CONTINUING PROFESSIONAL EDUCATION: A STUDY OF GEOSCIENTISTS' PARTICIPATION, ATTITUDES AND FELT CPE NEEDS IN ONE PROFESSIONAL ORGANIZATION.

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ABSTRACT

Little data exist on continuing professional education (CPE) participation among geoscientists. This study sought to establish an understanding of CPE participation amongst geoscientists through their behaviour, attitudes toward CPE and felt need of CPE. Members in the Mineral Deposits Division (MDD), an affiliate of the Geological Association of Canada (GAC), were used as the population for the survey. A mail survey questionnaire of the 819 members of MDD produced a response rate of 72%.

The findings revealed the majority of geoscientists held positive attitudes toward voluntary participation in CPE. The respondents participated in both instructional and informal activities such as, attending field trips and reading professional journals. Eighty percent of the respondents indicated having participated in instructional CPE activities during the previous 12 months, with a mean of 6 activities. In addition, 100% reported participating in the informal activity of reading professional journals for an average of 0.5 hours per week. Contrary to findings in the literature, no significant relationships were found between educational level, attitude, occupational positions, barriers to participation and the extent of CPE participation. These findings reflect the homogeneity of the

sample's socio-economic status: high education levels (39% B.A's/B.Sc's, 32% M.A's/M.Sc's and 27% PhD's), with a mean income of $44K. The general character of a MDD member is one who specializes in geology (68%), works for industry (60%), holds an occupational position of either project geoscientist or middle management (57%). Few barriers to participation were identified: scheduling difficulties and lack of time.

The anticipated future of the geoscience profession was reflected in the perceived CPE needs of the group. Geostatistics (59%), oral presentations (49%), mining laws (50%), and geochemistry (49%), were items most frequently cited.

Sixty five percent reported that sponsors of CPE other than their own institution were better providers of CPE activities. Although the lecture format was the most frequented CPE format during the previous year, field trips were the preferred format. T.V and video as CPE delivery systems were not favoured by geoscientists which contrasts trends amongst other professionals, particularly engineers in the United States (Greenburg & Beidenburg, 1987).

These findings are of importance to those in geoscience who sponsor, plan, provide, or evaluate CPE activities, but particularly the MDD in developing its CPE policy, and to those in the field of adult education conducting participation research because data has been gathered specifically pertaining to mineral deposit geoscientists in

Canada. Recommendations were proposed for the national umbrella organization, the Canadian Geoscience Council, which has the structure and influence to establish CPE as a priority within geoscience in the areas of programme planning, CPE policy development and resource management.

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CHAPTER 1: INTRODUCTION

The purpose of this study was to investigate the extent of geoscientists' participation in continuing professional education (CPE) activities within the geoscience community. The researcher believed this was a fruitful area to research given the increasing social, technological and political pressures brought to bear on the geoscience profession in relation to issues of professional accountability, and professional competency.

Schools of Thought on CPE

This chapter will provide the reader with background on CPE in Canada, the schools of thought on CPE, research in the area of CPE, and geoscientists' involvement in CPE. Continuing professional education in North America is a widespread phenomenon. The distinction between CPE in the U.S and Canada is its implementation. For example, numerous occupations in the U.S have adopted mandatory CPE for those practicing in the professions, a trend supported by professional organizations and government agencies. By contrast, in Canada, CPE is more frequently a requirement for maintaining membership in a professional organization, rather than a requirement for professional practice.

The functions of the professional organization in CPE have become more complex: developing a CPE philosophy; regulating programmes; facilitating programmes; monitoring

members' attainments; acting as advisors to government agencies. Carrying out such diverse functions can result in confusion about the professional organization's objectives. Whose objectives are being met: the professional organization's?; their members?; or society's? Increasingly CPE is used by professional organization's to police its members' practice, and to provide legal accountability of professional's competency. CPE offers some consumer protection but no guarantee that all those bearing the title of "professional" are practicing ethically or competently. The growth in the CPE industry over the past twenty years has also spurred research into how and why professionals continue to learn beyond their initial training.

There are various schools of thought on the extent to which demands for CPE reflect the economic, social, and technical changes in society. Most researchers examine issues and concerns in the context of present social climate. In recent years the public's demand that the professions be accountable has helped remove the veil of mysticism surrounding medicine and law. This in turn, has spurred researchers to examine the public's concerns through assessment, participation, and evaluation of CPE. The use of CPE and mandatory CPE (MCPE) by those in the professions has been strongly endorsed by consumer advocacy groups.

Professional associations concede that given the influx of new information and technology pertinent to the professions, an increasing gap exists between some

individual professional's level of knowledge and that of the individual's skills for professional practice. Professional organizations and individual professionals view CPE as a way of coping with the new knowledge and skills. CPE is obviously perceived by both professionals and the public as a means of preventing professional obsolescence.

CPE is said to also act as a means of regulating the professions and of reducing the number of fraudulent or incompetent professionals. For example, if specific course content can be evaluated by a professional organization, and the progress of a professional can be identified, then the professional organization has a means of demonstrating its members' commitment to professional development. The keeping of such records can identify those members' who have failed to keep abreast of the profession through the instructional courses deemed as "suitable" by the organization. Maintaining records on CPE is becoming increasingly necessary in the U.S where the amount of litigation against professionals continues to increase (Phillips, 1987). Some professionals consider CPE as a natural extension of the preservice training process. Given that it is impossible for any one period of learning to suffice for a professional's entire work life, on-going learning provides opportunities to expand one's knowledge, and to develop a professional network and encourage a more active membership in the profession.

Professional organizations have eagerly jumped onto the CPE bandwagon because it provides an additional source of revenue (Ohliger, 1984; Atkinson, 1987). CPE is estimated to be a $90 million industry in the U.S (Berger, 1989). Debate continues on whether professional organizations are the most suitable providers of CPE. While arguments are hotly contested on both sides, the professional organizations maintain their monopolistic control over CPE (Seldon, 1981).

Research in CPE

Research in CPE has tended to fall into three areas: participation, programme planning and evaluation. The largest number of studies have been conducted in the area of participation. There are several limiting factors to participation research: 1) These studies tend to focus on the active participant; 2) comparative studies of participation in the professions rarely examine more than three groups of professionals; and 3) researchers have tended to study individual variables for a multivariable problem. This selective approach to research has thus far failed to develop a single encompassing theory of participation. However, the growth in the number of studies on individual professions does enhance our understanding of participation which will eventually formulate a general conceptual framework for CPE in the professions.

Research in programme planning has been guided by the schools of thought in business management: cost

effectiveness versus efficiency in transferring X amount of information; and from adult education which focuses on understanding the components of participation, and needs from all communities. Thus far there seems to be little exchange of research between business and adult education.

Evaluation is an encompassing area of research where researchers have looked at evaluation of programmes, participants, and facilitators. Increasingly, professional organizations are questioning the effectiveness and impact of mandatory CPE on professionals. Research in CPE is frequently conducted through individual professions such as medicine or through individual groups such as the Professional Engineers Association of British Columbia. The lack of collaboration between individual researchers and professional organizations prolongs the process of developing a general theoretical framework.

Geoscientists' Involvement in CPE

There is a lack of literature specific to geoscientists' participation in CPE activities. However, from a perusal of professional journals the researcher surmised that CPE as an activity is flourishing in geoscience. A diverse range of programmes, formal and non-formal, are being offered all over the world. Some journals provide a calendar of events occurring up to 2-3 years in advance. Despite this abundance, no one has investigated the extent of CPE participation in the profession,

geoscientists' attitudes toward CPE, or geoscientists' felt CPE needs. This lack of investigation on CPE in the professions should be of concern to employers, government(s) and professional organizations who will need to address in particular the issue of an aging Canadian labour force.

The changing social demographics reveal the work force in North America is aging. This will necessitate a change in social attitudes towards the older learner; recurrent training of workers several times throughout the duration of their work career; and reeducating people to accept the notion and necessity of continuing education in the work place. CPE will be the primary means of maintaining an efficient and effective professional work force.

The rapid technological changes experienced in the profession of geoscience mirror the technological changes within our society. Many professionals have had to acquire ongoing training and development in their areas of work in order to maintain a functioning level of professional competency and to avoid professional obsolescence. For example, in science and engineering, the current estimated level of professional obsolescence is seven years (Stanley & Holmes, 1987). That is, within seven years of graduation from an university engineering programme, the knowledge those students acquired of the profession will be obsolete for professional practice. One increasingly popular vehicle used by professional associations for demonstrating professional competency is participation in CPE activities.

In response to these changing conditions, professional associations, industry, government and educational institutions are offering a profusion of CPE activities to prevent professional obsolescence amongst geoscientists. To date, many of these activities have been reactive measures to a particular event (be it social or economic), what Botkin refers to as "shock learning" (1979, p.17). These CPE activities are provided in a variety of ways, from formal credit courses, to participation in field trips, to reading professional journals. Debate continues as to the success of CPE with respect to a) demonstrating professional competency, b) increasing worker performance and c) developing the individual professionals' growth. In contrast to some professions such as nursing, the lack of literature about continuing education in geoscience limits our understanding of geoscientists' participation in CPE.

Purpose

The purpose of this study was to gain an understanding of participation in CPE amongst geoscientists. This was achieved through identifying the extent of participation, reasons for participating, felt needs, attitudes toward CPE and barriers to participation. Identifying such aspects of participation will encourage programme planners both to acknowledge these barriers, and to search for ways to overcome such barriers. The data provide some understanding of geoscientists' attitudes, behaviour and needs relating to CPE. These findings should prove useful to programme

planners, the association that provides leadership on issues such as education, and adult educators who study participation across a spectrum of professions. A more complete understanding of the geoscience community may create a potentially larger audience for CPE programmes. This chapter presents the definition of terms to be used in this study, and an outline of the proceeding chapters.

Definition of Terms

As adult education suffers from ambivalence and multiple definitions of terms, on advise from my committee it was decided to use the glossary of terms developed by the United Nations Educational Scientific and Cultural Organization (UNESCO) especially as UNESCO's philosophy informs much of adult education theory and practice. The following terms will be used throughout this paper:

CONTINUING PROFESSIONAL EDUCATION (CPE): "designed for practitioners in the professions or high-level occupations to keep them up to date with new developments in their field, to acquire new skills related to their profession or occupational setting, and to understand the societal context in which they work" (UNESCO, 1979, p. 40).

INFORMAL EDUCATION: "Structured sequential education for adults, successful completion of which is not intended to be recognized by a formal award, such as a credit...or professional qualification, but which is undertaken to meet

some other - usually immediate- interest or need" (UNESCO, 1979, p. 49).

NON-FORMAL EDUCATION: "Educational programmes which do not require or involve enrollment or registration of learners" (UNESCO, 1979, p. 54).

PARTICIPANT: A participant is the person who undertakes CPE activities.

PARTICIPATION: The act of undertaking some form of learning for the purpose of personal gain (financial, employment opportunities, or personal satisfaction).

GEOSCIENCE: A collective term to describe the wide diversity of occupations whose common goal is to understand the planet Earth, and the processes acting upon it (Bates and Jackson, 1980, p. 260).

Design of the Study

The general design of the study was a mailed survey questionnaire to a select population of geoscientists. The survey incorporates instruments from a variety of North American studies to measure demographics, participation levels in CPE, attitudes toward CPE, and geoscientists' felt CPE needs. These instruments where based on the work by Houle, (learning patterns of professions, 1983); Schon (model of learning of professionals, 1983), Cervero (professionals participation in CPE, 1988); Cross (participation and non-participation, 1981).

Chapter 2 will examine a selection of works from adult education and continuing education in the professions. A discussion of the role of the professional association and CPE will be presented in Chapter 3. An outline of the methodology including the study design and method of analysis comprises Chapter 4. The findings from the main study will be presented in Chapter 5. Chapter 6 will offer the researcher's interpretations, implications of findings, recommendations, directions for future studies and conclusions.

CHAPTER 2: LITERATURE REVIEW

This chapter will discuss CPE, with sub-sections on: developing the individual professional, avoiding professional obsolescence, and accountability, followed by a discussion on participation, attitudes toward CPE and felt CPE needs. As there is no little material specific to geoscience, this literature review will incorporate material on professions other than geoscience and adult education.

Continuing Professional Education (CPE)

The UNESCO definition for CPE has been widely accepted by researchers both in adult education and individual professions. CPE is:

> designed for practitioners in the professions or high-level occupations to keep them up to date with new developments in their field, to acquire new skills related to their profession or occupational setting, and to understand the societal context in which they work (The International Bureau of Education, 1979, p. 40).

CPE is considered as "on-going" learning for practitioners in the professions, for the purpose of improving their knowledge or skills, and exploring new ideas, trends and developments in the profession (Broski & Upp, 1979). It is not for the purpose of obtaining additional professional qualifications. CPE is rarely continuous in nature but is, rather, episodic. (Jarvis, 1983)

Professionals engage in CPE for various reasons including: to develop their own individual professional knowledge and skills (Johnstone & Rivera, 1965); to avoid professional obsolescence (Scott, 1984); and to provide a measure of accountability to other professionals and the public (Cervero, 1988).

The form of CPE ranges from formal credit courses offered by educationally accredited institutions to non-formal activities that are dependent upon the self directedness of the individual learner. Some professionals maintain that sponsors of CPE ought to provide formal recognition for satisfactory completion of a particular programme (Broski & Upp, 1979, p. 25). Others argue that of all groups of adult learners, professionals are the most capable of assessing and rectifying their own learning deficiencies (Cervero, 1988).

CPE is the comprehensive term for the practice enabling professionals to acquire on-going learning for the purpose of developing themselves and the profession, and for demonstrating a measure of accountability. Some professions utilize CPE as a voluntary act and place responsibility for learning on the individual professional, while others employ a mandatory CPE policy. Currently, the interpretation of the existing CPE definitions and the diversified methods of implementation vary from profession to profession. The arbitrary application of the present CPE definitions have resulted in confusion for all. "How much CPE is enough to

demonstrate professional competence?," "who should oversee CPE of professionals?," and "what can be done to ensure participation?", are frequent questions from both professionals and non-professionals. The following sub-sections will discuss: developing the individual professional; avoiding professional obsolescence; and accountability.

Developing the Individual Professional

In their study of American adults and continuing education Johnstone and Rivera (1965) found that professional and technical persons cited upgrading their professional knowledge as the primary reason for participation. Other researchers have found similar sentiments among dietitians (Zibrik, 1983), and engineers (Cervero, Miller & Dimmock, 1986). Whether or not upgrading one's knowledge is for career advancement or for other reasons, the reality is that CPE is increasingly necessary to maintain an occupational position. (Oddi, 1987).

Cervero suggests CPE should be a vehicle for developing skills that will provide the learners with "tools" for self assessment and evaluation of their performance and competence. This, he proposes, would complement the preservice training period where the emphasis is on acquiring content knowledge (1988). Many researchers assert that the ability to evaluate and critique one's performance is a necessary skill for professionals to which insufficient attention is devoted during preservice training (Schon,

1987; 1983; Wenecour & Reich, 1983). In a society where the amount of knowledge is increasing, the possibility that practitioners' knowledge is obsolete also increases. Avoiding professional obsolescence is of concern not only to the practitioner but also to the professional associations, the public, and legislative agencies (Stanley & Holmes, 1987; Cervero, 1988).

Avoiding Professional Obsolescence

Rapid technological changes have catapulted North America into new areas of research and development. The technological products of such research means individuals have to learn "new" techniques and tools. The difficulty with an expanding knowledge base is the rapid obsolescence of professional competence (Lindsay, Morrison & Kelly, 1974). Knowles (1979) refers to CPE as "prevention" against professional obsolescence, unlike Botkin, Elmandjin and Maltiza (1979) who view CPE more pessimistically as a "reactive" measure, where practitioners continually try to keep pace with an ever expanding knowledge base.

Professional obsolescence, according to Knox, points to the difference between the knowledge and/or skill possessed by individuals at the completion of their formal education and that of a recent graduate. Knox bases this statement on an assumption that professionals do not gain new knowledge from their daily practice. This seems unrealistic given that professionals are in positions where problem solving and decision making skills are central components of their work.

These skills which are based on the practitioners' previous knowledge, are being continually challenged and changed to meet the demands of new work problems. (Schon, 1983). It is more correct to say that the estimated "half-life" of scientific or engineering knowledge is between 5-7 years. This means that half the knowledge possessed by students upon graduation will be obsolete within 5-7 years of graduation (Stanley & Holmes, 1987; Campbell, 1983). Therefore, professional obsolescence can be said to occur from: a) a result of a lack of knowledge; b) practitioner not possessing the knowledge or skill in the first place; or c) a practitioner failing to keep abreast of the technological changes in their profession (Grabowski & Associates, 1981; Knox, 1987).

In attempts to avoid professional obsolescence some people perceive CPE as being a panacea to "cure" all incompetent practice (Ohliger, 1984; Jarvis, 1983). The public increasingly demands accountability from all professionals, as it recognizes the gap between what professionals may say they can do and what they actually practice (Loring, 1980, p.12). The public's negative perceptions of and attitudes toward professional groups has fostered dissatisfaction among many professionals (Caplan, 1983, p.323).

Professionals do not deliberately choose to possess obsolete knowledge and they may not be aware of their educational deficiencies. This is especially true where the

professional has limited collegial contact due perhaps to geographic locality or an underdeveloped professional organization. However, professionals are increasingly being required to demonstrate their professional competency (Ohliger, 1984), as indicated by the 77 occupations in the U.S. which insist upon CPE or MCPE (Phillips, 1987).

Failure of professional organizations and practitioners to evaluate, discard or accept new information will mean clients' changing needs may not be served by professionals who operate with obsolete knowledge and skills. In turn, such obsolescence will have negative effects on professionals' ability to compete in a global economy. Concern among public citizens groups, professional associations and the governments on the issue of professional obsolescence have necessitated the development of measures that can be regarded as demonstrative of professional competency.

Accountability

Matters of professional accountability and competency have until recently been the responsibility of those within the professions. Increasingly government agencies and consumer advocacy groups have stirred the public's demand for increased accountability of those practicing in the professions (Scott, 1984). This action is the result of changing societal concerns and demands of the past twenty years and of the realization that there is a growing gap between what professionals say and what they do

Each professional organization will need to address the issues of control and accountability, given the mounting negative public feelings towards professionals. CPE has been adopted by professional organizations to demonstrate their commitment to ridding fraudulent and incompetent practitioners from their ranks (Houle, 1980; Oxenham, 1984).

Rockhill contends that CPE and MCPE will provide an increased probability of professional competence, and subsequently a measure of accountability. This is based on the assumption that exposure to CPE will result in some information filtering into the professionals even if they are taking the CPE under duress. However, she does question the benefits of MCPE, and advocates that CPE be a "voluntary open learning policy" (1981, p. 68). Darkenwald and Merriam (1982) argue that much of what constitutes CPE today goes against the one major principle of adult education: voluntary participation. Illich, in contrast, objects to any form of normative measurement for demonstrating professional competency, stating "There is no correlation between education for a specialized function and the technical competence of the performance of this education" (1977, p.7).

There is, however, a relationship between possessing knowledge and being able to use that knowledge. For example, knowing the theory behind a subject (often) better informs one on how to apply that knowledge. On this premise some professions are moving away from normative testing of

professionals to their demonstration of applied knowledge. In B.C, the family practitioners are considering peer review of professional practice as an alternative to instructional assessment (Wainmouth, 1989). This is a positive use of peer review as opposed to the disciplinary use of peer review that is sometimes found in engineering or medicine (A. Wessen, personal communication, September 15, 1988). The public's need to know there is an "expert" and the attitude that only "experts" become professionals, may explain our willingness to accept CPE, and especially MCPE as a quality control measure of professional practice (Manning & Petit, 1987; Campbell, 1983).

This is an age when many tend to equate education with competence: the more education people possess, the more competent they are assumed to be in practice. Relying upon normative testing forms to demonstrate competency could be dubious, given the idiosyncratic implementation of CPE in each profession. Despite this concern, CPE is increasingly used as evidence of professional development in cases of litigation in the U.S (Ohliger, 1984). However, where participation in CPE is required or mandated for professional membership or practice, there is growing resentment among professionals (Corbett, 1979). People resent the time consuming tasks of CPE which result in both personal and professional expenditures (from the loss of fees and time away from practice) particularly as they see it as unnecessary merely to demonstrate their practice to

bureaucrats (Rockhill, 1983; Manning & Petit, 1987). But as yet, CPE conducted by professional organizations appears to be a feasible, pragmatic approach to the problem of professional accountability.

Houle sees CPE being useful in three major ways: firstly, as a power in shaping education policies within a professional association; secondly, as a means of instruction that could inform and influence membership; thirdly, as a means of enlightening and influencing the members to contribute to the professionalization of the vocation (1980, p.165-173). When CPE becomes entrenched into a profession, the public's perception of that profession shifts in a positive way; practitioners also "feel good" about their profession, themselves and their dealings with those outside the profession. This has been the case with both physicians and nurses (O'Conner, 1979). CPE within associations operates under the subjective political climate of its members. That is, where there is a positive climate, CPE is more willingly accepted by members. Attitudes toward CPE held by practitioners influence and determine the future direction of the profession and its CPE policies (Grotelueschen & Caulley, 1977).

CPE has developed further because of the social concerns expressed by the public, the professional associations, and practitioners toward professional competency (Seldon, 1976). The rapid growth of knowledge and technology within the professions precludes the continued

laissez-faire approach to CPE by professionals or their professional organizations.

CPE is one ingredient in the recipe for a competent professional. Others include the possible restructuring of preservice training, and fostering awareness on the possible implications of technology in the workplace (H. Menzies, personal communication, June 1, 1989; Oddi, 1984). Given the need for CPE in the future, it seems fruitful for the professional associations and other CPE providers to understand their clients: how they learn; why they opt to participate or not participate in CPE; their attitudes toward CPE and their felt needs. These items will be discussed below.

PARTICIPATION

Participation is one aspect of adult education that continues to develop. There are many components to understanding professionals' participation in CPE. The following discussion of the literature will outline participation research, professionals as learners, participation in education, participation and age, and barriers to participation.

Participation research

Participation research in adult education has shaped CPE research in the professions (Knowles, 1979). CPE research tends to focus on the active participants, in an attempt to understand their participation behaviour, and

their reasons for participation. The research methods employed have traditionally included a multitude of descriptive techniques (Istance & Schultz, 1987).

These techniques have not only been limited in scope but misleading, mostly due to the variety of data gathering and analyzing procedures used to conduct participation research. Data gathered through survey questionnaires typically elicit response rates of between 10%-18% from the general population (Glass & Hopkins, 1989). CPE studies on participation in the professions have reported rates of return varying from 28% (Seymour, Connelly & Gardener, 1987), to 76% (Denford, 1983). However, surveying professionals per se does not guarantee a high rate of return. The Association for Professional Engineers of British Columbia (APEBC) have repeatedly experienced response rates of less than 1% for survey questionnaires on CPE (D. MacDonnell, personal communication, September 14, 1988; Chakrabarti, 1985).

In addition ambiguity exists in the use of the terms "adult", "education", "professional", and "learning activity" which have contributed in the wide discrepancy in the literature, frequently making direct comparison between studies difficult (Istance & Schultz, 1987). Despite these failings researchers frequently make comparisons to other studies quite liberally.

The dominant approach to participation research has been to study single variables such as motivation, age or

education. Johnstone and Rivera's 1965 study produced data that was restrictive for many statistical analyses. Most of the questionnaire was restricted to an ordinal scale thereby excluding most statistical tests. Despite such problems descriptive statistics have been incorporated in numerous participation studies in engineering (Wilson, 1974), dietitians (Zibrik, 1983) and physiotherapy (Denford, 1983).

Some adult educators recognize the complexity of participation research among adults, and have shifted from studying single variables to multiple variables. Knox and Videbeck suggested studying multiple variables in 1963, and Miller expanded upon their idea in his force field analysis which examined social class, technological change, associational structures and their relationship to participation (Cross, 1981. Similarly, Rubenson adapted an expectancy-valence model to the study of participation which assessed learners expectations of success and the value of their participation as seen by the learner in relation to other factors in their life (1976). This model has since been used in research in Canada and Sweden (1976, 1983).

CPE research had tended to describe the professions in isolation, which has caused some to claim that participation research lacks theoretical principles (Schultz & Istance, 1987): studies are not generalizable to other groups of professionals. However, such criticism may be unjustified: descriptive research identifies the commonalities among the professions and the unique characteristics between the

professions (Cervero, 1988). Stalker (1989) maintains that qualitative and quantitative research approaches to participation are not mutually exclusion, each contributes to the other.

Increasingly qualitative research methods are being explored in participation research as a way of uncovering the "deeper" meanings given to a single questionnaire response. Researchers have found that utilizing both quantitative and qualitative research approaches to be more fruitful in understanding participation than using either approach independently. This has been shown in the recent phenomenological studies on municipal workers (Stalker, 1989) and professionals as learners (Dahlgren & Pramling, 1985).

Developing an understanding of participation behaviour in CPE is important to all parties concerned with meeting the needs of professionals. The following sections will expand this discussion by examining: professionals as learners.

Professionals as Learners

Researchers distinguish professionals from the general population of adults because the former possess unique characteristics (Wenecour & Reich, 1983) which affect their participation in CPE activities. Professionals are frequently members of a higher socio-economic group. Their salaries reflect their academic attainment, technical expertise and performance in a specialized area of work

(Houle, 1980; Jarvis, 1983). Their formal instructional education has proven to be economically and socially rewarding for those who have entered the professions (Wilensky, 1964; Houle, 1983). Given these rewards for educational attainment professionals are more likely to hold positive attitudes toward continuing education (Grotelueschen, Harnish & Kenny, 1977b). In turn, research indicates the social and economic benefits obtainable with higher education encourage professionals to participate in further educative programmes (Ibid).

Johnstone and Rivera's study on 'American adult learners' revealed that the majority of participants were well educated, middle class, Caucasian (1965). Twenty five percent of all adult learners participating in adult education were classified as professionals. These early findings adequately depict adult learners across Canada in the 1980's, as is illustrated by the 'One in Every Five' study (Devereaux, 1985). Devereaux found only 20% of the Canadian population participated in adult education and, similar to the earlier American study, found a disproportionately high number of university educated, middle class Caucasians participating in vocationally-oriented education programmes. While the Devereaux study did focus on several forms of adult learning offered by a variety of providers, the importance of non-formal education was underscored. It did not include collegial contact/discussion groups; reading of professional journals

or attending a professional organizational meeting. These are subtle but important ways for professionals to acquire knowledge. Both Johnstone and Rivera, and Devereaux focused on the descriptive aspects of the research area: How many hours of participation were subjects involved in?, Why did they participate?, What types of CPE courses were they involved in? The use of descriptive statistics are crucial in obtaining an understanding of participation in adult education. Their frequency of use then enables researchers to establish comparisons between different professional groups.

Research is developing on professionals' conceptions of knowledge. Dahlgren and Pramling conducted a longitudinal study with 70 university students in three professional areas: business administration, engineering, and medicine. Dahlgren and Pramling hypothesized that preservice professional training would shape students' future conceptions of Knowledge (1985).

They found students in business administration and medicine decontextualised knowledge: they were able to analyze many contributing factors of a problem, then reassemble their findings. For example, understanding the relationships between the political and cultural needs of workers involves an awareness of the political, social and economic policies and their relationship to the cultural needs of a community. These students were said to deal with knowledge on a holistic level. This contrasted with

engineers who typically contextualized knowledge, that is, focused on one aspect of a problem, for example inflation caused increased labour demands. Marton, the founder of Swedish phenomonolgical research, would describe this as an atomistic or surface level approach to a problem (F. Marton, Personal communication, July 11-12, 1989). As practitioners the nature of problem solving and knowledge were reversed, physicians and business administrators contextualized knowledge in the form of applied knowledge. Many felt their work environment created this narrow focus approach to problem solving: that is, treat the disease, as opposed to a systemmic approach to understanding the cause of the disease; unlike engineers' whose training had somehow prepared them to decontextualize knowledge to facilitate problem solving. Researchers continue to answer, is it the engineers preservice training that makes them better holistic problem solvers?, or is it the type of learner attracted to engineering? Most professionals also felt their preservice training was not maximized in the work place (Dahlgren & Pramling, 1985). Few professionals would contend that preservice training does any more than equip graduates with a general knowledge of their profession (CCPE, 1988). Analysis of conceptions of knowledge held by professionals represents only one aspect of research on how professionals learn.

The chain of response model developed by Cross (1981) depicted participation occurring as a consequence of a

sequence of events. First individuals evaluate and identify their learning needs, followed by an assessment of their attitudes toward education based on past experiences. Next individuals set out the goals and objectives to be achieved by this new learning which is usually defined according to their life situation, such as returning to the work force. The next stage identifies the possible impediments to participation. Finally, participation occurs. Cross found most adults (83%) participated in continuing education due to a change in their life, such as a divorce, while 56% stated they participated due to job or career needs.

Schon's model of professional practice supports the notion that professionals are capable of assessing their own learning needs. His argument is based on two modes of professionals' practice: "knowing-in-action", where the practitioner performs without being able to logically define the reasoning for such action; and "reflection-in-action", where the practitioner develops a repertoire of knowledge in which the individual integrates new knowledge and previous experience (of the practitioner or other colleagues) into a pool of resources, from which can be constructed general concepts for application (Schon, 1987). Refection-in-action allows the practitioner to enter new work situations knowing "how to" assess situations, utilize previous experiences in similar situations, and implement action, then reflect (evaluate) upon those implemented actions (1987, 1983). Several research studies have used this model to analyze

practice in other professions such as teaching (Munby, 1987).

The literature illustrates that professionals' are a unique group of people within society. Professionals socio-economic status is a contributing factor which favorably predisposes them to participation in CPE. Working from the basis of these favorable dispositions toward CPE, Schon provides a model of how professionals learn, and how professionals apply such learning into their practice. These models stress first that professionals are problem solvers, and second that problem solving distinguishes them from "other" workers. This distinction has caused some people to question the worth of CPE attempting to assess such a highly educated group in society: professionals (Nyre & Reilly, 1979). And, skeptics continue to debate whether reflection-in-action is a useful tool for developing CPE for the future because it assumes all practitioners participate equally in this CPE process.

Participation and Education

Educational level is seen as the most significant factor in determining participation in adult education (Coombs, 1985; Istance & Schultz, 1987). Professionals, by definition, have typically completed formal education at a university or professional school, such as law school. Many social theorists argue that social, economic, and cultural factors predispose individuals for access into higher

education, and thus entrance into a profession (Aronowitz & Giroux, 1985).

Professionals are frequently members of higher socio-economic groups. Their salaries reflect their academic attainment, their technical expertise, and performance in a specialized area of work. Formal education can therefore be considered as one of the main components for entrance into any profession (Cervero, 1988; Burke, 1985). CPE could be seen as a key factor in maintaining and developing the professionals knowledge and technical skills once in the work place, in both specific and broader areas within that occupation.

The type of employer clearly influences participation in CPE. Large corporations are more likely to have the resources (physical, financial and the manpower) to accommodate in-house training and development programmes for employees. The annual expenditure on education programmes for all IBM employees is $9 million (Berger, 1989), while Volvo, the Swedish car manufacturer, recently invested $10 million on an education programme for its engineers (Atkinson, 1987). Smaller business operations may desire employee participation in CPE but lack the resources to provide for such activities (Shelton & Craig, 1983). The unequal access to CPE has become unacceptable to many professional organizations, whose intervention is seen as a way of balancing the opportunities for all members to participate in CPE activities.

Participation and Age

Second to education level, age has proven to be a significant factor in predicting participation in adult education (Johnstone & Rivera, 1965). Those under thirty are the most frequent participants in adult education programmes (Cross, 1981). This is consistent with recent studies. In the Canadian survey 'One in Every Five' a negative correlation was found between age and participation in adult education programmes (Devereaux, 1985). The study revealed a national participation rate of 19%, which decreased with age; those 65 years or older had a participation rate of 4%. Professionals are most active in CPE activities between the mid thirties to mid forties (Cervero, 1988). This reflects the social environment within a profession. Social environment refers to both their work environment and work conditions, factors which seem to influence participation (Rubenson, 1983).

Professionals typically enter their professions in their late twenties or early thirties. A few years are (sometimes) needed to settle into the profession and to become acquainted with the profession's "working rules" before engaging in CPE activities. CPE then becomes a means to achieve career goals within the profession. Employers have traditionally been more willing to invest in the continuing professional education of younger professionals because they consider the rate of economic return to be greater than for older professionals. Older professionals,

past mid 40's, are assumed to have secured their career goals, and are seen as less motivated to participate in CPE. The literature supports such notions by indicating participation in CPE decreases with age (Cross, 1981; Seaman & Schroeder, 1970).

However, some studies suggest otherwise, pointing out that professionals who are active participants in their thirties are more likely to remain active participants in their sixties. These studies are supportive of the theory of continuity (Neugarten, & Havighurst, 1977). Researchers postulate that childhood experiences of learning shape adults' ways of learning. One longitudinal study of 2008 blue collar workers, begun in 1973 attests to the claim that chronologic age is less significant than attitudes toward adult or continuing education which are formulated during childhood years (Rubenson, 1983).

Given the above, Cookson (1986) takes the stance that the importance of age as a variable has been overstated in participation research. He believes researchers have incorrectly extrapolated cross-sectional study findings such as age and income. That is, researchers have predicted intended participation in CPE based on information gathered from small select groups. He states,

> By controlling the formal education attainments, the independent effects of not only age but other ascribed and achieved social positional variables, have usually been reduced to nonsignificant (Cookson, 1986: 134).

Taken in isolation, age may not be a significant influence on participation. The traditional positivistic approach to participation research of analyzing one or two variables in isolation may be hindering our understanding of this multi-dimensional problem. Participation is not just age, or education related, but is related to a spectrum of factors. Obviously there is a need to study single and multiple variables using both quantitative and qualitative research approaches, in the form of longitudinal studies for a clearer understanding of participation in CPE. The following section will look at participation as it pertains to lifelong learning.

The concept of one period of formal training at a young age will not suffice in the twenty-first century. In addition, the increased life expectancy, and the falling birth rate in Canada mean a continually aging work population that cannot be totally replaced (Ironside, 1984). Therefore attitudes commonly held toward the aging worker in our society will need to be evaluated by all sectors in the workforce.

CPE is considered a component to one's lifelong learning regime. In today's workforce, in both the professions and non-professions, technological developments are anticipated to create the need for frequent career or job changes (Oddi, 1986;1987). Lifelong learning will not only become necessary in most professions due to technological changes in the work place, and job

reclassification (H. Menzies, personal communication, June 1, 1989), but will be considered a valuable human resource tool in the future (Toffler, 1980).

Examples of employers' acknowledging the benefits of supporting CPE programmes are becoming more evident across a wide spectrum of workplaces. Volvo, the Swedish car manufacturer, found its new engineers had difficulty communicating technological information with its more senior engineers. Both groups had different technical language. Rather than replace the older engineers, whose years of practical experience would be lost, the company developed in-house training programmes to meet their employees' needs. Moody contends that our future productivity of post-industrial economies will depend on retraining of adults and older workers in order to maintain competitiveness on a world market (Atkinson, 1987).

Both societal and technical changes will encourage the much neglected area of longitudinal research studies on participation and aging. Age has traditionally been considered a significant variable in participation research. Increasing evidence is gathering that suggests the process of extrapolating cross sectional age findings is misleading. Longitudinal studies indicate participation is more dependent on childhood experiences of education that age per se. In understanding participation more completely it is necessary to review why adults opt for non-participation in CPE.

Barriers to Participation

We know adults frequently undertake educative activities when they face a personal crisis, experience disenchantment in their workplace, or have a sense of inadequacy (Campbell, 1983). And, the focus of participation research has usually been on active participants, and their barriers to participation. This is primarily a matter of expediency on the part of educators and programme planners. Data from studies on barriers to participation are frequently conducted on active participants then extrapolated to the estimated population of non-participants.

The prevalent approaches to participation research are survey questionnaires and personal interviews. Yet the very methods used may act as barriers: questionnaires are often impersonal while interviews are time consuming (Knox, 1987; Glass & Hopkins, 1989). There are three recognized forms of barriers: 1) situational barriers arising from an individual's set of circumstances such as cost of programme, or lack of transportation; 2) institutional barriers are those organizational and bureaucratic procedures that act to exclude the individual, such as formal requirements; 3) dispositional or psychological barriers are those arising from the individual's self-concept as a learner (Cross, 1981 Darkenwald & Merriam, 1982).

The economic climate within geoscience can operate as a situational barriers to geoscientists' participation in CPE.

The cost of a programme may be significant barrier during periods of economic recession when unemployment is higher in the profession, whereas the cost in terms of time away from work may be greater during healthy economic periods.

Institutional barriers are more apparent for geoscientists who live and/or work in geographically remote areas. They do not have access to centres of education. Therefore the cost of education for such geoscientists is increased through transportation costs. In addition the nature of the profession results in large numbers of geoscientists working in isolation without collegial support.

Dispositional or psychological barriers to participation are difficult to measure. Cross believes current knowledge on dispositional barriers may be only the tip of the iceberg. Studies show only 5-15 percent of potential learners think these barriers inhibit participation (1981 p.106) She believes it easier for individuals to say their non-participation is a result of "costs", or "lack of time" rather than "being too old", or "lack of ability" In studies which have asked respondents to cite barriers that other adults might find inhibitive of participation in CPE, they found "lack of interest" and "inability to do the work" (Peterson et al, 1982) were the main barriers. However, when the same individuals were asked to indicate how these barriers affected their own

participation, these variables were rated as having a minimal effect (ibid).

Situational, institutional and dispositional barriers to participation may be internally created by the individual's self-perception, or be external. These barriers affect all socio-economic levels, including professionals. The cost of education and the lack of time are the most frequently cited reasons for non-participation by adults (Rubenson, 1983). Although the majority of professionals do participate in CPE, the question is, "should we (the public, the professional association) be satisfied with only the majority participating?"

Some individual professionals have been eager to consume "new" technologies, for example, computers, while others have feared them (Menzies, 1982). Those who willingly accept the new directions occurring in their professions are active participants in many forms of CPE. This is consistent with recent CPE studies and surveys in engineering where participation rates were low, but where active participants took more than four activities per year (Cervero, Miller, & Dimmock 1986; A. Wessen, personal communication, September 15, 1988). Similar findings have been reported in physiotherapy (Denford, 1983) and nursing (Zibrik, 1983). There is a need for professional organizations and programme planners to acknowledge that even professionals perceive barriers to participation. One

avenue of research which provides insights into non-participation is attitudes toward CPE.

Attitudes Toward CPE

Attitude is generally considered the disposition one feels towards a specific stimulus; in this instance the stimulus would be participation in CPE. Grotelueschen and Caulley (1977, p. 25) suggest that a "professional's attitude is dependent on his or her judgement of the worth of consequences." They ascertain studying attitudes will explain "why" people participate unlike descriptive statistics which merely report discrepancies among different groups of learners. Zibirk (1983) by contrast, states "attitudes are simply descriptive evaluative statements which contribute little to our understanding of what prompts health professionals to participate" (p. 32). Though she may be correct in saying attitudes are evaluative statements, they have provided insights as to "why" people participate in CPE. However, attitudes toward continuing education do not always reflect the extent of educative behaviour (Seaman & Schroeder, 1970, p. 104), and should not be used as a predictor of CPE participation (Groteleuschen and Caulley, 1977).

Attitudes are often products of our unconscious social conditioning. As such, they are frequently difficult for either the learner or researcher to identify, and even if identified the interpretation may be a reflection of

researcher's own biases. Thus, measuring, and interpreting attitudes has proven to be a challenge for many researchers. To date there have been several theoretical models proposed for participation but it seems too early to acclaim any one as being a comprehensive, interdisciplinary framework. However, there does seem to be a relationship between one's attitudes to education and participation or non-participation.

Studies in physiotherapy, engineering, and nursing have shown professionals who are active participants have favourable attitudes toward CPE compared to their non-participating counterparts (Curran, 1983; Cervero, Miller, Dimmock, 1986; Titchen, 1987). These attitudes have been established during one's formative period of education (Rubenson, 1983). If it is true that most professionals hold positive attitudes toward education, why should researchers be hesitant about such a pronouncement?

Increasingly professionals are being called upon by their professional associations, the public and legislative bodies to participate in CPE for the purpose of maintaining professional membership, maintaining professional licensure, and well as for personal/ professional growth. Programme planners and educators have been known to use results from attitudinal studies inappropriately: as a predictor of both participants' intended learning and instructional content. Currently there are no accurate participation predictors, and learners attitudes toward education alone is too

subjective a variable to be used in isolation. However, researchers have found that identifying the learners' needs to be a reasonably reliable participation predictor.

Felt Needs

Researchers in adult education have produced a myriad of definitions for the term "need" (Griffith, 1978; Sork, 1986). Bradshaw (1972) defined need as having four aspects: 1) normative; where need is diagnosed by an expert for a specific audience and situation, such as a task force prescribing learning activities; 2) comparative need where several similar group receive a similar service their outcomes are examined, then standards are established by an external group, such as a professional organization determining criteria for professional registration; 3) felt need, a need perceived by the recipient/client; and 4) expressed need, which is a felt need turned into action. Beatty (1981) offers a simplified definition of need: "the measurable discrepancy existing between a present state of affairs as asserted either by an 'owner' of need or by an 'authority' on need" (p.40). From these definitions it can be seen that need comes into two distinct categories: the external force, and the internal force. Houle (1980) terms these divisions as 'ascribed' and 'felt need' whereas Sork (1986) calls them 'prescribed' (as denoted by societal standards) and 'motivational' needs (individual wants for

personal gain). Table 1 illustrates the relationship between all the needs definitions presented here.

Table 1

A schematic Diagram of the Relationship between Needs Definitions

GENERAL ⟶		SPECIFIC
EXTERNAL	ASCRIBED	NORMATIVE
	PRESCRIBED	COMPARATIVE
INTERNAL	FELT	FELT
	MOTIVATIONAL	EXPRESSED

In the specific grouping of needs studies found that felt needs corresponded to the number of "would-be-learners", while expressed needs matched actual participants (Carp, Peterson, & Roelfs, 1974). Debate continues as to who should assess learners needs, educators, professional organizations, individual professionals (LeBreton, 1979). The medical profession has relied upon its professional organizations for their needs assessments (Manning & Petit, 1987) whereas the engineering and geoscience communities have left this responsibility with the individual professionals (APEGGA, 1885; CGAB, 1985).

In summary, the definition of CPE adopted by many professional associations has traditionally been vague.

Professionals are assumed to be capable problem solvers for all situations be it in educational, scientific or technical areas. The responsibility for assessing learning needs, and determining a course of action in CPE is frequently left to the individual practitioner. For this reason it is important for researchers to understand how professionals learn, and what motivates them to participate in CPE. The level of participation according to the literature appears to be determined by the following factors: age, educational attainment, attitude toward CPE; age; education level; type of learner; barriers to participation and felt needs.

More and more CPE is used not only as an instrument to guard against professional obsolescence by professional associations, but as a proxy measure of professional performance. The demand for professional accountability has resulted from increased public focus and litigation of professionals recognizing the distinction between rhetoric and practice.

The literature illustrates that professionals are a unique group of learners. Their preservice training is seen as an influencing factor in shaping the conceptions of knowledge held by professionals. But within this collective exist a wide variety of learning modes, as Houle and others have demonstrated. Professionals are not immune to experiencing barriers to participation. This literature review has paved the way for a discussion of the role of the

professional association, and its role in CPE within the context of geoscience in Chapter 3.

CHAPTER 3: THE PROFESSIONAL ASSOCIATION AND ITS ROLE IN CPE

Chapter Three provides a description of professional associations and their role in the provision of CPE for their members. The distinguishing criteria for entrance into, and practice in, the professions as well as the common characteristics held by professions and professionals will provide support to the researcher's claim that professionals are a "unique" group of adults and adult learners. The discussion of the characteristics of a profession will be followed by three sections on the role of the professional association: protecting its members; protecting the public; and providing a collegial network. The final section of this chapter will include the role of the association in CPE.

Characteristics of a Profession

In their early work on the professions Carr-Saunders and Wilson (1928) assumed professional characteristics to include: being male, from a middle to upper socio-economic level, possessing a liberal education from a university, and providing a paid service (Becker, 1962). Debate has ensued during the intervening years regarding the utility of creating a definition for " a profession" (Wilensky, 1964). Carr-Saunders and Wilson's prediction that most occupations would become professionalized could be more accurately described as occupations struggling for the status of a profession through the ideology of professionalism. Their

argument has been confirmed by Wilensky's (1964) study, which found fewer than 40 occupations in the U.S that complied with his largely static criteria of a profession. His criteria for an occupation to hold the position of a profession included: members having university training; members belonging to a professional organization, which operated under codes of ethics; and providing a service to fee paying clients (pp. 144) Occupations that fail to meet the full criteria of these traditional professions are labeled as semi-professions, quasi-professions, paraprofessions or marginal professions. Friedman supports Wilensky's inclusion of service and knowledge as being key elements in his definition of professionalization:

> A process by which an organized occupation, usually but not always by making a claim to special esoteric competence and to concern for the quality of its work and its benefits to society, obtains the exclusive right to perform a particular kind of work, control training for and access to it, and the right of determining and evaluating the way the work is performed (1979, p.22).

This process is facilitated by the establishment of an association. A professional association provides a service to a group of people who have undertaken specialized academic and technical training and share a common philosophy of practice (Gross, 1982). Engel and Hall (1973) provided a concise table of comparisons of the characteristics of traditional professions as defined in the late nineteenth century and their counterparts of the late twentieth century (Table 2).

Table 2

Evolving Professional Characteristics

Traditional	Modified
1. Isolated individual provides service.	Team provides service.
2. Knowledge from a single discipline typically used.	Knowledge from diverse fields used.
3. Remuneration predominantly fee-for service.	Remuneration predominantly by salary.
4. Altruism:Selfless service limited by entrepreneurial service.	Altruism:Increased opportunity for selfless
5. Restricted colleague evaluation of product.	Increased opportunity for colleague evaluation of product.
6. Privacy in client-professional relationship.	Decreased privacy in client-professional relationship.

This table demonstrates, according to Engel and Hall, that the professions are not static or conservative but respond to the changes in society. However, they have assumed the traditional professional characteristics as a given, ignoring many sociological analyses of developing professions such as, the struggle for surgeons to attain professional status (Moore, 1970; Bradshaw, 1978). Surgeons won their claim to be professionals by demonstrating their skills on the battle front, to the public humiliation of doctors. The medical association quickly recruited surgeons to be members of their professional organization (Burke, 1985). All occupations striving for professional status are influenced by the sociological conditions of the day.

In today's complex and continually changing society the context and role of the professions is also changing. The

apparent flexibility of professions in their approach to professionalization may be a result of the necessity to adapt to continual societal changes (Houle, 1980)

The ideals of a profession are maintained through the expectations of its practitioners, which are in turn facilitated by the professional association (Moore, 1970). Professional associations operate as a collective: individual members within a profession join to form a group with a common purpose. Recurring themes occur in discussion of professional associations: power, control, and accountability. These themes will be considered in the discussion of the three general roles an association is said to perform: a) to provide membership protection; b) to protect the public; and c) to provide a communication network for its members (Jarvis, 1983).

Protection of Members

Professional associations act as gatekeepers to a particular occupation (Wilensky 1964, p.142). This enables the members to control who enters the profession as they establish the educational and professional requirements for people who aspire to practice in the profession. Influence on preservice training curriculum occurs through the three mechanisms of accreditation, validation, and assessment. Accreditation is the process whereby the association assesses the qualifications of a granting institution but has no direct control over the curriculum. However,

accreditation standards are frequently those the professional association deems necessary for membership into their organization. For example, The Canadian Geoscience Accreditation Board (Marr, 1985), established through the umbrella organization of the Canadian Geoscience Council (CGC) during the mid 1980's, reviews undergraduate programmes at the request of the educational institutions. The institutions that successfully meet/pass the review board gain a higher status of approval by those in the profession, and subsequently receive more acknowledgement of its students and research.

Validation is a procedure for assessing the suitability of a particular course, not the entire programme, which may be conducted by the association, university faculty, the CGC or a combination of the above. In addition, the association may assess individual graduates upon completion of their formal preservice training to ascertain their content knowledge of the discipline. This is the case in law and medicine where board examinations are required following educational training and before commencing professional practice.

Creating requirements for membership in an association serves to establish a minimum level of professional competency, at least at the time of entrance into the profession (Bledstein, 1976). Demonstration of required knowledge and skills varies from association to association. Admission into the Geological Association of Canada requires

documentation indicating one's education and work experience. As an affiliate of the GAC, members of the MDD must also satisfy the GAC's criteria for admission.

Traditionally, there has been limited access into the professions for women, ethnic groups, or those from low socio-economic levels (Fox-Keller, 1985). This continues to be the case in geoscience. The American Geological Institute has begun a longitudinal study with 2702 Canadian geoscientists for the purpose of collecting information on the demographics of this profession. The first study revealed 92% of the respondents were male, and 96% were Caucasian (1988). Although other professions such as medicine and engineering do not show the same disproportionate representation as geoscience, the underrepresentation by certain minorities (although technically women are not a minority in number) continues in the professions. Some sociologists and feminists heatedly contest that access into the professions and their associations will not change significantly, given the gender, ethnic, and cultural biases of our society. In addition, career selection for the professions commences in the early years of schooling. The masculine portrayal of many professions, and the social pressures for women to be mothers, have been negative factors in attracting females into the professions. Despite their equal academic skills, fewer women enter the professions than men (Fox-Keller, 1985; Aronowitz and Giroux, 1985). Socio-demographic

imbalances in the professions are not systemic of associations per se, but a reflection of the biases inherent in society at large.

Where associations maintain control over CPE activities of their members the degree of control and form of control vary. Some associations have required CPE units or CPE time in order to maintain membership, which is different from MCPE which is required learning for continued practice in the profession that is frequently enacted by legislation (Felch, 1987).

It would be incorrect to assume associations are guardians of excellence and purity. Professions have traditionally clung to their right to a specific body of knowledge, and have sought the allegiances of the universities which have acted to acclaim such knowledge as worthy of academic pursuit. Allowing universities access into a particular field of study, and entrusting the universities to train future practitioners means the associations lose a certain amount of control over the profession.

Professional associations are attempting to regain greater control of their members through the establishment of accreditation boards, for example the APEGGA (1985), and the CGAB (1985), both of whom have establish guidelines for entrance into the profession as well as for practice. That the associations have been able to do this is partly due to the bureaucratic structures within a university which

sometimes fail to realize the rapidly changing needs of professionals in industry. Accordingly, many associations have become vendors of CPE in an attempt to meet their members' learning needs. The professional associations' involvement in CPE is not necessarily undertaken for unselfish reasons, as CPE is proving to be an additional source of revenue for its providers be they associations, government, industry or entrepreneurs.

To summarize, many professionals argue that CPE is necessary to demonstrate professional competency to those outside the profession, while others argue the notion of CPE and certainly MCPE undermines the principles of being a professional: the ability to assess one's needs, and responsibility to rectify these needs in an appropriate manner. Limited CPE course selection, and the lack of programmes that meet the associations requirements have been sources of frustration for professionals (Denford, 1983). This lack of course selection is a primary reason for the associations involvement in CPE, they are then able to maintain control over the course content and facilitators. Such assertive action by the associations' in CPE ensures both its members and the public of the organizations commitment to acceptable professional standards.

The associations existence have also been premised on protecting its' members. Professionals have attained social and economic positions as a result of lengthy academic training which have allowed them access to stations of

"power" in society. Therefore, it is not surprising that professionals strive to maintain their status through rigid entrance criteria into a profession, and through joining associations. Preservice training and entrance examinations into the professions are a means of monitoring and controlling access into the professions. Some consider CPE to be a form of monitoring. A distinguishing characteristic of monitoring a student during preservice training and entrance into the profession and that of CPE, is they occur once. By contrast CPE is frequently employed by the professional associations, and employers, as an on-going ritual of control of practitioners. Professionals have maintained a distance between the lay person and themselves through limited access to their body of knowledge, thereby reinforcing the notion of "expert."

Protection of the Public

Professional associations serve to protect the public from incompetent and unethical practitioners. As self-governing bodies, professional associations employ a variety of mechanisms to police members, from MCPE to formal peer review boards, (Manning & Petit, 1987). Critics argue that such dominance of a profession by an association undermines the power and control of individual citizens to make informed decisions regarding their own welfare (Illich, 1977). For example, policing by a review board depends upon the public making the initial complaint against a professional. This suggests the association assumes the

public to be well informed about its recourse to procedures against incompetent or fraudulent practitioners.

Likewise, some associations assume their members, who are trained problem solvers, can, and will rectify their areas of educational/professional need. The APEGGA's suggested guidelines for practice include: attending professional functions; maintaining a current professional library are considered as demonstrative acts of CPE (APEGGA, 1985, p. 36)). However, their guidelines imply that it is the individuals responsibility to assess and diagnose their professional needs. Other professional associations, such as the RNABC, have opted to prescribe CPE for its members.

The Professional Association as a Network

Professional associations are important in facilitating practitioner's collegial networks and for developing their occupation as a profession (Carr-Saunders & Wilson, 1928, pp.298-302). This is particularly the case in geoscience, where individuals may work in geographical isolation, or work for small organizations that can not offer the resources for collegial support. The association then becomes a vehicle for connecting not only similar minded professionals, but also for exposing practitioners to a wider diversity of colleagues than they may otherwise encounter in the work place.

The strength of a professional network is in its ability to support its own community. Each association provides varying degrees of support/protection depending

upon its place in a hierarchy of professional development which indicates its power relative to any other profession. Many occupations adopt the title of profession in name only, such as computer science, while others have some but not all of the characteristics of a traditional profession. Business administrators, for example, lack the legal authorization to self govern from any level of government.

Self government refers to the creation of policies and guidelines for practice by those elected to the association's executive, who act on behalf of their members. Professional associations strive to attain autonomy in, and self-government of, their profession. They decide amongst themselves their own policies, whilst remaining accountable to both the public and the legislative bodies. CPE policy setting often becomes the jurisdiction of the professional association.

The Role of the Professional Association and CPE

The social pressures which have resulted in the need for CPE has meant that many professional associations are now in the position of, or are becoming sponsors, programme planners, providers and evaluators of CPE activities (Grabowski & Associates, 1981, p.88). Hoffman (1979) contends that professional associations' involvement in CPE may have direct consequences on their membership, programmes and finances. The professional associations shift from back seat to front line in CPE has provided them with an opportunity to analyze their education policies, determine

future priorities and explore new avenues in the area of CPE.

In re-examining educational policy, associations can assess their role in society. The CCPE asked 70 engineering executives for their opinions of the future of the profession and observed: "The education for tomorrow is the single greatest challenge for the profession today" (p.74). This emphasis, and the consensus by the engineering executives on the importance of education, appears to be focused primarily on preservice training rather than CPE for practitioners (CCPE, 1988).

Traditionally professional associations have side-stepped politically sensitive issues, and avoided the issue of CPE among practitioners. Filer (1988) disagrees with such distance between society and the professional association on this occasion. He advocates that every professional should become an active citizen, as decisions made by non-professionals such as politicians can have profound effects on the profession (p.30). From the literature there appears to be a fine balance between acknowledging professionals as unique, highly trained problem solvers, and the implementation of any form of formal accountability process. Given this situation, professional associations need to be clear about their role and responsibilities to their members and the public.

The role of the professional association in CPE is both diverse and influential. Puetz notes that the associations

are the second largest sponsors of CPE programme after educational institutions (1985). They organize specific events such as conferences, provide resource people from its' network of members, and sponsor professional research journals. This type of active involvement in CPE by the professional associations acts to increase their visibility among their own community, increase their public visibility and add an element of quality control. The CGC, the GAC and the MDD are active in many aspects of informal CPE.

Opposition exists to the monopolistic domination by any one professional association of CPE for its members. Ohliger claims that vesting control of a profession in the hands of a few ensures discriminatory measures will be established (1984). Accordingly, Seldon proposes alternative roles for the professional association. Rather than assuming an autonomous position toward CPE, professional associations could either abdicate all CPE responsibility leaving the responsibility to the legislative bodies, which would not please practitioners, or they could work co-operatively with the government legislative body (1976, p. 64-66).

In summary, the perceived static definition of the profession created during the nineteenth century is not feasible for today's occupations which operate under more fluid social, economic and political conditions. More occupations strive to obtain professional status than possess it. By the twenty first century Canadian geoscientists are anticipated to become registered

professionals through a marriage between provincial engineering and geoscience associations.

In gaining full professional status a profession is entitled to self government, a privilege that bestows upon it degrees of power, control over an occupation, and a position of political influence within society. Self government entitles associations to police their members through establishing entrance criteria for the profession, professional standards of practice for the purpose of protecting their members, and the public. The degree of policing varies. Some associations profess the rhetoric but do little to enforce such policy, as is the current case in geoscience; other associations actively implement their CPE policy, such as the law profession.

CPE and MCPE are educational measures associations employ to police their members' professional development. For the purpose of efficiency, effectiveness and quality control, the associations are becoming more involved in all aspects of CPE from planning to implementation. The MDD, although active in sponsoring CPE, has not concerned itself in long term CPE development, understanding its clients participation in CPE or their attitudes toward CPE which is the impetus of this study. The next chapter describes the study's methodology for obtaining answers to the research questions.

CHAPTER 4: METHODOLOGY

This chapter will present the procedures by which the researcher conducted this study. A description of the population, the design of the study, both pilot and main will be provided. The research questions focus on three areas: participation in CPE, attitudes toward CPE and felt needs which are the control aspects of this study.

Population

The population studied included all 819 members of the Mineral Deposits Division (MDD). The GAC is the parent body of the MDD. The GAC encompasses many fields of geoscience whereas the MDD is specific to mineral deposits geoscientists. MDD members came from all provinces and territories in Canada, as well as from America and overseas. Admission into the MDD is dependent upon geoscientists' meeting membership criteria for the GAC.

Instrumentation

The study was designed with the intent of gaining an understanding of MDD members' behaviour and perceptions of continuing professional education. Information regarding socio-economic status, professional affiliation, behaviour, attitudes, felt needs and barriers toward CPE were thought useful to the MDD and could be fruitful as a basis for comparison with studies of other professions.

A survey method was used for this study to investigate the interrelationships between the sociological and psychological variables influencing geoscientists' participation in CPE activities. A descriptive questionnaire which was pre-tested in two stages was used in the study.

A survey questionnaire was considered to be the most effective and efficient method of data collection for such a large and geographically dispersed population. The instrument had five components: a) demographic data; b) attitude index; c) participation index; d) needs assessment index and e) barriers to participation index. A copy of the questionnaire is attached (Appendix A).

Section A: Demographics. Questions regarding the geoscientists' age, education level, year of graduation, income level, years employed in geoscience, the type of organization they worked for, current occupational position, field of work, and the division of time at work were asked of respondents. Age was divided into five categories of: less than 30, 30-39, 40-49, 50-59, 60 or more. This followed the same categories as the AGI demographics survey, thus allowing comparison of findings. The highest educational attainment was requested along with the year of graduation. The length of employment in geoscience was requested in years; where respondents gave partial years the researcher rounded up to the next whole number. Income derived from geoscience was divided into ten categories in units of ten thousand dollars (Canadian) from less than $19,000 to more

than $90,000. Such categories of income were used rather than an exact income figure.

The type of organizational employer, occupational position and field of work were solicited from checking boxes of predetermined choices. One question requested the amount of time spent at different work locations, and time at each location was then measured as a percentage of the overall time spent. The locations specified included: the office, the laboratory, an educational institution, the mine, in the field, and an "other" group.

Section: B Attitudes. A selection of previously tested items (Zibrik, 1983) was used to measure geoscientists' attitudes toward continuing professional education. The original statements were reworded using language appropriate for geoscientists. The statements were then judged, and selections were made from among them.

A panel of five judges from adult education and geoscience rated the applicability of the statements to the intended study group. This resulted in discarding eight items where the interquartile-value was greater than two. The judges also eliminated four statements that the majority considered to be irrelevant to geoscientists.

The means of the remaining thirteen items were then plotted. This plotting revealed that all item responses were polarized at either 'extremely favourable' or 'extremely unfavorable'. The items were then placed on a five point Likert scale from 'strongly agree' to 'strongly disagree'.

A further two questions were included to elicit attitudes toward CPE. One question asked respondents to prioritize their three preferred ways of maintaining knowledge and skills. The selection of skills included formal and informal means of CPE, from "taking X number of hours coursework per year" to "reflecting upon one's professional development". One represented the respondents' highest priority, three the lowest. The second question solicited respondents' reasons for participation in CPE. This was scored on a Likert scale ranging from 'most often' (receiving a score of five) to 'least often' (receiving a score of one).

Section C: Participation. The method used to gather information on the geoscientists' participation level in CPE during the previous 12 months was to ask for the number of CPE activities they had engaged in. Each CPE activity constituted "1". Activities ranged from field trips to lectures.

This method was selected over other specific indexes such as the Educational Participation Scale (Boshier, 1982) because the response from the pilot study indicated that this approach was more convenient for respondents; it was easier for them to remember the number of activated, rather tan the number of hours spent participating. The language on other indexes did not seem appropriate to geoscientists, and rather than create a deviation from the original intent of the statements, a simple reporting of the number of

activities was sought. In addition the researcher selected 5 prominent geoscience professional journals and asked respondents to indicate the number of hours spent reading them per week. This activity represented a non-formal CPE activity. Respondents were encouraged to include other reading sources pertaining to their professional practice.

Section D: Barriers to participation. The literature consistently indicated professionals have some obstacles to participation in CPE activities. A section on "barriers" was included on the questionnaire for comparison between geoscientists and other groups of professionals. A panel of judges selected thirteen items that, according to the literature, represented the most common barriers to participation in adult and continuing professional education. The wording of these statements was expressed in such a way as to avoid placing blame on the individual, (using "scheduling difficulties" rather than "I can't make daytime/evening classes" for example). These items were rated on a five point scale of which five represented the "most considerable obstacle" and one represented "not an obstacle."

Section E: Needs assessment. This section consisted of 22 items which was divided into four subsections representing areas of geoscientists' work: a) personal skills; b) computer skills; c) legal and business skills; and d) professional/scientific skills. These items were used to assess the geoscientists' "felt needs" (Sork, 1986). Each

question required the respondents to rate their felt needs regarding specific areas, (for example:, oral presentation, word processing, mining and law regulation). Responses were rated on a five point scale ranging from 1 ("I need considerable training in this area"), to 5 ("I definitely do not need training in this area"). In each section the option of "other (please explain)" was included.

No provision was made for the assessment of ascribed/prescribed needs (Houle, 1980; Sork, 1986), though some adult educators maintain such an assessment is essential to systematic needs assessment (LeBreton et Al, 1979). Attention was directed exclusively to the respondents' own sense of their needs. No effort was made to identify areas in which their knowledge may have been obsolete but of which they were unaware.

Pilot Study

The third stage of the pilot study involved a panel of eight judges. Four were faculty members at the University of British Columbia: two were geoscientists and two were graduate students in adult education.

In order to pilot test the questionnaire for the proposed national survey, in September 1988 a sample of 30 geoscientists from Vancouver were asked to volunteer for the pilot study. The volunteers represented a cross-section of practitioners from industry (26 volunteers) and educational institutions (4 volunteers). Given that most geoscientists are still "in the field" at that time of the year,

volunteers were selected on the basis of availability. The researcher personally delivered the pilot questionnaire, consisting of twenty (20) questions. Respondents were asked to complete the survey, to critique its format and wording, and to indicate the length of time taken to complete the questionnaire.

One week later, the researcher picked up 17 completed questionnaires, 5 more were mailed in, and 8 were not returned. The 22 completed questionnaires were then analyzed. Based on the comments from respondents the questions asking "gender"; "marital status", and "the number of dependents" were considered to be too personal, and insignificant given that the MDD population was estimated to be 95% men. After a discussion with thesis committee, these items were omitted. The question on CPE participation was modified, to ask for the total number of CPE activities attended because subjects of the pilot study, in communication with the researcher, expressed difficulty in remembering "details", which resulted in their becoming frustrated, and stating the question was "too time consuming". Revisions were made following the pretesting. Some questions were omitted on the basis of being too threatening and personal, such as "How many dependents do you have?"; for being too much of an imposition for example, "Please indicate your gender"; or for being too time consuming, "Please indicate the number of hours spent on continuing professional education activities during the

previous year." These peculiar reactions by respondents has caused the researcher to postulate that respondents were unfamiliar with this format of questionnaire. The literature did not indicate similar reactions to such questions. Questions of this nature are quite standard within the social sciences. These omissions were not thought to detract significantly from the original intent of the questionnaire. But, these omissions restricted any in-depth comparison with similar studies in terms of demographics.

Procedures

The researcher presented a written proposal for the study to the members of the Mineral Deposits Division (MDD), an affiliate of the Geological Association of Canada (Appendix B 1). They agreed to give their 1988 membership list to the researcher, providing an accessible population to study. A mail survey questionnaire was used as the means to gather data. A pilot survey was first conducted. Prior to the survey questionnaire of the MDD members, notices were published in an informal geoscience magazine 'Geolog' vol 17, part 4, 1988 (Appendix B 2), and the MDD 1988 fall newsletter the 'Gangue' (Appendix B 3). A covering letter for the questionnaire was included (Appendix B 4).

The main survey was accompanied by a stamped, self-addressed return envelope to the researcher. This was mailed to members of MDD along with their fall 1988 newsletter, in late October 1988. The cover letter explained the purpose of the study and stated that confidentiality would be

maintained. Each questionnaire was numerically coded by the researcher prior to being mailed and cross checked against the master mailing list. The questionnaires were mailed during the last week of October, 1988. Returned questionnaires were checked off the master list to: 1) identify the geographic dispersion of responses, and 2) reduce the possibility of duplication, as a follow-up second mailing to non-respondents was proposed. Confidentiality was maintained by not identifying any individuals in the findings. Completed and returned questionnaires indicated the consent of the respondents to participate in the study. The first mailing response was 344 (42%). Due to the Christmas holiday season, and the year end provincial government work reports surveys conducted during December 1988, the second mailing was postponed until January 1989.

Data analysis

The data were numerically coded and entered onto an AT 720 personal computer using a d-Base programme (Foxplus III). Random sampling of the records were used in verifying the accuracy of coding. Frequency counts for all variables were conducted on the P.C. Data was then uploaded onto the U.B.C's mainframe where, using S.P.S.S (Statistical Package for Social Sciences) the data were analyzed using a condescriptive routine to provide information about the following variables: age and participation rate; occupational position and participation rate; occupational

rate and attitudes toward CPE; occupational position and felt CPE needs.

CHAPTER 5: SURVEY FINDINGS

The following chapter presents the findings from the survey; conducted in late 1988. This chapter is divided into the following sections: 1) the general description which includes response rates and demographics; 2) the description of the responses to the survey questions; and 3) a brief analytic summary which relates the discussion of the data to the research questions.

Response Rates and Demographics

Response Rate

The study had a response rate of 42% (342) after the first mailing, and 72% (589) after the second survey mailings. Sixteen respondents returned incomplete questionnaires which were not included in the main analysis, reducing the total number included in the analysis to 573 (70%). The range in response rates suggest that some questions depend more heavily on respondents' choosing to answer which may be based on the relevance of a particular item to each respondent.

Geographic Dispersion

Responses were received from Canada, the U.S and from overseas (Table 3). Within Canada, provincial responses ranged from a high of 100% of MDD members in the Northwest Territories, to a low of 46% from Newfoundland. Numerically, Ontario had the most respondents 224 or 39% of the total MDD

Table 3

Response Rate of MDD Members by Geographic Region

Geographic Region	Questionnaires					
	First Mailing			Second Mailing		
	Number Sent	Returned Number	%	Number Sent	Returned-Number	%
Newfoundland	26	4	15	22	8	51
New Brunswick	19	12	63	7	5	43
Nova Scotia	14	5	36	9	6	15
Quebec	63	23	36	40	22	35
Ontario	306	129	42	177	95	31
Manitoba	16	7	43	9	5	31
Saskatchewan	22	8	36	14	7	32
Alberta	34	18	53	16	7	21
British Columbia	230	111	48	119	66	29
Northwest Territories	5	4	80	1	1	20
Yukon	15	5	33	10	5	33
U.S.A	40	15	38	25	9	23
Overseas	27	5	18	22	9	33
Total	817	346	42	473	589	72

population. Although 60% of the U.S members had responded they constituted only 4% of the MDD population; similarly the 52% of international members who responded comprised only 2% of the MDD population.

The survey's response rate of 72% is high for a questionnaire. This may be attributed to the fact that MDD members are both highly educated and members of a profession factors that the literature states are relevant to an increased response rate. The topic of the questionnaire was relevant as the issue of professional accountability is a concern to both the members and the professional association. As the survey is not a random sample, generalization to any other population would be statistically unsound.

Characteristics of Respondents

According to the literature, several factors seem to influence CPE participation: age, education level, income level, primary field of work, number of years in the profession, occupational position, percentage of time in different work environments, professional affiliations, reasons for participation and perceived barriers to participation.

Age

Table 4 indicates that 41% of the respondents are between 30 and 39 years old, the single largest grouping. The age group 40-49 had the second largest response (29.6%).

It would therefore seem that the majority of the respondents were "baby boomers". Given the declining birth rate in Canada, these findings suggest the number of "older" geoscientists will outnumber those under 35. This may have repercussions on the policy of CPE: who gets to participate?

Table 4

The Age Demographics of Geoscientists

Respondents by Age

Age	Number	Percentage
Less than 30	69	12.1
30-39	234	41.0
40-49	171	30.0
50-59	72	13.0
60 or more	27	5.0
Total	573	101.0

Education

Nearly all respondents (98.5%) have university training, most frequently a B.A. or B.Sc. degree (39%). Geoscientists with M.A. or M.Sc. degrees were the second largest grouping (32%), followed by those holding Ph.D's (27%). Two geoscientists indicated they held diplomas in subjects related to their field of practice that were obtained from colleges/technical institutes. Eight geoscientists indicated "other" on the questionnaire. Their explanations ranged from "not having completed a university programme", to "having a high school level of education."

The majority of geoscientists had been graduated between 1970 and 1979 (38.78%). Those graduating in the 1980's represented the second largest grouping (33.6%). Only 1.6% of respondents had graduated prior to 1950 (Appendix C 1).

Income

Table 5 illustrates the division of income groups ranging from $19,000 to $90,000 or more. Twenty-four percent of respondents earned $30,000-39,999, closely followed by those earning $40,000-$49,999 (22%). The majority of respondents earned less than $49,999. The smallest category was for those geoscientists earning between $80,000-89,999 (1.9%). However, 6.2% of respondents earned more than $90,000. The mean income for this group of geoscientists was $ 30,000-39,999.

Table 5

The Demographics of Geoscientists by Income
Respondents by income

$	n	Percentage
Less than 19,000	25	4.4
19,000 - 19,999	34	5.9
20,000 - 29,999	72	12.6
30,000 - 39,999	138	24.1
40,000 - 49,999	127	22.2
50,000 - 59,999	69	12.0
60,000 - 69,999	40	7.0
70,000 - 79,999	21	3.7
80,000 - 89,999	11	1.9
90,000 or more	36	6.3
Total	573	100.1

Field of Work

The majority of geoscientists worked primarily in geology, (67.5% of the respondents). The second largest grouping was geology/geochemistry (13%). Four respondents indicated their speciality to be geophysics (0.6%). The category of "other" accounted for 56 (9.8%) responses, which included areas of specialty such as financial consultants, systems analysts, computer graphics specialists, and people who indicated that they worked in two or more of the previously named categories (Appendix C 2).

The number of years each respondent had been employed in geoscience ranged from 0 years to 45 years. The researcher grouped responses in five-year intervals. The grouping with the largest number of respondents were those employed 11-15 years in the profession (128); 16-20 years was the second largest category (107). While the majority of geoscientists (379 out of 573) had been employed in the profession for 20 years or less, seven had been employed in the profession for 41 to 45 years (Appendix C 3).

Occupational Position

Table 6 indicates 'project geoscientist' was the most frequently cited occupational position, (87 or 34% of respondents). Second to project geoscientist were middle management positions (121 or 22% of respondents) and president (73 or 13% of respondents). No other categories had more than an 8% response. The positions of senior administrator, consultant and "other" each accounted for about 7% of the responses. The category of "other" included retirees, and not working by choice. Only 2 respondents indicted they were unemployed (0.3%).

Table 6

The Distribution of Geoscientists by Occupational Position

Position	n	Percentage
President	73	12.7
Sr. Administrator	46	8.0
Middle management	121	21.1
Project geoscientist	187	32.6
Junior geoscientist	17	2.9
Consultant	42	7.3
Educational Instructor	29	5.1
Student	18	3.1
Unemployed	2	0.3
Other	37	6.4
Total	572	100.0

Percentage of Time in Different Work Environments

The breakdown of the geoscientists' work time in different work environments indicated the office and field to be the primary and secondary work locations for the majority of geoscientists. Although a majority of geoscientists worked in the office environment for some of the time, few actually worked in the office 100% of the time (Table 7). The vast majority spent 40% of their time or less in the field, and no geoscientists spent 100% of their time in the field. The laboratory was the work site for (13%) of the respondents but only 1 respondent worked full time in

Table 7

PERCENTAGE OF TIME GEOSCIENTISTS SPEND WORKING IN DIFFERENT ENVIRONMENTS

	TIME										
%	100	90	80	70	60	50	40	30	20	10	(n)
Office	13	28	46	84	66	89	78	49	35	18	506
Laboratory	1	2	0	0	3	1	7	2	21	12	76
Educational Institution	2	2	7	11	17	5	6	1	6	7	64
Mine	5	2	0	1	1	3	5	9	18	25	69
Field	0	2	2	10	20	31	42	81	133	94	415
Other	2	1	0	1	0	1	4	0	4	94	107

the laboratory. Similarly the 'mine' and the 'educational institution' were cited rarely.

The category of 'other' included (0.2%) people who had reached mandatory retirement age, and they labelled themselves as not being active in geoscience. However most still continued to act as geoscience consultants. In addition, (19%) geoscientists indicated that travelling to work sites or conferences consumed 10% of their work time.

Professional Affiliations

Total memberships from the 573 respondents was 1668 with 96.7% responding to this question. The mean number of memberships held by respondents was 2.9. The most frequently cited memberships were in the Geological Association of Canada (GAC) (96.7%), the Canadian Institute of Mining and Metallurgy (CIMM) (63.4%) the Prospectors' and Developers' Association of Canada (PDAC) (46.8%), and the Society of Engineering Geologists (SEG) (21.2%). The category of "other" was checked by 121 (21.2%) of the sample, and this included membership 45 different professional or scientific organizations. No individual organization had more than 6 responses (Appendix C 4). The findings will now be related to the research questions.

PARTICIPATION IN CPE

Participation in CPE

Table 8 indicates the frequency categories. Total response to this question was 531. Two hundred and forty eight (47%) indicated they had participated in 1-5 activities, followed by 103 (19%) who did not participate in any CPE activities and the 100 (19%) who took 6-10 activities. Slightly more geoscientists (4.3%) took 20 or more activities than the number who participated in 16-20 activities 23 versus 16 (3%). The mean number of CPE activities geoscientists participated during the previous 12 months was 6.

Format of CPE Activities

Based on a frequency count the most popular format during the previous 12 months were the lectures, and conferences (766 and 716 respectively), followed by field trips (385), short courses (196), and seminars (193) (Table 9)

Use of Journals

Table 10 shows geoscientists distribution according to their reading of professional journals. The overall pattern was to spend 0.5 hours or less per week reading professional journals and publications. The number of readers for this category was almost double the number of respondents in the next groupings (1-2 hours). The exception

Table 8

FORMAT OF CPE ACTIVITIES ATTENDED DURING THE PREVIOUS 12 MONTHS

	(n)	1	2	3	4	5	5+
Lectures		40	26	31	17	21	68
Short Course		109	30	5	0	0	2
Conference		153	132	57	3	10	11
Field Trip		117	60	28	1	5	7
Seminar		53	26	5	5	5	8

Table 9

FREQUENCY OF CPE PARTICIPATION BY GEOSCIENTISTS

Frequency	(n)	%	Frequency	(n)	%
0	103	19.4	11-12	26	4.9
1-2	111	21.1	13-14	17	3.2
3-4	92	17.3	15-16	14	2.7
5-6	47	8.7	17-18	18	3.4
7-8	37	7.1	19-20	3	0.5
9-10	39	7.4	>20	123	4.3
	Total	531	100.0		

Table 10

TABLE NUMBER OF HOURS SPENT READING PROFESSIONAL JOURNALS/PUBLICATIONS PER WEEK

	HOURS PER WEEK						
	<0.5	1-2	3-4	5-6	7-8	>8	(n)
CANADIAN JOURNAL OF EARTH SCIENCE	43	188	10	2	0	0	445
CANADIAN MINING JOURNAL	173	70	0	0	0	1	244
CIM	305	125	1	0	0	0	432
ECONOMIC GEOLOGY	301	172	20	7	0	1	501
NORTHERN MINER	151	244	3	2	1	1	402
OTHER	115	29	17	3	4	0	168

to this was the item Northern Miner. Although the researcher did not specify whether this item referred to the weekly newspaper or monthly journal, most respondents marked "newspaper." Responses to this item indicated that geoscientists read the newspaper more than any other publication by a ratio of almost 2:1. The "other" category elicited 168 alternate reading sources.

Organizational Employer

The types of organizational employers were broadly defined as industry, government, educational institution, consultant and other. As seen in Table 11 the majority of respondents worked within industry, followed by educational institutions. The government was not a major employer for this group of geoscientists. Those responding to the "other" category included people who were unemployed or working for more than one of the above categories.

Table 11

TYPE OR ORGANIZATION EMPLOYED IN CURRENTLY

	(n)	Percentage
Industry	345	60.4
Educational Institution	89	15.6
Government	52	9.1
Consultant	54	9.4
Other	31	5.4
Total	571	99.9

Professional Affiliation

The 573 respondents held a total of 1668 professional memberships in 57 organizations. These included local, provincial, national and international organizations spanning a diverse spectrum of interests (Appendix C 4).

Reasons for Participation

Three hundred and thirty-nine (62%) respondents gave "Maintaining competence in my field" as the primary reason for participating in CPE activities. No other item rated as strongly.[1] "Expanding one's professional network" (111 or 21%), and "broadening one's knowledge in their field" (115, or 22%) which received more responses in the "sometimes" category (145, or 26%). "Escaping from stress" (458 or 80%) or "meeting employer's requirements" (338 or 59%) were least often cited as reasons for participating in CPE activities (Appendix C 5).

Maintaining Knowledge and Skills

Attending conferences represented the most preferred way to maintain knowledge and skills (n=378).[2] This was followed by being employed (n=344), subscription to professional journals (n=328), taking x amount of course work per year (n=287), attending professional association meetings (n=135), and reflection (n=39). Eleven geoscientists selected "other", and the majority of these explained they preferred field trips (Appendix C 6).

Perceived Barriers to Participation

Scheduling difficulties were indicated by 73% of respondents, followed by 51% who perceived the lack of study time as a moderate/considerable barrier. Contrary to the literature, geoscientists did not see age, fear of failure, or being viewed as ambitious as barriers to participation (each item received more than a 90% response) (Appendix C 7). [3]

GEOSCIENTISTS ATTITUDES TOWARD CPE?

Attitudes Toward CPE

Sixty-four percent (363) of respondents agreed or strongly agreed with the statement "a geoscientist's ability to learn remains constant for a life time"; 21% disagreed or strongly disagreed. Asked if "CPE was as important as basic education" 486 (86%) agreed or strongly agreed while 45 (8%) disagreed or strongly disagreed. CPE was considered to increase one's confidence by 444 (70%); only 26 (4.5%) disagreed with this statement. [4]

When asked if government(s) should invest more money in CPE, 260 (46%) of the respondents agreed or strongly agreed, and 153 (27%) were undecided. This contrasted with the statement asking if industry should invest more money in CPE, for which 451 (80%) strongly agreed. On the issue of whether there should be mandatory CPE 226 geoscientists (40%) disagreed or strongly disagreed with the statement,

although a significant number were undecided (174 respondents or 31%).

Two hundred and sixty-eight (47%) disagreed that the need for CPE was greatly exaggerated by those who stand to gain the most from it, although again, a large group of respondents was undecided about this item (190 or 34%). The statement asking if the benefits of CPE were too obscure to justify it received 461 (82%) strongly disagreed or disagreed responses, while the largest remaining group of respondents were undecided. The item asking if most geoscience courses waste time on non-essentials found 269 (48%) thought not, while 184 (32%) were undecided. The statement indicating that CPE is unnecessary since you can get all information you need from a book, had a resounding 455 (85%) negative reply from respondents who either strongly disagreed, or disagreed. This item received the largest number of negative responses. In response to the item asking if CPE courses were too expensive respondents were basically evenly divided between those who agreed and those who disagreed (Table 12).

Table 12

Attitudes Toward CPE

	STRONGLY AGREE 5	4	UNDECIDED 3	2	STRONLGY DISAGREE 1
			n / %		
A GEOSCIENTISTS ABILITY TO LEARN REMAINS CONSTANT FOR A LIFE TIME	231 (41.1)	132 (23.5)	68 (12.1)	80 (14.2)	51 (9.1)
CPE IS JUST AS IMPORTANT AS BASIC GEOSCIENCE EDUCATION	276 (49.1)	186 (33.1)	55 (9.8)	33 (5.9)	12 (2.1)
CPE INCREASES ONES CONFIDENCE	219 (39.3)	225 (40.3)	88 (15.8)	23 (4.1)	3 (0.5)
GOVERNMENTS(S) SHOULD INVEST MORE MONEY IN CPE	146 (26.1)	114 (20.4)	153 (27.4)	77 (13.8)	67 (12.1)
CANADIAN INDUSTRY SHOULD INVEST MORE MONEY IN CPE	263 (46.8)	188 (33.5)	77 (13.7)	18 (3.2)	15 (2.67)
CPE SHOULD BE MANDATORY IN THE GEOSCIENCES	67 (11.9)	91 (16.2)	174 (31.1)	94 (16.8)	132 (23.8)
THE NEED FOR CPE IS GREATLY EXAGERATED BY THOSE WHO STAND TO GAIN THE MOST FROM IT	30 (5.4)	69 (12.7)	190 (34.1)	132 (23.7)	136 (24.4)
THE BENIFITS OF CPE ARE TOO OBSCURE TO JUSTIFY IT	7 (1.3)	22 (3.9)	66 (11.8)	192 (34.5)	269 (48.4)
MOST GEOSCIENCE COURSES WASTE TIME ON NON-ESSENTIALS	19 (3.3)	88 (15.7)	184 (32.8)	181 (32.3)	88 (15.7)
CPE IS UNNECESSARY SINCE YOU CAN GET ALL THE INFORMATION YOU NEED FROM A BOOK	11 (1.9)	23 (4.0)	45 (7.9)	230 (40.8)	225 (45.1)
MOST CPE COURSES ARE TOO EXPENSIVE	73 (13.0)	142 (25.3)	189 (33.7)	107 (19.1)	49 (8.7)

Occupational Position and Attitudes Toward CPE

The overall pattern for this item was that respondents "agreed" or "strongly agreed" with items that favoured positive attitudes toward CPE, for example, "a geoscientist's ability to learn remains constant for a life time." Likewise respondents "disagreed" or "strongly disagreed" with items that were negative toward CPE such as "the benefits of CPE are too obscure to justify it" (Appendix C 8).

FELT CPE NEEDS OF GEOSCIENTISTS?

Felt Needs

Geoscientists assessed their CPE felt needs for the next 12 month period in the areas of personal skills; computer skills; legal and business skills; and professional and scientific skills. The findings will first be described as individual items before an overall comparison is made. Respondents selected a score on a 5-point scale where 1 represented "I definitely need training in this area", and 5 represented "I do not need training in this area." Most of the findings indicated an asymmetrical curve toward the side of "in need of training in this area." Items were regrouped into three categories: group one included scores 1 and 2, group two included items scored as 3, and group three included scores 4 and 5. The researcher thought it preferable to indicate trends which would be more apparent

in such regrouping than if the original five groups were compared.

Personal Skills: Interpersonal skills were selected by 269 (36%) respondents as the most needed area in their personal skills category, followed by expanding one's professional network with 228 (35%) respondents. Two hundred and fifty-four (47%) respondents indicated that they did not need technical writing skills, and 213 (39%) said they did not need interpersonal skills.

Computer Skills: Geostatistics was the item most frequently identified as a need, (336 respondents or 62%), followed by the need for an introduction to computers (301 respondents or 55%). A bimodal distribution appeared with the item on the need for word processing: 241 (44%) respondents reported they were not in need, versus 232 (42%) who said they were in need of word processing skills. [5]

Legal and Business: Knowledge regarding taxation and mining laws was considered to be needed by 272 (50%) of the geoscientists, closely followed by financial management 253 (47%), marketing 233 (44%) and time management 226 (43%). Whereas skills in the areas of staff supervision and recruiting were considered as the least needed skills for this group with, 244 (46%) and 229 (44%) responses respectively.

Professional and Scientific Skills: Respondents indicated equally that their professional and scientific

skills required 'considerable' to 'some' training. Both of these responses were selected by 48% (Appendix C 9).

Occupational Position and Felt Needs

Personal Skills: Those in lower occupational positions such as 'project geoscientist', 'junior geoscientist' and 'student' were more likely to indicate a felt need for oral presentations, technical writing and developing a professional network. Those in higher occupational positions cited developing a professional network as the only significant personal felt need. These findings are presented in appendix C 10.

Computer Skills: Introductory computer skills were considered as being a need by 36% of respondents in occupational positions of middle management, project geoscientist, of junior geoscientist, and educators. Thirty-eight percent of presidents were undecided, and 41 percent of senior administrators indicated they did not need this skill. Computer graphics were indicated as a need by the majority of respondents in all occupational positions, with the exception of middle management and consultants. Only senior administrators did not feel the need for acquiring some computer statistics applications: between 44 and 55% of all other groupings indicated this need. The felt need for word processing was indicated to be between 60 to 70 percent for project geoscientists, consultants and educators. This was in contrast to the responses by those in senior administration (47%), middle management (46%), junior

geoscientist (56%) and students (55%) who did not perceive word processing as a need.

Legal and Business: Knowledge and skills in the legal and business areas were cited as a need generally by those in administrative positions. Knowledge of mining laws was considered a need by presidents (55%), middle management (45%), and project geoscientists (49%), but not by senior administrators (51%), consultants (43%), educators (53%), junior geoscientists (43%) and students (47%). The researcher considered this interesting, given the practical and economic necessity of this item for those geoscientists operating in mining or mineral exploration. This may reflect that few of these respondents have any dealings with mining.

Taxation regulation was considered to be more of a felt need by a greater number and range of respondents. The need for CPE in this area accounted for a total of 50% of the respondents. Financial management followed a similar pattern to that of taxation. Marketing was perceived as a need by presidents, middle management, project geoscientists, consultants, educators and students. Administrative skills are rarely incorporated into preservice training although many geoscientists assume positions which require such skills soon after graduation. Forty-nine percent of presidents, 70 percent of project geoscientists, 42 percent of consultants, and 50 percent of educators considered administrative skills to be an area of CPE need within their foreseeable future.

Mineral economics was mainly cited as being a need for those in middle management (50%), project geoscientists and (51%), junior geoscientists (46%). Presidents (37%), senior administrators (35%) and consultants (57%) felt they did not need this skill in the next 12 months. Educators were evenly distributed across each category.

Recruiting was considered a need by project geoscientists (79%), junior geoscientists (66%), consultants (50%) educators (64%), and students (47%). This was in contrast to the opinions of those in president's positions (42%), and senior administrators (47%). Middle managers were equally distributed between feeling in need of CPE training in this area and not feeling any need of CPE training in this area.

Supervision of staff was not considered a CPE felt need by the majority of respondents in any one category. Responses were divided between being unsure if this was a need, to not being a need. There was a statistically significant probability level of 0.0299, indicating the findings were unlikely to have occurred by chance. Staff supervision has traditionally not been given a high priority amongst professional geoscientists; therefore these findings were expected.

Time management was a felt need for most project geoscientists (65%): in no other category was this item indicated as the single greatest felt need. Presidents (51%), senior administrators (57%), middle managers (43%),

consultants (56%), and educators (52%) did not consider time management to be a felt CPE need in the future 12 months.

Professional and Scientific Skills: The areas of professional and scientific skills were consistently indicated by respondents in each category as being felt needs. Upgrading geology was considered a need by senior administrators (47%), and project geoscientists (47%). Educators were equally divided between "in need of training in this area" and "not a need for training in this area." Geochemistry was a need for the overall majority of respondents (48%) with the majority of respondents in each category indicating this was a area they would consider taking training in during the next 12 months. This pattern was repeated for geophysics, geostatistics and acquiring knowledge in other areas of geoscience.

Preferred Formats

Field trips were selected as the most preferred format for CPE (376 or 76%), followed by short courses (248 or 47%) and meetings/conferences/conventions (189 or 36%). The least preferred formats were television (197 or 39%), tutorials (169 or 35%), and video tapes (145 or 29%) as indicated in Table C 11.

Preferred Sponsors

Scientific organizations were selected as the most preferred sponsor by 408 (78%) of the geoscientists. Technical organizations, industrial and educational institutions followed with 359 (70%), 335 (68%), and 323 (63%) respondents. The least preferred sponsors for CPE activities were entrepreneurs (193 or 39%). Question 13 (ii) has the lowest response rate on the questionnaire, ranging from 422 to 521 responses per item (Appendix C 12).

Analytical Discussion of Survey Responses

The following discussion provides some understanding and possible interpretations of the findings. The section contains an analysis of the findings for age, educational attainment, occupational position, participation, felt needs, and attitudes toward CPE, as the literature indicated these were significant variables in contributing to the knowledge of CPE among professionals.

Age

The findings of this study revealed an insignificant level of correlation between the professional geoscientists' age and their participation in CPE activities. This suggests that geoscientists have to maintain their professional skills through participation in CPE or face obsolescence. If geoscientists are participating voluntarily then these findings would support the theory of continuity (Neugarten & Havighurst, 1977). However, it could be argued that these

high participation levels are not revealing the complete picture. Geoscientists may be participating due to peer pressure, or other external motivational forces such as complying with an employer's request. The influence of peer pressure or employer's was not tested in this study.

Education

Within a profession, there is typically little variance in the education level, and university level education is increasingly presumed. The finding that 99.8% of the respondents held university degrees was not unexpected. However, the percentage of doctoral degrees in this study was higher than expected (27%), which probably mirrors the number of geoscientists who hold occupational positions which require such level of education, for example, educational institutions or government.

Occupational Position

"Project leader" and "middle management" were the most frequently cited occupational positions for this sample of geoscientists. These findings support the expectation that professionals will commonly hold positions of authority. Such positions provide financial remuneration as indicated with a mean income of $40,000-49,999 for this group. Only 2 respondents were unemployed, indicating that either the economic conditions during the late 1980's are favourable for geoscientists, or the early 1980's recession forced some long-time unemployed geoscientists to seek second choice jobs to which they are now committed.

Due to the nature of geoscience, geoscientists frequently operate in more than one work environment. Most of the geoscientists in this study rotated between 60%-40% in the office with 40%-60% in the field, which indicates that geoscience is dependent upon "hands-on" work and office work. Few geoscientists were occupied at educational institutions. This split between work sites may explain the only statistically significant barrier to participation: scheduling difficulties. The lack of classical barriers to participation, such as cost or family responsibilities (Cross, 1981; Darkenwald & Merriam, 1982), reinforces geoscientists' overall positive attitudes toward CPE.

Participation

The reasons for participation clearly indicated an interest in maintaining knowledge and skills in the broad field of geoscience. Eighty percent of the respondents had participated in some form of CPE activity during the previous 12 months, and few perceived obstacles to participation in CPE activities.

Attendance at many CPE activities is often restricted to those who hold professional affiliation to a particular organization. This provides an explanation for the numerous and diverse listings of professional memberships held by respondents. Holding professional membership and attending professional CPE activities supports the argument that one reason professionals participate is to maintain a

professional network. Professional journals were also seen as important as they informed members of CPE events.

Professional journals are provided by most associations. The CJES received two divergent groups of responses. The first group received the most derogatory comments, and respondents went to great lengths to emphasize the small amounts of time they devoted to reading it, but the second group had more respondents who actually read it for longer periods of time than any other journal. This contradiction may stem from the myth held by some MDD members that the CJES is too theoretical and research oriented, thus not appealing to those in industry. The researcher included the Northern Miner without specifying whether it was referring to its weekly or monthly format. The results, although possibly misleading, indicate a large number of geoscientists relied upon the Northern Miner as a vital news source about the geoscience industry.

The format of CPE programmes most frequently attended by geoscientists was "field trips" followed by "attending conference." Both formats are typically flexible in structure, with multiple options, for example, 10 concurrent lectures at a conference. In addition, both formats provide opportunities for networking with colleagues. The large number of respondents who held professional journal subscriptions and spent time reading them, in combination with the responses to question 9, the preferred ways of maintaining ones skills and knowledge, and question 14,

preferred CPE formats, supports arguments that respondents preferred self-directed learning.

The researcher allocated each CPE activity, regardless of duration, equal numerical weight. From the finding the number of individuals attending lectures exceeded all other formats in the category of "5+" which can be variously interpreted as: 1) more geoscience lectures are available than other CPE formats and 2) The lecture format is a less expensive for both the provider and client compared to conferences or field trips. These factors therefore may overemphasize the degree of popularity of lectures. This conclusion was supported by the question asking geoscientists to indicate their preferred formats for CPE. Field trips and attending conferences were the most popular, with lectures in third position of choice. The hands-on experience of field trips seems to be a crucial element of the profession at this time. However, with increasingly sophisticated software modelling packages, some may argue against the necessity for the abundance of field trips in the future. These findings suggest that no one sponsor was adequate for this group of geoscientists. Rather, different CPE activities warrant different sponsors. The apparent dislike for entrepreneurial sponsors by those responding may indicate a mistrust of those operating outside the traditional forums of education.

The classic barrier of "programme costs" is negligible for this group perhaps because, as the data suggests, they

possess the economic means to remove it, the majority of geoscientists earned annual incomes of between $30,000-59,000. An alternative interpretation is that they receive educational subsidies from their employer. Geoscientists are active participants in formal, informal and non-formal CPE. Whether the learning occurs within a group setting or in isolation, geoscientists appear to favour self-direction in learning.

Felt Needs

The felt learning need of the geoscientists again reinforced a positive attitude and behaviour toward CPE. Generally, respondents' choices seemed to span the scale for all items, but it should be noted that respondents self assessment of CPE needs can be misrepresented, in that few people want to appear to be educationally lacking (Cross, 1981). In the area of personal skills, the largest number of respondents indicated technical writing to be the greatest CPE need in the next 12 months. The lack of responses for items such as interpersonal skills and oral presentations may reflect the self confidence often associated with professionals, or their insensitivity to the issue within their practice. It may be argued that interpersonal skills are required less by geoscientists than is technical writing. Geoscience journals are the recognized forums for communication with one's professional colleagues. Personal skills could be indicative of the geoscientist's self

assessment of felt needs based the applicability of such needs in the next 12 months.

Computer skills were seen as a need by many geoscientists. Roughly half of the respondents required introductory level courses, and word processing, as well as geostatistics. This may reflect the restructuring in the work place where professionals are expected to perform what had previously been considered clerical duties, such as, writing first drafts of reports on the word processor. Menzies (1982, personal communication, June 1, 1989) maintains that computer technology has frequently served to demote and reduce the number of professionals, especially those in middle management positions. Stalker, (1989) found some participants took computer courses as a means to keep up with their children, rather than for the purpose of acquiring a job skill. Technology is reliant upon the operator to maximize its worth, and computers are no exception. If the computer can relieve the geoscientist of mundane work tasks then CPE would seem a reasonable means of disseminating new applications to the largest number of geoscientists.

There were fewer respondents completing the business and legal section of "felt CPE needs" (526-537). This may be attributable to the fact that not all geoscientists feel a need for such skills, or that geoscientists only plan CPE needs for the purpose of fulfilling short-term educative goals. In the legal and business area, most respondents

wanted practical courses with immediate application, such as dealing with mining laws and taxation regulations. This orientation reflects the needs of those operating in a competitive industry where negligence could be both costly and time consuming.

One possible explanation for these findings is that the longer geoscientists work in the profession, the less likely is their need for personal skills. This distribution may reflect the inadequate preservice training for geoscientists. It focuses on scientific and technical content rather than business or administrative skills which occupies a significant portion of practicing geoscientists work time, particularly project geoscientists and middle managers. It can only be assumed that those in senior positions are confident in either their own business knowledge or of those operating underneath them. Likewise consultants indicated confidence with their current level of knowledge in this area.

The CPE needs of geoscientists may actually be greater than was revealed in the findings. Although geoscientists are trained scientists, can it be assumed they will know how to carry out their own educational needs assessment? If it is assumed that geoscientists are reflective practitioners, does the current CPE system in geoscience facilitate practitioners' "reflection"? Is the definition of CPE needs consistent with both the professional association and its members? Are CPE needs considered as band aid solutions for

practitioners' immediate application? If needs are not being met, should the professional association assume the role of enforcer for the sake of protecting the public from incompetent practitioners? The roles of both the organization and the professional should be clearly defined, then a course of CPE action could be implemented that would reflect the ever changing nature of the geoscience profession.

Attitudes

The cross tabulations indicate that professionals hold positive attitudes toward CPE. They considered CPE to be important, beneficial, and a lifelong endeavor which is consistent with the literature (Cross, 1981 Cervero, 1988). Most members thought the geoscience industry ought to provide support for CPE, rather than government agencies. This is consistent with the philosophy within the industry, which prefers self-help to government aid. The geoscientists' attitude toward mandatory CPE was negative (50%), although a significant proportion were still undecided about the issue (31%).

The geoscientists indicated that the sponsorship for CPE activities was not a crucial factor. The respondents were more concerned with the content of CPE. However, the researcher believes the education philosophies held by the CPE sponsor play an important role in the programme planning process: shaping both the programme content and determining the facilitators. Depending upon the educative philosophies

held by the sponsor, priorities may range from profit making to philanthropy. The negative response in the findings, where few respondents indicated entrepreneurs to be their preferred sponsor for CPE activities, may reflect the traditional ties members have with their professional association. The educative needs of the professional can not be met by organizations outside the professional association or formal educational institution. In a similar vein, unfavorable responses to video and T.V formats may demonstrate respondents' commitment to traditional formats of education, namely formal/informal instructional programmes. It was interesting to note that no respondent found her/his organizational employer to be as good as any other CPE agency. Such sentiments may indicate discontent with their organizational employers or reflect the diverse nature of geoscience and the difficulty of any one agency attempting to service all sectors of CPE.

The majority of geoscientists participated in some form of CPE during the previous 12 months. However, few participated in more than 5 instructional activities or spent more than 1 hour reading professional journals per week. Geoscientists' reasons for participation were positive: they viewed CPE as a lifelong endeavor, of necessity in maintaining professional skills and to developing the individual professional. The favourable attitudes toward CPE may be attributed to geoscientists' experience of formal preservice training. The preferred ways

of maintaining professional skills was through their work, attending conferences, and subscribing to professional journals. Chapter 6 discusses the possible implications of the findings, offer recommendations for the professional organization, and suggest areas of future research.

End notes

Respondents indicated additional comments to several questions:

1. Reasons for participation include being able to share their knowledge with others; to travel; to expand their skills; to research; and to work more efficiently.

2. Preferences for the following CPE formats: poster sessions; and interdisciplinary lectures.

3. Barriers to participation received the most additional comments from respondents, who cited: illness, lack of time, busy earning a living, geographic location, and unstable income/employment doesn't allow for long term planning of CPE as situational barriers to participation in CPE. Institutional CPE barriers of availability, starting time and duration of courses, academic courses lacking application, and insufficient knowledge of courses available were also mentioned.

4. Some respondents said the market place should determine professional competency not CPE or MCPE. Although most respondents indicated that CPE programme costs were "reasonable", particularly those offered by government agencies, several respondents considered time away from work too costly. Some indicated that cost was irrelevant if employer was paying, but considerable it a factor when they were paying.

5. Requests for computer software training were diverse ranging from geological modelling to accounting. One respondent even indicated a need to sell computer services. With reference to legal and business skills, several geoscientists indicated a need to learn the rules of the Vancouver Stock Exchange, the art of negotiation, and long term financial planning. In the area of professional and scientific knowledge respondents cited a need for interdisciplinary subjects, such as, mining and waste management.

6. A number of respondents indicated the type of CPE sponsor was irrelevant; the categories used made it difficult for

some respondents to choose any one sponsor, for example not all government agencies were equal in their ability to sponsor CPE activities.

CHAPTER 6: LIMITATIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to gain some understanding of participation by geoscientists in geoscience CPE. Presently a wide variety of CPE activities is available from lectures to field trips, but no research has been conducted on participants' or non participants' CPE behaviour, their reasons for participation or non participation or their felt needs. It was hoped that this study might provide some useful insights into geoscientists' CPE participation, their attitudes toward CPE and their perceived CPE needs. This chapter will present a discussion on the limitations of the study, followed by a discussion of the possible implications of the study and recommendations for enhancing CPE in the geoscience profession.

Limitations

The use of a self-selected group of geoscientists rather than a random sample is subject to biases such as disproportionate representation from geographic locations, and, given the predominance of men in the profession, unequal representation from one gender. The decision not to use a random sample was thought to best serve the association in providing a study which permitted equal opportunity for every member to respond to the issue of CPE in their profession. However, findings from the study should

only be generalized to the membership of the MDD association.

In selecting a mail survey, the researcher assumed each member received a copy of the questionnaire. This survey approach relies on respondents' honesty in completing this self administered questionnaire, and on their ability to recall both the number and sponsors of CPE activities they had participated in during the previous 12 months. In addition, placing equal numerical weight on all CPE activities precluded gaining knowledge regarding the scope and depth of specific courses/ activities. For the purpose of this study CPE referred to instructional and professional reading activities. Question 4 was not explicit in asking for incomes to be in Canadian funds, nor was it explicit that this was asking for income derived solely from their geoscience practice. These oversights were indicated by 4 respondents. Question 8 asked for respondents to, "Prioritized preference of ways for maintaining skills and knowledge in geoscience," which was construed by some as a double barrelled question, an oversight on the part of the researcher. Therefore, the researcher is uncertain how the respondents interpreted this question. Question 11, "Please indicate the number of CPE activities you attended during the previous 12 month" placed equal weight on all types of CPE activity, for example, a one hour lecture and a two week field trip both counted as one CPE activity. The survey method is not congenial for soliciting attitudinal

responses. Despite these limitations, it was possible to attain some insights into how the MDD members viewed participation, attitude and felt needs in CPE.

Implications

The study revealed a high level of voluntary participation by MDD members in CPE activities during the previous 12 months (80%). But, the extent of that voluntary participation remains questionable given the group mean for participation was six CPE activities which may have ranged from six one hour lectures to several extended field trips. Geoscience, like many other professions, is undergoing a change due to rapid technological advances in the work place. This restructuring has reduced or eliminated mundane tasks, thus shifting the nature of the professional's work from being problem solvers to highly trained technicians. Geoscientists are currently faced with having to assess their own professional education needs to either maintain or develop their competencies in order to keep abreast of such technologies.

Technological Impact

The U.S. has traditionally been a barometer of social and economic trends. During the past decade the effect of technology in the work place has both created and eliminated jobs. Job creation has occurred mainly in the service sector, while middle management positions have been eliminated. This has occurred across numerous occupations

including professions (H. Menzies, personal communication, June 1, 1989).

A significant proportion of the survey respondents indicated their occupation position as being "middle management." Several scenarios are possible for geoscientists with their increasing dependency upon technology in the work place. Typically, middle management positions are eroded, their tasks are divided between senior administrators and junior professionals who rely on computerized software. The hierarchy of the professional pyramid is much flatter at the bottom, with greater differential between senior and junior practitioners. Those in junior positions increasingly become specialists in a small area of the technological system. This specialization has the effect of narrowing employment opportunities, because many of the newly created skills and knowledge have little transferability.

Given the changes in the professional's work place due to technology, the patterns resulting from such change in the U.S, and public focus on environmental issues the professional association and its members should ask: Is geoscience so different from other occupations that changes in technology will not affect it? Is the preservice training for geoscientists adequate for the future of the profession? What will be the role of the professional association in the future, especially if geoscience experiences rapid demographic shifts, eradicating large

numbers of middle management positions? Resolution of such questions can only come after the professional organizations and their members recognize the importance of CPE to the profession.

Recommendations for the Professional Association

The impetus for these recommendations come in view of the changing role of the geosciences in Canada, and the changing perception of this profession by the public. I do not believe that legislation can effectively enforce or monitor the CPE of practitioners. I support Filer's (1988) stance that professionals should be active citizens in society not solely because the profession may be controlled by non-professionals but because professionals have a social and moral obligation to serve society to the best of their ability: by utilizing their expert knowledge and skills. Letting the professional associations act as facilitators of CPE has proven, in many instances, to be successful in disseminating accurate, current information to members.

The numerous professional organizations servicing geoscience operate at local, provincial, national and international levels, each addressing a specific audience. The GAC is the parent body of the MDD. The GAC encompasses many fields of geoscience, whereas the MDD represents one, primarily national, professional association for a special interest group, mineral deposits geoscientists. Within the MDD the organizational structure consists of: the chairman; the executive; ad hoc committees; and the membership. CPE is

periodically reviewed by a volunteer ad hoc committee. Given the increasing significance of CPE in geoscience (demonstrating public accountability, acting as a measure against incompetent professionals, and the growth in technical and scientific knowledge) the following recommendations would, I feel, be best executed by the parent organization, the CGC.

The CGC is a national geoscience/earth science body with representatives from all sectors of industry, government and education, it serves the collective interests of approximately 16,000 earth scientists. The CGC (Fig. 3) objectives are:

> to provide a central forum for earth science societies in Canada, to provide advice to government on geoscience policy, to enhance the health of the geosciences in Canada, and to increase the public awareness of the vital role which these sciences play in our country (Garland, 1988, p. 1).

To carry out these objectives, it is necessary to have an informed membership committed to the philosophy of continuing professional education: CPE. The CGC has credibility in the eyes of many Canadian geoscientists, and it has the organizational structure to influence CPE in geoscience. The researcher's recommendations include:

1) A review of CGC's CPE policy would provide a useful step in assessing the nature of the geoscience profession, its role in society, and the changing role of practitioners. In addressing these points, the role of the association

regarding its responsibilities to both its members and the public will have to be taken into consideration.

2) Given the current diverse professional journal subscriptions which most respondents indicated spending less than 0.5 hours reading per week, the association could explore alternative mediums for marketing and advertising CPE information. One suggestion would be to form a central information centre on CPE programmes and activities at all levels (local, provincial national) through a computer communication system. This would enable a speedy dissemination of information to members, in an increasingly utilized forum, computer networking.

3) In addition to an information network, the association could compile a CPE resource library. This could include listings of providers, facilitators, hardware, potential sponsors, speakers and field guides. Such a listing could be easily maintained and updated. The CGC should consider how to make CPE accessible to all geoscientists. Developing alternative CPE formats, such as video or T.V for geoscientists who operate in isolated regions or have scheduling difficulties may be one solution. The negative responses to either the use of T.V or video for CPE purposes with geosciences may reflect geoscientists unfamiliarity with these modes of communication for CPE.

4) As the cost of providing CPE continues to increase, the financial burden to professional associations also increases. Rather than each geoscience organization's

operating independently, co-operative undertakings could occur in developing and providing CPE. This may also act as a way of expanding geoscientists awareness of colleagues in related fields and raise the likelihood of interdisciplinary research, in both academic and applied geoscience.

5) Members' participation in CPE activities could be acknowledged, possibly in the form of annual awards. These awards could be for either participation as a learner, or for facilitating CPE.

6) Although the cost of CPE was not indicated as being a significant barrier to participation, I predict it will become a barrier given the increasing number of smaller geoscience organizations. The literature shows the differences between large and small employers' funding for educational programmes. The study found geoscientists who worked for small operations were totally responsible for providing their own CPE, but were also threatened with losing their jobs for taking time off work. Given the rising cost of education in terms of tuition, time away from work and loss of income for members working in small operations, the association may consider developing an educational fund (with support from industry) for travel, sabbaticals, or course subsidies.

7) The responsibility for maintaining competent professionals rests, to a degree, with the professional organizations. In light of the increasing litigation against professionals, the CGC should consider the establishment of

a formal peer review council where claims of negligence, fraud or incompetence could be taken to arbitration.

8) The professional association has indicated through its accreditation board that it is concerned with maintaining professional standards amongst those entering the profession. Thus far, the review of Canadian educational institutions by the CGAB has been voluntary. However, with the future prediction of litigation against geoscientists, it will become a burden upon the association (as well as the individual practitioner) to indicate the efforts in: a) maintaining acceptable professional standards within the profession; b) demonstrating the association not only provided written policy on professional standards but assessed those providing the training for geoscientists; c) providing up to date information on CPE, demonstrating equal opportunities for members to undertake CPE.

One advantage to having a professional association oversee CPE is the potential to establish standards for programmes, programme facilitators, sponsoring institutions, evaluation measures, or any combination of the above, which could then be monitored across programmes (Grabowski & Associates, 1981, p.88). In addition, the size of the association's membership and the priority given to educational policy frequently determines the funding available for CPE programmes. As the CGC has an estimated membership of 16,000, the probability of the association developing and funding its own CPE is quite feasible.

If the CGC opts to be proactive in the area of CPE then it stands to reap benefits in several ways: the profession is promoted within its community; the profession is promoted in the public arena; the knowledge of the profession is advanced; the membership is informed of the research development through its professional journals and professional meetings (Manning & Petit 1987; Puetz, 1981). An assertive leadership role by professional associations in the area of CPE also increases the probability of larger active membership. This study only represents the beginnings of CPE research in the geosciences, given the results and limitations of this study the researcher has outlined several possible areas for future research.

Future research

- Due to the limitation of studying one population, it might be more informative to conduct a random sample of all Canadian geoscientists regarding CPE to establish the status within the profession as a whole. This would inform the CGC as to the general status of CPE across the spectrum of Canadian geoscientists.

- Investigate geoscientists' conceptions of knowledge at both the preservice training, and full practitioner stage. If preservice training does influence geoscientists' future participation in CPE. Is it possible to develop preservice training that will instill the necessity for CPE throughout one's years of professional practice?

- Establish longitudinal studies on Canadian geoscientists' participation in CPE activities. This would provide the professional organizations with information pertaining to the patterns and trends of CPE in the geosciences.

- Incorporate both quantitative and qualitative 'research approaches to participation studies. This utilization of two distinct research methods will enable a greater depth of understanding of participants and non-participants of CPE.

- Given the changing social and economic demographics in Canada (aging population, decline in birth rate, global economics), perhaps it might be fruitful for the professional organizations to analyze their future role.

Concluding Summary

The purpose of this study was to gain an understanding of CPE participation among members of the MDD. Research questions were asked regarding their behaviour, their felt needs and their attitudes toward CPE. In addition, the study attempted to identify perceived barriers to their participation. The findings suggest geoscientists have positive attitudes to voluntary CPE, which they demonstrated by participating in some form of CPE activity during the previous 12 months. Similarly, the geoscientists indicated their own felt CPE needs for the next 12 months as being diverse, with a strong emphasis on developing their professional content areas, such as geochemistry, as well as

new skills necessary to meet the technical changes in the profession, as indicated by the felt need for computer skills.

The profession of geoscience is undergoing changes in the both the work force due to technological change, and structural change, in forming professional alliances with provincial engineering associations. Both the geoscience professional associations and their members need to address these issues and any subsequent long term implications of such changes upon the profession.

The public and politicians of Canada seem committed to making environmental issues not only a social or political issue but an economic one. Those who operate in the primary industries will, I believe, rapidly come under public scrutiny. Most geoscientists are employed in the primary industry of mining. It is therefore in the interest of the profession for the associations to provide clear guidelines of professional accountability, ones that will be legally defensible. Litigation will (I fear) occur at unprecedented levels for those in geoscience within the next decade. I believe it is the joint responsibility of both the professional associations and their members to become proactive in the area of CPE to ensure the long term growth of the geoscience profession.

The most effective and expedient manner to establish a change in awareness about, and attitudes toward CPE among geoscientists is for the CGC to take leadership in CPE, and

provide direction for Canadian geoscientists. This study was a necessary beginning to understanding participation in CPE in geoscience. The methodology selected by the researcher placed limitations on the type of data that could be gathered. Frequently the researcher was left wondering "why?" a respondent had answered in such a manner. It is for this reason that additional research building on the insights gained in this study would be necessary in unravelling geoscientists' reasons for participation or non participation and to provide the information required to facilitate effective programming to serve the field.

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APPENDIX A

CONTINUING PROFESSIONAL EDUCATION FOR GEOSCIENTISTS

e Mineral Deposits Division of the G.A.C. is sponsoring the following survey regarding continuing professional education in e geosciences. The resultant data will provide information regarding the attitudes, behaviour and needs of continuing ofessional education in geoscience. In addition the data will be used as part of a M.A thesis in the field of Adult Education. ur assistance in completing this survey would be most appreciated. ALL RESPONSES WILL BE TREATED IN THE STRICTEST E CONFIDENCE.

A. PERSONAL INFORMATION

1. Age in years Less than 30yrs ☐ 30–39years ☐ 40–49yrs ☐ 50–59yrs ☐ 60 years or more ☐

2. Please indicate your level(s) of education and date of graduation.

	Example:	B.Sc.	4/70
		DEGREE	DATE OF GRADUATION
	1	_____	_____
	2	_____	_____
	3	_____	_____
OTHERS (PLEASE EXPLAIN)		_____	_____
		_____	_____
		_____	_____

3. Number of years of professional employment in geoscience. _____years

4. Please indicate your income level. (CHECK ONE ONLY)

less than $19,999 ☐	$50,000 - 59,999 ☐	$80,000 - 89,999 ☐
$20,000 - 29,999 ☐	$60,000 - 69,999 ☐	$90,000 - 99,999 ☐
$30,000 - 39,999 ☐	$70,000 - 79,999 ☐	more than $100,000 ☐
$40,000 - 49,999 ☐		

B. PROFESSIONAL INFORMATION

5. Please indicate your present employment environment, position and field (CHECK ONE FROM EACH CATEGORY)

ORGANIZATION	POSITION	FIELD
Industry ☐	President ☐	Geology ☐
Educational Institutions ☐	Senior Administrator ☐	Geophysics ☐
Government ☐	Middle Management ☐	Geochemistry ☐
Other (PLEASE EXPLAIN)	Project Geoscientist ☐	Geology/Geophysics ☐
_____	Junior Geoscientist ☐	Geology/Geochemistry ☐
_____	Not working by choice ☐	Geostatistics ☐
	Unemployed ☐	GeoEngineering ☐
	Educational Instructor ☐	Other (PLEASE EXPLAIN)
	Student ☐	_____
	Other(PLEASE EXPLAIN)	_____
	_____	
	_____	

6. Please indicate the percentage (%) of time spent annually at the following: (TOTAL SHOULD EQUAL 100%).

Office	_____ %
Laboratory	_____ %
Educational institution	_____ %
Mine	_____ %
Field	_____ %
Other (PLEASE EXPLAIN) _____	_____ %
	TOTAL = 100%

Please indicate your membership(s) in scientific or professional organizations. (CHECK ALL APPLICABLE BOXES)

C.A.C ☐	I.M.M. ☐	P.D.A.C ☐
C.I.M ☐	A.E.G. ☐	Other _____
C.S.P.G. ☐	S.E.G ☐	Professional Engineer in the province / territory of _____

C. CONTINUING PROFESSIONAL EDUCATION (C.P.E.)

8. The following statements represent reasons for participating in a continuing professional education activity. For each statement CIRCLE ONE (1) NUMBER that most often describes your reasons for participationg in continuing professional education activites.

	MOST OFTEN		SOMETIMES		LEAST OFTEN
To maintain competence in my field	5	4	3	2	1
To expand my professional network	5	4	3	2	1
To broaden my knowledge within my field	5	4	3	2	1
To escape the stresses of my work/home	5	4	3	2	1
To meet employers requirements	5	4	3	2	1
To broaden my career opportunities	5	4	3	2	1
Other (Please Explain) _____	5	4	3	2	1

9. How would you prefer to maintain your skills and knowledge in geoscience? (SELECT THREE(3) IN ORDER OF PRIORITY). (1 = YOUR HIGHEST PRIORITY).

Self reflection ☐	Being employed ☐
Periodic refresher courses ☐	Attending Conferences ☐
Require x number of hours coursework per year ☐	Attending professional organization(s) meetings ☐
Maintain professional association(s) membership(s) ☐	Other (EXPLAIN)_____
Subscription to geoscience journals ☐	

10. Check ALL scientific and professional publications you subscribe to, indicating , on average, the number of hours spent per week reading these publications.

	HOURS PER WEEK		HOURS PER WEEK
CIM		Northern Miner	
Economic Geology			
Canadian Journal of Earth Sciences		Other	
Canadian Mining Journal			

11. Please indicate your total number ofcontinuing professional education activities for the past 12 months, (From September 1987 to September 1988), indicating the format of the activities and the sponsor/organization hosting the activities.

Total number of continuing professional education activities during the previous 12 months _____

Format		Sponsor	
Lecture	☐	Educational Institution	☐
Short course	☐	Technical Organization	☐
Conference	☐	Scientific Organization	☐
Field trip	☐	Professional Engineering Ass.	☐
Seminars	☐	Government	☐
Other (PLEASE EXPLAIN)	☐	Entrepreneur	☐
		Industry	☐

12. Please indicate your preference in (i) format and (ii) sponsorship of CPE activities.

i) FORMAT

	MOST PREFERRED		UNDECIDED		LEAST PREFERRED
Lectures (includes course instruction)	5	4	3	2	1
Short courses	5	4	3	2	1
Workshops	5	4	3	2	1
Seminars	5	4	3	2	1
Meetings/conferences/conventions	5	4	3	2	1
Field trips	5	4	3	2	1
Video tapes	5	4	3	2	1
Television	5	4	3	2	1
Tutorials	5	4	3	2	1
Independent study	5	4	3	2	1
Other (PLEASE EXPLAIN)	5	4	3	2	1

(ii) SPONSORSHIP

	most PREFERRED		undecided		least PREFERRED
Educational Institutional	5	4	3	2	1
Technical organizations	5	4	3	2	1
Scientific organizations	5	4	3	2	1
Professional engineering	5	4	3	2	1
Government	5	4	3	2	1
Entrepreneur	5	4	3	2	1
Industry	5	4	3	2	1
Other (EXPLAIN)	5	4	3	2	1

13. The scale below is designed to reflect your attitude toward continuing professional education (CPE). Circle one number per statement to indicate where you think you belong.

	STRONGLY AGREE		UNDECIDED		STRONGLY DISAGREE
A geoscientists's ability to learn remains constant for a life time	5	4	3	2	1
CPE is just as important as basic geoscience education	5	4	3	2	1
CPE increases one's confidence	5	4	3	2	1
Government(s) should invest more money in CPE	5	4	3	2	1
Canadian industry should invest more money in CPE	5	4	3	2	1
CPE should be mandatory in the geosciences	5	4	3	2	1
The need for CPE is greatly exaggerated by those who stand to gain the most from such activities	5	4	3	2	1
The benefits of CPE are too obscure to justify it	5	4	3	2	1
Most geoscience courses waste time on non-essentials	5	4	3	2	1
CPE is unnecessary since one can get all the information from books	5	4	3	2	1
Most CPE courses are too expensive	5	4	3	2	1

14. Please rate your perceived continuing professional education needs for the following 12 months (September 1988 - September 1989)

1 = I need considerable training in this area.
2 = I need some training in this area.
3 = I do not know if I need training in this area
4 = I am quite sure that I do not need training in this area.
5 = I definitely do not need any training in this area

PERSONAL SKILLS

Interpersonal skills	5	4	3	2	1
Oral presentations	5	4	3	2	1
Technical Writing	5	4	3	2	1
Expanding one's professional network	5	4	3	2	1
Other (PLEASE EXPLAIN) _____	5	4	3	2	1

COMPUTER SKILLS

Computer literacy/Introduction to computer	5	4	3	2	1
GeoGraphics	5	4	3	2	1
GeoStatistical	5	4	3	2	1
Word processing	5	4	3	2	1
Other (PLEASE EXPLAIN) _____	5	4	3	2	1

LEGAL AND BUSINESS

Mining Laws and Regulations	5	4	3	2	1
Income tax/taxation	5	4	3	2	1
Financial management	5	4	3	2	1
Marketing	5	4	3	2	1
Administrative skills	5	4	3	2	1
Mineral economics	5	4	3	2	1
Recruiting	5	4	3	2	1
Supervising staff	5	4	3	2	1
Time management	5	4	3	2	1
Other(PLEASE EXPLAIN) _____	5	4	3	2	1

PROFESSIONAL AND SCIENTIFIC SKILLS

Upgrading geology	5	4	3	2	1
Upgrading geochemistry	5	4	3	2	1
Upgrading geophysics	5	4	3	2	1
Upgrading geostatistical	5	4	3	2	1
Acquiring knowledge of other areas of geoscience	5	4	3	2	1
Others (PLEASE EXPLAIN) _____	5	4	3	2	1

15. Please indicate how the following obstacles are likely to prevent your participation in continuing professional education (CPE) programmes in the next 12 months.

	CONSIDERABLE obstacle		MODERATE obstacle		NOT AN obstacle
Cost of programme	5	4	3	2	1
Scheduling difficulties	5	4	3	2	1
Not enough time to study	5	4	3	2	1
Friends/family don't like the idea of taking courses	5	4	3	2	1
Home responsibilities	5	4	3	2	1
Strict attendance requirements	5	4	3	2	1
Too old to study	5	4	3	2	1
Don't enjoy studying	5	4	3	2	1
Tired of school	5	4	3	2	1
Fear of failing	5	4	3	2	1
Don't want to appear too ambitious	5	4	3	2	1
Past experience of incompetent CPE instructors	5	4	3	2	1
Not enough energy/stamina	5	4	3	2	1
Others (PLEASE EXPLAIN) _____	5	4	3	2	1

_____

_____

16. Please write in the name of your home town. _____

THANK YOU FOR YOUR TIME, AND CO-OPERATION. ANY ADDITIONAL COMMENTS ON THE ISSUE OF CONTINUING PROFESSIONAL EDUCATION WOULD BE MOST WELCOME.

Please return in the SAE to:
Ms. Karen E. Yong
University of British Columbia
Adult Education Research Centre
5760 Toronto Road
Vancouver V6T 1L2
British Columbia

Appendix A -2

CONTINUING PROFESSIONAL EDUCATION FOR GEOSCIENTISTS

The Mineral Deposits Division of the G.A.C. is sponsoring the following survey regarding continuing professional education in the geosciences. The resulting data will provide information for your professional association regarding geoscientists attitudes, and current practice of continuing professional education in geoscience. In addition the data will be used as part of a M.A thesis in the field of Adult Education. Your assistance in completing this survey would be most appreciated. ALL RESPONSES WILL BE TREATED IN THE STRICTEST OF CONFIDENCE.

A. PERSONAL INFORMATION

1. Age Less than 30yrs ☐ 30–39years ☐ 40–49yrs ☐ 50–59yrs ☐ 60 years or more ☐

2. Please indicate your level(s) of education and date of graduation.

	Example: B.Sc.	1972
	DEGREE	YEAR OF GRADUATION
1	_____	_____
2	_____	_____
3	_____	_____
OTHERS (PLEASE EXPLAIN)	_____	_____
	_____	_____
	_____	_____

3. Number of years of professional employment in geoscience. _____years

4. Please indicate your income level. (CHECK ONE ONLY)

less than $19,999 ☐	$50,000 - 59,999 ☐	$80,000 - 89,999 ☐
$20,000 - 29,999 ☐	$60,000 - 69,999 ☐	$90,000 - 99,999 ☐
$30,000 - 39,999 ☐	$70,000 - 79,999 ☐	more than $100,000 ☐
$40,000 - 49,999 ☐		

B. PROFESSIONAL INFORMATION

5. Please indicate the type of organization you work for, your position, and your field (CHECK ONE FROM EACH CATEGORY)

ORGANIZATION	POSITION	FIELD
Industry ☐	President ☐	Geology ☐
Educational institutions ☐	Senior Administrator ☐	Geophysics ☐
Government ☐	Middle Management ☐	Geochemistry ☐
Other (PLEASE EXPLAIN)	Project Geoscientist ☐	Geology/Geophysics ☐
_____	Junior Geoscientist ☐	Geology/Geochemistry ☐
_____	Not working by choice ☐	Geostatistics ☐
	Unemployed ☐	GeoEngineering ☐
	Educational Instructor ☐	Other (PLEASE EXPLAIN)
	Student ☐	_____
	Other (PLEASE EXPLAIN)	_____
	_____	

6. Please indicate the percentage (%) of time spent annually at the following: (TOTAL SHOULD EQUAL 100%).

Office	_____%
Laboratory	_____%
Educational institution	_____%
Mine	_____%
Field	_____%
Other (PLEASE EXPLAIN) _____	_____%
_____	

TOTAL = 100%

7. Please indicate your membership(s) in scientific or professional organizations. (CHECK ALL APPLICABLE BOXES)

G.A.C	☐	I.M.M	☐	P.D.A.C	☐
C.I.M	☐	A.E.G	☐	Other _____	
C.S.P.G	☐	S.E.G	☐	Professional Engineer in the province / territory of _____	

C. CONTINUING PROFESSIONAL EDUCATION (C.P.E.)

8. The following statements represent reasons for participating in a continuing professional education activity. For each statement CIRCLE ONE (1) NUMBER that most often describes your reasons for participating in such activities.

	MOST OFTEN		SOMETIMES		LEAST OFTEN
To maintain competence in my field	5	4	3	2	1
To expand my professional network	5	4	3	2	1
To broaden my knowledge within my field	5	4	3	2	1
To escape the stresses of my work/home	5	4	3	2	1
To meet my employer's requirements	5	4	3	2	1
To broaden my career opportunities	5	4	3	2	1
Other (PLEASE EXPLAIN) _____	5	4	3	2	1

9. How would you prefer to maintain your skills and knowledge in geoscience? (SELECT THREE (3) IN ORDER OF PRIORITY 1 = YOUR HIGHEST PRIORITY).

Reflecting upon ones professional development	☐	Being employed	☐
Taking periodic refresher courses	☐	Attending Conferences	☐
Fulfilling x number of hours coursework per year	☐	Attending professional organization(s) meetings	☐
Maintaining professional association(s) member(s)		(PLEASE EXPLAIN)_____	
Subscribing to professional geoscience journals	☐		

10. Check ALL scientific and professional publications you subscribe to, indicating the average number of hours spent per week reading these publications per week.

	HOURS PER WEEK		HOURS PER WEEK
CIM	_____	Northern Miner	_____
Economic Geology	_____		
Canadian Journal of Earth Sciences	_____	Other	_____
Canadian Mining Journal	_____		

11. Please indicate your total number of continuing professional education activities for the past 12 months, (From September 1987 to September 1988).

_____

12. Of the continuing professional education activities in #11, how many were in the following (i) formats and (ii) who sponsored/organized these activites. Sponsors/ organizers include: educational institutions, professional associations, industry, government, and entrepreneurs.

	NUMBER OF ACTIVITIES	NAME(S) OF SPONSOR(S)/ORGANIZER(S)
Lecture	____	_____
Short course	____	_____
Conference	____	_____
Field trip	____	_____
Seminar	____	_____
Other (PLEASE EXPLAIN)..	____	_____

13. Please indicate your preferred (i) format and (ii) sponsorship of CPE activities.

(i) FORMAT

	MOST PREFERRED		UNDECIDED		LEAST PREFERRED
Letures (includes course instruction)	5	4	3	2	1
Short courses	5	4	3	2	1
Workshops	5	4	3	2	1
Seminars	5	4	3	2	1
Meetings/conferences/conventions	5	4	3	2	1
Field trips	5	4	3	2	1
Video tapes	5	4	3	2	1
Television	5	4	3	2	1
Tutorials	5	4	3	2	1
Independent study	5	4	3	2	1
Other (PLEASE EXPLAIN) _____	5	4	3	2	1

(ii) SPONSORSHIP

	MOST PREFERRED		UNDECIDED		LEAST PREFERRED
Educational Institution	5	4	3	2	1
Technical organizations	5	4	3	2	1
Scientific organizations	5	4	3	2	1
Professional engineering	5	4	3	2	1
Government	5	4	3	2	1
Entrepreneur	5	4	3	2	1
Industry	5	4	3	2	1
Other (EXPLAIN) _____	5	4	3	2	1

15. The scale below is designed to reflect your attitude toward continuing professional education (CPE). Circle one number per statement to indicate where you think you belong.

	STRONGLY AGREE		UNDECIDED		STRONGLY DISAGREE
A geoscientist's ability to learn remains constant for a life time	5	4	3	2	1
CPE is just as important as basic geoscience education	5	4	3	2	1
CPE increases ones confidence	5	4	3	2	1
Government(s) should invest more money in CPE	5	4	3	2	1
Canadian industry should invest more money in CPE	5	4	3	2	1
CPE should be mandatory in the geosciences	5	4	3	2	1
The need for CPE is greatly exaggerated by those who stand to gain the most from such activities	5	4	3	2	1
The benefits of CPE are too obscure to justify it	5	4	3	2	1
Most geoscience courses waste time on non-essentials	5	4	3	2	1
CPE is unnecessary since one can get all the information from books	5	4	3	2	1
Most CPE courses are too expensive	5	4	3	2	1

16. Please indicate how the following obstacles are likely to prevent your participation in continuing professional education (CPE) programmes in the next 12 months.

	CONSIDERABLE OBSTACLE		MODERATE OBSTACLE		NOT AN OBSTACLE
Cost of programme	5	4	3	2	1
Scheduling difficulties	5	4	3	2	1
Not enough time to study	5	4	3	2	1
Friends/family don't like the idea of me taking courses	5	4	3	2	1
Home responsibilities	5	4	3	2	1
Strict attendance requirements	5	4	3	2	1
Too old to study	5	4	3	2	1
Don't enjoy studying	5	4	3	2	1
Tired of school	5	4	3	2	1
Fear of failing	5	4	3	2	1
Don't want to appear too ambitious	5	4	3	2	1
Past experience of incompetent CPE instructors	5	4	3	2	1
Not enough energy/stamina	5	4	3	2	1
Others (PLEASE EXPLAIN)_____	5	4	3	2	1

_____

_____

17. Please write in the name of your home town. _____

THANK YOU FOR YOUR TIME, AND CO-OPERATION. ANY ADDITIONAL COMMENTS ON THE ISSUE OF CONTINUING PROFESSIONAL EDUCATION WOULD BE MOST WELCOME.

Please return in the SAE to:
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University of British Columbia
Adult Education Research Centre
5760 Toronto Road
Vancouver V6T 1L2
British Columbia

14. Please rate your perceived continuing professional education needs for the following 12 months (October 1st, 1988- October 1st, 1989).

1 = I need considerable training in this area.
2 = I need some training in this area.
3 = I do not know if I need training in this area
4 = I am quite sure that I do not need training in this area.
5 = I definitely do not need any training in this area

PERSONAL SKILLS

Interpersonal skills	5	4	3	2	1
Oral presentations	5	4	3	2	1
Technical Writing	5	4	3	2	1
Expanding one's professional network	5	4	3	2	1
OTHER (PLEASE EXPLAIN)_____	5	4	3	2	1

COMPUTER SKILLS

Computer literacy/Introduction to computer	5	4	3	2	1
Geographics	5	4	3	2	1
Geostatistical	5	4	3	2	1
Word processing	5	4	3	2	1
Other (PLEASE EXPLAIN) _____	5	4	3	2	1

LEGAL AND BUSINESS

Mining laws and regulations	5	4	3	2	1
Income tax/taxation	5	4	3	2	1
Financial management	5	4	3	2	1
Marketing	5	4	3	2	1
Administrative skills	5	4	3	2	1
Mineral economics	5	4	3	2	1
Recruiting	5	4	3	2	1
Supervising staff	5	4	3	2	1
Time management	5	4	3	2	1
Other (PLEASE EXPLAIN) _____	5	4	3	2	1

PROFESSIONAL AND SCIENTIFIC SKILLS

Upgrading geology	5	4	3	2	1
Upgrading geochemistry	5	4	3	2	1
Upgrading geophysics	5	4	3	2	1
Upgrading geostatistical	5	4	3	2	1
Acquiring knowledge of other areas of geoscience	5	4	3	2	1
Others (PLEASE EXPLAIN) _____	5	4	3	2	1

APPENDIX B

APPENDIX C

Table C-1

Educational Characteristics of Respondents

Degree type	n	Percentage
Diploma	2	0.3
BA/Bsc	224	39.1
MA/Msc	184	32.1
PhD	155	27.1
Other	8	1.4
	n= 573	

Year of graduation

Year	n	Percentage
Before 1950	9	1.6
1950 - 1959	35	6.1
1960 - 1969	113	19.8
1970 - 1979	221	38.8
1980 - 1989	192	33.7
	n= 570	

Table C 2

Respondents Primary Field of Work

Field of Work	n	Percentage
Geology	387	67.54
Geophysics	4	0.6
Geochemistry	5	0.8
Geology/geophysics	13	2.2
Geology/geochemistry	76	13.23
Geostatics	20	3.50
Geoengineering	12	2.2
Other	56	9.77
		n=573

Table C 3

Number of Years Employed in Geoscience

Years	n	% N
0 years	15	2.6
1 - 5 years	39	6.8
6 - 10 years	90	15.7
11 - 15 years	128	22.3
16 - 20 years	107	18.7
21 - 25 years	89	15.5
26 - 30 years	44	7.6
31 - 35 years	33	5.8
36 - 40 years	21	3.7
41 - 45 years	7	1.2
Total	573	99.9

Table C 4

Memberships in Professional or Scientific Organizations

Organizations	n	% N
GAC	54	96.7
CIM	363	63.4
CSPG	19	3.3
IMM	16	2.7
AEG	53	9.3
SEG	121	21.1
PDAC	268	46.8
MAC	46	8.7
APPGQ	15	2.6
TDGD	11	1.9
GSA	42	7.3
OTHER	121	21.2
PEng	39	6.8

Table C 5

REASONS FOR PARTICIPATION IN CONTINUING PROFESSIONAL EDUCATION ACTIVITITES

	MOST OFTEN 5	4	SOMETIMES 3	2	LEAST OFTEN 1
			(percentage %)		
TO MAINTAIN COMPETENCE IN MY FIELD	339 (61.75)	124 (22.59)	59 (10.75)	13 (2.37)	14 (2.55)
TO EXPAND MY PROFESSIONAL NETWORK	111 (20.56)	122 (22.59)	172 (1.85)	70 (12.96)	65 (12.04)
TO BROADEN MY KNOWLEDGE IN MY FIELD	115 (21.82)	119 (22.58)	145 (27.51)	45 (8.54)	103 (19.54)
TO ESCAPE FROM STRESS AT WORK OR HOME	3 (0.58)	6 (1.16)	42 (8.09)	53 (10.21)	415 (79.96)
TO MEET MY EMPLOYERS REQUIREMENTS	7 (1.34)	24 (3.84)	99 (19.00)	88 (16.89)	307 (58.93)

Table C 6

PRIORITIZED PREFERENCE OF WAYS FOR MAINTAINING SKILLS AND KNOWLEDGE IN GEOSCIENCE (1=HIGHEST PRIORITY)

	1	(%)	2	(%)	3	(%)
ATTENDING CONFERECES	72	(19.05)	153	(40.48)	153	(40.48)
ATTENDING PROFESSIONAL ORGANIZATION(S) MEETINGS	17	(12.59)	46	(34.07)	72	(53.33)
BEING EMPLOYED	262	(76.16)	38	(11.05)	44	(12.79)
REFLECTION	18	(46.15)	10	(25.64)	11	(28.20)
REFRESHER COURSES						
TAKING X HOURS OF COURSEWORK PER YEAR	104	(36.23)	102	(35.54)	81	(28.22)
SUBSCRIBING TO PROFESSIONAL JOURNALS	74	(22.56)	139	(42.38)	115	(35.05)
OTHER	6	(54.55)	4	(36.36)	1	(9.09)

Table C 7

BARRIERS TO PARTICIPATION IN CPE

	CONSIDERABLE OBSTACLE		MODERATE OBSTACLE		NOT AN OBSTACLE
	5	4	3	2	1
			(%)		
COST OF PROGRAMME	94 (17.0)	109 (19.7)	194 (35.2)	82 (14.8)	72 (13.0)
SCHEDULING DIFFICULTIES	243 (43.8)	160 (28.9)	112 (20.2)	24 (4.3)	14 (2.5)
NOT ENOUGH TIME TO STUDY	85 (15.4)	137 (24.8)	169 (30.67)	82 (14.8)	80 (14.1)
FRIENDS/FAMILY NOT SUPPORTIVE	5 (0.9)	13 (2.3)	44 (7.9)	86 (15.5)	403 (73.1)
HOME RESPONSIBILITIES	23 (4.1)	46 (8.3)	120 (21.7)	156 (28.2)	207 (37.5)
STRICT ATTENDENCE REQUIREMENTS	48 (8.7)	58 (10.5)	110 (20.0)	113 (20.5)	221 (40.1)
TOO OLD TO STUDY	4 (0.7)	12 (2.1)	32 (5.8)	62 (11.2)	440 (80.0)
DON'T ENJOY STUDYING TIRED OF SCHOOL	7 (1.3)	14 (2.5)	73 (13.3)	89 (16.2)	368 (66.8)
FEAR OF FAILING	2 (0.3)	3 (0.6)	23 (4.2)	64 (11.6)	457 (83.3)
DON'T WANT TO APPEAR TOO AMBITIOUS	0 (0.0)	1 (0.2)	9 (1.6)	41 (7.4)	498 (90.7)
PAST EXPERIENCE OF INCOMPETENT INSTRUCTORS	6 (1.1)	17 (3.1)	75 (13.9)	115 (21.8)	324 (60.1)
NOT ENOUGH ENERGY/STAMINA	5 (0.9)	15 (2.8)	43 (7.9)	112 (20.7)	367 (67.7)
OTHER	33 (70.2)	6 (12.8)	3 (6.38)	0 (0.0)	0 (0.0)

Table C 8

Cross Tabulation of Respondents Attitudes Towards CPE and their Occupational Position

KEY

Occupational Position

1= President

2= Senior Administrator

3= Middle Management

4= Project Geoscientist

5= Junior Geoscientist

6= Consultant

7= Unemployed

8= Student

9= Other

Attitude range

1= Strongly Disagree

2= Disagree

3= Undecided

4= Agree

5= Strongly Agree

CPE is just as important as basic geoscience education

	1	2	3	4	5	ROW TOTAL
0			1		1	2 .4
1	6	5	9	19	31	70 13.2
2	7	3	7	8	21	46 8.7
3	10	22	15	25	49	121 22.8
4	13	28	24	49	70	184 34.7
5	4	1		4	8	17 3.2
6	3	6	3	8	22	42 7.9
7		1	1			2 .4
8	3	4	2	9	11	29 5.6
9	1	2	2	6	7	18 3.4
LUMN OTAL	47 8.9	72 13.6	64 12.1	128 24.1	220 41.4	531 100.0

A geoscientist's ability to learn remains constant for a lifetime

	1	2	3	4	5	ROW TOTAL
0	1					1 .2
1	12	22	15	6	6	61 12.3
2	5	10	15	7	4	41 8.3
3	4	52	33	19	6	114 23.0
4	21	81	43	26	7	178 36.0
5	3	9	3		1	16 3.2
6	3	21	10	5	2	41 8.3
7		1		1		2 .4
8	7	10	4	4	1	26 5.3
9	2	6	1	4	2	15 3.0
COLUMN TOTAL	58 11.7	212 42.8	124 25.1	72 14.5	29 5.9	495 100.0

Most CPE courses are too expensive

	1	2	3	4	5	ROW TOTAL
0	1					1 .2
1	30	25	7	4	3	69 13.0
2	18	22	6			46 8.7
3	63	43	8	4	3	121 22.8
4	83	81	11	9	2	186 35.0
5	6	10	1			17 3.2
6	15	17	6	3	1	42 7.9
7	2					2 .4
8	15	8	3	1	2	29 5.5
9	5	12		1		18 3.4
COLUMN TOTAL	238 44.8	218 41.1	42 7.9	22 4.1	11 2.1	531 100.0

CPE is unnecessary since one can get all information from books

	1	2	3	4	5	ROW TOTAL
0	1		1			2 .4
1	11	17	26	10	5	69 13.1
2	1	14	17	12	2	46 8.7
3	17	38	43	18	3	119 22.5
4	30	70	51	30	4	185 35.0
5	4	7	4	2		17 3.2
6	4	14	13	8	3	42 8.0
7	1		1			2 .4
8	14	9	5	1		29 5.5
9	1	7	6	3		17 3.2
COLUMN TOTAL	84 15.9	176 33.3	167 31.6	84 15.9	17 3.2	528 100.0

CPE increases ones confidence

	1	2	3	4	5	ROW TOTAL
0			1		1	2 .4
1	3	6	10	18	33	70 13.2
2		5	8	14	18	45 8.5
3	1	8	10	48	54	121 22.8
4	5	9	12	62	97	185 34.8
5			2	4	11	17 3.2
6	1	4	5	14	18	42 7.9
7				1	1	2 .4
8	1		2	11	15	29 5.5
9			3	2	13	18 3.4
COLUMN TOTAL	11 2.1	32 6.0	53 10.0	174 32.8	261 49.2	531 100.0

The benefits of CPE are too obscure to justify it

	1	2	3	4	5	ROW TOTAL
0			2			2 .4
1	19	11	22	8	8	68 13.0
2	10	10	18	4	3	45 8.6
3	21	34	40	14	10	119 22.7
4	53	47	60	19	5	184 35.0
5	3	7	4	3		17 3.2
6	7	10	12	10	2	41 7.8
7	1		1			2 .4
8	10	5	9	5		29 5.5
9	7	1	7	3		18 3.4
_UMN TOTAL	131 25.0	125 23.8	175 33.3	66 12.6	28 5.3	525 100.0

Most geoscience courses waste time on non-essentials

	1	2	3	4	5	ROW TOTAL
0	1		1			2 .4
1	30	16	15	6	1	68 13.0
2	18	17	6	1	2	44 8.4
3	56	49	12	1	2	120 22.9
4	97	62	18	7		184 35.0
5	5	11	1			17 3.2
6	19	15	5	3		42 8.0
7	2					2 .4
8	16	6	3	3		28 5.3
9	8	6	3	1		18 3.4
COLUMN TOTAL	252 48.0	182 34.7	64 12.2	22 4.2	5 1.0	525 100.0

THe need for CPE is greatly exaggerated by those who stand to gain from such activities

	1	2	3	4	5	ROW TOTAL
0	1			1		2 .4
1	23	8	20	8	9	68 12.9
2	17	3	18	4	4	46 8.7
3	30	24	38	17	11	120 22.8
4	37	30	58	32	27	184 34.9
5	1	2	5	8	1	17 3.2
6	12	12	11	4	3	42 8.0
7		2				2 .4
8	2	6	9	5	6	28 5.3
9	2	3	6	4	3	18 3.4
COLUMN TOTAL	125 23.7	90 17.1	165 31.3	83 15.7	64 12.1	527 100.0

	CPE should be mandatory in the geosciences					ROW TOTAL
	1	2	3	4	5	
0	1			1		2 .4
1	4	4	10	16	36	70 13.2
2	1	2	7	18	18	46 8.7
3	3	3	13	45	57	121 22.8
4	3	5	26	65	84	183 34.5
5		1	2	7	7	17 3.2
6	2	2	8	15	15	42 7.9
7				1	1	2 .4
8	1	2	3	4	19	29 5.5
9			1	7	10	18 3.4
COLUMN TOTAL	15 2.8	19 3.6	70 13.2	179 33.8	247 46.6	530 100.0

	Government(s) should invest more money in CPE					ROW TOTAL
	1	2	3	4	5	
0				1	1	2 .4
1	1	3	10	27	26	67 12.7
2		4	10	14	17	45 8.6
3		4	18	51	48	121 23.0
4	1	6	28	77	73	185 35.2
5			1	8	8	17 3.2
6		2	10	20	10	42 8.0
7				1	1	2 .4
8	1	3	3	8	13	28 5.3
9			4	6	7	17 3.2
COLUMN TOTAL	3 .6	22 4.2	84 16.0	213 40.5	204 38.8	526 100.0

	Canadian industry should invest more money in CPE					ROW TOTAL
	1	2	3	4	5	
0	1			1		2 .4
1	11	9	15	11	23	69 13.1
2	9	5	16	8	7	45 8.6
3	15	19	35	23	26	118 22.4
4	18	26	48	41	51	184 35.0
5	1	2	7	2	5	17 3.2
6	5	7	10	12	8	42 8.0
7			2			2 .4
8	4	6	3	4	12	29 5.5
9	2	1	5	5	5	18 3.4
COLUMN TOTAL	66 12.5	75 14.3	141 26.8	107 20.3	137 26.0	526 100.0

Table C 9

Geoscientists perceived CPE needs for the following 12 months

1= I NEED CONSIDERABLE TRAINING IN THIS AREA
2= I NEED SOME TRAINING IN THIS AREA
3= I DO NOT KNOW IF I NEED TRAINING IN THIS AREA
4= I AM QUITE SURE THAT I DO NOT NEED TRAINING IN THIS AREA
5= I DEFINETLY DO NOT NEED TRAINING IN THIS AREA

PERSONAL SKILLS	5	4	3	2	1	n
INTERPERSONAL SKILLS	4	169	134	155	37	539
%	(8.1)	(31.3)	(24.8)	(28.7)	(6.8)	
ORAL PRESENTATIONS	55	126	91	207	62	541
%	(10.1)	(23.2)	(16.8)	(38.2)	(11.4)	
TECHNICAL WRITING	73	181	100	158	30	542
%	(13.4)	(33.3)	(18.4)	(29.1)	(5.5)	
EXPANDING ONE'S PROFESSIONAL NETWORK %	42 (7.85)	109 (20.4)	156 (29.2)	170 (31.8)	58 (10.8)	535
COMPUTER SKILLS	5	4	3	2	1	
INTRODUCTION TO COMPUTERS	114 (20.9)	84 (15.4)	46 (8.4)	150 (27.5)	151 (27.7)	545
GRAPHICS	79	88	109	133	116	525
%	(15.0)	(16.7)	(20.7)	(25.3)	(22.1)	
STATISTICS	52	80	71	201	135	539
%	(9.6)	(14.8)	(13.2)	(37.3)	(25.0)	
WORD PROCESSING	129	112	67	118	114	540
%	(23.9)	(20.7)	(12.4)	(21.8)	(21.1)	

Table C 9 contd

	5	4	3	2	1	
FINANCIAL MANAGMENT	51 (9.5)	107 (20.0)	124 (23.2)	176 (32.9)	77 (14.4)	535
MARKETING	78 (14.7)	86 (16.3)	132 (25.0)	143 (27.0)	90 (17.0)	529
ADMINISTRATIVE SKILLS	43 (8.1)	144 (27.1)	127 (23.9)	171 (32.2)	46 (8.7)	531
MINERAL ECONOMICS	53 (9.9)	131 (24.5)	115 (21.5)	191 35.7)	45 (8.4)	535
RECRUITING	83 (15.9)	146 (28.0)	139 (26.6)	116 (22.2)	38 (7.3).	522
SUPERVISING STAFF	64 (12.1)	180 (34.0)	105 (19.9)	145 (27.4)	35 (6.6)	529
TIME MANAGEMENT	57 (10.8)	139 (26.4)	104 (19.8)	165 (31.4)	61 (11.6)	526

PROFESSIONAL AND SCIENTIFIC SKILLS

	5	4	3	2	1	
UPGRADING GEOLOGY	53 (9.85)	134 (24.9)	92 (17.1)	218 (40.5)	41 (7.6)	538 %
UPGRADING GEOCHEMISTRY	43 (8.0)	122 (22.7)	110 (20.5)	216 (40.2)	46 (8.6)	537
UPGRADING GEOPHYSICS	40 (7.6)	95 (18.0)	99 (18.7)	223 (42.2)	72 (13.6)	529
UPGRADING GEOSTATISTICS	44 (8.3)	91 (17.2)	81 (15.3)	225 (42.5)	89 (16.8)	530
ACQUIRING KNOWLEDGE OF OTHER AREAS OF GEOSCIENCE	31 (6.0)	72 (13.9)	134 (25.8)	222 (42.6)	62 (11.9)	521

Table C 10

Cross Tabulation of Respondents Occupational Position and their Felt CPE Needs for the Next 12 months

KEY

Occupational Position:

1= President

2= Senior Administrator

3= Middle Management

4= Project geoscientist

5= Junior Geoscientist

6= Consultant

7= Unemployed

8= Educational Instructor

9= Student

0= Other

Felt CPE Need Scale:

1= I need considerable training in this area

2= I need some training in this area

3= I do not know if I need training in this area

4= I don't think I need training in this area

Technical writing

POS	1	2	3	4	5	ROW TOTAL
0 other	1	1				2 .4
1 president	15	12	18	8	7	60 12.0
2 senior admin	8	9	7	10	10	44 8.8
3 middle managemen	28	25	24	19	20	116 23.2
4 project leader	34	58	39	32	17	180 35.9
5 junior	3	6	4	2	1	16 3.2
6 consultant	11	8	6	3	13	41 8.2
7 not working by c	1		1			2 .4
8 educator	5	5	3	4	6	23 4.6
9 student	5	4	3	2	3	17 3.4
COLUMN TOTAL	111 22.2	128 25.5	105 21.0	80 16.0	77 15.4	501 100.0

Interpersonal skills

POS	1	2	3	4	5	ROW TOTAL
0 other		1				1 .2
1 president	8	16	24	10	5	63 12.4
2 senior admin	6	8	11	12	8	45 8.9
3 middle managemen	11	32	40	28	6	117 23.1
4 project leader	19	66	56	29	12	182 35.9
5 junior	2	5	5	4		16 3.2
6 consultant	3	17	7	8	4	39 7.7
7 not working by c	1			1		2 .4
8 educator	3	9	5	6	3	26 5.1
9 student	3	4	6	2	1	16 3.2
COLUMN TOTAL	56 11.0	158 31.2	154 30.4	100 19.7	39 7.7	507 100.0

Expanding one's professional network

POS		1	2	3	4	5	ROW TOTAL
other	0	1	1				2 .4
president	1	18	20	9	8	6	61 11.9
senior admin	2	9	10	7	7	10	43 8.4
middle managemen	3	32	38	15	20	14	119 23.3
project leader	4	46	77	26	27	8	184 36.0
junior	5	4	5	4	2	1	16 3.1
consultant	6	14	12	2	7	6	41 8.0
not working by c	7		2				2 .4
educator	8	6	12	3	3	1	25 4.9
student	9	1	9	3	1	4	18 3.5
COLUMN TOTAL		131 25.6	186 36.4	69 13.5	75 14.7	50 9.8	511 100.0

Oral presentations

POS		1	2	3	4	5	ROW TOTAL
other	0	1	1				2 .4
president	1	18	16	9	7	12	62 12.0
senior admin	2	11	15	2	6	11	45 8.7
middle managemen	3	32	28	8	18	33	119 23.1
project leader	4	55	53	18	30	29	185 35.9
junior	5	3	7		5	1	16 3.1
consultant	6	10	10	4	4	13	41 7.9
not working by c	7	1	1				2 .4
educator	8	7	7	1	5	6	26 5.0
student	9	3	5	2	3	5	18 3.5
COLUMN TOTAL		141 27.3	143 27.7	44 8.5	78 15.1	110 21.3	516 100.0

POS	geostatistics 1	2	3	4	5	ROW TOTAL
1 president	12	17	15	15	6	65 12.9
2 senior admin	5	11	13	10	5	44 8.7
3 middle managemen	18	41	21	28	7	115 22.8
4 project leader	37	58	38	23	26	182 36.1
5 junior	1	6	5	3		15 3.0
6 consultant	8	14	9	6	3	40 7.9
7 not working by c	1			1		2 .4
8 educator	7	6	5	3	4	25 5.0
9 student	4	5	4	1	2	16 3.2
COLUMN TOTAL	93 18.5	158 31.3	110 21.8	90 17.9	53 10.5	504 100.0

POS	Introduction to computers 1	2	3	4	5	ROW TOTAL
0 other	1	1				2 .4
1 president	21	13	9	6	12	61 11.9
2 senior admin	12	8	1	13	10	44 8.6
3 middle managemen	24	27	16	21	30	118 23.1
4 project leader	32	45	19	43	45	184 36.0
5 junior	1	3	5	4	3	16 3.1
6 consultant	9	6	7	9	10	41 8.0
7 not working by c		2				2 .4
8 educator	4	5	3	5	9	26 5.1
9 student	2	4	3	4	4	17 3.3
COLUMN TOTAL	106 20.7	114 22.3	63 12.3	105 20.5	123 24.1	511 100.0

Geographics

POS	1	2	3	4	5	ROW TOTAL
1 president	8	21	12	17	6	64 12.6
2 senior admin	2	14	9	13	6	44 8.7
3 middle managemen	11	47	16	32	12	118 23.3
4 project leader	18	83	36	27	18	182 36.0
5 junior	3	6	3	3		15 3.0
6 consultant		16	9	13	3	41 8.1
7 not working by c		1			1	2 .4
8 educator	5	10	2	2	6	25 4.9
9 student	1	7	3	1	3	15 3.0
COLUMN TOTAL	48 9.5	205 40.5	90 17.8	108 21.3	55 10.9	506 100.0

Word processing

POS	1	2	3	4	5	ROW TOTAL
1 president	8	20	14	17	6	65 12.8
2 senior admin	3	11	13	15	3	45 8.9
3 middle managemen	15	40	27	22	12	116 22.9
4 project leader	31	66	37	30	19	183 36.1
5 junior	1	6	4	4		15 3.0
6 consultant	2	17	9	9	3	40 7.9
7 not working by c	1		1			2 .4
8 educator	7	7	3	2	6	25 4.9
9 student	5	2	5	3	1	16 3.2
COLUMN TOTAL	73 14.4	169 33.3	113 22.3	102 20.1	50 9.9	507 100.0

POS	Mining Laws and regulations 1	2	3	4	5	ROW TOTAL
1 president	11	21	14	9	9	64 12.7
2 senior admin	5	10	14	6	9	44 8.8
3 middle managemen	18	27	30	24	15	114 22.7
4 project leader	37	52	43	21	29	182 36.3
5 junior		4	8	3		15 3.0
6 consultant	5	12	8	11	4	40 8.0
7 not working by c	1		1			2 .4
8 educator	6	7	3	2	7	25 5.0
9 student	4	3	3	4	2	16 3.2
COLUMN TOTAL	87 17.3	136 27.1	124 24.7	80 15.9	75 14.9	502 100.0

POS	Supervising staff 1	2	3	4	5	ROW TOTAL
0 other		1				1 .2
1 president	5	20	19	12	8	64 12.6
2 senior admin	5	13	8	10	6	42 8.3
3 middle managemen	5	44	22	36	10	117 23.1
4 project leader	15	84	40	34	9	182 36.0
5 junior	2	9		4	1	16 3.2
6 consultant	3	19	6	10	2	40 7.9
7 not working by c		1	1			2 .4
8 educator	4	8	2	7	4	25 4.9
9 student	2	4	3	5	3	17 3.4
COLUMN TOTAL	41 8.1	203 40.1	101 20.0	118 23.3	43 8.5	506 100.0

Financial mamagement

POS	1	2	3	4	5	ROW TOTAL
1 president	5	18	14	21	6	64 12.6
2 senior admin	1	12	11	12	9	45 8.9
3 middle managemen	9	36	26	37	9	117 23.1
4 project leader	17	73	37	40	16	183 36.1
5 junior	2	8	2	3		15 3.0
6 consultant	2	15	10	10	4	41 8.1
7 not working by c	1	1				2 .4
8 educator	3	13	2	1	6	25 4.9
9 student	4	3	5	1	2	15 3.0
COLUMN TOTAL	44 8.7	179 35.3	107 21.1	125 24.7	52 10.3	507 100.0

Administrative skills

POS	1	2	3	4	5	ROW TOTAL
1 president	11	10	10	19	13	63 12.5
2 senior admin	2	9	8	21	4	44 8.8
3 middle managemen	7	34	25	40	10	116 23.1
4 project leader	6	66	34	61	14	181 36.1
5 junior		5	5	5		15 3.0
6 consultant	1	8	9	12	11	41 8.2
7 not working by c				2		2 .4
8 educator	3	6	3	7	6	25 5.0
9 student	3	1	8	2	1	15 3.0
COLUMN TOTAL	33 6.6	139 27.7	102 20.3	169 33.7	59 11.8	502 100.0

Mineral economics

POS	1	2	3	4	5	ROW TOTAL
1 president	13	10	11	17	12	63 12.6
2 senior admin	4	17	6	14	3	44 8.8
3 middle managemen	15	35	21	35	9	115 23.0
4 project leader	16	71	40	39	13	179 35.8
5 junior		4	5	5	1	15 3.0
6 consultant	2	10	10	11	8	41 8.2
7 not working by c		1		1		2 .4
8 educator	6	4	5	3	7	25 5.0
9 student	3	3	4	4	2	16 3.2
COLUMN TOTAL	59 11.8	155 31.0	102 20.4	129 25.8	55 11.0	500 100.0

Time management

POS	1	2	3	4	5	ROW TOTAL
0 other		1				1 .2
1 president	10	25	13	9	6	63 12.5
2 senior admin	7	14	8	10	5	44 8.7
3 middle managemen	9	43	24	29	11	116 23.1
4 project leader	24	98	30	27	11	180 35.8
5 junior	3	10	1	2		16 3.2
6 consultant	5	17	9	6	3	40 8.0
7 not working by c		1		1		2 .4
8 educator	5	11	4	3	2	25 5.0
9 student	3	4	4	4	1	16 3.2
COLUMN TOTAL	66 13.1	214 42.5	93 18.5	91 18.1	39 7.8	503 100.0

Recuiting

POS	1	2	3	4	5	ROW TOTAL
0 other		1				1 .2
1 president	4	24	11	14	9	62 12.2
2 senior admin	5	13	6	12	9	45 8.8
3 middle managemen	7	42	18	38	12	117 23.0
4 project leader	13	83	29	46	12	183 36.0
5 junior	2	8	2	3	1	16 3.1
6 consultant	3	19	8	8	3	41 8.1
7 not working by c		2				2 .4
8 educator	3	9	4	6	3	25 4.9
9 student	1	4	5	3	4	17 3.3
COLUMN TOTAL	38 7.5	205 40.3	83 16.3	130 25.5	53 10.4	509 100.0

Marketing

POS	1	2	3	4	5	ROW TOTAL
1 president	12	9	12	17	11	61 12.3
2 senior admin	7	8	8	14	6	43 8.7
3 middle managemen	4	28	36	32	14	114 23.0
4 project leader	6	50	49	49	26	180 36.3
5 junior		4	5	5	1	15 3.0
6 consultant	1	7	11	13	9	41 8.3
7 not working by c		1	1			2 .4
8 educator	2	5	5	6	7	25 5.0
9 student	2	2	6	2	3	15 3.0
COLUMN TOTAL	34 6.9	114 23.0	133 26.8	138 27.8	77 15.5	496 100.0

POS	Income tax/taxation 1	2	3	4	5	ROW TOTAL
1 president	8	17	15	18	5	63 12.5
2 senior admin	2	11	14	13	4	44 8.7
3 middle managemen	8	38	28	34	9	117 23.2
4 project leader	16	77	40	40	9	182 36.1
5 junior		7	6	2		15 3.0
6 consultant	1	7	9	14	9	40 7.9
7 not working by c	1			1		2 .4
8 educator	5	5	5	5	5	25 5.0
9 student	2	4	5	3	2	16 3.2
COLUMN TOTAL	43 8.5	166 32.9	122 24.2	130 25.8	43 8.5	504 100.0

POS	Upgrading geophysics 1	2	3	4	5	ROW TOTAL
0 other			1		1	2 .4
1 president	6	5	9	19	31	70 13.2
2 senior admin	7	3	7	8	21	46 8.7
3 middle managemen	10	22	15	25	49	121 22.8
4 project leader	13	28	24	49	70	184 34.7
5 junior	4	1		4	8	17 3.2
6 consultant	3	6	3	8	22	42 7.9
7 not working by c		1	1			2 .4
8 educator	3	4	2	10	10	29 5.5
9 student	1	2	2	6	7	18 3.4
COLUMN TOTAL	47 8.9	72 13.6	64 12.1	129 24.3	219 41.2	531 100.0

POS	Upgrading geology 1	2	3	4	5	ROW TOTAL
1 president	17	24	11	7	5	64 12.7
2 senior admin	5	12	9	9	6	41 8.2
3 middle managemen	12	49	14	30	11	116 23.1
4 project leader	32	78	32	28	9	179 35.7
5 junior	4	8	1	1	2	16 3.2
6 consultant	7	16	5	8	5	41 8.2
7 not working by c		2				2 .4
8 educator	4	14	4	3	1	26 5.2
9 student	1	7	2	3	4	17 3.4
COLUMN TOTAL	82 16.3	210 41.8	78 15.5	89 17.7	43 8.6	502 100.0

POS	Upgrading geochemistry 1	2	3	4	5	ROW TOTAL
0 other	1					1 .2
1 president	12	22	15	6	6	61 12.3
2 senior admin	5	10	15	7	4	41 8.3
3 middle managemen	4	52	33	19	6	114 23.0
4 project leader	21	81	43	26	7	178 36.0
5 junior	3	9	3		1	16 3.2
6 consultant	3	21	10	5	2	41 8.3
7 not working by c		1		1		2 .4
8 educator	7	11	3	4	1	26 5.3
9 student	2	6	1	4	2	15 3.0
COLUMN TOTAL	58 11.7	213 43.0	123 24.8	72 14.5	29 5.9	495 100.0

POS	Upgrading geostatistics 1	2	3	4	5	ROW TOTAL
0 other			1		1	2 .4
1 president	3	6	10	18	33	70 13.2
2 senior admin		5	8	14	18	45 8.5
3 middle managemen	1	8	10	48	54	121 22.8
4 project leader	5	9	12	62	97	185 34.8
5 junior			2	4	11	17 3.2
6 consultant	1	4	5	14	18	42 7.9
7 not working by c				1	1	2 .4
8 educator	1		2	11	15	29 5.5
9 student			3	2	13	18 3.4
COLUMN TOTAL	11 2.1	32 6.0	53 10.0	174 32.8	261 49.2	531 100.0

Table C 12

PREFERRED SPONSORS OF CPE ACTIVITIES

	MOST PREFERRED 5	4	UNDECIDED 3	2	LEAST PREFERRED 1	n
EDUCATIONAL INSTITUTIONS	159 (31.8)	164 (32.2)	137 (26.9)	31 (6.1)	19 (3.8)	510
ENTREPRENEUR	51 (10.4)	82 (16.8)	163 (33.3)	87 (17.8)	106 (21.7)	489
GOVERNMENTS	73 (14.2)	169 (32.9)	157 (30.5)	63 (12.2)	52 (10.1)	514
INDUSTRY	181 (36.9)	154 (31.4)	135 (27.6)	26 (5.3)	18 (3.7)	490
PROFESSIONAL ENGINEERING	52 (10.8)	89 (18.5)	202 (42.1)	72 (15.0)	65 (13.5)	480
SCIENTIFIC ORGANIZATIONS	245 (47.0)	163 (31.3)	94 (6.5)	12 (2.3)	7 (1.3)	521
TECHNICAL ORGANIZATIONS	176 (34.2)	183 (35.5)	129 (25.1)	21 (4.1)	6 (1.2)	515