which they drew upon in various situations. "We tried the options of just playing, then the mirror, and then we were just trying anything as far as I remember!" states one student referring to trying to engage a child in the measuring. In remembering an incident where Minda was unsuccessful in getting a measurement from a particular child one can see this idea of improvisation in action as the other students steps in with an unrehearsed strategy:

Catherine: I think one time I remember at Place des Arts (one of the measuring sites), we had one more measure on abdominal or something (that they couldn't get from the child). I think Monica or Minda was measuring.

Minda: It was me.

Catherine: And then, and then in the end I talked to this kid and I said, I said (whispering) "Well you know, maybe she (the other student) didn't do it

quite right. Maybe if I tried it won't hurt." She let me try it! And I got that last measurement!

Minda: *Yup. (smiles)*

Catherine related the effectiveness, to her surprise, of an unrehearsed strategy which she devised "on the spot" in response to an un-cooperative child. Another example of the students' creativity was described earlier in the discussion as they were talking about how the skinfold calipers acquired various "pet" names in order to engage the children. In particular the calipers were often referred to as "kissers" (because they supposedly gently kissed the folds of skin as they were measuring). The students remembered a time where they had to respond to an element of surprise with a child who did not want to be "kissed" that day by anything!

Minda: *We had everything but...dinosaurs, birds...Then we had one kid that didn't want to be kissed that day by her Mom so when we said "kisser" she screamed!! (laughter) So it quickly became a dinosaur!!*

The students became increasingly capable of adapting to unforeseen circumstances, without the frustration and energy drain evident in their earlier encounters. This understanding, or knowing, had become part of their action and as Schön (1983) states:

> Once we put aside the model of Technical Rationality, which leads us to think of intelligent practice as an *application* of knowledge to instrumental decisions, there is nothing strange about the idea that a kind of knowing is inherent in intelligent action. (p. 50)

Other examples reflected how the students became adept at dealing with surprise and their strategies became more spontaneous in nature:

Nancy: *Later on in this (referring to the video they are watching), I'm not sure it's where you're measuring Callie, with the French braids. How did you deal with those issues? (measuring head girth when the girl has French braids, ribbons , and barrettes in her hair)*

Minda: *Ask (if they could take it out). If it was a tight French braid and it as all done up, often we would leave it. Take out any barrettes that were in the way and we'd leave it, then we'd write on the side, whether or not that's of any use, but we'd write on the side (of the data recording sheet). Usually we'd try to take it out whatever it was, pony tail, barrettes, whatever...get under the pony tail—do the best we could.*

The student talked about this situation and some of the considerations they took into account, noting concern for accuracy and resolving to take the measures they could to ensure it (remove as much as possible and note the braid on the data sheet) while attempting not to upset the child and potentially losing the rest of the measures. Other challenges to the actual measuring that, when first seen, were surprises were also discussed:

Minda: *Leggings were another problem.*

Nancy: *Well, I was going to ask you about that...clothing in general in the winter.*

Minda: *That was tough because the kids would have leggings, and then body suits and jumpers and..*

Catherine: *Chuckles.*

Minda: *So it became a bit of an issue.*

The students then went on to discuss strategies used and how some of the strategies taken created a whole other set of unexpected challenges.

Minda: *...we had to get, usually in the daycare we got somebody else to take them (body suits etc.) off, get them all set up or change them into something else, put on shorts or something.*

Catherine: *And if they were really tight we were able to use stickers actually...to stick them on.*

Nancy: *Yeah.*

Catherine: *To use those they had to be like really nice and tight otherwise they move (she and MC laugh) along with the ...*

Nancy: *Clothes.*

Catherine: *Yeah. (students chuckle remembering problems with the stickers)*

Minda: *(So the big problems were) nylons, dresses, because depending on their age, I mean the skirt you have to lift it up and stuff and that's a poor spot for it and you have to pull it down. And...sleeves, we had sleeves!*

Catherine: *Yeah.*

Minda: *Cause to get this one (biceps measurement) they didn't always want to take their shirt out, then you pull up here and they have this bunch of stuff (gesturing to the shoulder) here and it's pushing down on the shoulder and*

Catherine: *Yeah...(acknowledging how this solution created another problem)*

Minda: *We'd have one arm out, so that wasn't great either. And sometimes it was cold when we were measuring and the kids are going "oh, it's cold!"*

Having had their training session in the summer, something as simple as the change of season as the work term progressed created little surprises, which the students dealt with by reflecting on the problems and discussing strategies with each other and their supervisors.

As can be seen in the above examples, and as stated by Schön (1987), learning a theory of skills (as the students did in their training sessions and through coursework) and learning a theory of action (implementing their skills in the field) are different but linked. They require two different environments in order for the complete learning experience to occur. Schön's (1987) notion of reflective practice allows us to view the co-operative education practicum as more than simply providing the opportunity to put what was learned in school into practice in the workplace. There is an artistry to competent professional practice that the co-op students begin to develop and Schön (1983, 1987) argues can only be gained through experience. The students learning is rooted in the dialogue and social interaction with each other and their supervisors. If learning professional practice comes through contextually relevant experiences in problem solving within a community of practice which facilitates dialogue among differently skilled practitioners, then the co-operative work term plays an important role in that learning. It provides an environment for the learner to interact with others and begin the internal re-construction of knowledge necessary for the development of higher cognitive functions. Further, the co-op term provides opportunities for students to repeatedly experience this knowledge and understanding in practice, and gain confidence in their peformance. It also provides a venue for the construction of the "parallel" curriculum, or the "art" of practice, through situated experiences in problem-setting and -solving within a community of practice. The students, as they progressed through the term (and their zones of proximal develoment), adapted and learned the "art" of their practice, through the construction and re-construction of knowledge. One of the major processes at work appears to involve a process of engaging in conversations both with the problems and each other.

Conversations about Practice

The importance of dialogue with others in the community of practice (peers and supervisors) has been shown in earlier passages. Vygotsky (1978) believed it to be central to how people learn and transform knowledge. Lave and Wenger (1987) see it as one way in which people become further engaged in their communities through the process of legitimate peripheral participation. Schön talks about the need for reflective conversations in and on action in order to clarify theory and description. The process of framing and re-framing a problem through discussions with others (reflection-on-practice) describes some of the events in this co-op placement. In others, re-framing occurred through the problem "talking back," to the practitioner and the practitioner reacting intuitively (reflection-in-practice) to this. This notion of reflection-in-practice helps in understanding several events described by the students:

The group's attention is focused on TV monitor watching the introduction given at the recorded measurement session.

Nancy: *Now what are you thinking as this is going on? What are you watching for?*

Catherine: *Just to see how they're reacting.*

Minda: *If they cringe. (laughs)*

The students talk about the situation or problem "talking back" to them, and "reading the lay of the land" so as to formulate and utilize strategies for optimal practice. Later in the discussion one of the students reflects upon what would go through her head if a child stepped on the scale with an object, such as the toy dinosaur, in hand (thereby potentially invalidating the reading). Her response reflects the sort of internal dialogue that occurs as she frames, re-assesses and re-frames the problem:

Minda: *Well, when we see someone step on with something like that, first of all you kind of go (to yourself) "OK is it heavy enough?"*

Richard: *Yeah. (chuckle)*

Minda: *Is the kid going to scream? Will the kid let us even measure them if we take it away from them? So everything runs through your mind at once. And I think with him we saw that and went "Ahhhh," and felt he would be able to handle it so we took it off and then measured either way and we make a game of it: "Let's measure your dinosaur!."*

All of this internal dialogue is invisible to an observer and only by having the student describe her actions as she watches herself on video are we able to gain this perpsective. These internal events occur so quickly that the actions of the student appear fluid and non-problematic. In fact, the student has undergone a process of detecting one or more potential problems, analyzing the probability that those will in fact be the key issues regarding solving the problem(s), and determining which will be attended to and how.

Conversation with each other about various events, though informal, was a key way in which the students developed better understandings of their practice. Reflection-on-practice formed the basis of much of the discussion in this study and is the subject of the following dialogue regarding the difficulty the students had trying to get a one year-old child to co-operate. It is interesting to note that this conversation took place some eight months after the placement was completed, perhaps as noted earlier, allowing a different perspective to emerge than may have been the case had the students discussed it immediately after it occurred. After several minutes ineffectively trying to cajole the child into removing her socks and having her ankle landmarked, the students decided to involve her older sister who had been measured earlier and had left the area. The students commented as they watched themselves on video interacting with the child:

Nancy: *(referring to the video) Now here you're bringing the sister...*

Minda: *This didn't work!*

(laughter)

Minda: *Didn't work. She was, she took a strategy that she would force her sister to get measured. If she held out, there see her sister didn't look too sure here. (referring to the reaction of the 1 year old on the video). She kept saying "oh it's easy" and grab her arm and say "here measure it." She didn't like that. And she was...*

Minda analyzes both the older sister's approach and younger sister's reaction and is asked about her understanding of why this might have happened.

Nancy: *It would be interesting to know why her sister took that sort of strategy.*

Minda: *I don't know. She seemed kind of like, kind of an active sort of "let's do it now" sort of person whereas another sister or brother might have been a little less likely to do that. Cause we've had other kids that would come and be, just hold them or "here I'll do it for you!"*

A comparison is made to how other siblings have acted in past experiences and based upon these, and her perceptions of the older girl being "action oriented," Minda surmised that this was not a good approach.

Catherine: *See I get to touch her leg now! (laughs, referring to that part on the video). I'm sneaking up but she soon realizes what I'm doing!*

Catherine tried to landmark without the child noticing but her efforts too are thwarted. Another strategy fails.

Catherine: *But even the pen marking (used to landmark measurements) isn't that comfortable either. Like those felt pens that you use to mark, it's not that comfortable. It kind of, you can feel it kind of, sometimes even before you touch the child, they kinda, they kinda go back you know. Even if in our 303 !(referring to Kin 303 the Kinanthropometry course)*

Richard: *Yeah.*

Minda: *They were cold too at one point.*

Catherine: *And then it'd depend on what point (on the pen). What kind of fine or very fine points you used. It's a difference you know.*

Catherine re-framed the problem as one of potential discomfort for the child drawing from her other experiences, trying to find an explanation.

Janet: *Which one did you find better?*

Catherine: *I think the fatter one, the fine, fine one kind of scratched. It actually kind of scratched. A bit yeah, I think the uh, not the super fine but ...*

Janet: *The fine.*

Catherine: *Maybe the fine or even the one step up was even better cause you can do it quicker that way 'cause more ink kind of flowed out...yeah,...yeah.*

The supervisor, Janet, who was herself now beginning to measure children at the hospital, was curious to follow up on the observations about the pens, likely for her own learning and development. Here, then the students supported the supervisor in movement through her zone of proximal development by sharing their experiences in conversation.

Minda continues to interpret what she sees in the video along with remembering how she felt, acknowledging feeling defeated with respect to measuring the child.

Minda: *We'd given up at this point.*

Catherine: *See she's very quiet. Like ...but...like you think you're gaining ground with her but you're not! (laughs)*

Minda: *Yeah, she seemed to be studying us. And I think that if she had been there longer she would have probably sat there and watched and then figured it all out on her own and...*

Again a re-framing back to a sense that this child was the type that needed to have more information and that perhaps if she had been at the measurement session earlier it would have helped.

Janet: *Then she might have had the time to observe. She might have been able to do it.*

Minda: *Yeah. Cause we'd done that before, we'd brought in,...you'd be measuring two kids and you'd bring in another one to watch. And if you thought one kid was going to be especially challenging you'd bring them in to watch maybe a couple of sessions just to sit there and play, help you out or whatever.*

Minda concluded her conversation with Janet, who, now that she was beginning to measure patients, was more motivated than ever to know what strategies worked and why . The students were helping her to become more central to their community of practice so that she might benefit from it. In fact, conversations around reflection-in and -on-practice are a primary means of engaging newcomers in the community itself (Lave and Wenger, 1987).

Engaging in the Community of Practice

As the students proceeded further in their work term, they began to take some of the cultural practices of the work community and make them theirs. As noted earlier, the students assumed some of the goals of the larger project that went beyond their job descriptions such as actively initiating recruitment and performing promotional activities. As well, Catherine was retained on a contract basis after the work term to complete the data entry portion of the project. The students began to feel more a part of the overall project rather than simply "the measurers" and as a result new opportunities for learning emerged. Part of their learning may then be described as the result of participating in a social, interactive environment.

This conceptualization of learning (legitimate peripheral participation) provides a way of viewing the co-operative education placement as an apprenticeship, one which provides the student, or learner, with a means of entering and participating in a community of practice. It affords the students the opportunity to learn the knowledge that is most powerful for that situation by embedding them in the very culture where it is learned, used, and valued. This knowledge is fundamentally "situated," being in part a product of the activity, context, and culture in which it is developed (Brown et al., 1988). As such, situated knowledge can only be gained through direct, participatory experience in the practice in question. This may explain why the language and assumptions which define academic learning are generally inadequate when used to describe co-op learning. Co-op learning rests on different set of assumptions, including legitimate peripheral participation, which are not generally well understood or easily articulated. In the absence of a clear understanding of these underlying theories, we, in co-op, are often left inadequately describing the co-op learning process as "learning by doing."

The co-operative education placement, seen as a "learning" apprenticeship, becomes integral to a student's "complete" educational experience. It not only provides for an opportunity to "apply" some of the more generalized forms of knowledge learned through

traditional educational formats such as lectures, seminars, and laboratories but it also provides a venue for learning the more specific or situated knowledge and skills that are valued in the community of practice. This notion of generalized versus specific knowledge can be seen early in the dialogue with the students when they are asked to reflect on how they felt at the beginning of their work term.

> *Minda:* *...Janet did an intro. and I understood what was happening but you didn't really understand the scope of it until you really got into it and understood once you'd had all the contacts...*

Here the student talked about being introduced, in a decontextualized setting, to what the project is about and recognizing, in hindsight, that her initial knowledge was limited by not yet having participated in the culture, people, and social values of the community of practice. Later again she stated:

> *Minda:* *Having the training session there (at Sunny Hill Hospital) helped. Cause I hadn't heard of it before, and once we had the training session there, you were immersed in it and realized in going to the Daycare and meeting the kids, and walking past the different care units and stuff you got a sense of it...*

She described in more detail the types of influences that were critical to her learning. She talked about getting a "sense of it," referring to the "culture" or social practices of a community which are elusive and difficult enough to describe, let alone learn, in a decontextualized setting. It is to this dilemma of teaching and learning out of context that Richard, the professor, also referred to in an earlier quote regarding learning:

> *Richard:* *I think that they (co-op students) find in the practical situation that there's a lot of information they can find to use, it's how do they use it. Whereas our system seems very predominantly "tell me the facts I have to remember" and the exams are set up that way. I do it in (Kin) 142 (another course he teaches), they have to learn a tremendous amount of information...You're not using some skill you've learned over here and then sort of saying "well that's similar if I apply it over here."*

Further along he comments that the confidence the students said they now had in their kinanthropometry skills was directly due to the experience they had in the community of practice:

Nancy: *How do you feel about your Kinanthropometry skills? (asks students)*

Catherine: *Much more confident, (laughs) yeah.*

Richard: *With that, it's just practice. And they've had practice in a very challenging situation where they've had to think all the while so...*

Perhaps this is an acknowledgment of the learning the students experienced in an environment where variables change constantly and where professional practice evolves from the interactions among the performers, the setting, and the performance itself.

Similarly, Richard acknowledged the limited value he placed on the "pre-training" session where the measurement skills were taught in a de-contextualized, lab type environment, then later a mock session. When discussing the training he comments that "the best training they had was when they trained themselves." He stated the limitations he felt teaching them (despite his numerous years of anthropometry experience), citing the difference in the age group he was most familiar with and length of time it had been since he had measured children one to five years of age. He re-iterated that "the best experience they have is their own," referring to the experience they gained during the term, implicitly understanding the situatedness of the learning and the value of practice.

Lave and Wenger (1987) talk about the process of legitimate peripheral participation (LPP) to describe how newcomers move slowly towards full participation in the socio-cultural practices of their community. This co-op workterm seems to embody many of the elements that Lave and Wenger describe as implications of viewing practice from this perspective (e.g. more learning is observed than teaching, the community creates the curriculum, the learners become absorbed into the culture of the workplace, etc.). The concept of situated learning and the process of LPP provides an interesting perspective on the learning that occurs in co-op. The student can readily be seen as a newcomer whose goal is to move towards full participation in the work placement community of practice. The student is a legitimate participant in the sense of being full-time, paid staff with specific responsibilities (as opposed to a "job shadow" role or part-time volunteer role) and motivated (they are there by their own

choice and are being paid, evaluated and graded) to move towards full participation in their community of practice.

The process of LPP is therefore highly personal, dependent upon the interaction between the learner and the specific community of practice. Often a more experienced person, such as a supervisor, will facilitate opportunities for engagement in a mentor-like fashion. In this case, unlike many co-op placements, there was little formal supervision or teaching evidenced with the exception of the initial training sessions concerning anthropometric techniques and some intermittent monitoring of measurement sessions. Much of the students' learning occurred less formally, primarily through direct experience. Following their brief training, the students were sent into the field where the observable behaviour was predominantly learning versus formal teaching:

Nancy: *Do you remember your first session?*

Catherine: *My first session in?*

Nancy: *Measuring. Like real data collection.*

Catherine: *Measuring for real? Yes, actually we had two groups all together, we were doing it uhm, at City Hall..*

Minda: *That's right. (chuckling)*

Catherine: *Yeah. (also chuckling)*

Minda: *Oh, those fond memories! (sarcastically, then laughs)*

Catherine: *At City Hall we had two groups, I think we expected uhm, more. We expected more measuring and we soon found out that, oh, it was only a couple of hours, and then, and then the kids weren't that co-operative...(giggling)*

Minda: *Yeah, and that's when we were introduced to the problem of getting the forms back, and not having all the kids there, and kids sick, and kids home that day, and...*

Catherine: *Yeah.*

Minda: *So it was a short session but it broke us in. We had a screaming child, a whole bunch.., oh everything . We had pretty much on the first day.*

The students recalled a situation that overwhelmed them on their first day in the field. They became aware of problems that were "created" by the community including incomplete paperwork, time changes, and subjects being unavailable or un-cooperative.

Nancy: *So what did you do?*

Catherine: *(laughing) We did the best we can.*

Nancy: *There's the good answer!!*

Minda: *We tried...(laughing) I'm sure we measured about 40% of the kids or something (laughs)...Well, it was still a trial very much, I mean* ***learning*** *about the stomach skinfold. It never was extremely easy but we became much better at getting it by the end. So that was the one that we noticed at the very beginning right away that we would have the problem with.*

Here Minda actually used the term "learning" as she describes how, through repeated participation in the community of practice and discussions with other students (who had similar experiences) and with "old-timers" (such as the Director of the Daycare at Sunny Hill), she improved her skills and understanding of this technique.

Again, upon reflection, the students acknowledged the learning that occurred through informal means such as "throwing ideas off each other" and talking about what had happened (reflection on practice). Little formal teaching is observable but rather the "curriculum" is created by the community of practice. An illustration of this follows a discussion regarding how they solved a problem they had in taking the height measurements:

Nancy: *Now is that what was in your training session? You probably, did you learn that?*

Minda: *We didn't have those (referring to the boards used to take height measurements) in the training session.*

Catherine: *Yeah we didn't have those.*

Nancy: *Oh right...so that evolved from what?*

Minda: *Trying it and having the kids stand on their toes.*

Catherine: *Yeah.*

Minda: *...And standing on their toes and (moving up and) down...*

This can clearly be understood as the learning curriculum being presented by the community through the interaction of the measurers with various subjects at various sites. In the training sessions measurements were done on each other and such incidences of non-compliance from which the learning occurs, were not evidenced.

Catherine: *Well, we probably learned that in that practice session that we did.*

Nancy: *Yeah.*

Catherine: *We probably realized that in that practice session. Did we have those in the practice session?*

Janet: *No you just used the tape on the wall.*

The students struggled to figure out how and where this was learned. Catherine's comments reflected the dominant technical rational basis of learning which she has been exposed to through her formal education, as she seemed to feel that the protocol in question was probably learned in the training sessions, then *applied* to practice. The supervisor then responded that in fact it could not have been learned in the training session as they were using a different technique for measuring height at that time. The students are then left to acknowledge that this was indeed learned "on the job" versus taught to them in the traditional sense.

Opportunities for learning through further engagement in practice are referred to regularly throughout the transcript though they are not described explicitly as such. Again, they present themselves as stories about problem detection and solving where much of what is learned remains implicit. An example of this was seen in the earlier story about the different needs of the Chinese participants and the students responses to those needs. This opportunity for learning was a direct result of the community of practice "presenting" the motivated newcomer, or student, with issues that needed addressing. Catherine had a chance to develop her problem detection and re-framing abilities in acknowledging the need (what was first seen as a language issue, and upon reflection became more of an issue of different cultural expectations), then develop her communication skills by first articulating the problem to her

father and then later, in written and verbal form to the Chinese participants. There is a lot of learning here that, because it is not explicit, often remains hidden and unacknowledged. Again students know they have learned through the experience but may not be able to articulate exactly what they have learned because their understanding of it is limited. While some may question whether this learning needs to be made explicit, my experience as a co-op practitioner has been that, in the absence of this knowledge, the students have difficulty expressing what they know later on resumes or in interviews for example.

Situated learning allows us to understand the co-op learning as a combination of social, material and experiential phenomena, taking the concept well beyond a process that simply occurs in someone's head. The zone of proximal development allows us to understand how an individual's learning and development may be facilitated by social aspects of the experience which precipitate the transformation of knowledge at an internal level. It appears, then, that much of the learning in co-op is constructed and re-constructed by the learners as they interact with others in their community of practice and, in so doing, become exposed to new learning opportunities and new concerns. It is also some of the most powerful learning with respect to employability as it is contextually relevant, valued, and directly usable in the workplace.

Learning Through Mediated Activity

It was clear throughout the discussion, and has been shown in the examples, that the students and supervisors strongly believed in the notion of learning by doing. Learning was assumed to be part of the doing. This is echoed in the following quote (used earlier to illustrate the students' lack of ability to connect product with process). Here, Catherine reflects on how she feels she developed her skills with respect to dealing with small children:

> *Catherine: Well I think it just happened. Because you know in our practice sessions we had play strategy with Diane (the hospital daycare director) a couple of times we had, we just, she didn't know what to expect too, so she gave us a few hints but of course it's never the same when you're out there!*

> *Right? You have to really experience it yourself— and she gave us a few, uhm, play strategies and we tried a few of those out. I('ve) only got the experience of knowing my niece and nephew so I see what they like. And then I went to the library to borrow some kids tapes to listen to 'cause I didn't know what was in or what was out sort of thing. Then (in the field) you learn their "in thing" pretty fast!*

The learning process that Catherine experienced was not well defined by her, however it does seem to depend upon her recognizing key qualities of the practice which must be learned by doing. Near the end of the discussion of practice with the supervisors and students, one of the students gives her analysis of the key issues regarding the child they had difficulty measuring. The child had been un-cooperative from the start and the team did not succeed in measuring her, despite nearly 15 minutes of attempting various strategies. This reflective quote provides a good example of Minda's competency in recognizing key qualities of the practice, something Shön believes is critical to competent performance, and which she developed through her various related experiences with other children:

> *Nancy:* *Let's just watch this one, which is, uh, your ...challenge! (referring to the little one year-old to be measured in the video). Just comment on it,...anyone.*
>
> *Catherine:* *I don't remember, I don't know why...(chuckles)*
>
> *Minda:* *She (the 1 year old subject) wasn't there for the introduction, she wasn't even there to see her sister measured I don't believe or any of the other kids. Maybe she came half way through but one of the major problems with this I think is that she wasn't there. She didn't get to see the whole introduction, which might not have mattered for her, but to see her sister get measured or all the other kids get measured, as well as having her measured at the same time as the other kids. She would have been less conscious of being the center of all of our attention.*

Minda listed several key qualities of effective practice for such instances of non-compliance, including providing an introduction to the child, having siblings nearby, having the child measured while others were being measured, and not allowing the child to become the center of attention. Minda was only able to state these key elements because of her many experiences with similar situations—there was not a "how to" list for each incident provided in the training or through a course. This example occurred near the end of the term and she had

clearly constructed a wealth of knowledge by this point. For example, responding to why she thought that bringing in the one year-old child's sister did not help, Minda said that she didn't know. "Perhaps," she thought," it was her (the sister's) approach," because the team had other experiences where siblings enabled difficult measuring to occur, as well as other positive experiences bringing in the younger children to watch more of the session. Her observations and analysis were clearly based on previous related experiences.

As no one in the project had prior experience with this age group and these activities, none of this could have been learned before hand. Even if it had, the students would likely have had to construct personal understandings based upon their particular experiences in order for it to become tacit knowledge in action, allowing for the fluid movement from one strategy to the next that was seen on the videotape.

Less prevalent in this co-op placement was learning occurring as a result of the students being shown how to do something. With the exception of the measurement training sessions held before the work term, little of this was evidenced in this work term. Effective coaching of students could involve a follow me (tell, listen, demonstrate, imitate) or joing experimentation (students and coach continually shift perspectives so that the students acquires not only the competencies but also a way of teaching or getting to those competencies) type of approaches (MacKinnon, 1989). This occurred only to a limited extent in this practicum case study. As discussed, supervisors/coaches were not on site most of the time and had not recently been practicing in the field with children of this age group. Therefore, most of the supervisor's coaching was "tell and demonstrate," while the student's coaching of each other was "joint experimentation," or "follow me." In this study the majority of coaching was of the latter type, which may be of significance in terms of the high level of student interdependence and self-directedness that was observed.

Early in the discussion with supervisors and students, the technical supervisor talked about his views on the most effective way to "train" the measurers:

Nancy: *Yeah. When you were watching it Richard, given that you're the technician here, any comments on the ...*

Richard: *Well just, what would have been better for the training is if they could train themselves. Because the training, what you had was—I'm used to dealing with adults mainly ...*

Here the supervisor is supporting the notion that some of the most relevant learning must occur through experimentation, the idea that he expressed as "training themselves."

Nancy: *Yeah.*

Richard: *And so it's "sit up, sit down, turn around, do this , do that" and so , and I guess 1979, I guess was the last time I measured a lot of kids.*

Nancy: *Yeah, The Co Gro (referring to Coquitlam Growth Study).*

Richard: *Yeah, and then prior to that I'd measured babies and stuff but that's a long while ago. I had some, I had some concerns about the, uhm, play strategies, whether they would get in the way or not...whether they would impede getting the measurements done or not. But it seems to have worked out quite well.* ***But the best experience they've got is their own.***

Richard related how he felt unable to fully lead by example given the time that had passed since his last work with this age group. He re-iterated that the best experience they received was simply going and doing it. He later noted that if future training were required he would invite these students to conduct it, perhaps unconsciously acknowledging the value of the "experiment with me " approach that they could bring to the exercise.

Later in the discussion, the project supervisor, Janet, noted:

Janet: *Well I've also learned from their learning experience too because I now have the package to actually measure the 1-5 year olds. And so I've started to measure 1-5 year olds and I now remember some of the stories! (laughs), of their experiences because uh, not all of the children are non-ambulatory—they actually run around. And so they chase around the office and you chase them around trying to get measures out of them and I remember: Yeah! Catherine used to say it was like this!" (laughter) So, actually learning from them some of the struggles that they had working with like the 1-5 year olds I can now try to put some of it to practice too and then realize that there were a lot of challenges in trying to accomplish that.*

This reflection on her own learning that resulted from sharing in the students' experiences which became most real for her once she experienced it herself in her own

measurement sessions. Here the students actually served as the coach, or "old-timer," for the supervisor, who developed her measurement skills (and moved along her zone of proximal development) with a greater understanding based upon seeing the students' struggles, then experiencing them herself.

Changing Concerns

An interesting observation regarding the nature of the learning observed in this practicum experience is that *what* was learned reflected the changing concerns of the students as they became further integrated into their community of practice. Initial student concerns focused on technical skills, with both Catherine and Minda questioning their ability to do the measurements effectively:

> *Catherine: Yeah, well when I first heard about this co-op job I was really interested because Richard was talking about it in his (Kin) 203 showing the little things you can do with Excel and so uhm...*
>
> *Richard: Yeah, I gave it as a lead in to basic programming.*
>
> *Catherine: Yeah, just you know, and then when I found out that i got the job I was really happy but then when I went there like everything seemed kind of ...(looks at other student) like we were sort of on the same boat—not too sure of what to expect and, and uhm, yes I hadn't take (Kin) 303 also. So even after training I didn't feel THAT confident (giggles)...not in me. Right, you know, and I think that uhm, as time went on with the measuring I was more confident.*

Catherine recalled her initial excitement about getting the job was quickly tempered by a combination of not knowing what to expect and being unsure of her anthropometry skills. Mastery of performance and control over one's environment are early concerns regarding survival as outlined in Fuller and Bown's (1975) conceptualization of practice concerns. As both performance and control improve over the course of the term, the students change their focus slightly to the environment they are working in and the clients they are working with. Fuller and Bown note that as newcomers progress their survival concerns shift towards a greater understanding of their environment, often seen as frustration with some of the

limitations it presents. Questions regarding their effectiveness in relating to clients (the children, and the employer) and colleagues become of concern but are often still left unattended as the newcomers deal with the urgent tasks of the job. This conceptualization helps explain a small shift seen over time, away from a singular focus on collecting the data first to one of ensuring that the children had fun and that the overall experience was enjoyable. This is evidenced in discussion regarding how some of the daycare sites were ill-prepared for the arrival of the measurement team:

Nancy: *I know when I went to visit you at the SFU Daycare I don't know what those kids thought was going on. They didn't get much of a lead up there, they were just kind of like you said put in two by two.*

Minda: *Just shoveled in.*

Minda's choice of words indicated her empathy for how some the children may have felt about this process, indicating her concern for *their* overall experience.

Janet: *Well the idea of sending out information to the daycares ahead, the letter and that introduction thing, was that we were trying to sort of explain it to the daycares so the daycares, like a lot of times the staff could explain it to the kids what was going to happen and they could do it as a special event. We're going to be doing this today sort of thing, like that was sort of like our idea behind it for them to sort of do a little bit of prep. And that was what Diane had sort of suggested too. She said a lot of times daycares like to do a special event for something that a visitor's coming in like that so they can do a little bit of explaining about measurements ahead of time. So like that might have happened at some of the places too but uhm...*

Janet explained that the intent was different, that they were trying to frame the measurement days as "social events."

Minda: *But not that one! (referring to the SFU Daycare)*

Minda responded quickly that this did not occur in this case. While not aggressive about her frustration, it was nonetheless notable given that the environment in which the discussion occurred was not designed to elicit criticism of the workterm in that it was fairly public and focused on other issues.

Janet: ***Yeah. It would have been helpful if it had been a little bit more organized that way.***

Janet acknowledged the frustration with a follow-up comment regarding the lack of organization on Sunny Hill's behalf. I had also spoken to the students informally about some of these issues but while of concern, the students may have been too busy getting the job done, as Fuller and Bown's (1975) conceptualization suggests, to be able to step back and address any larger problems of client or colleague relationships.

Appreciating the nature of the newcomer's concerns, and how these change over time, helps in understanding the nature of the learning in this co-op experience. The students may have been initially motivated to detect problems that were focused on issues of survival (e.g. skill mastery, control of subjects) and only later shifted their attention (and resultant learning) to less egocentric issues (e.g. whether participant needs were being met).

Summary

Examination of the co-operative education research, policies and procedures, as well as employability "tools" such as the *Employability Skills Profile* has often assumed a very individualistic notion of learning. This is consistent with much of the public discourse on education which tends to assume that there are discreet sets of knowledge and skills which can be defined and "taught" to students in schools, and which, once "learned," will better position students as they enter society. This "empty vessel" notion of education, implies that students simply need to be "filled" with the relevant information and they will then be capable of the requisite performance.

This study indicates quite a different perspective. Much of the learning which was observed in this placement was embedded within processes in which the students engaged as part of the placement itself and as a result of participating in this study . This study in fact provided an unique opportunity to re-visit and discuss the students' practice after a significant period of time (eight months) had passed. It allowed the students to engage in focused dialogue regarding various aspects of their practice with each other, and their supervisors, and

as a result they constructed new understandings based on each other's perceptions, and their experiences since the completion of the work term. The initial videotape of the students "at work" served as a stimulus for this reflection, allowing the students to re-experience some of their practice through new eyes (they had experienced more school and work in the interim time) and in the presence of both a supervisor and a professor. This opportunity for group reflection with peers and supervisors, not part of the normal co-op process, may in fact have precipitated a significant amount of the learning observed. A combination of the students working together in a community of practice, engaging in dialogue with each other and more knowledgeable colleagues, and the opportunity for reflection on all of this appear to be key processes which underlie much of the learning discovered in this study.

Understandings of this learning emerged slowly as I too engaged in a process of reflecting upon the conversations videotaped during the students/supervisors "reflective session" in relation to theoretical concepts from the literature which framed this study. One of the main ways in which the learning could be understood was in terms of Schön's notion of reflective problem solving. This was particularly evident in the ways in which the students described their experiences trying to measure the non-compliant one year-old child and their reflections on how they dealt with the ongoing problem of obtaining the abdominal skinfolds. The continuous process of problem detection, framing, and re-framing described by Schön provided an excellent way in which to view what was occurring as the students talked about their interactions with these problems. In obtaining the abdominal skinfold measure, for example, the students moved from seeing it as the child's problem regarding personal privacy to seeing it as more of the measurers' problem of projecting fear through their own timidity or tentativeness. Schön sees this framing and re-framing process as being critical to solving the problems of practice. His representation of problem solving through reflection-in and -on-practice provided a useful way of seeing and understanding some of the learning events described by the students. Their descriptions of internal dialogue (Minda's consideriations

regarding whether or not to remove a toy from a child's hand), and external dialogue (their discussions of the problems of practice during their commute to and from the measurement sites), are more easily understood as examples of reflection-in- and reflection-on-practice as they engage in reflective problem solving.

Another underlying process that was key to the students' learning was participation in a community of practice. The students learned by becoming part of a situated social setting where they, as newcomers, had access to others with more experience (oldtimers), and engaged with them in dialogue about the problems of practice. Lave and Wenger's notion of "legitimate peripheral participation" provided a way of viewing the co-op placement experience which helped explain how the students became more and more central to the community of practice. Minda and Catherine talked about assuming tasks such as recruiting and promoting the SHAPE project as they progressed in their term. Through this further engagement, new opportunities for developing organizational and communication skills arose as they interacted with their supervisor in a new capacity. Access to others more experienced than they, such as the Daycare Director regarding dealing with children or Catherine's father with respect to communicating with the Chinese families, provided the students with learning opportunities that could be understood in the context of Chaiklin and Lave's (1993) work regarding newcomer and old-timer interaction. An interesting role reversal was evident in this co-op placement with respect to the measurement skills. Due to their extensive experience, the students soon became the old-timers as compared to the supervisor, Janet, who remarked how she had come to learn from them in this area. Of particular interest in this study was the newcomer/newcomer interaction where the students, often left to work unsupervised, relied extensively upon each other for coaching and learning. They spoke about learning each other's roles and interchanging when appropriate. They were respectful that each had skills the other did not; Catherine saw Minda as very organized and capable of doing several things at once while Minda appreciated Catherine's ability to relate to children, and the Chinese

participants. They reflected on their practice and learned, incrementally, from each other's experiences and perceptions.

Vygotsky's "zone of proximal development" provided a way of understanding how this process of engagement in a community of practice might work with respect to the individual learner. His work suggests that the students' learning was stimulated by engaging in dialogue with more knowledgeable individuals such as the supervisor, daycare director, father, and peers noted in the examples above. His notion that learners must experience learning as an interpersonal process before internalizing it argues that the students' learning and development was dependent upon their interpersonal experiences. This differentiates the co-op environment from the classroom environment in significant ways. Co-op environments such as this one usually provide for work that is rooted in social activity, and usually provide opportunities for the students to engage in dialogue with more knowledgeable colleagues and supervisors. These two processes, engagement in the community of practice and in dialogue with those more capable, as described by Lave and Wenger and Vygotsky, provide useful ways of describing learning in this co-op placement.

Unique for the students in this study was their engagement in the research which necessitated significant reflection on their practice, something not normally part of the co-op process. In addition, eight months elapsed between the actual co-op experience and the formal discussion of it with each other and their supervisors. During this time their personal experiences were enriched by more schooling, work experience, and life in general, and the co-op placement was viewed through these "new" eyes. The data in this study was very rich in terms of the learning events described and I believe this relective process was critical both in terms of articulating what was learned and stimulating new learning.

Engagement in three critical processes underlies much of the student learning described in this study. The students needed to experience practice in context, to engage in opportunities for interaction with more knowledgable colleagues and supervisors, and to reflect on these

interactions with respect to learning and problem solving. Much of the learning observed and described in this study became apparent because of, and was informed by, the theoretical frameworks presented in Chapter Three.

Chapter 6

Conclusions, Limitations, and Implications

After my co-op term I'm beginning to realize that most of the things I'm learning (in the classroom) probably won't be used in my future job. I'm still going to school because I like it and think that the "University Experience" gives me general knowledge and skills that will help me. (Student Quote from "A Portrait of Students," SFU, 1994)

Conclusions

The nature of learning in co-op is complex. However, the concepts of reflective practice, legitimate peripheral participation, and the zone of proximal development, along with the research on co-op and employability, has helped in understanding some of what occurred when these kinesiology students entered the "black box" of their co-operative education placement.

The findings of this study of co-op in the applied sciences, provide evidence that the students learned much, both in terms of what they knew and how they were able to perform as members of a community of practice. This learning extended far beyond the application of the anthropometry and anatomy skills taught in their academic coursework. Much of this learning was not explicit to the learner and was most observable during periods of reflection by the students, supervisors, and me. General learning "categories" or themes emerged from the data and included: appreciating the difference between theory and practice; managing the unexpected; working effectively as a team and multi-tasking; focusing on, prioritizing, and responding to key issues; developing community specific technical and interpersonal skills; understanding the "big" picture and connecting with it; and learning to learn differently.

These categories are consistent with some of the current research regarding employability skills (i.e., teamwork, personal management, etc.) as well as some of Schön's perspectives regarding learning professional practice (i.e., problem detection and solving). Also included are themes that may be more unique to co-op students such as "learning to learn

differently" and "appreciating the difference between theory and practice," both of which may be useful in describing what happens in terms of learning in co-op which the traditional employability skills alone cannot adequately address.

Consistent with Lave and Wenger's notion of legitimate peripheral participation, it appears that engagement in the community of practice is critical in order for the opportunities and conditions, as well as appropriate motivations for learning to unfold. This observation was made very clear to me a year later during an incident with another co-op student. Although the anecdote is not part of the database for this study, it is, nevertheless, instructive to discuss it here as it provides a striking contrast. A member of the other student team involved in the SHAPE project, Vicky, was interviewing for a research co-op position. She was the only student among the group being interviewed who had previous work experience in a research environment and presumably should have been able to respond effectively (as compared to the other students) to the interviewer's general questions about her understanding of a "research environment." At the conclusion of the interviews, I met with the employer who shared an interesting observation about this particular student. He admitted to "ranking her the highest on paper" (based upon her resume) and wanting her to interview well. However, he found Vicky unable to "translate" or convey her experiences and learning from the Sunny Hill project in a way that was meaningful for his proposed research. He knew or felt that she should have gained relevant knowledge and skills but she was unable to see this or express it. When I discussed the feedback from the interview with her, Vicky was surprised at the employers comments telling me that "she told him what she did there." We talked about the difference between telling someone what you did and telling someone what you learned from what you did, and with much guidance from me she began to appreciate her learning in a more general, or conceptual, sense though still had difficulty describing it.

This situation is clearly complex. I did not engage in any formal review of it, and in the absence of data, any conclusions I might draw would be speculative at best. It is nonetheless interesting to note that it appeared that Vicky did not benefit as fully as she might

have from her co-op placement at Sunny Hill. Given the findings of this study, perhaps she failed to engage herself fully in the community practice (her team did have some troubles early on dealing with a variety of things and developed a bit of a "chip" on their shoulders around certain aspect of the project) and therefore did not have as many learning opportunities unfold for her or choose to engage in them when they did. Perhaps the environment during her SHAPE placement did not facilitate her moving through her zone of proximal development and learning was limited. Perhaps the learning that she did experience was not apparent to her, and in the absence of reflection upon it, remained hidden. Or, perhaps the learning, upon reflection with me, became explicit but remained difficult to articulate because the nature of this learning is difficult to describe and requires a language, such as the employability skills, with which students are relatively unfamiliar. Regardless of where the problem lies in this particular case, there appears to be a need to find a way of enabling students to gain from a contextualized co-op experience a more general understanding of the resultant learning (much in the same way that co-op provides the opposite; a way for some of the generalized academic learning to become contextualized). My conversations with Vicky served to underscore some of the critical aspects of the nature of learning (engagement in the community of practice, continual opportunities for problem solving, experiences reflecting in and on practice, etc.) that were evident in the co-op experiences that were investigated in the present study.

There appears to be an "art" to professional practice which, as Schön has described, can only be learned through experience such as that provided by the co-op practicum. This art of practice may be developed through experience, reflection in and on it, and through interactions with more competent others—opportunities which would embody an ideal co-op placement. Vygotsky's "zone of proximal development" provides a way of understanding what may be occurring between the co-opstudent and the supervisor(s) and between the learners themselves. It may help to understand differences in learning that are seen between students in a similar environment as this construct recognizes each student's unique learning and developmental potential, rather than assuming homogeneity in the learners based upon a

perceived developmental level, marked by their progress through a program of studies (i.e., 3rd year engineering, A+ student).

The students in this study seemed to learn in a variety of ways. Problem detection and solving processes were obvious and served to help the students deal with on-the-job issues and develop certain skills and understandings around those issues. Critical to this problem solving was opportunity for dialogue, and access to others who had more knowledge about certain subjects (i.e., working with the Sunny Hill Daycare Director regarding working with children) so that the students' zones of proximal development were stimulated and potential learning was actualized. The learning events described in this study were often results of dealing with problems that were encountered in the field; as such, the community of practice was largely responsible for the "learning curriculum" in this co-op placement. It also appeared that the more the students became involved in the project, the more opportunities for learning emerged. The notion of legitimate peripheral participation helps to understand how a co-op student may become part of the larger community. There was also evidence of the learner's concerns changing over the course of time as they move from newcomer to being more established in the community, and this too may have some implications for co-op education preparation and counseling.

Limitations

Chapter Four included a discussion about how, as I continued in the study, the theoretical perspectives of Schön, Lave and Wenger, and Vygotsky began to frame the way I *saw* the events of co-op and the nature of the learning I observed. I recognize that, although this has provided some clarity in the work, the method and findings are limited to these particular theoretical vantage points. Further, I have grappled with my experience and bias as a co-op co-ordinator, and have attempted to see and portray events faithfully.

Selecting a small group of students to study allowed for obtaining very rich data as we were able to discuss in some detail the nature of their co-op placement. The qualitative case

study approach taken with this co-op placement allowed for a deep exploration of the problem, something that had previously not been evident in co-op research. However, it does not provide for conclusions which may be generalized in the usual sense, for example, to all co-op placements. This was not the purpose of this study, as my principal intent was to develop an understanding of the learning taking place in specific situation, and to "test" the ideas of a particular literature on learning.

Finally, there is an abundance of literature related to learning that was not referred to in this study, which might serve to provide a more eclectic view of the co-op learning. The lenses of Schön, Lave and Wenger, and Vygotsky did, however, provide particular perspectives which were enlightening and, at the same time, provocative in terms of inviting questions which require further investigation.

Implications for Research

This exploratory study has given rise to several ideas for further reseach. Schön argues that a central task of professional education is to formulate "what we already know," to capture the insights, values and actions of competent performers in situations they encounter in practice. Research initiatives which look to investigate "best practices" in various formal and informal settings provide an interesting approach to Schön's notion of formulating the actions of competent performers by investigating the learning factors involved. The co-op work placement could serve as an excellent research site for such work as it focuses on both education and training, and provides a bridge between the formal and informal learning environments. These findings could enrich our understanding of the nature of learning in both co-op and professional practice, and in so doing lead to improved education and training initiatives in both settings.

Another implication for research involves further exploration of the uses and limitations of the *Employability Skills Profile* developed by The Conference Board of Canada. In this study, Minda spoke strongly to the notion of "learning by doing," whereas Catherine

saw some of Minda's skill as being more innate. My experience in talking about "employability skills" to many co-op practitioners has produced similar comments. Because of the lack of clarity on exactly what we mean by these skills, how they may be demonstrated, and how we can evaluate their acquisition, they are difficult to understand. Consequently we often tend to ignore the messy issues and assume that some people are just more gifted than others when it comes to such competencies.

The *Employability Skills Profile* provides a way of talking about those skills which have traditionally been difficult to define and articulate, but further research needs to be conducted regarding the nature of these skills such as how they are acquired, whether they are transferable, how they may be evaluated, etc. It may also be useful to investigate the extent to which these skills are useful to particular communities of practice. The effort to formalize, categorize, and measure them in a technical, rational way may be limiting; there is a need to consider these more holistically as traits of character and habits of mind—qualities that emerge from a particular kind of engagement in a community of practice. These understandings are simply not carried by the prevailing representation of "skills."

Another research implication looks at the positioning of field-work within education. Often, the meaning or role of field-work has been unclear and, though many students feel they have learned something important, they are unable to state what or how they have learned or how it relates to their school-based learning. Many see co-op solely as the place to apply the learning done in school. This is particularly true in the science-based disciplines, where the model of technical rationality dominates our thinking(Schön, 1983). This creates an ongoing "rigor versus relevance" dilemma which keeps the learning of theory and practice independent rather than interdependent. Further research involving the role of the practicum in the applied sciences is needed in order to appropriately situate and support the practicum portion of the students' education.

There is also a need to investigate ways in which the learning that students experience in co-op can be made explicit so that they are able to recognize and express it. This was

evident throughout the discussions with the students in this study. I have found this to be the case in much of my work as a co-op co-ordinator; students seldom reflect upon their learning, tend to see learning in a very narrow, institutional sense, and seldom know what they know or have difficulty expressing what they know. Enabling students' learning to become more explicit through various methods, such as peer-observation, self-reflection and expression through videotaping and analysis with more experienced members of the community, and a number of other strategies, have implications for both research and practice.

Implications for Practice

The students in this study came to recognize some of the various skills and knowledge they developed through their co-op experiences. Recognizing and being able to articulate knowledge gained from co-op is significant for three reasons. First, it is plausible that students are better able to represent themselves in subsequent interviews, resume preparation, etc., to prospective employers. Second, with a better understanding of their knowing and learning, co-op students will likely become more self-directed and responsive in their own and others' professional development. Third, it is reasonable to expect that best practices emerge when learning becomes a principal focus of professional practice and inquiry.

There is a need to understand the technical, rational roots of co-op education and recognize that they create limitations in terms of the role and positioning of co-op within post-secondary education. These roots may need to be challenged as technical, rational approaches to professional practice do not account for much of the learning seen in this study. This does not mean we need to discard the cognitive basis upon which one's actions are founded, (and which forms the basis of most traditional education), but rather to recognize there is another process involved wherein the practitioner interacts with the problematic situation, including all the social, cultural, and political environmental factors, and in real time converses with it. This learning is more than simply the application of the science learned in school to "real world" situations. It is new learning that is situated in the community where it is valued. The

challenge for co-op practitioners and educators will be to explore ways of bridging the formal (school) and informal (co-op) learning that optimize the students' understanding. Learning knowledge and skills in both educational settings needs to be seen as complementary and formative in terms of constructing future understandings in each environment.

This co-op placement presented opportunities for the students to learn a parallel "curriculum" (the art of practice, employability skills) which unfolded for them as they further engaged in problem solving within their community of practice. If this is true of other co-op placements (and as stated, this research needs to be done), there may be a need to re-visit the Canadian Association For Co-operative Education definition of co-op with the intention of incorporating the notion of complementarity to formal education and co-op's unique ability to provide opportunities for learning the "parallel" curriculum.

It may also be an opportune time to review the goals of co-op in general. As Argyris and Schön (1974) suggest, the objective of the field experience, like the objective of all clinical experience, is to learn to become more reflective under real time conditions so that effective *ad hoc* theories of action can be created and tested. We need to re-visit the co-op goals and objectives to see if they are consistent with the overall mission of co-op, and examine the ways in which we ensure and measure success. Argyris and Schön (1974) also note several characteristics of practica which may provide a useful model for co-op practitioners to draw from when evaluating their placements. The intent of such an effort would be to maximize the educational experience for all co-op students and their employers.

Given the enhancement of Catherine's course learning due to her prior work experience, it might also be interesting to examine the ways in which earlier co-op placements (where experience precedes theory) might be appropriate. In her work on teacher education, Fuller (1969) suggests that a fundamental goal of professional education would be to create practical contexts to serve as foundations from which students might better understand the theoretical perspectives relating to practice. This reflects back to Schön's (1983) idea of turning the dominant model for the teaching of professional practice "on its head," having the

practical exposure first, or early on, in order that the theory has an experiential coat rack to hang on.

While this study is limited to one specific co-op situation, I found the *Employability Skills Profile* both useful in terms of describing some of the learning I observed, yet limited in describing other skills. It may be useful to review the language used in the *Employability Skills Profile* to better reflect the artistry of practice and to break down certain skills into their component parts. For example, instead of using the term "problem solving skills," (which universities currently purport to teach, and which industry continues to claim as a shortfall of formal education), terms such as problem detection, problem framing and re-framing, improvisation in action, and implementation may better clarify the meaning of this multi-faceted "skill," and ultimately assist in its acquisition.

Although this study is limited to a small group of students in the applied sciences, it would nonetheless be interesting to try new ways of preparing the co-op students based upon some of the findings in this study. The extent to which these findings are generalizable, as discuss in Chapter Four, depends upon the degree to which the concepts, units of analysis, populations, settings, etc., "fit" with other co-op situations. For those cases in which such naturalistic generalization occurs, the following implications for practice are worthy of consideration: an examination of learning and the role of the learner that extends beyond the university experience, provision for reflection on experiences and dialogue with others, and ultimately opportunities for students' construction of knowledge about themselves, their work, and society. Potential curriculum implications could include:

- using co-op as a mechanism through which we can examine "foundation disciplines" in applied science through issues that arise on work terms. This provides one way of integrating course work and practical experiences.
- valuing process as much as product. "Seeing" co-op placements as opportunities for learning through "legitimate peripheral participation" in a community of practice.
- creating opportunities—including credit offerings—for co-op students to examine and discuss their practice with peers and more experienced colleagues.

- acknowledging the importance of learning processes and community interactions in student handbooks and co-op curriculum design.

These implications for practice are tentative until there is a larger body of co-op research that provides for a better understanding of the nature of learning in co-op education in general. What is clear, is the need to better integrate the learning that is occurring in both the formal and informal settings for co-op students. The interdependence of this learning is apparent at the level of the individual who constructs and re-constructs personal understandings based upon the interplay of theory and practice. The challenge is to acknowledge this complementarity at the institutional level in order to facilitate the most effective learning experiences for the student, through stimulating and sustaining reflective dialogue between partners.

> From the standpoint of the child, the great waste in the school comes from his inability to utilize the experience he gets outside the school in any complete and free way within the school itself; while, on the other hand, he is unable to apply in daily life what he is learning in school. That is the isolation of the school—its isolation from life. (Dewey, 1899/1965, p. 75)

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Appendix I

Employability Skills Profile

Corporate Council on Education
National Business and Education Centre
The Conference Board of Canada

Academic Skills

Those skills which provide the basic foundation to get, keep and progress on a job and achieve the best results

Canadian Employers need a person who can:

Communicate

- Understand and speak the languages in which business is conducted
- Listen to understand and learn
- Read, communicate and use written materials, including graphs, charts and displays
- Write effectively in the languages in which business is conducted

Think

- Think critically and act logically to evaluate situations, solve problems and make decisions
- Understand and solve problems involving mathematics and use the results
- Use technology, instruments, tools and information systems effectively
- Access and apply specialized knowledge from various fields (e.g., skilled trades, technology, physical sciences, arts and social sciences)

Learn

- Continue to learn for life

Personal Management Skills

The combination of skills, attitudes and behaviours required to get, keep and progress on a job and to achieve the best results

Canadian Employers need a person who can demonstrate:

Positive Attitudes and Behaviours

- Self-esteem and confidence
- Honesty, integrity and personal ethics
- A positive attitude toward learning, growth and personal health
- Initiative, energy and persistence to get the job done

Responsibility

- The ability to set goals and priorities in work and personal life
- The ability to plan and manage time, money and other resources to achieve goals
- Accountability for actions taken

Adaptability

- A positive attitude toward change
- Recognition and respect for people's diversity and individual differences
- The ability to identify and suggest new ideas to get the job done—creativity

Teamwork Skills

Those skills needed to work with others on a job and to achieve the best results

Canadian Employers need a person who can:

Work with Others

- Understand and contribute to the organization's goals
- Understand and work within the culture of the group
- Plan and make decisions with others and support the outcomes
- Respect the thoughts and opinions of others in the group
- Exercise "give and take" to achieve group results
- Seek a team approach as appropriate
- Lead when appropriate, mobilizing the group for high performance

Appendix II

Transcription of Video Review Session

August 22, 1995

Minda	Co-op student
Catherine	Co-op student
Janet	Sunny Hill supervisor
Richard	SFU kinesiology professor
Nancy	Co-op co-ordinator (investigator)
Allan	Video camera operator

Group met to review and discuss the video of a measuring session taken December, 1994.

Session began as participants were given consent forms to complete. Nancy introduced the intent of the session. She related that they were there as part of the overall project to look at co-op learning and asked to discuss their thoughts on the learning that occurred in this term and comment on the video. Students were asked to begin by reflecting back to the start of the work term and try to remember their initial impressions, things such as how they found out about the Sunny Hill culture, how they were feeling at the start, things they understood about the project (as it was a new project which evolved as it proceeded), things they were concerned or anxious about, things they were confident in, etc.

Minda: For not confident, (nervous laugh), I hadn't taken Kinanthropometry, so at first I was...

Catherine: Yeah, I didn't either.

Minda: I mean I had done my STFA (A fitness appraiser certification that included basic kinanthropometry techniques) but I hadn't taken (kin) 303, so wasn't sure about that but then Richard (professor of kinanthropometry) did the training session and I felt totally confident after that. That was one of the things I wasn't confident in to begin with.

Nancy: And then there was a training session in August.

Minda: Yeah, with Richard and I felt completely confident after that.

Nancy: Where was that done at?

Minda: At Sunnyhill.

Richard: At Sunnyhill. (responding at same time)

Nancy: And how was that done?

Minda: We did it with each other.

Nancy: OK, like a lab that you would teach.

Richard: Yeah, and then we eventually did them with kids, when you came down with yours and...

Janet: Then they practiced in the daycare on the children.

Richard: Oh that's right, (recalling) in the Daycare.

Janet: We got to practice for a few days with them then we did the drop-in.

Nancy: How about you Catherine?

Catherine: Yeah, well when I first heard about this co-op job I was really interested because Richard was talking about it in his (Kin) 203 showing the little things you can do with Excel and so uhm...

Richard: Yeah, I gave it as a lead in to basic programming.

Catherine: Yeah just you know and then when I found out that I got the job I was really happy but then when I went there like everything seemed kind of...(looks at other student) like we were sort of on the same boat—not too sure of what to expect and, and uhm, yes I hadn't take (KIN) 303 also. So even after training I didn't feel *that* confident (giggles)...not in me. Right, you know, and I think that uhm, as time went on with the measuring I was more confident.

Nancy: Right.

Catherine: Yeah. So uhm...

Nancy: Do you remember your first session?

Catherine: My first session in?

Nancy: Measuring, like real data collection.

Catherine: Measuring for real? Yes, actually we had two groups all together, we were doing it uhm, at City Hall.

Minda: That's right. (chuckling)

Catherine: Yeah. (also chuckling)

Minda: Oh, those fond memories! (sarcastically, then laughs)

Catherine: At City Hall we had two groups, I think we expected uhm, more. We expected more measuring and we soon found out that, oh, it was only a couple of hours, and then, and then the kids weren't that co-operative...(giggling)

Minda: Yeah, and that's when we were introduced to the problem of getting the forms back and not having all the kids there, and kids sick, and kids home that day, and.

Catherine: Yeah.

Minda: So it was a short session but it broke us in. We had a screaming child, a whole bunch.., oh everything we had pretty much on the first day.

Catherine: Yeah, uhum...

Nancy: So what did you do?

Catherine: (laughing) We did the best we can.

Nancy: There's the good answer!!

Catherine: We did ah...

Minda: We tried...(laughing) I'm sure we measured about 40% of the kids or something (laughs)...

Catherine: Yeah, we found out that they weren't too hot on the skin folds, I think one person, most of the kids they...especially the abdominals because you're getting more into their privacy sort of like you know...and uhm, the kids are...they're...they have their own minds like(laughs) you know some kids you can play with them and they will get attached to you and let you do your measurements and some kids just stay away and...(laughs)

Minda: Well, it was still a trial very much, I mean learning about the stomach skin fold. It never was extremely easy but we became much better at getting it by the end. So that was the one that we noticed at the very beginning right away that we would have the problem with.

Nancy: So, how did you...how did you deal with that?

Minda: In the end? (talking sat same time, difficult to distinguish). At the time I remember, we had one list with everything but that and just screamed... so at the time I think...oh (recalling) the other group was there too so we threw ideas off each other and just went with that. But gradually we learned that you just didn't make a big deal out of it. You kinda just go "OK now, we're going to do the tummy" and then you go for it but at that time I think we were hesitant a bit probably, like we knew it was going to be a problem. What we did was (in a hesitating voice) "OK we're going to do the tummy"...and we looked unsure I think and the kids picked up on that.

Nancy: Was there a time, after that first session, or at anytime after sessions that you would kind of yak about what went on, the problems, or did you deal with it mostly on the fly?...How did you deal with those things?

Minda: Well we deal with a lot of it on the fly but then we did have a lot of times, I mean driving to and from we yacked about the kids all the time and ah, problems. And we talked to Susan about the things too and she had suggestions.

Nancy: Right.

Minda: She came out to a few sessions and saw.

Nancy: And Susan was your project leader?

Janet: Well she was the recruitment co-ordinator. So she was recruiting a lot of the kids so she actually had a lot of contact with the centers too, so it was really helpful for her working directly with each of the teams and then working with the centers, and trying to sort out what would be best in both cases too.

Nancy: Good. So now back-stepping again, when you went out in the field, who were you representing? Did you have a sense of how you were to carry yourselves and how did you base that?

Minda: Well, we felt we could be quite professional about it because we had two large institutions behind us. We felt we could always kind of throw out the Sunnyhill and SFU (names) and it would be fine. I mean when you have anything "university" it usually works reasonably well. So you did feel that you had a lot to back you up and you went in presenting yourselves as such—as best you could.

Nancy: When did you feel you got the big picture sense of all of what you were doing? Or have you yet? (chuckle)

Minda: The BIG picture?

Nancy: Yes.

Minda: The biggest picture I got just recently when we went to the session (a few weeks back)...but uhm, we were introduced to it right at the very beginning. Janet did an intro and I understood what was happening but you didn't really understand the scope of it I don't think until you really got into it and understood once you'd had all the contacts with what was going on.

Nancy: And Sunnyhill? When you were representing Sunnyhill you got a sense of what that meant...the culture there?

Minda: Having the training session there...'cause I hadn't heard of it before, and once we had the training session there, you were immersed in it and you realized in going to the Daycare, and meeting the kids, and walking past all the different care units and stuff you got a sense of it pretty quick...I thought.

Nancy: Was there anytime where you sort of went, oh I don't know, things sort of changed and problems got easier or you figured out solutions that didn't seem to be there before? or any incident that happened?

Catherine: I think our measurements became really routine. Like we would start off like measuring arm and then leg, and then go down the arm first and then the leg...

Minda: Yeah.

Catherine: Yeah, I think then Minda, most of the time she did the recording, and she knew exactly where we were and then...

Minda: It clicked one day.

Catherine: Yeah. (chuckle)

Minda: I don't know when but it clicked one day.

Catherine: And when we would kind of make it out of order she'd say "What?" (laugh)

Minda: Just like "you missed!"; "you did this!"

Nancy: Without it having been decided you just kind of worked into that?

Catherine: Yeah, we just went, its funny because the other group did the other way like they started with legs first. Yeah and then uhm, and then ah,...we just started with arms first for some reason, yeah, it was a routine that we just went on and it was fine.

Minda: And I think we were all, very much, we were very interactive, and as a group we were we were very interactive—as a group everybody knew where the other person was. I mean I knew where they each were (in the recordings) and I got the sense that they each knew where each other was. If one were heading over to do a head, the other would speed up so they could get over there so they could help—it all worked out.

Nancy: Now is that something that you practiced?

Minda: No.

Nancy: Was it something important to help...

Minda: It made us much faster.

Catherine: More efficient.

Minda: Definitely.

Nancy: Any thoughts on how that happened?

Catherine: Well I think it just happened. Because you know in our practice sessions we had play strategy with Diane a couple of times we had, we just, she didn't know what to expect too, so she gave us a few hints but of course it's never the same when you're out there! Right? You have to really experience it yourself—and she gave us a few uhm play strategies and we tried a few of those out and I only got the experience of knowing my niece and nephew so I see what they like and then I went to the library to borrow some kids tapes to listen to 'cause I didn't know what was in or what was out sort of thing. Then you learn their "in thing" pretty fast"! You know,...yeah.

Nancy: (inaudible)

Minda: And I think it was also a lot to do with our personalities.

Catherine: Yeah.

Minda: We were all very similar in a lot of ways. And I think we were all the type of people that pay attention to what other people are doing and concentrate on that and so I think that's why it "clicked" in that way.

Nancy: OK, great. Well let's take a look at uhm, some of this stuff (the video). I'll start it off at the very beginning and I just wanted to ask you , ah there we go (as the video starts), how you decided how you would start each session?

Minda: This is us?

Nancy: Uhuh, this is you. That's Callie (the girl being measured).

(Video plays back tape from beginning of the measurement session from the past December)

Nancy: So you started by doing this sort of...

Catherine: It depended.

Nancy: Showing it on a doll?

Minda: Yeah.

Catherine: It depends. This is probably only the third time that we had an intro like that (referring to the introduction being given to the kids on the tape).

Minda: Yeah.

Catherine: We hardly ever had an intro because when we went to the Daycare. The Daycare worker already had the forms and they would ask us "how many would you, like at a time and, and, uhm, and who would you like?." So we just take two in and then let them know a little bit about what we're doing. Because not everybody was getting measured, so sometimes only like 2 out of 15 or so was measured so we uhm just didn't do that actually.

Nancy: You gave a really long, good explanation (on the tape)...

Janet: But you did some kind of intro for each child.

Minda: Some intro of some sort, with a doll.

Catherine: A doll or...

Minda: We didn't just jump into it all, but not necessarily a large introduction like this.

(The group's attention is focused on TV monitor watching the introduction given at the recorded measurement session)

Nancy: Now what are you thinking as this is going on? What are you watching for?

Catherine: Just to see how they're reacting.

Minda: If they cringe. (laughs)

Catherine: It's neat because kids at that age like to show what they know, if you ask them they're proud to show where their shoulders are (laughs), and you know they, I think they like that.

Nancy: Now you guys had some problems prior, not so much in this session although a little later, but with the markings. Can you tell me about sort of how those evolved and ideas you came up with.

Minda: Well we had been, in the training sessions, we had been told basically to use the marking pens and had been writing on them (the kids). It had worked for the most part quite well, and we hadn't noticed really any particular problem with the pens but I think Susan (project co-ordinator) came out to a couple of sessions and she felt we had been losing some kids because they were scared that they were possibly needles. As well as some kids didn't like to be written on, so they were complaining too right, and you say well it will wash off but that's not always good enough, they don't always want to wait until you take them to the sink later. So she suggested that we use little stickers. She had used them before I guess at Sunnyhill or something, so she had used those. So we tried using those for a bit and we thought it worked for the little ones. So we probably ended up being able to measure more kids than we would have otherwise.

Nancy: So that's an example of "someone else sees a problem, brings it to your attention, and then discusses it." Did that happen a lot, like did you interact with Janet, or Richard, or Susan...

Minda: Uhuh, yeah. At the very beginning one of the problems was the height board, measuring our height. And that was something we noticed right away and I think that Richard (technical researcher) was probably aware of it at the beginning anyhow, but we went out and practiced and we found that we couldn't do it. By sticking the tape up it wasn't very accurate and you couldn't have the same situation every center so that was something we went to Richard and Janet right away and sorted that one out.

Nancy: OK.

Minda: So there was the odd instance.

Nancy: Yeah. I'll just move ahead here on this tape (forwards the tape they are watching) and I'll just get you to comment...(inaudible chatter and laughter as tape goes on fast forward.)

Nancy: Who dubbed the calipers "kissers" and how did that start?

Catherine: I don't think t was our group actually, I think it was the other group that said they were "kissers." Was it?

Minda: I thought it was you?!

Catherine: Was it me? No I don't think I said that they were "kissers" actually.

Minda: We had everything but...dinosaurs, birds...Then we had one kid that didn't want to be kissed that day by her Mom so when we said "kisser" she screamed! (laughter) so.. it quickly became a dinosaur!

Catherine: I think that, yeah, I don't think our group said they were "kissers."

Nancy: So did you interact with the other team? You guys would sort of yak about things that you'd done? Was that, did you get a lot of ideas from that?

Minda: Well it was generally when we got, we didn't get together that often, there was a couple of joint measurement sessions and that's when we'd sort of compare ideas.

Nancy: Right.

Minda: Or we'd get feedback through Susan as to what worked maybe for another group...

Nancy: Right.

Minda: ...but generally we didn't phone each other and discuss our problems or anything. And it did help when we were together, but it was difficult too because we didn't measure the same kids and so it was tou[illegible] sometimes but we did get some feedback. It was hard though too because often you felt that you knew your situation better and that they knew their situation better so that when they were offering suggestions, you kind of—half the time I think we kind of went: "hey, this is working for us—don't criticize" and I'm sure they felt the same way. So it was tough that way because we were separate units that measured differently.

Nancy: Uhuh.

Catherine: Yeah, because they had to go and do one of re-measures right, this was a week later and they say "oh, you've landmarked wrong, because the marks are still on the kids! (laughter)

(laughter)

Nancy: A week later!!

Catherine: Yeah it was though—still on the kids uhm, so, uhm they immediately said, you know " the other team did it wrong," and we felt kind of you know like, we felt kind of that they were being too critical, like the wrong way to kind of approach us...

Minda: And then we did get together for a joint measurement session soon after that so we compared and got it all sorted out.

Catherine: Yeah, uhum.

Nancy: And nothing was really different.

Minda: Well there was some things different but we got it sorted out at that point.

Catherine: (nods in agreement) Yeah.

Janet: And that was around the time too, that we decided to do, look through some of the repeat measurements.

Richard: Uhum.

Janet: We gave them to Richard to do.. 'Cause there was a difference between the scales too..

Minda: Yeah.

Janet: The scales had a different (can't make out the word) one team to the other team.

Unknown: Yeah.

Janet: It was consistent but it was always there. And so that was when the two of them (the teams) got together and went " this one's this way and the other is.."

Minda: "Oh just a second!" (imitates the reaction at the time of discovering the differences). chuckles.

Janet: We had to sort that out.

Nancy:: Yeah. When you were watching it Richard, given that you're the technician here, any comments on the...

Richard: Well just, what would have been better for the training is if they could train themselves. Because the training, what you had was—I'm used to dealing with adults mainly...

Nancy: Yeah.

Richard: And so it's "sit up, sit down, turn around, do this , do that" and so , and I guess 1979, I guess was the last time I measured a lot of kids.

Nancy: Yeah, The Co Gro. (referring to Coquitlam Growth Study)

Richard: Yeah, and then prior to that I'd measured babies and stuff but that's a long while ago. I had some, I had some concerns about the, uhm, play strategies, whether they would get in the way or not...whether they would impede getting the measurements done or not. But it seems to have worked out quite well. But the best experience they've got is their own.

Nancy: Out in the field?

Richard: Yeah, yeah. So if we had to train again, these (students) are the one's we've got to bring in to do the training.

(chuckle)

Nancy: (to the students) What would be your, ah, first "bits" of advice?

Catherine: Yeah, exactly.

Richard: But what Catherine said earlier, the practice, is what makes anthropometry. You can spend a week and you're still not going to be measuring really reliably. You'll change... I measure and then three months later do another measure, and haven't done some for three months, and I measure differently.

Nancy: Yeah.

Richard: And then you get back all you're doing this right or wrong, it's a, it's a tricky business measuring. And ah, that's one of the negatives against the whole system, is the anthropometry. You have to train people...

Nancy: Yeah.

Richard: ...how to do the anthropometry.

Nancy: Mind you, you did get a lot of measures in a concentrated period of time, so hopefully...

Richard: Oh, the measurement they got are great. Oh no, there's no problem there. But I just mean the ah, the application of the system we're establishing. Going to Dietitians and Nurses—it's getting them trained appropriately so the values you're getting are worthwhile.

Nancy: Later on when we watch this, I don't know if you guys remember this but uhm, you were doing the weight measurements on David, the little guy that is being measured there (points to the screen). And he stepped on the scale once with the dinosaur and once without and. Can you explain to me when you see those kinds of things what would usually go on, and if you can remember what happened, then we'll watch it.

Minda: Well, when we see someone step on with something like that, first of all you kind of go "OK is it heavy enough?"

Richard: Yeah. (chuckle)

Minda: Is the kid going to scream, will the kid let us even measure them if we take it away from them? So everything runs through your mind at once. And I think with him we saw that and went "Ahhhh," and felt he would be able to handle it so we took it off and then measured either way and we make a game of it: "Let's measure your dinosaur!."

(chuckling)

Minda: Try to make it as fun as possible, so those are the little things you worry about.

Nancy: When that first happened you were probably more thinking about accuracy were you?

Minda: Yeah.

Nancy: Than to try and remedy the problem, then you've got yourself a new problem! (chuckling)

Minda: Yeah! Well we found that it hardly ever affected the scale. It would take a lot to switch it the extra .5 Kg

Richard: It was out half a kilogram.

Nancy: Yeah, it wasn't very sensitive...

Minda: But it was often, more often than not they would hold onto something. They kind of hold on to Catherine or hold onto their Mom...

Minda: ...or the wall or something.

Nancy: That's my trick: "Ooh, I'm only 125!"

(Chuckle and continue to watch video for a few seconds)

Nancy: Do you remember what happened, I think it was Monica that was doing it actually, let me fast forward to it and then get you guys to comment on it. (fast forwards the tape as group watches an comments to selves)

Nancy: (Commenting on boy on scale) He gets on the first time without it.

Catherine: Oh, there it is. (as the dinosaur comes into view in his hand)

(Some chuckling in background as students watch themselves)

Nancy: There it is, yeah.

(mumbling and continue to watch)

Nancy: Minda notices it.(referring to the dinosaur in hand during the measurement session)

Minda and Catherine: (laughing) Oh my god!! there it wasn't quite right!! (in reference to Monica weighing the dinosaur)

Nancy: So what's she, she figuring there that she's going to subtract the weight of the dinosaur or what was...

Minda: She was just trying to see if it mattered at all, and then if it did she would re-measure him.

Nancy: Oh I see.

Minda: Sometimes we would subtract it if it was a significant weight but usually we wouldn't re-measure in that case. If a kid was upset...

Nancy: Now what kind of techniques on your height, even once you had that new board made, I mean that seemed to be one where the kids really like to tip toe and move, and look up...

Minda: We always had two people over there measuring, and if, sometimes three—a parent or we'd just stop whatever was going on. One person would hold the feet, one person would hold the face and one person would move the top down.

Nancy: Now is that was that in your training session you probably, did you learn that?

Minda: We didn't have those in the training session..

Catherine: Yeah we didn't have those...

Nancy: Oh right...so that evolved from what?

Minda: Trying it and having the kids stand on their toes.

Catherine: Yeah.

Minda: ...And standing on their toes and down...

Catherine: And also it went kind of up so fast.

(laughter)

Nancy: I can see you get the good grip on the face! (referring to the tape)

Catherine: Well, we probably learned that in that practice session that we did.

Nancy: Yeah.

Catherine: We probably realized that in that practice session. Did we have those in the practice session?

Janet: No you just used the tape on the wall.

Minda: Catherine: Yeah, yeah.

Nancy: Did the other team have similar...

Minda: They had the same...

Nancy: ...problems.

Minda: Yeah, they had to move them.

Catherine: I'm sure 'cause all kids are the same right? (laughter)

Minda: They dropped it on the kids head a few times too (smiles). The top part when it's not screwed in all the way...boom!

Catherine: Sorry!!!

(laughter)

Richard: I'm surprised they survived, they weren't that well put together.(referring to the height board)

Minda: There's a big hole where we screwed it into the...

Richard: Yeah, the other ones had the laminated one, that's right. (mumble)

Nancy: Is this kind of how Janet and Richard thought most of the sessions would go, is this watching the tape sort of...

Richard: Uhm...

Catherine: Yeah, how did you guys think it would go ?

Richard: Well the people that were granting the money didn't think we'd get it done I don't think. There was one comment in there that sort of said, well "it seems a bit ambitious" or something, to get that many measured.

Janet: Trying to measure 500 (children they set out to measure)

Richard: ...(inaudible) so that you do the measuring when you get them.

Nancy: You guys did well.

Janet: Yeah when we first started out I think our biggest problem was just finding enough kids.

Nancy: Uhum.

Janet: Initially, and trying to keep a steady flow in order to...

Richard: Keeping them in flow.

Nancy: (directed at students) And part of that became your challenge?

Minda: We did some of that, most of it was Susan's (project co-ordinator) challenge. But then we started looking for our own measurement sessions.

Catherine: Minda was really helpful in that...the Place des Arts kids...(chuckle)

Nancy: I thought you guys—I remember you telling me you were going through shopping centers going "ah!, there's a 4 year old!."

(laughter all around)

Minda: Oh yeah! I still do!! I still do! I can tell how old they are...yeah I can tell now.

Nancy: Later on in this, I'm not sure it's where you're measuring Callie, with the French braids and that kind of thing...

Nancy: ...How did you deal with those issues on the fly. You're doing a head girth and the girls got some sort of fancy French braid, ribbons and...

Minda: Ask, if it was a tight French braid and it as all done up, often we would leave it. Take out any barrettes that were in the way and we'd leave it, then we'd write on the side, whether or not that's of any use, but we'd write on the side (of the data recording sheet). Usually we'd try to take it out whatever it was, pony tail, barrettes, whatever...get under the pony tail—do the best we could.

Nancy: Yeah

Minda: Leggings were another problem.

Nancy: Well, I was going to ask you about that...clothing in general in the winter.

Minda: That was tough because the kids would have leggings, and then body suits and jumpers and..

Catherine: Chuckles.

Minda: So it became a bit of an issue. So we had to get, usually in the daycare we got somebody else to take them off, get them all set up or change then into something else, put on shorts or something.

Catherine: And if they were really tight we were able to use stickers actually...

Nancy: Uh huh

Catherine: ...to stick them on,

Nancy: Yeah

Catherine: To use those they had to be like really nice and tight otherwise they move (she and Minda laugh) along with the...

Nancy: Clothes.

Catherine: Yeah. (chuckle)

Nancy: What were the most common things then, the clothing problems?

Minda: Nylons, dresses, because depending on their age, I mean the skirt you have to lift it up and stuff and that's a poor spot for it and you have to pull it down. And...sleeves, we had sleeves!

Catherine: Yeah

Minda: Cause to get this one (biceps measurement) they didn't always want to take their shirt out, then you pull up here and they have this bunch of stuff (gesturing to the shoulder) here and it's pushing down on the shoulder and

Catherine: Yeah...

Minda: We'd have one arm out, so that wasn't great either. And sometimes it was cold when we were measuring and the kids a re going "oh, it's cold!." We had one session at a pool where they were in bathing suits.

Nancy: Oh beautiful.

Minda: Not bad! (chuckles) It was easy!

Nancy: I noticed you guys were talking about "Beauty and the Beast," and Barney and all of this. (turning to Catherine) Now you said that you went and rented all this stuff but how did the rest of you guys get up to speed?

Catherine: (laughing) I remember Monica made a mistake. (chuckles)

Minda: Oh yeah! (laughs)

Catherine: I wasn't there but you told me about it.

Minda: I can't remember what it was though.

Catherine: It was supposed to be The Little Mermaid and she said something else and the kids corrected her .

Minda: And she said little fishy or something. And all the kids know, so (they said) " I can't believe you don't know that!." So I think Monica was the least in touch with children, she had a lot of experience I believe with kids but just because she—I mean I got little sisters and (pointing to Catherine) she's got nieces and nephews so I've heard all the stuff lately and know all the songs and whatever—but you pick it up quick.

Nancy: Didn't know what Sparks was though uh! That little girl (in the video they are watching) said she went to Sparks and you just...(chuckles and shrugs)

Minda: "Oh yeah!"

Nancy: Was that important?

Minda: Yeah, well not necessary,...well, Barney was important and different things like that were but no so much. You didn't need to know the name brands so much, you didn't need to know too much about that although they did catch on to Power Rangers and different things.

Catherine: Yeah, like you need to uh...to keep a conversation going you kind of need to talk (about) what they're interested in. And if it's like you don't know anything you kind of have to be stuck with like "what did you do at school?" or "what did you do today?" or you know like that. But if you know that much more then they say "wow, this person knows Power Rangers or Barney!" (laughter)

Nancy: Instant credibility!

Minda: But if you don't know enough about the Power Rangers you don't want to delve into that one because all, of a sudden they go "do do do do do" (makes expressions with hands of chatter) and you're just going "oh no, let's go back to something I know!."

Catherine: Yeah, right.

Nancy: They know more than you want to know!

Minda: Yeah.

Nancy: At one point Catherine when you're doing Michael uhm, and I'll speed ahead to it, you make a comment and I just want you to comment on that. Whoops, there we go (adjusts video). I think you said something like this doesn't look right or this doesn't feel right or something like that. I'm just wondering how you got to get that sort of feel. (Aside as they watch the tape on fast forward):There's Minda doing five million things at once!...How 'd you get to be good at that Minda?

Minda: Practice (laughs)

Catherine: She's a natural! (chuckles)

(Video is still being forwarded to desired spot)

Minda: Jobs I've been in before...a lot of things.

Nancy: Could you explain everything you did in your role Minda? How would you describe it?

Minda: Oh, huh, Catherine may have helped too. I mean, basi-, I did some measuring so I did have a part in that, and supervising the measuring so I did have to know where they all were to make sure that, and double checking, the paperwork, and contacting Janet and Susan and making sure that everything was on schedule and I organized some sessions and co-ordinated/talked with the daycares, problem solving that's keeping other kids happy while they were measuring—did a bit of that—and just generally keeping it all flowing—which was one of the toughest things that I found. Just making sure that the kids that were coming up were happy and that the daycare wasn't sending them up to fast, that they were happy and that you were in the right spot. There was a lot of different things to worry about.

Nancy: And when that went well...

Minda: It felt really good. And you could tell that it was going well—they were quite efficient and everybody was happy. That's generally what we were aiming for—accurate measurements and having everybody—kids included- happy.

Nancy: The head girths with the braids (referring to what they are watching on video)

Catherine: Yeah we took the barrettes out...It' s not a comfortable measurement you know that...

Minda: The head.

Catherine: No it's not.

Nancy: Kids didn't like it?

Catherine: Well even on adults (laughs). Even on ourselves I don't think it was a comfortable measurement. Cause the tape is steel right so it's not...nice.

Nancy: What would make it better?

Catherine: I don't know (laughs). Maybe, maybe uhm, something like...not steel...like clothing. But like but, you can't because they stretch in time.

Janet: Well they use the clothing and plastic ones in the hospital.

Catherine: Yeah.

Richard: Yeah, they just don't last as long, that' s all.

Minda: It's tough too because it takes a long time to get it exactly right. I think if it were really quite fast you wouldn't even notice. You'd just put it on fast and "doop," you're gone. But you have to adjust it and make sure everything's right and...

Catherine: And you have to pull it tight.

Minda: It's more difficult than some of the other measurements.

Nancy: So that was the hardest one?

Minda: One of the hardest.

Catherine: That one and the abdominals were the two.

Nancy: Now was that the one where you had the strategy of the mirror?

Minda: Yes.

Catherine: Yeah.

Nancy: How did that come about?

Catherine: Diane...(looks at Minda)

Minda: I think Diane noticed that the kids were squirming and didn't enjoy that one and were crying and she felt that if she had a mirror in front of them. Generally kids are distracted by looking at themselves or anything and so she put the mirror in front of them and it started to work. So we each got mirrors to do that, especially (inaudible)...so she bought those for us.

Nancy: Was there any other little things like that, little tricks that you developed over the course...

Catherine: I knew, I knew that, that they liked flashlights actually—

Nancy: Flashlights?

Catherine: Flashlight.

Nancy: Uhuh.

Catherine: They like lights so I bought one and I lost it (laughter). It worked because there was a flashlight and you put it on and it plays one of the songs...I forget, one of the kiddie songs.

Minda: Twinkle Twinkle Little Star.

Catherine: Oh yeah that's right, yeah. And that worked like you know they liked it, but like I lost that...I don't know where that went!

Minda: Noisemakers—they generally like noisemakers.

Catherine: Noisemakers, music...

Minda: Lite Brite—a few different toys were big hits. Some not. The battery powered ones of course were the fun ones.

Nancy: Now with all that noise going on did that create other distractions for you guys?

Minda: Yes. We had one toy which the kids loved and that was...you'd bang on this (uses hands to show shape), anyhow you banged on it and all these little balls would roll around and stuff. But it was very noisy and you couldn't hear. Sometimes it would be "nice and soft" and you'd say it again and again...

Nancy: So what did you do?

Minda: Oh, we hid it sometimes.

Catherine: We'd hide it. You'd say "OK that's enough."

Minda: "New toy!"

Catherine: Yeah "new toy," or we'd just say "when we finish measuring you can play a little bit with it" and you know they seem kind of happy. They liked that thing...(turns to Minda) you have it right? .

Minda: (nods and laughs) And some toys you had to watch out for because they'd break them, or...you just had to watch out. And you had to be careful which toys you had out with which kids—if they were edible or whatever.. .

Catherine: (whispers) edible! (chuckles)

Minda: Like the Lite Brite you couldn't have it with the young ones.

Catherine: Yeah.

Nancy: Janet, any comments?

Janet: Well, we had a lot of fun trying to select toys! (laughter). I learned a lot about that too, 'cause it was very helpful working with the daycare staff. We got to go to the toy stores and select out toys of what was commonly popular amongst kids at that age level which was really helpful so at least we started off with it but then I noticed that you guys bought lots of little things too like Power Rangers and stuff like that after as little extras and those seemed to be as much of a hit as some of the things we purchased. Just something small, small items that they could hang on to.

Minda: A lot of those were Catherine's that she brought from home.

Nancy: Were there anything that you saw from your perspective as the overall supervisor that the measurers would find as challenges and then you'd see them resolve that?

Janet: Well I think probably overall I initially didn't know what it would be like because we were just sort of starting up where everybody was trained and we say "OK now go out there and measure the kids and everything, and there's all your toys and here's all you gear and everything."

Minda: Yup.

Janet: So we weren't even sure if you were going to "get it" out there. And then they came up with the idea well that the stickers weren't really exciting enough so then we had to go and get little incentive prizes to hand out to the kids (instead of the stickers) 'cause the kids were just sort of going "oh, sticker" you know (in reaction to the stickers). And so then that was sort of like a change in strategy. Then we got them to design the "Treat Boxes," and stuff like that too so we were trying to make it more interesting for the actual sessions and also make the kids sort of have more fun.

Nancy: Uhuh.

Janet: Cause the big stress behind it was: we're coming in there, we're doing the research study BUT we're not supposed to be stressing out the kids and the kids are supposed to have fun too in the situation as much as possible. That's why we put so much emphasis on the play and the toys and everything else. But it wasn't always possible cause some kids would get upset anyway no matter what you do (chuckles). But I think it was trying to work through some of those kids of difficulties. And part of the problem too was that it was a different concept, being that it was part of a research study AND working with co-op students, and trying to run the research study and trying to sort of keep in contact with each of the teams, I was relying heavily on Susan to act directly with the teams and I think that was part of the drawback was that I didn't really have a lot of time to really spend doing problem solving and stuff with the teams like at the beginning stages and we actually went for what about a month and a half or something like that and then we sent down. And we had come across some problems and we had to re-hash them then, like some of it was paperwork and some of it was the data recording and some of it was making sure the data was coming together, getting the information, how we were recruiting. So we actually sat down and (looks at Richard), you came over too, and we had a little session to try and sort out some of the problems.

Nancy: Uhum.

Janet: But I think that was part of the difficulty too, not knowing what was all involved (giggles), running actually a project with students and having sort of a hierarchy and I wasn't really being paid to sort of take care of it. Everybody else was the staff and so I really relied quite heavily on Susan and I think we were lacking some of the supervisory time to actually work more closely with the teams and that probably would lower some of the frustration some of the times too from not understanding what things were doing and some of the processing.

(Brief pause while everyone watches the tape)

Nancy: (referring to the tape) I think you did Michael's legs already...

Catherine: I don't know...what were you going to ask me?

Nancy: Well you just said...(mumbling, inaudible) there was a comment...did you do legs first and then arms, is that how you guys do it?

Minda: We always do arms first.

Catherine: But maybe this time we decided backwards uhm, because, uhm, Susan suggested that do legs and once you get a routine going it's hard to change it.

Minda: (at same time) We might have done that.

Nancy: Yeah.

Catherine: And then whenever Susan's there I always remember "legs first, legs first, legs first." Yeah, (chuckles) Because you know, because...

Minda: For the same reason with the dots, she felt the arms more intimidating 'cause they would think it was a shot, then legs. Depends on the kid.

Catherine: It depends.

Nancy: Would you discuss that and you would then sort of hash it out as a team and decide you were going to change your (inaudible) around?

Minda: Yup, yup.

Nancy: (Adjusting the video) I'm going to go back because I, I don't think you did do the legs!

Minda: Yeah, we were being spontaneous!! (both students chuckle). To give you some material...

Nancy: That's right! (still adjusting the video to the right spot.) Did you ever fell like you were kinda doing these -well it got easier and easier- but how did it feel different at the end than from the beginning? Oh , I'll go back again (still looking for the spot on the video)...I can't tell if that's an arm or a leg...

Catherine: (chuckling) That's his arm.

Nancy: That's why I wasn't doing these! (Laughter and mumbling as video surfing continues) I just remember picking up on it about the second or third time through that I was looking at it. It was just sort of like, it's almost like you just sort of said "oh, this doesn't look right," and I just wondered how you got to that point. Were you able to do that quite a bit, to say "oh this must be off or...

Minda: And then she'd normally call someone over. Monica or myself to come.

Catherine: What are you thinking about?...landmarks?

Minda: Yeah. If you were feeling it and the bone just wasn't standard or something.(jumbled chatter)

Catherine: A lot of kids, I find that, that bone there, it doesn't nicely..

Minda: The knee.

Catherine: The knee was OK but then the ankle, it's not always a nice little sharp thing that kind of comes around...it's not. Some don't have it (the bone in question), I swear! (chuckles)

Minda: Yeah.

Catherine: Yeah. Like ah, some are really nice and you can see it right there but some it just...

Janet: Or if they turn their foot in a little bit it disappears. too...

Minda: Or if they're heavier.

(More video watching and inaudible chatter)

Nancy: Yeah, its just a little comment: "this looks different" and then you kept going.. (still watching video)

Minda: Or was that Monica that said it?

Nancy: Nope, that was Catherine.

Minda: Oh was it?

Nancy: Yup. She just said it there (referring to the video). She was looking, looking, looking and it looked like there was something going on in your head.

Catherine: See we're not supposed to remember what we measured right. But it's hard not to do that!

Nancy: Uhum.

Catherine: And that's one thing you have to kinda trust your measurement, but, but it's hard because just a little slight position off, like that or like that, it's different so, uhm. But then of course we take the, I guess we take the median, so it should be OK. But its on your mind.

Nancy: Uhum.

Catherine: But as time went on, I think this is near the end (of their measuring term) I shouldn't have been doing that actually, but at the beginning I remember we always, especially Monica (would say):"Is that what I got first?."

Minda: No, no!!! (chuckling, mocking her response). I'd be standing there in the corner of the room with the paper at my face: "You're not going to know!."

Catherine: Yeah, because normally I would just take it (the measurement) and read it and I would just say it (to the recorder) right. I don't,... I try not to think about what I just, uhm, did. Right?, but it's hard.

Nancy: What are you thinking when you do those measurements?.. I mean are you thinking about your Christmas list or are you?...I don't know...

Catherine: I would just try to take each measurement uhm, by itself like I try not to think of having already measured that measurement. But it's hard no to do that you know? (chuckles)

Janet: What would you do, Minda, if, if you got three measurements that were a lot different?

Minda: Well if it was something that was quite a bit off, I would have to say "ah, just a second," because sometimes they would, you know how you think one thing but you say something else. So often in that case of they were absolutely positive that they had completely said it wrong, they would say "oh, did I say that ? I really didn't mean that. What it was was..." And then sometimes we'd change it or..

Janet: Would you ask the other person the re-measure it?

Minda: Not usually. If it was something like that where she was positive that she had just said you know "10" instead of "20" or something like that, then it was obvious and we'd just change it. But if it was something where it was closer than that, but still a significant error, and sometimes Monica would be like "change it!" and I'm like "No, you're not measuring it again" So we'd just say "No, I'm sorry."

Richard: Yeah, you don't need to change it because you're using the median.

Minda: Yeah. So there's a couple of times when we'd go back and forth on it and we'd leave it. We rarely re-measured because we weren't supposed to.

Richard: Yep.

(Some mumbling as they continue to watch the video)

Richard: Yeah, there's always the concern to "get it right." Even I do that...

Richard: You know you just measure three times and forget about it..

Minda: But which one's right?!

Richard: Well, (inaudible)

Minda: Yeah.

Richard: (inaudible)...so you end up changing them around...

Nancy: (referring to video) so she said 51.4...there was one where there was a discrepancy...

Minda: There was one I remember in the video.

Nancy: It's not important but uhm...

Catherine: Sometimes in the measuring tape, is it a cm? the sphygmometer is it in mm? And of course like between 220 and 221 there's uhm, is that how it works? I

forget. I forget the markings on it BUT there's a longer line for the half way point right, (gesturing with hands) so sometimes I would read it so that it was 220 or 222, or sometimes I would read it as ""oh yeah it's two past that long line" right?, so that's how you think so it's really easy to get like about 5 off...do you get what I mean? yeah, so...

Minda: But I'm pretty sure we caught those if it happened..

Catherine: Yeah.

Minda: Sometimes you'd read the next one and you'd go "No I was quite a ways off on the last one" because you know that you did read the wrong line.

Nancy: Oh, OK. Now, you say you would get to the point where you would make a decision about which ones you would re-do and stuff. How did you get to...

Minda: Well that was something that we talked to Richard about at the beginning. We found out right away, how difficult it was to get the same measurement, of course who's to say the first one was right, and so we asked him and he said "no," he had calculated that and it was all included in the error and not to worry about it.

Richard: Yeah, you expect variability...

Minda: Yeah.

Richard: But its hard to accept when you want to get the "right" answer.

Nancy: When you're doing it.

Minda: Yup.

Nancy: Like the first one's the right answer!

Minda: Exactly, like the first one could have been completely wrong!

Richard: Some people look, at their sheets and go "all these are different!." Well sure they are, like the repeats with two kids. The numbers are different but they're within an acceptable tolerance.

Nancy: Yeah. (pause) Who, ah, who had the idea of the toys at the end. It started with stickers did it?

Janet: You mean the little rewards?...incentives and stuff?

Nancy: Yeah.

Janet: I think that was partly you guys (addressing the students), you were out doing some little thing, it was before we went to the mall I think, we wanted to give something besides stickers. We were at a public event so we went out and bought toys and things because we thought it would be fun if they had like a surprise box that they could take prizes out of rather than just doing the stickers. And then it actually become more popular to have the option —to have the toys or the stickers.

Minda: It also became an issue for it not to be a bribe. That we couldn't say "if you get measured you get this." We had to basically keep it a surprise.

Nancy: How did that become and issue?

Minda: I can't remember...I think in the daycare...

Catherine: Yeah.

Minda: Because at the very beginning at the daycare at Sunnyhill, we had said,...we'd been doing it,...not to all of them but you'd say: "oh, you get a sticker, one measurement left then you get your sticker," and I think one of the daycare workers said " ah, just a second, you can't bribe them, that's not acceptable and so we changed. As best we could we didn't bribe them, we were really quite good about that, the odd daycare worker or a parent would say "oh, you're going to get this ball if you do it, or you're going to get to go outside and play" but if they did it , it wasn't us, so that was fine. We didn't encourage them to but...

Nancy: Let's just watch this one, which is, uh, your...challenge! (referring to the little 1 year old to be measured in the video). Just comment on it,...anyone.

Catherine: I don't remember, I don't know why...(chuckles)

Minda: She (the 1 year old subject) wasn't there for he introduction, she wasn't even there to see her sister measured I don't believe or any of the other kids. Maybe she came half way through but one of the major problems with this I think is that she wasn't there. She didn't get to see the whole introduction, which might not have mattered for her, but to see her sister get measured or all the other kids get measured, as well as having her measured at the same time as the other kids. She would have been less conscious of being the center of all of our attention.

Nancy: Uhum...so what's going on in your heads now? (referring to the spot they are watching on the video)

Minda: We're looking at her and going "challenge!."(chuckles) Right from the beginning I looked at her "oh, this is going to be a tough one 'cause..."

Janet: There's no other kids being measured at the time.

Catherine: No, she was the last.

Minda: She was upstairs and we said " oh, we have one last one to bring down...," brought her down, she's a young one, right away that made it difficult.

Catherine: And then we NEED her! (they were lacking data on one-year-olds) (laughter)

Minda: Yeah, that was another issue!

Catherine: Yeah. I kept thinking , I said well we need her so I'll be patient, I'll be patient right. Cause we do—that was a 1 year old right and uhm.

Janet: Yeah, that was part of the problem with recruitment...it was very difficult to find one-year-old's at the daycares and we couldn't find five-year-old's either.

Nancy: Yeah, because they were at pre-school...

Janet: Out of it (daycare).(inaudible)

(More watching of the video as the measurers make further attempts to engage the last child in the measuring)

Nancy: So now you're trying Option 1 with the mirror, or Option 2...help me through this.

Minda: We tried the options just by playing and then we tried the mirror and then we were just trying anything, as far as I remember we would just try anything to get her interested in something so we could go from there. And, ah, nothing worked. Her favourite response was "No!."

Catherine: She doesn't even let us touch her. I think that the minute you touch her she'll just, uhm, kind of you know move back, right so?

Nancy: Was there any point that she let you touch her?

Catherine: I almost got her knee, her leg at the end...

Minda: At the end.

Catherine: I almost got her leg...

Minda: ...Yeah to put on her socks.

Catherine: Yeah.

Nancy: Again watching the video. So now what do you do Catherine? You're thinking "I need her!"

Catherine: Yeah. (chuckles).

Minda: We were trying to think of any other option. I think Monica's sitting back 'cause if you had too many people interested too, that didn't work either. So you had to have maybe one trying to distract them and one trying to measure.

Catherine: We're trying the dots now. (referring to the use of stick on dots as one way of distracting and marking landmarks at same time)

Minda: Yeah, dot strategy, (pause)...we'd stick them all over ourselves so that we'd look goofy and she'd look goofy and hope that she thought it was funny.

Catherine: (laughs)

Minda: (She) did not though! It worked quite a bit of the time.

Catherine: Yeah, sometimes it worked but sometimes it doesn't. One time with those dots, they would peel it off and eat them!

Minda: Or move them.

Catherine: (in agreement) Yeah, and they moved them.

Minda: So mainly Catherine did all the entertaining here, I think Monica and I sat back and maybe offered suggestions but we basically just stayed out of it. And at one point we brought her (the 1 year old's) sister in. It's coming up.

Nancy: Now at this isn't the first time you've had this kind of situation?

(students indicated no)

Nancy: Do you talk about them after? Or, uh?

Minda: Reassurance. (chuckles) A lot of times "it wasn't anything you did Catherine,...you tried everything and..."

Catherine: At the beginning I felt kind of discouraged because, you know, it felt like a challenge, that you kind of want it, you know. But then after a while you just say "oh well, if we get it we get it, we don't we don't " so like you know. Because like I said, after I went home I felt so exhausted playing with these kids right you know, it seems like we hardly accomplished anything. And uhm, so after a while you just say you know, that they have their own minds and, and if they don't co-operate then that's, let it be.

Minda: And you can't take it personally, we found that. For instance, one, I mean maybe, not in those case but in other cases, say Catherine would try to measure someone and it wouldn't work and then Monica would measure them and it would work, or vice versa, or you know waiting 10 minutes and it would work. And it was nothing you did wrong,...just for whatever reason somebody else was able to take to it better.

Janet: Yeah, sometimes the other team (of measurers) got back to the same center at a later date and would get it.

Minda: Yup. And get the kid.

Nancy: Yeah, get them in a different mood or...

Catherine: I think one time I remember at Place des Arts, we had one more measure on abdominal or something, and then I think Monica and Minda was measuring.

Minda: It was me.

Catherine: And then , and then in the end I talked to this kid and I said, I said:" Well you know, maybe she didn't do it quite right! —maybe if I tried it won't hurt . She let me try it! And I go that last measurement!

Minda: Yup.

Nancy: So what you're saying is you sacrifice your pride!

Minda: Exactly!! And it was me, I remember!

Catherine: I don't remember but I just thought, you know, you know. That was like 5 minutes later or something like that yeah. You know it's really hard , if you just have one more measurement to do, you really want it, like you know you really want it,...badly! You do!

Minda: Really badly!

Catherine: You do . I do!

Minda: Cause it's not, it's not a complete form and you can't really do much with it.

Richard: (laughs)

Minda: You're just sitting there going "aahhrrrr" Fake it!...

Catherine: Just one more!

Minda: ...But we didn't!

Nancy: Now when you would get back to Sunnyhill would you talk about some of those instances with Susan I guess primarily?

Minda: Yes, mainly with Susan. Then some of them we'd record on there "missed this because of this," and then hopefully someone would be going back to that center and could get that one measurement and so we'd try to follow up on those.

Nancy: What were some of your strategies you came up with for one-year-old's?

Minda: Having a parent there really helped, or a brother or a sister often helped.

Catherine: A lot of them they like their music. You know like, I had this round thing (gestures with hands) and you press it and it played Christmas carols...

Minda: Christmas songs.

Catherine: And they kind of liked that one. They like music, soft music...or anything that's different. Anything that was big that they could hold like that. (pause) Another thing is that uhm, uhm, I found that it was really hard to, like a lot of, some of them they don't know English, so like a lot of centers we went to they had like Chinese so they got my Chinese (laughs) which is not that great actually! So uhm, but, but I think sometimes it helped because they, they say "hey, this person knows my language."

Minda: Uhum.

Catherine: So, and then it got to the point where we, I forget which one, that we had to do up a Chinese letter...

Janet: Oh yeah, we got some Chinese lady at...

Catherine: I forget, it was a drop-in type center...

Nancy: Uhum.

Catherine: And then, and then, a lot of, a lot of parents come and ask me in Chinese and I found it really difficult to explain and then one day my dad and I got together and I said "well this is really what I kind of want to say, so can you write up a letter saying this." And then my dad helped me write up a little thing so (when they would ask) I would just kind of go "here, read it!." Sort of like, yeah.

Nancy: Uhuh.

Catherine: Yeah. Because I think a different culture, they expect different thing you know, so uhm , so it really helped in that sense.

Minda: Yep, definitely to have the other languages in the group was helpful.

Nancy: (referring to the video) Now here you're bringing the sister...

Minda: This didn't work!

(laughter)

Minda: Didn't work. She was she took a strategy that she would force her sister to get measured. If she held out, there see her sister didn't look too sure here. (referring to the reaction of the 1 year old on the video). She kept saying "oh it's easy" and grab her arm and say "here measure it." She didn't like that. And she was...

Nancy: It would be interesting to know why her sister took that sort of strategy.

Minda: I don't know. She seemed kind of like, kind of an active sort of "let's do it now" sort of person whereas another sister or brother might have been a little less likely to do that. Cause we've had other kids that would come and be, just hold them or "here I'll do it for you!."

Catherine: See I get to touch her leg now! (laughs, referring to that part on the video). I'm sneaking up but she soon realizes what I'm doing!

(Pause as everyone watches for a few seconds more)

Catherine: But even the pen marking (used to landmark measurements) isn't that comfortable either. Like those felt pens that you use to mark, it's not that comfortable. It kind of, you can feel it kind of, sometimes even before you touch the child, they kinda, they kinda go back you know. Even if in our 303 !(referring to Kin 303 the Kinanthropometry course)

Richard: Yeah.

Minda: They were cold too at one point.

Catherine: And then it'd depend on what point (on the pen). What kind of fine or very fine points you used. It's a difference you know.

Janet: Which one did you find better?

Catherine: I think the fatter one, the fine, fine one kind of scratched. It actually kind of scratched. A bit yeah, I think the uh, not the super fine but...

Janet: The fine.

Catherine: Maybe the fine or even the one step up was even better cause you can do it quicker that way 'cause more ink kind of flowed out... yeah,...yeah.

(More watching of video)

Minda: We'd given up at this point.

Catherine: (at same time as Minda's comment above) What was she staring at? (referring to subject in the video)

Minda: I think Nancy was offering food!

Catherine: Oh! (laughs)

(More watching)

Catherine: (referring to herself turning off a toy on the video). Yeah, we went to turn the Lite Brite off every time it's not in use too!

Minda: (laughs) Ahhh, dead Lite Brite!!

(More watching of video for a few seconds)

Catherine: See she's very quiet. Like...but...like you think you're gaining ground with her but you're not! (laughs)

Minda: Yeah, she seemed to be studying us. And I think that if she had been there longer she would have probably sat there and watched and then figured it all out on her own and...

Janet: So if she'd been there during the rest of the session, she might have...

Minda: No, if she had.

Janet: Then she might have had the time to observe. She might have been able to do it.

Minda: Yeah. Cause we'd done that before, we'd brought in,...you'd be measuring two kids and you'd bring in another one to watch. And if you thought one kid was going to be especially challenging you'd bring them in to watch maybe a couple of sessions just to sit there and play, help you out or whatever.

Nancy: How many one-year-old's did you end up measuring?

Minda: I don't know.

Catherine: We had 50...

Minda: We were pretty close.

Catherine: 47 to 50, yeah.

Richard: The allotted number.

(chuckles)

Minda: The magic number!

Nancy: So, did you have a strategy or just sort of take it uhm, as you went?

Minda: To get them all?

Nancy: Well yeah. You got 47 of them so...

Minda: By the end we were targeting just the ones and five's (year-old's). So, we were trying to head to community centers, there were family centers that we went to and that's where the younger kids were. We steered right away from daycares for quite a while.

Nancy: How about in terms of measuring them? Was there certain things you'd go into with a mind-set to approach it a certain way or did you have a whole lot of options?

Catherine: Not too much, uhm like I said they are all different right. And just, actually I got tired of our toys! (chuckles) That's why I want to bring, like you know I always look around home to see what I can bring in or them to play. I would kind of think "If I was a 1 year old would I like playing with that?," so uhm, I kind of kept looking around home to see what there was or for some cheapie toy to just buy just to kind of get them. (chuckles) Yeah, yeah.

Minda: With the "one's" (year-old's), I think we were a little bit more patient with them at the end but also at the same time you weren't that patient that you would necessarily not go to another center because you were waiting for a few at this one. I mean if a kid was definitely "no, no, no," you'd say: "OK, we're trying to get you your 1 year old but we're going to go on to somebody else, maybe another center where you may have five kids that you could at least try.

Nancy: Uhum.

Minda: So, you got to the point where you tried a fresh crop instead of trying to work with the old one. (students chuckle)

Nancy: Uhm, what did you guys gain from all of this experience?

Minda: One of the most important things I think I gained was just basically being at the ground level of a research project .

Nancy: Uhum.

Minda: Seeing what actually happens, seeing how everyone interacts, and what goes on with the data and everything, the whole process. I really enjoyed that part of it.

Nancy: Did it change some of your original thinking?

Minda: Well of course at school you're always taught to be skeptical of what you read and I think it made me more so (laughs) in a lot of ways. You realize what really goes into it and the chances we had, I mean you know, when you do have a problem in the measuring whose to say, who was there to say you don't just change it. You rely a lot on the honesty of the researcher.

Nancy: How about you Catherine?

Catherine: Basically the same thing. Yeah because this one you can see everything from beginning to end. And uh, like the measurement, the practical end, and then the, what they actually did with the data, and even the final outcome of the profiles that were shown.

Nancy: What about skills or things that you learned along the way?

Catherine: Measurement.

Minda: Yup, the measurements, interpersonal skills,...and it opened my eyes to the ethics— I think of the whole situation with children, all the hoops and all sort of things that you have to do and the importance of having everything exactly right on forms, and absolutely everything exactly the way it's supposed to be.

Catherine: Yeah. Like, when you take like, you can tell like...After doing this one I took the 303 course (Kinanthropometry) and I can tell that people were being really careful in their measures, taking a long time to read the measurement right? And then, then the minute you read, some adults even, and they take a long time, then they do one and "Oh that one's off, and that one's off." And here I am thinking "just , just do it and read it!" right and sort of like thing, and don't spend so much time putting those points right on the points (gestures with hands)right cause you're doing it three times anyways right, yeah. And they want to get everything exactly, and which you can't because we're human and we move and you can't stand still for that long or sit still for that long right, you know.

Nancy: And you learned that mainly by doing it for four months or?

Catherine: Yup, you just learn that, the measurements...it's important to be consistent in your measurement but , ah it's like you don't have to be super duper accurate reading it too because things from measurement to measurement. Yeah and then, like I said, near the beginning we weren't sure if we got the right landmark, or if we were measuring it properly, and how we held the tap and as time went on things just kind of came natural...in your measurements.

Minda: You weigh your priorities—you've got to figure out what's more important. Is it to be fast, to be efficient, to be accurate? you've got to find a half way point I guess.

Nancy: When you took 303 (Kinanthropometry course), how do you think it was different than if you had taken it without that experience?...It's a hard question.

Minda: I haven't taken it! (chuckles)

Nancy: You still haven't taken it!

Catherine: Can you say that again?

Nancy: Yeah. You took 303 after having had the experience. How do you think that was different for you?

Catherine: Uhm,...I think that I've already had the outside experience so I didn't take it as uhm, I sort of went in there and I understood how the measurements were supposed to be taken and, and not to worry if, if the second measurement came out really off from the first. Like the group I worked with uhm, they kept asking me "well, what did I get last time or something?" and I said "uhm, don't worry about it" you know and, and then they couldn't understand they said "oh come on tell me " right and I said "well, it's closer " you know, right and then it's hard to convince them that it doesn't really matter that much. And, and also we did our project and it really helped because I knew exactly: consent forms, and description of the thing... like no problem, I knew that! Maybe that's why our group was kind of relying on me to do everything! Because I knew that. I already had a, uhm, an idea of what a consent form should be like, had an idea of what's involved and, and things like that so it *really* helped me in that way, and I felt confident in going ahead and doing whatever I was going to do for uhm, uhm the little project that we were doing for 303. So it really helped the 303 class.

Richard: I mean Catherine's project, they ended up measuring kids again because they (solved) the equations to predict heigh. from length and that's what they did for their project .

Nancy: Right, yeah. Did you ever,...you've taught lots of Co-op students, I wonder if you notice a difference in them from other learners? The ones that have come to you with experience versus...

Richard: (pause) Yeah,...from the ones,...(pause) I have to go back to this semester to the one's I know were Co-op and haven't. They tend to have become less of the memorizer and everything has to be known and more of the try to understand everything. There's one person who I've had in courses before and isn't one of the top students but, they've been through Co-op and they seem to be different now. And the type, I give open book exams in 303, and she did *really* well in that, in that form. Now It's a different type of thinking. But the first part, I have a one hour closed book and a two hour open book, the closed book was still back to what she was before, which was the memory and the picky detail stuff that you put in to keep the people happy who are the memorizers.(giggles) And the open books there as the challenge to see who can use the information.

(chuckles)

Nancy: Is that how you...yeah, OK, yeah I guess that's the truth...

Richard: It seems to make a difference.

Nancy: So there's a difference in their ability to "use" .

Richard: I think that they find in the practical situation that there's a lot of information they can find to use, it's how do they use it. Whereas our system seems very predominantly "tell me the facts I have to remember" and the exams are set up that way. I do it in 142 (another course he teaches), they have to learn a tremendous amount of information...

Nancy: Uhum.

Richard: ...and there's little about using...thinking about how to use it. It's just this is the way it is, learn this, understand, you say understand...understand the concept, but you're still learning this thing. You're not using some skill you've learned over here and then sort of saying "well that's similar if I apply it over here." And that's where you find very different abilities in people.

Nancy: Yeah. yeah. And we don't often, well, we don't always measure the "applying" part. How do you feel about your Kinanthropometry skills?

Catherine: Much more confident, (laughs) yeah.

Richard: With that, it's just practice and they've had practice in a very challenging situation where they've had to think all the while so...

Nancy: How about you Janet, any other...?

Janet: Well I've also learned from their learning experience too because I now have the package to actually measure the one- to five-year-old's. And so I've started to measure one- to five-year-old's and I now remember some of the stories! (laughs), of their experiences because uh, not all of the children are non-ambulatory—they actually run around. And so they chase around the office and you chase them around trying to get measures out of them and I remember: "Yeah! Catherine used to say it was like this!" (laughter) So, actually learning from them some of the struggles that they had working with like the one- to five-year-old's I can now try to put some of it to practice too and then realize that there were a lot of challenges in trying to accomplish that. But it was really good that, I mean we originally wanted to have 500 children measured and I think we ended up with what, about 630 measured?

Richard: Yeah, there were the 50 that were done twice so it was over 600,...630 I think or something like that.

Janet: Yeah, so that was really good. The total number of measurements we actually exceeded our original expectations which was really tremendous 'cause at the beginning it looked like it was going to be pie in the sky that we'd ever get there. And I think that was the hard part was that it seemed so far away like the...

Students: Yeah, Uhum.

Janet: ...the 500. When we first started rolling everybody was saying like "oh yeah, we'll get going, we'll get doing and everything," then after about a month they started saying "we're drying up on kids," you know, "we need kids"!

Nancy: Yeah, uhum, I remember that stage.

Janet: So I think there was a lot of pressure at some points on both of the teams , and you know, while we were trying to recruit more kids—I think that was hard on everybody. And that's part of doing a research study, it's not a 9-5 job, and it's, and I think that was something that was a challenge to do as a Co-op.

Nancy: Uhum.

Richard: It doesn't fit the mold.

Janet: It doesn't fit into to mode of regular hours and stuff. It's a great learning experience but it's not the same as a regular job because you can't control the day to day, when you're going to be doing the measurement, and actually controlling a lot...

Nancy: uhum.

Janet: And I think there was a lot of frustration with that too, and that's one of the difficulties of ah, doing research too, that it doesn't fit into the normal routines and everything. I think that was quite a challenge for trying to adapt that—everybody was running around with extra jobs.

Richard: And when you've got three people on a team to co-ordinate. It's tough.

Janet: And so, so that was I think a bit harder on everybody... I think they did really well!

Nancy: Yeah they did.

Minda: It worked! It's done!!

(Group chuckles)

Richard: Yeah.

Nancy: Yeah, it's done. Now you just need to sell the darn thing right!...

Minda: Yeah!

Nancy: Good, well, thanks...is there any other comments that you would like to make, just about the whole...experience?

Minda: Yeah! No, it was fun and I thought I really did benefit from it , it opened my eyes.

Catherine: And I just, I'm just always just amazed at how well our team worked. (chuckles) yeah.

Minda: It did.

Nancy: In light of your recent non-working team! (laughs) (referring to a poor experience Catherine had recently had.)

Richard: Yeah! (laughs)

Catherine: That's right.

Nancy: Yeah, it's and interesting dynamic.

Catherine: It was...you know...

Minda: Yeah, and that's something maybe Janet, I mean you, I had mentioned to you about how, or I said how we all worked well together and you said that you noticed that in the interview and you thought that we probably would.

Janet: That's right we sort of selected your personalities...we selected your personalities.

Richard: (at same time as Janet) Oh that's right, we debated about who we would put together.

Janet: We did better, with your selection, your team sort of, it molded together better with personalities.

Nancy: Good.

Allan: I have a little, little question if I may. Uhm, you know when you were pinching kids I noticed that, I mean there was quite a difference in the way that you were talking about that at first— you sort of prepared them where you, gee Allan I right in thinking about this? Uhm, you sort of built up to that and prepared them by pinching your own tummy here and so forth, and then you came to the point where you thought that, that talk in trying to prepare them was actually, uhm, causing them to be frightened?

Minda: A certain amount, yeah. Not in all cases but in a lot of cases. If we looked timid about it and we were expecting them to be timid about it, they would feel for that and be "oh, no, I should...," you know, they're thinking "I should be scared about this" therefore they'll be putting that out and they'll be not letting you do it. So if you're "oh, it's no big deal" and rub their tummy and...

Catherine: Yeah, and choice of words are very important. You don't, you don't, try not to say "pinch" or, or uhm, things like that. We just say that we just want to measure how much skin you have or something you know. (chuckles). And uhm...

Minda: And also, not to ask was also one...

Catherine: Yeah, don't ask.

Minda: Not that you force them but often you don't say "can I measure your tummy?" and then wait for an answer, you'd just go "we're going to measure your tummy" and..

Catherine: Yeah.

Allan: So you're, you're pretty confident that the approach that you developed was a better one...Yeah.

Minda: It seemed..

Allan: Yeah. Is it, I'm curious, how did that happen?

Minda: Some of it I think we did talk over as. Definitely the "asking" part I think that we found that out right away at the very beginning people were saying. I think Diane, maybe it, was it?...

Catherine: Was it Diane?

Janet: Yeah, I think she said don't ask.

Minda: Yeah, Diane said "you don't, you can't ask. You just have to start doing it and tell them that that's, you're going to do it." And it worked. So that was one we discussed right away and I think the tummy we did, almost right after that first session. I seem to remember we, when we had that problem with the first child and we started to talk about it and tried to develop other strategies and I think—I can't remember if we came back to Susan with that or not, or just started, we just changed it on our own. But it seemed to improve.

Allan: Ah.

Minda: We still did, with a lot of kids, we still did say "oh, you know, it's not going to hurt" and certain kids we did use that approach but not as much as we did at the beginning. So...

Allan: I cut you off Janet I think...did you want to say something?

Janet: No. (smiles)

Richard: Actually even with adults the ah, the attitude of the measurer is very important. If you sort of dither around and..., they feel uncomfortable too. But if you're ah sort of, you move fairly quickly and you don't say "oh, is it OK if you move your shorts?" or something, just say "oh, just move your shorts please." Then they feel more comfortable.

Nancy: Uhum.

Richard: And the worst thing you can say to somebody is ah "this might tickle" because they immediately start laughing. It's a sort of a license to laugh. (chuckles) So you can influence how their going to react by what you tell them.

Nancy: When I think of what all those kids are told in that age group about their privates, and strangers touching you and uhm...I know when I went to visit you at the SFU Daycare I don't know what those kids thought was going on. They didn't get much of a lead up there, they were just kind of like you said put in two by two.

Minda: Just shoveled in.

Nancy: It would have been interesting to do another study and talk to these kids and ask them what they had, what just happened to them! (laughs)

Minda: Yeah...that would have been.

Nancy: But you weren't dressed medically, I mean I know you were representing Sunnyhill—that wouldn't mean anything to them.

Minda: No, and we had the "uniform" on but you know...

Nancy: Yeah.

Janet: Well the idea of sending out information to the daycares ahead, the letter and that introduction thing, was that we were trying to sort of explain it to the daycares so the daycares, like a lot of times the staff could explain it to the kids what was going to happen and they could do it as a special event. We're going to be doing this today sort of thing, like that was sort of like our idea behind it for them to sort of do a little bit of prep. And that was what Diane had sort of suggested too. She said a lot of times daycares like to do a special event for something that a visitor's coming in like that so they can do a little bit of explaining about measurements ahead of time. So like that might have happened at some of the places too but uhm...

Catherine: But not that one. (referring to the SFU Daycare)

Janet: Yeah. It would have been helpful if it had been a little bit more organized that way.

(Pause)

Nancy: We're done.

Minda: Tadah!

Richard: So did you pass!?

Nancy: Now I have to try and make sense out of all this! (laughter) Uhm, actually speaking of that , let's see, all of you guys, when I get through a draft I'll make sure that uhm, or you make sure you call me, and I'll make sure you can get your hands on it and take a look at what my take on all this has been. But basically like I said we're going to use this as a model for, what happens, and you sort of alluded to it too (talking to Richard)when you were talking a bit about why is it that it seems that some people go through Co-op have this greater application ability.

Richard: Right.

Nancy: Is that something learned on Co-op?, and how did they learn that?, and by doing what?...

Richard: Or is it people with those skills that tend to do well...

Nancy: Are attracted to it. Yeah. I mean I haven't done anything with that but just basically analyzing what do you learn on Co-op because uhm I think the party line is: Well you learn skills in school, you learn some application, then you go out (on Co-op) and you practice all that out in the workplace and ah...(turning to students) Is that what you think you did?

Minda: (pause) To a certain...yeah, pretty much.

Richard: I suspect they learnt a lot more out there than we gave them actually.

Nancy: Yeah. I think that's what does happen, is there's this sort of presumed knowledge that it's just a place to go and apply skills you already learned.

Janet: 'Cause you had to do a lot of on the spot adapting, and that's something you really grow from.

Minda: Uhum. With a lot of Co-ops you realize that you have to go into a lot more research than what you know and you know, you learn where to look for it and you learn who to talk to...

Richard: Yeah.

Minda: ...Phone your profs, or whatever, you go back to school—it's something you learn. I have to run!

Nancy: Yeah , I know . Thanks.

Richard: See ya!