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COGNITIVE AND AFFECTIVE LEARNING IN OUTDOOR EDUCATION

by

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A thesis submitted in conformity with the requirements
for the degree of Doctor of Education
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ABSTRACT

The goal of this study was to determine whether an outdoor education experience would have a more positive impact on the cognitive achievement and environmental attitudes of junior-level students than in a traditional classroom setting.

During the spring of 1997, six classes of junior-level students attended a half-day programme in beaver ecology at the Nonquon Outdoor and Environmental Education Centre near Uxbridge, Ontario, Canada (treatment group). Another six classes of junior-level students were taught a half-day programme in beaver ecology in traditional classrooms (control group). The learning outcomes for both programmes were very similar. A total of 184 students participated in this study.

Pre- and post-test questionnaires were administered to the students, one day before they participated in the programmes (pre-test), one day after they had finished the programmes (post-test), and two weeks later (retention).

The questionnaire consisted of four sections. The first section asked students for demographic information such as name, gender, grade, teacher's name and the school's name. The second section consisted of survey items that derived information from the student about his/her prior experience with nature. Section three consisted of Likert-style items and measured attitudes towards nature. Section four of the questionnaire measured cognitive achievement and consisted of 12 short-answer questions on the topic of beaver ecology.

Descriptive statistics (means, standard deviations and reliabilities) for all student variables were compiled using SPSS, a statistics software programme. The effects of the treatment were determined using univariate analysis of variance.

The results from the data analysis indicate that:

(1) neither treatment nor the control programmes had an impact on changing environmental attitudes.

(2) both the control and treatment groups made gains in cognitive learning. However, the programme offered by the Nonquon Outdoor and Environmental Education Centre made a greater contribution to cognitive learning compared to the classroom programme.

The results of this study demonstrate that outdoor education programmes are effective for promoting cognitive changes in students. Most outdoor educators continue to believe that their programmes have a positive impact on environmental attitudes. The results of this study have been unable to confirm this claim.

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This study is dedicated to my loving family: my wife Helen, daughter Heather and son David. They support my many undertakings with unconditional love, patience and a generous willingness to offer their help.

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CHAPTER 1

Introduction

As its title suggests, this study is concerned with cognitive and affective learning in outdoor education. Its foci are:

(a) to determine whether a student does grasp concepts and fundamentals better in an outdoor education setting as opposed to the traditional classroom setting, and

(b) to investigate whether an outdoor education programme on beaver ecology has more impact on changing environmental attitudes than a similar programme in a traditional classroom setting.

The intention of the study is to reveal quantitatively the degree of impact a typical outdoor education centre has on cognitive and affective learning compared to the traditional classroom.

Background

The Durham Board of Education is a provincial leader in providing programming for outdoor education. With outdoor education centres at Claremont, Nonquon and the Durham Forest, the board enables over 25,000 students and hundreds of teachers to take part in day and residential programmes each year. Forty-eight percent (Durham Board of Education, 1995) of all the elementary and secondary school students in the board attend one of the three centres each year. With that context in mind, in May of 1996, the board announced its intention to cancel the entire outdoor education programme. After considerable pressure from parents and teaching staff, the board then announced a 31% reduction in the forthcoming budget for outdoor education. The board trustees were not satisfied that this cut was sufficient. They informed system administrators that further cuts would be announced in the future. Like the Durham Board, centres operated by school boards and conservation authorities have experienced significant change, much of it negative, with major reductions in funding and staff and even closure of centres. For those centres

that have survived, rate increases and programme changes have been necessary. In addition to major funding cuts to outdoor education across Ontario, outdoor educators are also confronting a 'back to basics' wave designed to focus them and their students on identified learning outcomes and to reduce the time devoted to what are perceived as extraneous and frivolous experiential components and processes. Like instrumental music, technological studies and fine art, outdoor education is like numerous other programmes that are suffering from an image of being frivolous because it appears to lack formal and direct linkages with the Ontario Ministry Of Education And Training's (1998) The Ontario Curriculum Grades 1 - 8: Science and Technology. This situation makes it very difficult for trustees to justify the continuation of the programme, in this era of accountability and standards.

The Durham situation is a concrete example of a much broader current problem in outdoor education across North America and the United Kingdom. Humberstone (1993) suggests that in Britain, "many outdoor educators believe that outdoor education has been marginalised in the National Curriculum" (p. 18). She expresses concern that the potential of outdoor education has been severely curtailed rather than enhanced through British government intervention in the new school curriculum.

Outdoor education is acknowledged in the 'National Curriculum' as a valuable medium for personal, social and physical education. The report also notes its particular contribution to the enhancement of subject areas concerned with the outdoors and the environment such as biology, geography, etc. In her article, Humberstone (1993) also reveals that outdoor education centres are facing mounting economic threats. "As a consequence of the implementation of funding arrangements, a substantial number of outdoor/adventure and field study centres have been closed or under extreme threat of closure" (p. 20). Educational establishments in England have been put under great pressure to operate within a competitive market place. "...It may be difficult for heads and governors to support the use of monies for an area of work which requires a high teacher-pupil

ratio and additional equipment, facilities and training" (p. 20).

In the United States, education policies are developed and administered by the state governments. The American system does not have a document equivalent to the 'National Curriculum'. In addition, funding for education services varies dramatically from state to state. As a result, it is more difficult to trace national trends in subject areas such as outdoor education. However, the very recent attack on environmental education in Colorado by the politically far-right think tank called the Centre for the New West may indicate storm clouds on the horizon.

The State of Colorado has clear educational policies that encourage the delivery of environmental education at all levels of the school system. The New West political think tank has attacked these environmental education policies and is lobbying the public to modify these policies to suit a more conservative agenda. The New West (see Sanera, 1998) group claims that "environmental education uses behaviour modification of children in ways thought to be politically correct and the teaching of political skills such as lobbying, fundraising, and protest techniques" (p. 1). Colorado's environmental education programmes are said to be miseducating and propagandizing children instead of teaching them the skills that will allow them to make their own decisions.

Of the limited references to the status of outdoor education in the United States, Noble (1995) and Ewert (1989) have expressed concern for the recent withdrawal of financial support for outdoor education in some states.

It is my contention, in this thesis, that the chosen evolutionary path of outdoor education in Ontario has ultimately led to its demise. In the 1960's and 70's, the purpose of outdoor education was to use the out-of-doors to enrich the cognitive areas of the school curriculum, primarily in the fields of science, geography and history. Outdoor education complemented what was learned in the classroom.

In the 1980's and early 90's, outdoor education began to focus more on environmental

issues and greater emphasis was placed on the development of positive environmental attitudes, positive social interaction and leadership skills.

Cognitive improvements became secondary to what was perceived by society in general as the need to change inappropriate attitudes and behaviours toward the environment and other affective domain concerns. The original goal of using the out-of-doors to enrich the classroom curriculum became secondary. Most outdoor education research during the late 70's and 80's focused on affective measures, rather than on cognitive concerns. This philosophical shift in outdoor education is also evidenced by the dramatic reduction in cognitive research in the journals during the 1980's. Also at this time, more and more students of all ages were signing up to participate in experiential-based outdoor education programmes like rock climbing, initiative tasks, cross-country skiing, wildlife habitat improvement activities, etc. These activities were very popular, but unfortunately, as school budgets were trimmed and accountability concerns became very prominent, these programmes were the first to be eliminated or downsized.

Educational administrators have made it clear that they are no longer willing to support outdoor education programmes that do not complement and enrich the classroom curriculum. Numerous outdoor education centres in southern Ontario have shut down recently because they were either unable or unwilling to refocus their programmes immediately to support the classroom curriculum. It is my contention that outdoor education will be revitalized in this province when a concerted effort is made by outdoor educators to offer programmes that complement and enrich the classroom curriculum. I also believe that it will be essential to show educational administrators that outdoor education does have inherent value in terms of cognitive learning.

As a result of these questions concerning the value of outdoor education in general and specific programmes in a board, there is a definite need to have a more substantial and reliable basis of evidence to demonstrate whether outdoor education has a more positive impact on cognitive learning of a student than a traditional classroom setting. If the evidence from research is

not forthcoming soon, the field of outdoor education is likely to fade away. Previous research in the cognitive areas of outdoor education seems to be inconclusive as to whether students have attained a better grasp of environmental concepts in an outdoor education centre. Henderson (1986) found that approximately 40% of major studies showed that outdoor education had no significant impact on students' cognitive achievement. Studies did seem to indicate that a more conducive atmosphere to learning was promoted by an outdoor education centre because of the enthusiasm of the students and the uniqueness of the instructional setting. Henderson (1986) suggests that possible reasons for the discrepancies in the research could be attributed to a lack of set standards, procedures, objectives or evaluative methods for comparing and contrasting student achievement. Teacher enthusiasm and instructional style could also have had a significant influence on a student's achievement and cognitive gains.

More research seems to be needed before any conclusions can be drawn as to whether a student does grasp concepts and fundamentals better through an outdoor educational experience as opposed to the traditional classroom setting. It is to this end that this thesis is directed.

Definitions Of Outdoor Education

Reviewing outdoor education research is complicated by the lack of consensus as to how outdoor education should be defined. For example, Horwood (1993) suggests that outdoor education is the only means by which people can recover their stone age identity; "...it is the only way by which people can discover that they are wild life, no different in the basics of life from wombats and gum trees" (p. 5). He argues that when humans learn how to be wild, they learn how to become fully human within the framework of the laws of nature and within the limits of our humanity.

When outdoor education programmes attempt to bring alienated youth into touch with their

own wild natures, Horwood (1993) contends that such programmes consist of the following four major features:

(a) earthlinks - programme components that drive students to experience direct, intimate links with their surroundings,

(b) stories - descriptions and explanations including ancient myths that give us our images of the world and our place in it,

(c) wonder - that feeling of marvel, even awe, which people experience when they encounter the surprise and delight of life beyond themselves, and

(d) personal identification - the person recognizes that the 'outside' is part of one's self.

Horwood (1993) argues that it is essential that all four elements be present in outdoor education. One or other alone, only worsens the alienation.

Over a quarter of a century ago, the classic definition of outdoor education was "education in, about, and for the outdoors" (Donaldson and Donaldson, 1958, p. 63). In describing outdoor education as a method of learning, three key words were used. The word "in" referred to the location; taking place in the out-of-doors. The word "about" referred to the subject matter; learning about nature. The word "for" referred to the purpose of outdoor education; for the future benefit of our planet's finite resources.

This definition has been criticized from many viewpoints. Many educators, Priest (1986) contends, state that some aspects of outdoor education can take place indoors. Others feel that there is more to learn about than just the outdoor environment. They claim that the personal environment and socialization are equally important topics which lend themselves to outdoor education learning situations. Some believe that the purpose of outdoor education is not sensible stewardship, but independent learning, free thinking, and self-reliant problem solving. Despite the differences of opinion, this definition of outdoor education has provided a solid foundation for

outdoor education in North America for almost three decades (Priest 1986).

Priest (1986) has offered a new definition of outdoor education. "Outdoor education is an experiential process of learning by doing, which takes place primarily through exposure to the out-of-doors. In outdoor education the emphasis for the subject of learning is placed on relationships, relationships concerning people and natural resources" (p. 13).

This definition includes the following six critical attributes.

(1) Outdoor education is a method of learning.

(2) The process of learning is experiential.

(3) The learning in outdoor education take place primarily, but not exclusively, in the outdoor setting (ie. preparations for a field trip).

(4) Experiential learning requires the full use of the five senses and involves the three domains (cognitive, affective, and motoric) of learning.

(5) The learning in outdoor education is based upon interdisciplinary curriculum matter.

(6) The learning in outdoor education is a matter of many relationships (ie. interpersonal, intrapersonal, ecosystemic and community).

Priest (1986) believes that outdoor education can be metaphorically represented as a large tree. It has two major branches from the main trunk, each of which disappears into a mass of leaves. One branch is called adventure education, which relates to interpersonal and intrapersonal relationships. The other branch is called environmental education, which concentrates on ecosystemic and community relationships. He contends that the proper integration of both adventure and environment approaches, creates a truly functional outdoor education experience. Through exposure to the outdoor setting, individuals learn about their relationship with the natural environment, relationships between the various concepts of natural ecosystems and personal relationships with others and with their inner self. He recommends this blended approach

to outdoor education. Horn (1979) found that outdoor educators do not differentiate between environment-oriented, conservation-oriented and activity-oriented outdoor education.

Skatos (1979) suggests that outdoor education is a philosophy of holistic education and learning, which views children as a whole entity, hungry for knowledge and experience.

Outdoor education may also be viewed as an interdisciplinary process that utilizes the out-of-doors to cultivate a reverence for life through the ecological exploration of the interdependence of all living things. The purpose of outdoor education is to enrich, vitalize and complement content areas of the school curriculum by means of firsthand observation and direct experience outside the classroom. Instruction which traditionally has been limited to the four walls of the classroom is, for the most part, highly verbal. Extending the classroom into the out-of-doors provides the setting for bringing deeper insight, greater understanding and clearer meaning to those areas of knowledge which ordinarily, are merely read and discussed - seldom experienced. Outdoor education also seeks to nurture in students, ecologically sound values, attitudes and behaviour. Its *raison d'etre* is that twentieth century people have removed themselves from the land - and both they and the land are worse off for it (Eaton, 1978).

Hammerman (1973) in his book Teaching In The Outdoors states that the purpose of outdoor education is to enrich, vitalize and complement content areas of the school curriculum by means of firsthand observation and direct experience outside the classroom. Classroom instruction often deals with abstract ideas and non-real world experiences. Outdoor education allows students, who in today's world are often limited in their opportunities to interact with the natural world, a chance to do so in meaningful ways.

In Table 1.1, the definitions of outdoor education have been summarized to permit the reader to see similarities and differences between the researchers' viewpoints.

Table 1.1

Summary of Outdoor Education Definitions

Source of Definition	Date	Attributes of Outdoor Education
Horwood	1993	Students recover their wild heritage
Priest	1986	Combination of adventure education and environmental education
Horn	1979	Outdoor education is inclusive, not exclusive
Skatos	1979	Outdoor education is holistic
Eaton	1978	Outdoor education enriches classroom experiences outdoors
Hammerman	1973	Meaningful experiences outdoors

Because of the great variability in the way outdoor education is defined, I will offer the following definition. For the purposes of this research, outdoor education will be defined as all school-related academic education which takes place outdoors. This broad definition ensures that all research studies attempting to follow scientific procedures, which might offer insights into the issues of cognitive and affective learning will be included.

Outdoor education differs from summer camp or day camp in that it consists of school-directed activities carried on outside of the school building in a residential centre, school site or other suitable location for the purpose of providing students with educational experiences. Outdoor education includes all areas of the curriculum including such areas as art, language arts, math, physical education, social studies, music and science. Each uses the key ingredient of direct experience in the out-of-doors to develop concepts for children.

Environmental Education

Outdoor education and environmental education are not the same, by definition. Outdoor education explores only outdoor natural environments. Environmental education may provide many learning situations outdoors but will use any environment, natural or man-made, indoor or outdoor, to obtain first hand information and experience.

While these differences may appear to be substantial, in actual practice, it is less so. In part, this reflects the common purposes and goals of both.

In current teaching practice, outdoor education and environmental education are usually grouped together and thought of as synonymous. At present, environmental education emphasizes the natural environment and human impact upon it, and makes extensive use of the outdoors as the mileau of learning. At the same time, outdoor education emphasizes conservation, ecology and recreation-oriented disciplines, and pays less attention to subject areas such as mathematics, languages, etc.

For example, the Durham Board of Education has recognized the overlapping nature of both fields by modifying the names of all their outdoor education centres to include environmental education (ie. the Nonquon Outdoor and Environmental Education Centre).

Ford (1986) suggests that environmental education refers to "education about the total environment, including population growth, pollution, resource use and misuse, urban and rural planning, and modern technology with its demands upon natural resources." (p. 5)

Environmental education is seen as all-encompassing, while outdoor education is viewed by some to relate to the natural environment and not to include the wide sense of the world environment. Many people, Ford (1986) contends, think of outdoor education in its broadest sense and prefer the term outdoor/environmental education.

Other Terms Frequently Used In Place Of Outdoor Education

While differing in meaning, terms used instead of outdoor education include conservation education, outdoor recreation, outdoor pursuits, adventure education, experiential education and environmental interpretation. Their definitions have been taken from Ford (1986).

Conservation education is education about the wise use of natural resources. It tends to focus on animals, soil, water and air as single topics in relation to their utilization for timber, preservation, recreation or human relations and as such is more narrow than outdoor education.

Outdoor recreation means a broad spectrum of outdoor activities participated in during leisure time purely for pleasure or some intrinsic value. Included are hiking, swimming, boating, winter sports, cycling and camping.

Outdoor pursuits are generally non-mechanized, outdoor recreation activities done in areas remote from the human amenities. To many people, outdoor recreation and outdoor pursuits are similar.

Adventure education refers to activities into which are purposely built elements perceived by the participants as being dangerous. The activities are not inherently dangerous as taught, but appear to be so to the participant and thus they generate a sense of adventure. Adventure activities include such things as rope courses, white water canoeing, mountaineering and rock climbing.

Experiential education refers to learning by doing or experience. Many experiential education activities are often synonymous with adventure activities and outdoor pursuits. In many ways, outdoor education may be viewed as experiential, especially when the learning takes place through experience.

Environmental interpretation and nature education are terms usually associated with visitor centres administered by parks. The term refers to a technique used to help visitors understand the meanings of the phenomena on display, while simultaneously whetting the curiousity for more information.

History of Outdoor Education in Ontario

An examination of the history of outdoor education has been included in this study because such a review might help to explain the motivation for this study. To understand the rationale for the study the reader has to appreciate the context in which the research was done, including the history of outdoor education. I believe that outdoor education programmes declined because their proponents failed to demonstrate their value in relation to traditional school outcomes. I also believe that it is not too late to examine the cognitive outcomes of outdoor education, as well as its affective claims in order to (1) defend outdoor education, and (2) focus its programmes.

Early Development.

The origins of outdoor education date back to the 1920's (Rogers, 1982), when school camping began. School camping was a term used from the 1920's through the 1950's to denote camping programmes conducted by schools. These programmes allowed students to live and learn together in a camp setting for several days to a week. They were characterized by a relaxed pace of learning, flexibility in scheduling and total involvement of the teacher with the children in the lessons and day to day living activities of the camp. These programmes were an outgrowth of the recreational summer youth camps of the organized camping movement, and were based upon the pragmatic educational philosophy of John Dewey and others. The leaders of these early school camping programmes believed that students learned best through direct experience in real-life problem solving.

School camping later became part of a larger movement, namely outdoor education. Through the course of this movement, the term outdoor education has been defined in many ways; however, Rogers (1982) contends that there is general consensus today that outdoor education refers to a way of teaching a variety of outdoor-related facts, concepts and skills, using

the outdoors as both a facility and a medium for teaching. The term school camping has been generally replaced by the term resident outdoor education and rather than be called school camps, these programmes are now more often referred to as resident outdoor schools. Resident outdoor education experienced a boom period in the 1960's and 1970's when an abundance of government and private funding sources became available.

Although Birchard (1996) contends that it is hard to identify the origins and motivating factors of outdoor education in Ontario, he does reiterate Roger's (1982) assertion that its early, gradual growth may have grown out of the post-war conservation movement and the school camps of the U.S.A. The nature study movement and the rapid spread of several field centres in Great Britain and some parts of Western Europe may also have contributed to the beginning of outdoor education (Birchard,1996).

Raffan (1996) maintains a similar view. He asserts that a wave of enthusiasm for outdoor activity in the natural environment, that continued to build after World War II, contributed to the founding of outdoor education in Ontario. School camping, although largely disconnected from the school curriculum, gained popularity during this time as well.

Outdoor education emerged during the 1940's and 1950's as a reaction to traditional classroom-bound teaching (Knapp, 1992). Knapp (1992) contends that teaching of this era was generally practised as though the instructor possessed all required information and simply poured it into the empty heads of students.

Some educators became dissatisfied with this philosophy of teaching and learning, and wanted to revitalize education by moving some of it into the 'real world'. Knapp (1992) believes that outdoor education developed as one response to these circumstances.

The publication of Rachel Carson's Silent Spring in 1962 marked a transition for the conservation movement. Carson challenged the then current utilitarian view of nature, and argued that the world should be viewed as an ecological system in which human activity was doing

serious damage to natural communities upon which humans were dependent.

Miles (1987) contends that this change in public perception changed conservation to environmentalism and outdoor education to environmental education.

Dominance By Non-School Agencies.

Nature interpretation started in Algonquin Park in the 1950's by the former Department of Lands and Forests which may also have played an active and integral part in the formation of outdoor education in Ontario. Park naturalists continued to interpret Ontario's natural heritage to park visitors through the 50's and 1960's (Martin, 1996) . As the provincial park system expanded, so did the interpretive programmes, with an increased emphasis on outdoor education opportunities for schools. For example, the school programme at Pinery Provincial Park in the 1960's served as a model for other parks. Wildlife management areas, such as Tiny Marsh, offered programming to a variety of groups.

In 1947, the Ontario Athletic Leadership Centre was established at Camp Couchiching, and a year later the Ontario Camp Leadership Centre began operations on Bark Lake.

Ontario's thirty-three conservation authorities have played a pivotal role in the development of outdoor education. For example, as more land was acquired by the Metropolitan Toronto and Region Conservation Authority (MTRCA) in the 1950's, it became apparent that these lands represented outdoor classrooms which could accommodate the outdoor education needs of the Toronto area. Schools began to formally plan out-of-classroom trips and often used the staff of MTRCA as resource people. A good example of this trend towards cooperation and partnership, suggests Carr (1996), was the approach to the Humber Valley Authority in 1953 by two staff members of York Memorial Collegiate Institute, a Metro Toronto High School. The resulting first 'camp school', according to Carr (1996), was the forerunner and prototype of the MTRCA residential field centres. That was the pilot programme which ran for 11 years and culminated in

the establishment of the Albion Hills Conservation Field Centre in 1963.

The Albion Hills Conservation Field Centre prospered. By the mid-sixties, there was a recognized need to either add more accommodation or build another centre elsewhere on Authority property. The pressure for more time from the local school boards led to the 1967 opening of the Claremont Conservation Field Centre. In 1968, the day-use Cold Creek Conservation Field Centre was established. In 1974, eight local school boards entered into a agreement with the Authority to build the Boyd Conservation Field Centre, the third residential centre. In 1979, the Lake St. George Conservation Field Centre was opened. This was the Authority's first residential centre that was big enough to accommodate two classes of students at the same time. In 1979, the Kortright Centre for Conservation was officially opened to the public, providing unique outdoor education programmes to both school groups and the visiting public. By 1989, the Kortright Centre was attracting well over 100,000 visitors a year (Carr, 1996).

Establishment Of Outdoor Education Centres By Boards.

In 1960, the Toronto Island Outdoor School was opened by the City of Toronto Board of Education. This site was the first residential outdoor education centre operated by a board in Ontario.

In 1965, the Schools Administration Act was amended to permit school boards with enrolments of over 10,000 students to buy their own property outside of their jurisdictions for the purpose of erecting a natural science school. It also allowed boards to conduct a natural science and conservation programme in cooperation with a Conservation Authority (Birchard, 1996).

The Ottawa Board was the first board to take advantage of this new opportunity to purchase land outside of their boundary when they obtained 200 acres near Cumberland for the establishment of the MacSkimming Natural Science School.

The Golden Age.

The late sixties and early seventies were times of sweeping curriculum revisions and the use of outdoor education was strongly recommended in curriculum guidelines to illustrate and enrich educational experiences, particularly in science, environmental studies, geography and physical education (Birchard, 1996).

Many boards were quick to take up the new challenges and opportunities, and outdoor education was growing and spreading rapidly. Thousands of students were going outdoors with their teachers each year and learning in a wide variety of settings. They were learning in school yards and neighbourhoods, in the dozens of outdoor education centres and nature centres devoted to day and half-day programmes, and in the increasing number of residential field centres where students and teachers could live and learn together for two to five-day periods.

Throughout the sixties, many conservation authorities worked closely with local school boards to develop field centres and outdoor education programmes in Ontario.

In 1969, Pollution Probe was established by Donald Chant. Also in that same year, Queen's University established the precursor to the outdoor and experiential education programme. The Hall-Dennis report, Living and Learning, was published in 1969, and recommended that the Department of Tourism, the Department of Lands and Forests, and the conservation authorities support-out-of-classroom learning.

Although growth in outdoor education in response to these concerns was slower in Canada than it was in the United States, more and more teachers and students became involved, allowing Donald Hammerman to call outdoor education an 'emerging educational philosophy' across North America in 1968 (Raffan, 1996).

Raffan (1996) contends that the wave crested in 1970. Environmental concerns including northern development, energy conservation, etc. became intense. The first Earth Day occurred on

April 22nd, 1970. The Peel Board of Education opened the Jack Smythe Field Centre. The Outdoor Education Committee of the Ontario Teachers' Federation produced its first outdoor education manual. Camp Kandalore, Camp Tawingo, Forest Valley and many other traditional summer camps began to provide outdoor education programmes to children during the school year.

On February 5, 1971 the Council of Outdoor Educators of Ontario (COEO) was founded at the Ottawa Board's MacSkimming Outdoor Education Centre.

An international conference called 'Outdoor Education - Without Boundaries' convened at Camp Kandalore in September of 1972.

In 1973, the Ontario Camp Leadership Centre at Bark Lake offered its first teacher-oriented workshop in outdoor education skills. The City of Toronto Board of Education opened its second outdoor education centre, called the Boyne River Natural Science School, near Orangeville.

In 1974, The Association For Experiential Education was founded. That same year, at a conference sponsored by the Canadian Camping Association, COEO, the Ontario Teachers' Federation (OTF) and the Ontario Camping Association released the Code Of Recommended Practices For Outdoor Education In Ontario (Martin, 1996). In addition, the Leslie. M. Frost Natural Resource Centre was officially opened in April of 1974 by the Ministry of Natural Resources (MNR). Educational programming at the Leslie M. Frost Natural Resources Centre was focused on interpreting the principles and practices of resource management and use - the mandate of MNR. By the end of the 1970's, the Leslie M. Frost Natural Resources Centre became the destination of choice for many school groups in Ontario. Demand soon exceeded capacity. It was not unusual to have fifty groups on a waiting list (Martin, 1996).

In 1975, several members of the Ontario Teachers' Federation failed in their attempt to have outdoor education designated by the Ministry of Education as a curriculum subject in Ontario.

This failure to secure outdoor education as a teachable subject may have been the critical turning point for outdoor education (Raffan, 1996).

In 1976, COEO, Energy Probe, OTF and several ministries including MNR worked together to produce a Code of Ethics for Educational and Recreational Use of the Environment. Later MNR produced Land Resources for Outdoor Education to be used by educators in planning outdoor education experiences (Martin, 1996).

In the following years, more outdoor education centres were opened up by conservation authorities and boards of education. The 70's and 80's were the boom years. Outdoor education was happening across the province, and the popular view was that it was good. No one questioned these assumptions (Raffan, 1996).

During the seventies and eighties, both pre-service and in-service teacher education underwent significant evolution (Horwood, 1996). A highly rated component of teacher education is the practicum. The development of outdoor education centres enabled beginners to be placed in centres for part of their student teaching practicum. This worked to the advantage both of the centres, who deployed student teachers in key staff roles, and the student teachers who were able to have a reasonably sustained, supervised experience in outdoor education.

In 1985, MNR's Wildlife Branch worked with the Canadian Wildlife Federation to bring Project Wild, one of the largest and best resources in outdoor education to Ontario schools. In 1989 and 1992 respectively, two other comprehensive outdoor education resources for the classroom teacher, called Focus On Forests and Fish Ways, were developed. Up to 35,000 educators have attended workshops to learn how to effectively use these resources with their students (Martin, 1996).

During the eighties, several school boards developed agreements with MNR to access land and use facilities for outdoor programmes. Nonquon Wildlife Management Area (Durham Board), the Ganaraska Forest (Durham Board), Copeland Forest (Simcoe Board) and the Thunder Bay

Demonstration Forest (Lakehead Board) were examples (Martin, 1996).

Decline of Outdoor Education.

In spite of all the growth, outdoor education never became an integral part of the school programme. In 1981, the Outdoor Education Committee of the Ontario Camping Association, which Raffan (1996) contends had exercised such an influential role in the establishment of outdoor education to that point was disbanded. In 1989, Ewert (1989) reported that outdoor education programmes had failed to attract much interest and may actually be in a phase-out situation.

As the late eighties and early nineties passed, outdoor education centres associated with the school system showed troubling signs. In 1990, the G. W. Finlayson Centre in Peel Region closed. In 1992, every outdoor educator in Peel was returned to the classroom. In 1993, the annual COEO conference was cancelled due to lack of registration. Centres associated with the London Board, Hamilton-Wentworth, West Carlton, Hamilton Separate, Upper Canada College, Bark Lake, Kawartha Region Conservation Authority, and Queen's University's Co-op Outdoor And Experiential Education programme faced either downsizing or closure, to name just a few.

Surprisingly, the 1980's ended on a note of optimism for MTRCA conservation programmes (Carr, 1996). During this period when many outdoor education centres and programmes were experiencing significant changes and closings, the MTRCA programmes survived reasonably well. Because of their large size and unique arrangements with neighbouring school board user groups, they were somewhat isolated from the funding cutbacks at the school and school board levels. No MTRCA Centres have been closed, and staffing has remained essentially the same.

Substantial reductions in numbers of visiting school groups in the early nineties forced the staff at the Leslie M. Frost Natural Resources Centre to develop a new vision to ensure its very

survival. The centre has a new mandate to provide professional training for MNR employees from across the province. Fire-fighting crews, park wardens, foresters, wildlife managers, etc. take regular upgrading courses at the centre offered by professional staff. Many of the former outdoor educators have either been let go or reassigned to other areas (Martin, 1996).

Why has outdoor education spiraled downwards during the last few years? Raffan (1996) argues that outdoor educators failed to demonstrate that outdoor education was effective in promoting cognitive and affective learning. The organizational structure and research are not present to back the claims of the relevance of outdoor education. In addition, outdoor education became less and less connected to what was going on in the classroom. The high cost of outdoor education - transportation, room and board for students, fancy buildings, etc. made outdoor education financially untenable in lean times. Raffan (1996) also suggests that outdoor educators failed to develop a strong relationship with the Ontario Ministry of Education and Training.

Perhaps outdoor educators should have heeded the advice of classroom teachers by encouraging schools to develop their own programmes. Possibly, the bulk of the instruction should have been delivered by classroom teachers, rather than by a group of specialized teachers at expensive distant facilities.

As centres closed and programmes were reduced, the most damaging response by outdoor educators was the lack of response. Outdoor education continues to this day to be in a state of paralysis. I have seen little evidence among outdoor educators in this province to fight back, to evolve, and renew the spirit of outdoor education - just resignation. Outdoor educators were not prepared for the Common Sense Revolution that brought to the education system concerns about academic accountability and financial restraint. The future of outdoor education depends on finding its relevance to the education system and by demonstrating to administrators and politicians that it is more effective at promoting cognitive learning than traditional classroom instruction.

Research Design

The history of outdoor education shows that there is a serious problem based on the abdication of responsibility for cognitive outcomes. If outdoor education is to continue, it is only because it is able to deal with outcomes that matter to administrators and budget makers. Therefore, for this study, I have investigated whether outdoor education offers any cognitive and affective benefits to students.

The key hypothesis of the study was that I predicted that outdoor education would have a greater impact on cognitive learning than the traditional classroom setting. I attributed this greater influence to the experiential nature of outdoor education and the novel setting for students.

During the spring of 1997, six classes of junior-level students attended a half-day programme on beaver ecology at the Nonquon Outdoor and Environmental Education Centre near Uxbridge (treatment group). Six classes of junior-level students were taught a half-day programme in beaver ecology in classrooms (control group). The learning outcomes for both programmes were very similar.

Pre- and post-test questionnaires were administered to the students, one day before they participated in the programmes (pretest), one day after they had finished the programmes (posttest), and two weeks later (retention). Teachers administered the tests to their own students, and were given very clear written instructions on testing procedures.

Two forms (A & B) of the cognitive test were administered to the students. The tests were randomly distributed to the students during the pre-test. If students received Form A for the pre-test, they were given Form B for the post-test, and Form A for the retention test (A-B-A). The sequence B - A - B was used for students receiving the Form B pre-test. Students were randomly assigned to each test sequence within experimental conditions so that proportions of each sequence were the same in the treatment and control groups.

A total of one hundred and eighty-four students participated in this study, eighty-five

students in the treatment group and ninety-nine students in the control group.

Expected Limitations

The extent to which conclusions drawn from this research may be generalized is limited by:

(1) The degree to which design measures taken to ensure validity and reliability.

(2) The fact that the investigation is limited to only the one example of an outdoor education programme.

(3) The outdoor education programme is limited to a half-day experience. Attitudes develop over a long period of time. It would not be reasonable to expect a change during a half-day programme.

(4) The evaluation of the treatment and control groups was limited to 12 classes.

Researcher's Orientation

I have been a classroom teacher in Victoria County for twenty years at both the elementary and secondary levels. My outdoor education teaching experience includes former employment with

(a) the Albion Hills Conservation Field Centre near Bolton,

(b) the Forest Valley Outdoor Education Centre in North York,

(c) fourteen years experience as an Outers Club supervisor, taking students on experiential-type excursions including rock climbing and canoe-camping, and

(d) several years as a grade 11 Environmental Science teacher at Fenelon Falls Secondary School.

I wish to make it clear that my personal preference is to teach outdoor education. From my experiences, I have found that especially with junior and intermediate students, outdoor education programmes can generate genuine excitement for learning, create greater lasting impressions

months following the experience, and help students to recall information more effectively. I have rarely come across students who have not been impacted in some positive manner by their visit to an outdoor education centre. Assuming that the outdoor education programmes are implemented in the way intended, I believe that very specific social, psychomotor, cognitive and affective skills will be more effectively learned in an outdoor education setting than in a traditional classroom setting.

In chapter 2, I will identify the types of outdoor education programmes that are available and the effects of these programmes on students. The procedure for the study will be described in chapter 3. The data from the study will be presented in chapter 4, including the results from a an analysis of variance. A summary and discussion of the results will follow in chapter 5.

CHAPTER 2

Forms Of Outdoor Education

In chapter 2, I will identify the different types of outdoor education programmes that are available, and review the effects of these programmes on students. I also want to identify the type of programme that is examined in this study and the rationale for the research questions posed.

There are two methods of classifying outdoor education programmes in the literature. The first focusses on programme duration. The North York example is typical of this approach.

Classification Based On Programme Duration

The Outdoor Education Committee for the City Of North York Board of Education (1983) has categorized the field of outdoor education into the following three areas based on programme duration:

(1) Day programmes are minimal cost outdoor education programmes which can occur in an urban and/or natural setting and start and end in one school day or extended school day. An urban setting could be a shopping mall or museum, whereas a natural setting could be a city park. They can be within walking distance of the school or require transportation, but they do not include visits to field centres.

(2) Day Centre programmes also start and end in one school day or extended school day, but they occur in designated natural or urban centres. These programmes are funded primarily by the school boards.

(3) Residential programmes involve an overnight stay of one or more nights. These can occur in a natural or urban setting. A natural setting would be parkland with residential facilities or camping. An urban setting would be an overnight trip to another city. The funding for these

programmes is generally split between the school board and the students.

Outdoor education is taught through a variety of approaches and settings, ranging from day-use centres like the Kortright Centre For Conservation near Bolton where students participate in short, focused programmes for a few hours; to residential centres like the Leslie M. Frost Natural Resources Centre near Dorset, where an entire class of students will spend three or five days participating in a number of academic and recreational programmes, while living in dormitory-style accommodations.

There are two principles which underlie this classification system (Outdoor Education Committee for the City Of North York Board of Education, 1983) . The first relates to the expanding environment of the child. When a child is young, he/she likely explores only a short distance from the school, using the schoolyard, the local park and the school community. As the student gets older, studies will naturally take the student farther from the school, to farms, natural areas, etc. As children mature, they will tend to go farther and stay away longer.

The second principle relates to the development of independence in both the child and the teacher. For example, at first the children need food and shelter provided for them, and the teacher needs programme assistance. Later, having gained experience, the teacher can plan and conduct the programme on his/her own and as they get older, the children can prepare their own meals and eventually, provide their own shelter and transportation. These principles can be used to explain the need for all three types of outdoor education programmes. There have been a few evaluations of programmes organized around these principles.

Baird (1996) has conducted a study of a residential outdoor education programme at the Durham Forest Outdoor and Environmental Education Centre. Surveys from 296 grade eight students were evaluated to assess the amount of progress toward the centre's goals. The students were used as programme evaluators. The results indicated that the majority of the students were satisfied with the programme. Student opinion showed that eight of the ten aims for the programme

were met, while two needed improvements.

Eagles, Townsend, Blythe and Gilman (1997) have conducted a similar evaluation of the Waterloo County Board of Education's day-use outdoor education programme. Their study checked the level of fulfillment of the programme's goals. The 517 students surveyed from grades eight to twelve indicated that 11 out of 15 goals were fulfilled. The study showed that students also reported high levels of learning in key areas of ecology and environmental studies.

A survey on the status of outdoor education centres in the formal Ontario educational system has been compiled by Eagles and Richardson (1992). Of the 172 boards of education identified in their study, 46 reported using at least one outdoor education centre under their direct control (26.7%). Eighty-eight day-use centres are operated by boards of education throughout the province. Twenty boards reported having developed a residential outdoor education centre (11.6%). Their data reveals that the majority of boards of education in Ontario do not operate their own outdoor education centres, although it is common practice for some individual teachers to send their students to privately and publicly run outdoor education centres throughout Ontario. The 46 boards reported that 332,973 students visited their outdoor education centres during the 1988-89 school year. Out of 172 boards of education reporting to their study, eight had more than 50% of their students participating in at least one day of outdoor education at a board-operated centre in the previous year.

Out of 172 boards of education, 20 reported providing a residential form of outdoor education; 51,948 students were provided with such an education.

Their data suggests that most boards prefer the day-use option. Overnight accommodation is expensive to provide and often difficult to manage. It is also sometimes difficult to find teaching staff willing to supervise students in an overnight setting. More than six times as many students have day-use experiences than have overnight experiences. Their data also reveals that 3.2 days of experience are provided, on average, in a residential programme. This suggests that the attendance

is for one half a week. Such a split week provides for the serving of two classes each week. The shorter time is also less expensive in money and time, for the parents and teachers, respectively.

This study did not examine the provision of outdoor education services through private centres and publicly funded centres like the Leslie Frost Natural Resources Centre near Dorset and local conservation authorities. Boards of education encourage teachers to use these facilities, since the participation fees are frequently provided by parents and local schools through fund raising.

Eagles and Richardson's (1992) data also reveal that 20.6% of Ontario students participated in an outdoor education centre experience in the 1988-89 school year through their board-run centre. According to the authors, this has increased from virtually no participation before 1960.

It would be very helpful if a comparative study of non-board operated centres could be undertaken to establish an accurate student participation rate in outdoor education in Ontario.

Classification Based On Programme Goals

In addition to classifying outdoor education by programme duration, the field can also be classified by programme goals. During the last 20 years, both integrated outdoor education and experiential outdoor education have been successfully introduced in Ontario.

The development of integrated curriculum programmes, with a strong outdoor experiential education focus within the secondary school system in Ontario, has experienced significant growth in the 1990's (Henderson, Mehta and Arnott, 1996). These programmes offer multi-credits, and while the high school serves as a base of operations, most of the programme's activities take place outside of the school. Students work towards earning four credits during the school day, with all four courses taught by the same teacher. Credits may include physical education, history, geography, science, English and technical studies.

Another major recent thrust in outdoor education during the last 20 years has been experiential education. Experiences in the out-of-doors tend to be rich in opportunities for

nurturing growth in all of the developmental domains. Experiential programmes are offered at both day-use and residential settings, and include such activities as rock climbing, initiative tasks, kayaking, team-building exercises, winter camping, etc.

The approaches of integrated outdoor education and outdoor experiential education will now be examined in more detail.

Integrated Outdoor Education

Studies of Curriculum Integration In Indoor Education.

Before I address the studies of integrated outdoor education programmes, I will briefly review some of the research that has been done on the underlying ideas behind them, ie. curriculum integration, mainly in mathematics and science.

The emergence of outdoor education, environmental education, global education and experiential education have exposed the weaknesses of subject-based learning because the issues themselves are invariably interdisciplinary, and solving them requires expertise from all subject disciplines. To understand these problems, students need scientific knowledge. To discuss them, they need language and writing skills. To place them in context, and to detect the biases in what others say about them, they need social studies. To analyze data, make comparisons and identify relationships, they need math. And to give form and voice to the human response to these global issues, they need the expressive power of the arts.

By compartmentalizing reality into distinct subjects, high school education makes it difficult for students to grasp the 'big picture' and thereby find ways to affect change. Reality is integrated, Grant (1995) maintains, and students need holistic perspectives to make sense of the world around them. Put simply, teaching about global issues forces educators to integrate curriculum.

Beane (1991) contends that genuine learning involves interaction with the environment in

such a way that what we experience becomes integrated into our system of meanings. Integration is something that we do ourselves; it is not done for us by others. This means that the whole picture we start with - the problem or puzzling situation - is one that we ourselves create or imagine. It has importance for us, and this importance compels us to work on it.

Austin, Hirstein and Walen (1997) conducted a study of a newly-implemented high school mathematical curriculum which was integrated with science and technological application. For one year, twenty-two classrooms of mainly grade nine students studied this new curriculum. Students took a pre-and post-treatment attitude questionnaire, a PSAT examination and an end-of-year open-ended assessment constructed by the authors. A control group consisting of six classes of grade nine students also took the PSAT examination and the open-ended year-end assessment. The control group did not complete the attitude questionnaire.

Results indicated that

(1) there was a significant improvement in the experimental students' mathematical confidence,
(2) there were no significant differences between experimental and control classes on the PSAT, and
(3) there were significant differences on the end-of-year test favouring experimental classes.

Austin, Hirstein and Walen (1997) concluded that the new integrated curriculum of mathematics and science can improve students' attitudes towards mathematics and problem-solving skills.

Scarborough (1993) has reported on an attempt to improve high school physics through an integrated curriculum and team delivery. Forty-five integrated physics, mathematics and technology curriculum modules were developed, field tested, revised and packaged for teachers under the title 'PHYS-MA-TECH'. Five high schools participated in the study. During the field test year, data were collected to evaluate the success of the curriculum modules and teaching models.

The experimental (integrated) groups showed a higher interest in science than those in the control (regular) physics classes. Students in the experimental group showed a higher preference for physics; the control group showed a higher preference for biology and chemistry. There were no significant differences in achievement scores on the physics post-tests, despite the fact that the control group had significantly higher IQ's and GPA's compared to the students participating in the experimental integrated physics classes who would not have taken physics normally.

Roth (1992) has also reported on an attempt to integrate science, mathematics and technology at a private high school. Evaluative data on three grade 11 physics classes was obtained regarding student attitudes toward the new integrated activities, through the use of videotaping, written feedback and a questionnaire. Although Roth (1992) does report an overwhelming positive attitude in all the physics classes, there were no controls in this study, and 90% of the students were college or university-bound students, a rather exceptional group.

Friend (1985) reported that students with standardized reading and mathematics scores at least two years above grade level, who had science and mathematics integrated, scored significantly higher on a physics cognitive test than similar students who did not follow the integrated format. However, they did not tend to develop more positive attitudes toward science compared to their grade level counterparts.

Students with standardized reading and mathematics scores at grade level who had science and mathematics integrated did not produce significantly greater scores on the physics cognitive test than students who did not have the disciplines integrated.

Lastly, students with standardized reading and mathematics scores at least two years above grade level, who were taught by the non-integrated format, demonstrated significantly greater achievement on the physics cognitive test than at grade students who had science and mathematics integrated.

Case (1994) suggests that the notions of thematic units and fused courses are often

inappropriate strategies because they do not serve several important goals for curricular integration. Fused courses may not ensure curriculum relevance. In addition, increased horizontal integration of content may be at the expense of decreased vertical integration.

A summary of the research findings on integrated learning that have been reviewed in this chapter is presented in Table 2.1.

Table 2.1

Summary Of Integrated Learning Research

Author	Grade Level	Results
Austin, Hirstein and Walen (1997)	Grade 9	Integrated group demonstrated more mathematical confidence. No significant differences in achievement scores.
Scarborough (1993)	High School	Integrated group showed higher interest in science. No significant differences in achievement scores.
Roth (1992)	Grade 11	Integrated group showed more positive attitudes. No control group.
Friend (1985)	High school	Integrated group working above grade level scored significantly higher on a physics cognitive test. Integrated group working above grade level did not demonstrate more positive attitudes toward science.

Studies of Integrated Outdoor Education

In Deep River, Ontario, the concepts of the curriculum model called 'Integrated Curriculum ' have contributed to the apparent success of an experiential programme called the Tamarack programme. This programme is an experiential, multi-credit, integrated course designed for grades eleven and twelve students. Although the school does serve as a base of operations, most of the programme's activities take place outside of it. These activities include field trips, extended outdoor challenges, and community service.

Students who successfully complete the Tamarack programme receive credits in environmental science, physical education, English and human relations/peer helping. However, while individual subject credits are given, the programme is operated on an integrated basis.

Patterson (1995) identified the following four factors from the Tamarack programme which contributed most to the experience of integrated learning:

(1) Students were able to see a project through from conception to finished product. In preparing for a wilderness outing, for example, students designed and made their own pack baskets from black ash trees, stripping the bark and pounding the wood into long flexible strips.
(2) Students sensed that their work was both real and valuable because it was done in, and for, the non-school community. Students worked as lab assistants alongside scientists, and they frequently spoke to community groups and wrote for publications.
(3) There was a strong sense of community that developed among students in the Tamarack programme. This does not occur accidentally but was the result of students continually finding themselves in situations where mutual tolerance, respect and helpfulness, along with the giving and taking of constructive criticism, was essential to getting the job done.
(4) Tamarack students reported feeling a responsibility that was greater than in the regular school programme. They were in charge of critical elements of every undertaking, and were

responsible not just to themselves but to the teacher, the group and the wider community.

Patterson (1995) attributes the apparent success of the programme to

(1) its ability to help students find relevance and meaning in their learning through the integration of the high school curriculum.

(2) the experiential nature of the programme, which permits students to learn from direct experience in the out-of-doors.

Although Patterson (1995) and Horwood (1994) have both reported on the apparent success of the Tamarack programme in Deep River, their comments are based on anecdotal evidence only, including student interviews and observations. Qualitative and quantitative studies including control groups have not been conducted to determine whether the programme was achieving school outcomes.

Horwood's (1994) ethnographic study of a high school integrated programme showed three factors from the outdoor component that enhanced curriculum integration: the inescapable consequences of students' decisions in the outdoors, personal growth and the sense of wonder experienced by students in their encounters with themselves and the natural world.

Knapp (1996) has drawn the implications for outdoor education from the accumulated insights of current cognitive research. In doing so, he has provided a theoretical foundation for integration based on brain-based learning research. From his perspective, outdoor education

(1) enables teachers to orchestrate experiences that address many things that the brain can process simultaneously.

(2) involves environments that can provide relaxation, nutrition, and exercise.

(3) provides settings that, in many cases, contain familiar as well as novel and challenging elements.

(4) involves experiences that engage the mind in forming relevant patterns, often using activities that provide students with immediate feedback.

(5) can colour the depth of cognitive learning and become significant and lasting memories.

(6) when conducted wisely, provides a natural setting for viewing parts in context among wholes.

(7) provides a rich source of peripheral stimuli (including people) to engage learning. Teachers who are genuinely comfortable outdoors project this awareness, enhancing the importance of the lesson to students.

(8) usually capitalizes on the personal worlds of learners by engaging the 'instant' memory systems through direct experience.

(9) teaches 'in context'. It deals with specific facts, concepts, skills, attitudes, and values in the context of firsthand experience. This tendency reduces the need for the extended rehearsal and practice that rote memory working alone requires.

(10) provides supportive learning climates and challenging lessons, with a base in students' interests.

(11) works in a setting that cultivates individuality. Students can express a much wider range of visual, tactile, emotional and auditory preferences than is possible in a classroom. In other words, students have greater freedom to develop the disposition to learn.

Experiential Outdoor Education

In the artificiality of traditional schooling, some students do not accept purposes or see meaning in what they do. School is depersonalized and boring for some students. On the other hand, real experiences in life have many values. Experiences are the basis of all knowledge. Teachers and students operate as if knowledge comes from books, but knowledge comes first from

actual experiences, out of a person's efforts to solve a specific problem. These experiences are refined, reorganized and abstracted into books as knowledge. Experience is the foundation of meaningful verbal learning (Crew, 1977).

Experience-based learning generates special meaning and purpose, a purpose easily seen. When content is learned in relation to use in actual situations, the learning is more permanent, more functional and transferable (Crew, 1977). We accept this in non-academic learning. When someone is taught to swim, we rarely accept verbal knowledge, but performance. The same is, or should be, true in the academic areas; it is only more difficult to judge. Because words can be memorized and repeated, we often fail to recognize authentic learning.

Crew (1977) argues that learning is incomplete without productive activity; that is, applying experience and studies in an activity yielding a product of worth to the student, ie. a song.

In November 1994, the Association for Experiential Education (Luckmann, 1996) approved a definition of experiential education. "Experiential education is a process through which a learner constructs knowledge, skill and value from direct experiences" (p. 7).

The values of proponents of the experiential approach are encapsulated by Ryan and Gray (1993): "What has been preserved as a common theme is that education should impel people through experiences which enhance; self awareness and responsibility; an ability to value and work with others; an environmental appreciation; a capacity to embrace challenge; and a tenacious spirit" (p. 7).

Experiential learning is a blend of cognitive learning plus subjective interpretations based on the learner's feelings and values. Experiential learning refers to any learning that combines the behavioural, affective and cognitive dimensions; it need not take place outdoors, although the majority of experiential learning does (Thompson (1991). Learning must be participative, interactive, rich with feedback, adaptable to the changing needs of the leaner and guided by clear expectations for educational outcomes. Furthermore, it depends on structured interactions with the

'real world' that include variability and uncertainty.

"Tell me, and I will forget; show me, and I may remember; involve me, and I will understand...". This overused proverb seems to crop up whenever anyone attempts to explain what experiential learning is.

Experiential learning, according to Knapp (1996), consists of four segments:

(1) active student involvement in a meaningful and challenging experience,

(2) reflection upon the experience individually and in a group,

(3) the development of new knowledge about the world, and

(4) application of this knowledge to a new situation (where the cycle can begin again).

Although there are numerous models of experiential learning, Knapp (1996) argues that this basic four-step sequence exists in all of them.

The primary goal of outdoor educators was to establish more overall balance in the selection of both learning environments and instructional materials and methods. They saw merit in leaving the classroom occasionally to immerse students in direct experiences with people and places. These educators believed that students needed and wanted to learn outside in small and large groups, using more of their senses and their whole bodies as they explored meaningful problems. They wanted students to understand better the relationships between the school curriculum and community life. Additionally, they knew that bringing everything inside the classroom, either directly or indirectly, was not always appropriate.

Since the early 1980's in Ontario, there has been a major philosophical change in outdoor education from focussing on the affective and cognitive domains to more emphasis on experiential learning. Experiential activities include initiative tasks, rock climbing, camping, rope courses, cross-country skiing, snowshoeing, etc. Most current outdoor education programmes in Ontario include a major component of experiential learning.

Ryan and Gray (1993) purport that experiential outdoor education should "impel people through experiences which enhance; self awareness and responsibility; an ability to value and work with others; an environmental appreciation; a capacity to embrace challenge; and a tenacious spirit" (p. 139)

Many young children like to touch, pat, dig, poke, shake, listen to, pour and play around with whatever is new and interesting in their environment. Close observation of young children suggests that it is through activities such as these, that they learn about the world around them. Research strongly supports this observation. Because young children learn primarily through their senses and through manipulation, they are excellent candidates for outdoor education. The elements of the natural world offer the raw materials to manipulate, and best practices in early childhood education promote the hands-on approach to learning (Wilson, 1995).

Wilson (1995) suggests that the focus of early childhood education is on the development of the whole child; learning is not limited to the cognitive or academic domain. From this perspective, the experiential approach to outdoor education has invaluable resources to offer. Experiences in the out-of-doors tend to be rich in opportunities for nurturing growth in all of the developmental domains, including adaptive, aesthetic, cognitive, communication, sensorimotor and socioemotional.

Research by Tanner (1980) has clearly identified that frequent contact with natural habitats is the single most significant life experience for people in becoming informed and active on behalf of the environment. For his study, informed citizen activists were asked to describe those experiences which were significant in founding their current interests in environmental activism. Of the forty-five usable responses, thirty-five described the outdoors as a prominent influence. Other less important influences identified in the survey included parents (21), teachers (14), books (13) and other adults (12).The vital link between simply possessing knowledge about the environment to that of demonstrating environmentally responsible behaviour requires conviction, and that,

research shows, can come only from experience in the outdoors.

The reader should note that these two classification schemes overlap. For example, it is quite common for a class to participate in a day-long experiential activity like rock-climbing, or to participate in art and biology classes while attending a residential field centre. In addition, the Tamarack programme, reviewed earlier, is described as an experientially-based, integrated outdoor education programme for high school students.

For the purposes of this study, the treatment classes will be attending a beaver ecology programme at the Nonquon Outdoor and Environmental Education Centre, which is classified as an experiential, half-day activity.

Outdoor Education In An Outcome-Based Education Environment

Due to the relatively recent mandate from the Ontario Ministry Of Education and Training, all publicly-funded schools have been working quickly towards implementing an "outcome-based" curriculum in the K - 12 grades. Outcome-based education, commonly referred to as OBE, is one of the most significant reform initiatives sweeping Ontario today. The ideas of OBE are featured prominently in the new science restructuring efforts called the The Ontario Curriculum: Grades 1 - 8: Science and Technology 1998.

OBE is an approach to education that is distinguished by its underlying premises and its promotion of a belief system. The primary underlying premises are that all children can learn and succeed and that schools are responsible for ensuring the success of all students. The belief system that OBE promotes is based on two principles: (Thurlow, 1993)

(1) Instruction should be driven by clearly defined outcomes that all students must demonstrate.
(2) Schools must provide the opportunity for all students to reach the learning outcomes.

The first principle implies that instruction should not be curriculum driven. The goal of

instruction within OBE is to reach a certain outcome, not to make it through a specific book or set of instructional materials and plans.

The second principle implies that outcomes are constant, but that the amount of time needed to reach them, as well as the specific instructional techniques used, may vary for different students. This is in contrast to the typical approach, in which time is held constant and outcomes are allowed to vary for different students.

OBE does not promote a specific instructional technique to achieve a specific set of outcomes. However, it is widely held that mastery learning is an integral part of OBE beliefs and practices.

The essence of OBE lies in its shift away from typical school practices, where performance is based primarily on covering varying sets of requirements in a fixed period of time. Instead, students demonstrate their mastery of a common set of requirements in varying periods of time. Proponents of OBE argue that OBE will eliminate permanent failure, compromised standards and the need for streaming.

Spady and Marshall (1991) have identified seven classroom implications of using OBE. They include:

(1) Decisions, results and programmes would no longer be defined by and limited to specific time blocks and calendar dates.

(2) Grading would be much more criterion-based and would focus on what students can eventually learn to do well rather than on how well they do the first time they encounter something.

(3) There would be a much greater emphasis on collaborative models of student learning and much less inter-student competition for grades.

(4) The system would develop the capacity to respond to differences in student needs and learning rates while at the same time helping them accomplish high level outcomes of

significance. A 'success-for-all' philosophy would prevail.

(5) The learning capabilities of the students would become the central focus of teachers. Textbooks would be replaced by outcomes of significance as the driving force in curriculum design and delivery, rather than the other way around.

(6) Instruction would ultimately focus on higher level thinking and competencies for all students. The instructional methods and materials used in gifted and talented programmes would be accessible to all students.

(7) There will be far more reliance on criterion-referenced tests as indicators of either student or teacher accomplishment.

There are potential pitfalls with OBE. Opponents of OBE point out that

(1) there is a temptation to dilute the outcomes or lower the standards so that all students can reach minimal standards simultaneously.

(2) some parents and students have complained of boredom experienced by the motivated student whose work is completed before the other students.

(3) one of the weakest elements of the OBE approach has to do with the perceived value of effort over ability. A necessary condition for OBE to succeed is a conviction that all students can achieve a common set of outcomes if given sufficient time and support.

(4) students with disabilities typically are excluded from the assessment of outcomes despite the implied inclusiveness of all the students.

(5) the high stakes assessment typically included in OBE has been successfully challenged in American courts. The schools cannot legally deny a diploma to a student if the programme failed to provide the resources and support necessary for the student to achieve the outcomes.

(6) OBE contradicts several values of Traditionalist Christians. They object to affective emphases in content courses, and they oppose the covert indoctrination of social, political and economic

values.

(7) teachers lack the resources and training to successfully implement OBE.

(8) OBE does not encourage students to develop personal meaning from their educational experiences. Public knowledge defined by government-developed learning outcomes is considered more desirable.

OBE was introduced in Ontario several years ago to improve the educational system and make it more accountable. Learning outcomes now permeate every curriculum document being released by the Ontario Ministry of Education and Training. Whether OBE turns out to be the successful reform programme its proponents claim remains to be seen. In the short term, however, every school programme in Ontario including outdoor education, must focus on the achievement of learning outcomes. In the next section, the implications for outdoor education in an OBE environment will be discussed.

Implications For Outdoor Education In An Outcome-Based Environment

Adopting an outcome-based system in outdoor education will result in sweeping changes that include, yet go far beyond, curriculum reorganization, new models of evaluation and a revised daily schedule. While working to create a sound and workable framework for learning and assessment, every outdoor educator will be forced to rethink and reinvestigate the meaning and value of outdoor education.

For example, what constitutes 'A' work in outdoor education? How many times must a student complete a task to prove mastery of it? What is the ideal length of time for an outdoor education centre visit? These and countless other questions will dominate the thoughts of outdoor educators as OBE is introduced to the field.

Early in the implementation process, there will a demonstrated need to have more time set aside each day for curriculum planning and assessment. Outdoor educators are rarely assigned 'prep' periods during the school day to work with colleagues in curriculum planning and it is even more rare to set aside time during the visit for students to undergo formal evaluation, including performance-driven assessments.

Long before students arrive at the outdoor education centres, the classroom teacher and the outdoor education staff will have to develop outcomes for the various activities, to ensure that the visit fulfills the curriculum needs of the visiting students. This undertaking will likely reduce the number of programmes offered at the centres in the foreseeable future. Currently, many outdoor education centres offer at least twenty different programmes at three different division levels. This can result in over 60 different programmes being offered at the centres. Producing meaningful, measurable outcomes for 60 different programmes will be a formidable undertaking. In addition, constructing insightful and effective assessment items for over 60 different programmes will also be an immense task.

Currently, a number of outdoor education programmes in Ontario are delivered by technicians. These employees are paid substantially less than teachers, and have little or no curriculum training. If outcomes and authentic assessments become integral components of the programmes at outdoor education centres, these technicians will require further curriculum training.

There will be a danger for outdoor educators to create an initial list of outcomes and objectives with more idealism than pragmatism. In many cases, they will read like wish lists, containing every skill, attitude and behaviour that outdoor educators covet for their students. For example, the learning objective 'the student will appreciate the beaver and its environment' is currently an important one at the Nonquon Outdoor And Environmental Education Centre with the Durham Board, and is very relevant to this study.

As soon as the students begin to arrive, however, theory will collide with reality. It will become obvious that outdoor educators cannot effectively track 30 students on more than a few significant outcomes during a single day visit, which may last only five hours. Staff will struggle to condense, refine and broaden the outcomes to ensure that the centre is accountable to the curriculum needs of the students. This process will likely change the content and approach of outdoor education in the future.

Even more difficult than writing outcomes will be developing assessment criteria that accurately define student progress. During a five hour visit, it is difficult at best for outdoor educators to get to know their students. Likely, students will be assigned one of three broad performance levels (good, satisfactory, unsatisfactory) to assess how well they have achieved the outcomes, and classroom teachers will need to be heavily involved in programme planning and assessment.

Will five hours for a visit be sufficient time to ensure that most students achieve the stated outcomes and permit suitable authentic assessment? Perhaps a longer visit will be necessary, or a follow-up visit later in the school year will be required. Research and practical teaching experience clearly show that students learn at different rates, which poses a serious problem for outdoor education. The outdoor education experience is frequently restricted by time, due to transportation concerns and reservations by other classes. As a result, outdoor educators will have to address this practical problem that some students learn several times as quickly as others by including enrichment activities and additional support for slow-learners.

Writing the assessment criteria for each programme outcome will be an arduous task. However, the process is a necessary one if outdoor educators will be able to assess the actual progress of the visiting students. Should the assessments be performance-driven, or based on paper and pen tests or both?

Before the assessment criteria can be written, however, outdoor educators will need a

working definition of the learning attributes of students at each of the three performance levels - good, satisfactory, and unsatisfactory. A description of these attributes will require the considerable input from a professional group of outdoor educators, like the Council of Outdoor Educators in Ontario (COEO), to define. For example, members of COEO will need to brainstorm a list of attributes that describe a student working at the 'good' level during a pond study. In defining the characteristics common to the different performance levels, a general agreement on the meaning of the evaluative terms will likely take place.

Although the implementation of OBE in outdoor education is still in its infancy, we are likely to see visiting students to the centres who are learning in an atmosphere charged with meaning. Their programmes will consist of tasks and experiences that their teachers have made pertinent and authentic. Students will be encouraged to compete, not against one another, but against themselves. They will be more active in their own assessment and in diagnosing their own learning needs.

For those outdoor education centres that do not develop outcomes and performance assessments for their programmes, their value to classroom teachers and students will be diminished. Future outdoor education programmes will provide opportunities for students to achieve specific learning outcomes as outlined in recently released curriculum documents. As school budgets are trimmed and accountability concerns become very prominent, these centres without outcome-based programmes may find it more difficult to serve potential clients like school groups.

From a practical perspective, I do not believe that outdoor educators should include programme learning outcomes that promote environmental attitude changes and their assessment. The experience in the United States where OBE has been around for over a decade is clear. Not only is it very difficult to accurately assess short-term attitudinal changes without substantial teacher training, but there is little community consensus on what environmental attitudes

are important or relevant. For example, promoting a no-clear cutting outcome in a community dependent on the forest industry may generate open hostility and threaten community support for the outdoor education centre.

Although many educators and researchers once predicted that OBE would revolutionize educational practices in the classroom, there is little current evidence in Ontario of its dramatic impact. I am cautiously optimistic that outdoor education programmes will continue to prosper in a OBE environment without radical changes in programming. For example, the Trillium Lakelands District School Board recently announced in June 1998 that all grade 6 students in the board will participate in a residential outdoor education programme at the Yearley Centre despite the fact that the recently released science guidelines for grade 6 barely make reference to outdoor education outcomes.

Goals Of Outdoor Education

Attempts to articulate the rationale for outdoor education reveal a wide variety of perspectives and purposes. The most dominant are the affective perspectives but these frequently overlap with other rationales. These rationales will be reviewed using the following organizing scheme:

(1) Multiple Intelligences

(2) Affective

(3) Second Language Acquisition

(4) Holistic

(5) Psychomotor

Multiple Intelligences

Howard Gardner's theory of multiple intelligences, described in Frames of Mind (1985), is grounded in brain biology. Research has confirmed that our musical, language and kinesthetic abilities, for example, work in some ways independently from one another. Intelligence is complex and not limited to a single entity and humans have unique combinations of intelligences.

He defines intelligence as the ability to solve problems or to make something that is valued in one or more cultures (Gardner, 1995). First, though, this ability must address the following questions:

(1) Are there populations that are especially good or especially impaired in an intelligence?

(2) Can an evolutionary history of the intelligence be seen in animals other than human beings?

Gardner (1995) reveals further that "an intelligence is a biological and psychological potential; that potential is capable of being realized to a greater or lesser extent as a consequence of the experiential, cultural and motivational factors that affect a person" (p. 202).

Gardner identified seven intelligences in the early 1980's. A decade later when he revisited the task of identification, he found at least one more ability called 'naturalist' intelligence. Gardner had been asked to explain the achievements of the great biologists, the ones who had a real mastery of taxonomy, who understood about different species, who could recognize patterns in nature and classify objects. Charles Darwin would be a good example.

Gardner's eight intelligences are defined in Table 2.2:

Table 2.2

Summary of Gardner's Eight Intelligences (Checkley, 1997)

Intelligence	Description
Linguistic Intelligence	The capacity to use language to express what's on your mind and to understand other people.
Logical-Mathematical Intelligence	The ability to manipulate numbers, quantities, and operations.
Spatial Intelligence	The ability to represent the spatial world internally in your mind, like a painter or architect who can redefine the spatial world.
Bodily Kinesthetic Intelligence	The capacity to use your whole body or parts of your body to solve a problem, make something or put on some kind of production ie. athletics or dance.
Musical Intelligence	The capacity to think in music, to be able to hear patterns, recognize them, remember them and perhaps manipulate them.
Interpersonal Intelligence	The ability to understand other people.
Intrapersonal Intelligence	An understanding of yourself, of knowing who you are, what you can do, what you want to do, how you react to things, which things to avoid and which things to gravitate toward.
Naturalist Intelligence	The ability to discriminate among living things (taxonomy) as well as sensitivity to other features of the natural world

From Table 2.2, naturalist intelligence is seen to refer to the ability to recognize and classify plants, minerals and animals, including rocks and grass and all variety of flora and fauna. I believe that Gardner's 'naturalist intelligence' is one facet of a multi-pronged argument that I will be presenting in this thesis to support the continued existence and growth of outdoor education in Ontario's school system. Naturalist intelligence is intrinsically worth developing and/or a means to achieve other worthwhile ends.

In an interview with Checkley (1997), Gardner argues that naturalist intelligence is an ability that human beings need to survive. For example, humans need to know which animals to hunt and which to run away from. Gardner also reveals that there is brain evidence to support the existence of naturalist intelligence. There are certain parts of the brain particularly dedicated to the recognition and the naming of what are called natural things.

Klein (1997) contends that Multiple Intelligence theory is too broad to be useful for planning curriculum, and as a theory of ability, it presents a fixed view of student competence. Some of his criticisms of Gardner's theory are:

(1) Gardner's claim that the 'intelligences' are independent is insufficient to account for familiar experiences like dance and conversation. Gardner cannot adequately explain how these 'intelligences' work together productively.

(2) The abilities of geniuses and other exceptional people do not appear to correspond to the categories in Gardner's theory.

(3) The transfer of strategies for solving problems across 'intelligences' is difficult to explain within Multiple Intelligence theory. Even more difficult to explain is the role of language in moving information within and among other 'intelligences'.

(4) Gardner and his associates have developed assessment tasks based on authentic activities in several different 'intelligences'. According to Multiple Intelligence theory, students' performances on activities derived from the same intelligences should show high

correlations. However, in two studies, several pairs of tasks that were supposed to represent independent intelligences correlated strongly.

Klein (1997) believes that Gardner's theory is too broad to be useful for interpreting any specific educational tasks. In addition, knowing that a student is high in 'naturalist intelligence' provides no clues about how to enrich his/her naturalist education.

Outdoor educators are unlikely to question that the 'naturalist' is a true intelligence. Given the opportunity to go outside and observe, some students see things and make connections that others completely overlook. These students seem much more in tune with nature and have an inherent focus. To develop naturalist intelligence, children should be provided with a naturalistic setting like an outdoor education centre to help them understand and learn (Meyer, 1997).

Affective

Davies (1996) suggests that in early childhood education, the outdoor environment is generally recognized as a significant and essential component of the curriculum for young children. She contends that the outdoor environment is regarded as having the potential to foster and extend all aspects of development for children of all ages.

Citing numerous research studies on early childhood education, Davies (1996) offers the following benefits in the affective domain of outdoor environment experiences for young children:

(1) Affective (self efficacy): In meeting the physical challenges presented within outdoor environments, children can build a sense of personal accomplishment and confidence, as well as experience pride and pleasure in their physical achievements.

(2) Affective (attitudes): Contact with nature is vital for psychological well-being, for the development of an awareness and appreciation of the dependence of life on nature and for conceptual learning about the ecology of the natural world.

Zimmerman (1996) contends that a relationship between environmental knowledge and affect has been documented. The author cites five studies which suggest that levels of knowledge, awareness and concern are correlated in some complex, yet not well understood manner. "The fact that higher knowledge scores have been associated with more positive attitudes suggests the need for an investigation into whether more positive affect toward the environment encourages learning" (p. 43).

Newhouse (1990) argues that participation in outdoor-recreation activities encourages an affinity (affective: attitudes) for the natural environment , fostering a generalized opposition to unnecessary degradation. This may explain the environmental activism of leading conservationists.

Since 1985, freshman entering the University Of Puget Sound in Tacoma, Washington have embarked on a three day outdoor adventure programme called 'Passages' as part of their orientation experience prior to their first semester. Freshman evaluations of the programme indicate that the experience increases self-sufficiency and helps to develop a sense of community (affective: self-efficiacy) among the students . There has been a significantly higher rate of freshman-to-sophomore retention and a lower rate of academic probation at the end of the freshman year since 'Passages' began, compared to previous years (Stremba, 1989).

In a study of active, informed citizen conservationists in the National Wildlife Federation, The Nature Conservancy, the National Audubon Society and the Sierra Club, Tanner (1980) claims his research demonstrates that frequent contact with natural habitats is the single most significant life experience for people in becoming informed and active on behalf of the environment. The vital link between simply possessing knowledge about the environment to that of demonstrating environmentally responsible behaviour (affective: attitudes) requires conviction, and that, research shows, can come only from experience in the outdoors.

Second Language Acquisition

From a cognitive perspective, Yeoman (1991) believes that outdoor education is an excellent way of making a second language come alive, of introducing and practicing new vocabulary and structures through hands-on activities and meaningful interaction. She contends that second language classes are well suited to outdoor education settings because one can, more or less teach whatever content one likes as long as the requisite vocabulary and structures are acquired by the students. Further, she argues that classes involving hands-on activities are particularly favourable to second language acquisition because of their consistent linking of visual situations with meaning.

Holistic

Over a twenty year period, Cobb (1977) studied a child's particular need for a close and affectionate interaction with nature. Parents and teachers have all observed children's curiosity - even fascination - with the natural world. Cobb's (1977) theory is similar to that of psychologist Abraham Maslow, who argued that in order to develop our full human potential, we must pass through hierarchical stages, beginning with satisfying our most basic needs. Hence, the fundamental requirements for such items as food, clothing, shelter and safety must be resolved before we can turn our attention to the higher needs: love, friendship, a sense of self-esteem, etc.

Cobb (1977) reasoned that for individuals to evolve normally and attain their full potential, they must have a period of bonding with the natural world. "There is a special period, the little-understood, prepubertal, halcyon, middle age of childhood, approximately from 5 to 11 or 12... when the natural world is experienced in some highly evocative way, producing in the child a sense of some profound continuity with natural processes" (p. 19).

He speaks of the generating spirit of the child who must transcend nature psychologically

and semantically before he can know the nature he perceives in cultural terms. This step is, for each person, a true biocultural transcendence of biological heritage. Individual development is not merely a growth phenomena, but a genuine continuation of evolutionary striving.

In an eloquent explanation of the value of outdoor education, Raffan (1993) also views outdoor education holistically, and asks us to consider a distinction between public meaning and personal meaning. He suggests that public meaning refers to knowledge and skill which can be communicated in words or symbols. The present-day school curriculum consists almost entirely of public meanings. Personal meanings, on the other hand, are individual and idiosyncratic. A person's self-concept, gender identity and physical identity are private meanings and subjective. "In my estimation, the essential outcome of outdoor education is not the public knowledge that is gained... but the personal meaning engendered by direct experience with what is being learned" (p. 6).

Psychomotor

Because young children learn primarily through their senses and through manipulatives (to handle and explore physical objects), Wilson (1995) argues that they are excellent candidates for outdoor education experiences. She believes that the elements of the natural world offer the raw materials to manipulate, and that the best practices in early childhood education promote the hands-on approach to learning.

She suggests that the focus of early childhood education is on the development of the whole child (holistic); learning is not limited to the cognitive or academic domain. With this focus, outdoor education has invaluable resources to offer. Experiences in the out-of-doors tend to be rich in opportunities for nurturing growth in all of the developmental domains, including adaptive, aesthetic, cognitive, communication, sensorimotor and socioemotional.

Citing numerous research studies on early childhood education, Davies (1996) offers the

following benefits of psychomotor experiences in outdoor education:

(1) The potentially greater space and freedom of movement available for children, which enables children to engage in a variety of large muscle activities, enhanced fine motor development and the development of eye-hand-foot coordination.

(2) Experiences within the natural environment provide many rich and varied opportunities for children to use their senses as they come in contact with different types of textures, sounds, smells, colours and tastes.

In conclusion, numerous attempts to articulate the rationale for outdoor education have revealed a wide variety of perspectives and purposes. Although the most dominant rationale continues to be affective perspectives, surprisingly, it is arguably not the strongest or most defensible position. For example, my research at the Nonquon Outdoor and Environmental Education Centre does not reveal any positive attitude change as a result of student participation in the centre's programmes. Gardner's identification of a naturalist intelligence offers outdoor educators a very interesting concept for promoting outdoor education.

Despite the fact that most outdoor education programmes were developed to supplement and support classroom learning, the research offers few cognitive rationales for supporting outdoor education. I would argue that the lack of cognitive rationale to support outdoor education has greatly contributed to the field's recent demise in the current climate of accountability and budget reductions.

Review Of The Literature Concerning Cognitive And Affective Learning In Outdoor Education

A review of studies dealing with cognitive and affective learning in the outdoor environment indicates a meager research base, especially during the last two decades. A good deal

remains to be learned, particularly about how effective outdoor education may or can be.

In searching for articles to include in this research, I was struck by the number of research papers that read more like programme advertisements than research. Where there was some attempt at evaluation beyond anecdotal evidence, the analyses were rarely more than correlational. Several studies reviewed for this chapter are at least fifteen years old, and were conducted during the 'golden age' of outdoor education. The programmes, philosophical foundations, training and personnel have changed dramatically since many of these studies were first conducted. The need for new studies which meet scientific standards will be vital to ensure that outdoor education remains a viable option in the future. Several provincial governments have recently called for demonstrations of accountability in education, and one desirable outcome of these changes will be enhanced quality of research on outdoor education in future years.

A computer search of ERIC and International ERIC data base was conducted for this section of the review. Descriptors which were used included 'outdoor education', 'adventure education', 'environmental education', 'residential programmes', 'outdoor activities', 'experiential learning', 'natural history', 'resident camp programmes', 'outdoor recreation' and 'science instruction'. Manual techniques were also used, including the identification of studies cited by previous authors.

Meta-Analysis

Hattie, Marsh, Neill, & Richards (1997) have conducted an extensive meta-analysis to examine the effects of adventure programmes on a diverse array of outcomes such as self-concept, locus of control and leadership. The meta-analysis was based on 1,728 effect sizes drawn from 151 unique samples from 96 studies published between 1968 and 1994. There were approximately 12,057 unique participants, of whom 72% were male and 28% female. The majority (75%) of participants were classified as adults or university students, and their age was 22.28 years.

The programmes lasted between 1 and 120 days, with a mean of 24 days.

The overall immediate effect size from the various adventure programmes was .34, which the authors argue is similar to the effects of many innovations in classrooms. An effect size is determined by finding the difference between experimental and control group mean scores in standard deviation units. The effects of adventure programmes on self-esteem was .26, which slightly exceeds that of other educational programmes (.19). The meta-analysis also revealed that only some adventure programmes are effective, and then only on some outcomes, and it is probable that only parts of the programmes are influencing these outcomes. The most effective programmes were for adults in the Australian Outward Bound, longer (20+ day) courses (.51), and the least effective programmes were for adults in non-Australian, longer programmes (.07). For all programmes with school-aged students and for all shorter programmes, the mean effect was .26.

Hattie, Marsh, Neill, & Richards (1997) contend that the continued gains and longevity of the follow-up effects were the study's most impressive findings. The programme effect of .34 and a follow-up of an additional .17, leading to a combined pre-follow-up effect of .51, provides justification for adventure programmes. The authors concluded that adventure programmes seem to have a major impact on the lives of participants, and this impact is long-lasting.

The outcomes with the greatest effects included independence (.47), confidence (.33), self-efficacy (.31), self-understanding (.34), assertiveness (.42), internal locus of control (.30) and decision-making (.47). Most of these effects were maintained over time. It appears that adventure programmes are most effective at providing participants with a sense of self-regulation. The effects on most leadership, personality and adventuresome dimensions were also substantial, but increased less substantially over time.

The effects on academic performance - both general academic gains such as problem solving and direct effects such as mathematics scores - were found to be quite high. The effect size

for direct academic performance was .50, and for general academic gains was .45. This thesis includes a narrative review of the literature on cognitive and affective learning in outdoor education, and a quantitative study of the effects of a beaver ecology programme on these two dimensions. Unlike the study by Hattie, Marsh, Neill & Richards (1997), it is not a quantitative synthesis of previous studies, and the research is far more modest in scope.

In an extensive meta-analysis of the effects of various science teaching strategies on achievement by Wise and Oakey (1983), twelve categories of teaching techniques were specified. Among these were questioning, wait-time, focusing, testing, manipulative, presentation mode (including field trips), audio-visual, inquiry or discovery and teacher direction. A total of 400 effect sizes representing 160 studies were produced. The studies reviewed for this meta-analysis were (1) published between 1949 and 1982, (2) were reported in the United States, (3) included students from grades 6 to college, (4) written in English and (5) included control groups.

The main effect size overall was .34 (one-third of a standard deviation improvement over traditional techniques). The authors reported that the mean effect size for presentation mode obtained for cognitive outcomes only was .24. The average impact of using field trips and other presentation strategies was to increase achievement, therefore, by about one-quarter of a standard deviation. Unfortunately, field trips were only one of several alternative presentation modes included in the meta-analysis. Other examples of presentation mode techniques included group discussions, individual or self-paced lessons, simulation games and team teaching. As a result, the singular impact of field trips is unknown, though Wise and Oakey's (1983) meta-analysis suggested that non-traditional learning environments for teaching and learning were more effective than traditional ones.

My study also shares a similar outcome with Wise and Oakey's (1983) meta-analysis in that both are comparing teaching strategies. In my case, I am indirectly comparing the effects of direct experience (experiential learning) with teacher-directed instruction in the classroom.

Cognitive

According to Bloom (1956), the cognitive domain includes those objectives (outcomes) which deal with the recall or recognition of knowledge and the development of intellectual abilities and skills. This is the domain which is most central to the work of much test development, and the domain in which most of the work in curriculum development has taken place.

In a very recent study conducted by Baird (1996) for the Durham Board of Education, the results indicated that although a high number of students were satisfied with their visit to a local outdoor education centre and would like to have the chance to return, they expressed concern that more linkages were needed between the classroom curriculum and the outdoor education experience. Specifically, only 37% of the students surveyed believed that the local outdoor education centre programme helped them to learn concepts taught in the classroom, 38% could not remember, and 25% disagreed. Similar research also shows an insufficient integration between the regular classroom lessons and the specialized outdoor education programmes. Baird (1996) believes that the results show a need for more classroom preparation and follow-up to help students benefit from the outdoor education experience.

Lisowski and Disinger (1992) have completed a study of the effect of field-based instruction on student understandings' of ecological concepts. The researchers addressed the following questions:

(1) What are students' understandings of selected ecological concepts?

(2) Do field-based activities assist in the clarification of these understandings?

(3) Do students retain concepts learned after direct involvement in outdoor field programmes?

Lisowski and Disinger (1992) developed the Student Ecology Assessment (SEA) instrument as a means of obtaining information about students' understandings of concepts related

to ecology and feeding relationships. Two additional instruments were also developed: a student background and attitude form and an instructional emphasis instrument.

Three separate experiential marine science field programmes, each one conducted as a school-sponsored, seven day instructional excursion, served as the treatment. Their study did not include a control.

Their results indicated that participating students showed statistically significant gains in postest SEA scores, as compared to pre-test scores. Results on the retention test, administered four weeks after the postest, indicated that the concepts addressed in the instrument were retained by the students.

The only consistent predictor of student post-test scores was previous knowledge ($p < .001$).Generally, students with the lowest pretest scores showed the greatest gains.

In addition to a lack of controls, this study did not deal with field instruction opportunities typically available to most schools. The cognitive gains experienced by students with the lowest pre-test scores may have been the result of regression towards the mean or the ceiling effect.

Lisowski and Disinger (1992) contend that little educational research exists in the area of comparative effectiveness of various instructional strategies in outdoor education. If outdoor education is to be used more extensively as a preferred teaching and learning strategy for conceptual development, they argue that extensive research must be conducted to support the idea that particular concepts and processes such as those related to ecology can be learned more effectively in the outdoor environment than elsewhere.

Disinger (1987) has surveyed the research that addresses cognitive learning with respect to outside-the-classroom instruction at the elementary school level. He notes that affective, not cognitive learning has traditionally been the primary objective of outdoor education at all K-12 levels. He reveals that most educational research in outdoor education has been mainly non-

cognitive in nature. Disinger (1987) provided a summary of selected research that has had a connection with the cognitive gains possible in outside-the-classroom instruction. His review includes studies done in school situations, as well as museums, zoos and other novel settings. None of the studies he reported on have made claims that out-of-classroom learning experiences are sufficient in themselves to produce significant cognitive gains with elementary students. However, he suggests that there was ample evidence that out-of-classroom instruction is useful in promoting and achieving cognitive gain when effectively planned and managed.

Disinger (1987) concluded that the following factors were effective at promoting cognitive gain in elementary students.

(1) pre-planned trips
(2) coordination with other modes of instruction
(3) care in the selection of learning environments
(4) recognition and mitigation of the effects of novelty
(5) attention to readiness factors

Henderson's (1986) review of the research indicates that approximately 40 % of major studies found no significant discernible differences in their student achievement. The reviewed studies did seem to indicate that a more conducive atmosphere to learning was promoted by an outdoor education centre because of the enthusiasm of the students and the uniqueness of the instructional setting. In other words, the unique setting of the outdoor education centre leads to increased academic achievement.

He suggests that possible reasons for the inconsistencies in the results of the studies reviewed could be attributed to a lack of set standards, procedures, objectives or evaluative methods for comparing and contrasting student achievement. Teacher enthusiasm and instructional style could also have had a significant influence on a student's achievement and cognitive gains.

Backman and Crompton (1984) conducted an extensive review of forty-nine studies concerning cognitive development in outdoor education. Based upon the findings of several researchers, they concluded that it is likely that environmental concepts may be learned more effectively if students are oriented in the classroom with relevant concepts, so that they have some sense of structure before going to the outdoor experience. Their review also suggests that outdoor education may be effective in stimulating critical thinking, increasing problem-solving skills and developing concepts. Little evidence was found to support claims for the superiority of teaching language development in the outdoors. They offered qualified support to the value of outdoor education in facilitating cognitive development. They also noted that "much of the research which was reported falls short of the scientific standards necessary for it to make a meaningful contribution to the body of knowledge in this area" (p. 11).

Falk (1983) demonstrated clearly in his study that field trips (ie. novelty of setting) can have dramatic effects on students' behaviour and learning. Repeated visits to a site produced the best learning results for all ages but particularly for very young children. Significant cognitive learning can occur on field trips and the information may be remembered for a long time.

A single-visit, structured tour of a specific area of a zoological park can be a significant learning experience for elementary students, according to Falk and Balling (1982a). Their study demonstrated that children do learn a great deal on well-structured field trips, indicating that design and execution of the field experience, including well planned pre-trip orientation, are critical. Also, the most effective pre-trip orientation was that conducted by the classroom teacher, trained in advance by a targeted workshop. Orientation by a guide from the zoo or by the classroom teacher, supported only by zoo-generated printed materials, was found to be less useful.

A study by Falk and Balling (1982b) involved several hundred racially mixed, but predominantly white, middle-class suburban children drawn from both the third and fifth grades.

The researchers tested the two age groups because they believed that if the response to novelty of setting was as sensitive to an individual's experience as they had previously found in earlier research, then developmental level might also be an important variable. The activity in this experiment was an outdoor science lesson about trees. Half the children at each grade level did the activity as part of their regular science class in the woods just behind their school - a procedure that was intended to be minimally disruptive to their normal school day. The other half of the students went on all-day field trips, to a wooded nature centre they had not visited previously as a class, and did the same activity. All activities were led by the same two outdoor educators, using approaches that were as nearly identical as possible. Each class received a pre-test several weeks prior to the experimental activity, and were given two post-tests - one the day after the activity and another one month later.

The results indicated that groups showed significant learning as measured by pre-to post-test changes in their scores and significant retention of the content learned on a field trip for a period as long as one month. The fifth-grade children who went to the nature centre, a novel setting, learned the best, but the second greatest improvement was by third graders in a familiar setting. Equally important to note was that the fifth-grade children in the very familiar school environment showed the poorest performance.

MacKenzie and White (1981) examined learning retention among junior high school students involved in a geography field trip. The study was based on a model of memory proposed by Robert Gagne and Richard White. This model of cognitive processes, postulated on the belief that recall of any element is a function of its degree of interlinking in memory with other elements, implies that fieldwork should improve retention because it encourages students to associate various types of verbal knowledge, intellectual skills, images and episodes.

Their research involved comparing learning retention of geographical facts and skills among three groups of students (141 in all) in grades eight and nine in two junior high schools.

One group was treated to an excursion stressing processing of meaning of phenomena observed and experienced during the field trip (active participants); one group participated in a passive excursion (passive listeners only); and the final group participated in the same basic geography course but had no excursion. An achievement test was given to all students soon after the completion of the unit and again 12 weeks later to measure retention. The findings indicated that the students who received either form of fieldwork outperformed the students with no field trips on a test of geography knowledge. In addition, the students who participated in the field trip stressing knowledge and idea processing outperformed students who participated in the passive field trip.

The retention test means were expressed as a percentage of the initial achievement test mean. The processing group showed 90% retention, in marked contrast to the traditional group with 58% and the control group with 51%.

The authors concluded that the information and skill links such as those encouraged during the geography field trip aided recall of facts and skills.

Johnson's (1977) major purpose was to see if the outdoor classroom could be a viable and workable alternative to the standard approach of classroom instruction. Data were collected from selected areas of biology to determine the different achievement levels of an eighth grade group, composed of one hundred and twelve students. Instruction for the control groups was done indoors while the experimental groups were taught outdoors.

After analysis of all data, Johnson (1977) reported no significant gains or decreases and that outdoor education was comparable to that of the traditional indoor mode of instruction.

Based on the results of his study involving fifth-grade students, Howie (1974) determined that students need extensive and structured programmes of advanced organization in order to gain maximum benefit from outdoor education. He concluded that outdoor education programmes should be built as extensions of the classroom, not as unique, isolated events.

His prescription for the most effective programme included:

(1) teacher in-service training,

(2) classroom development of advance organization,

(3) the outdoor education experience and

(4) follow-up in the classroom.

A summary of the cognitive research findings is presented in Table 2.3.

Table 2.3

Summary Of The Cognitive Research Findings

Author	Grade Level	Results
Baird (1996)	Elementary	37% of students surveyed believed that the outdoor education programme helped them to learn concepts taught in the classroom.
Lisowski & Disinger (1992)	High school	Participation in seven day marine science programme resulted in significant cognitive gains. No controls were used in this study.
Disinger (1987)	Elementary	Out-of-classroom instruction is useful in promoting and achieving cognitive gain when effectively planned and managed.
Backman & Crompton (1984)	Mixed	Qualified support to the value of outdoor education in facilitating cognitive development.
Falk (1983)	Elementary	Significant cognitive achievement can result from field trips.
Falk & Balling (1982a)	Elementary	Pre-field trip orientation conducted by the classroom teacher results in the greatest cognitive scores.

Table 2.3 (cont.)

Summary Of The Cognitive Research Findings

Author	Grade Level	Results
Falk & Balling (1982b)	Elementary	Visit by 5th grade students to nature centre achieved the greatest cognitive scores.
MacKenzie & White (1981)	Junior High	Higher cognitive scores resulted from field trip experience.
Johnson (1977)	Elementary	Outdoor education was comparable to that of the traditional indoor mode of instruction in terms of achievement levels.
Howie (1974)	Elementary	Outdoor education should be developed as extensions of the classroom, not as unique, isolated events.

Affective

According to Shepard and Speelman (1986), research related to environmental attitude changes as a result of outdoor education programmes has been limited and generally inconclusive. Further, the correlation between environmental attitudes and behaviour toward the environment is not as strong as was once believed.

Shepard and Speelman (1986) have completed a study to determine whether or not any measurable impact on environmental attitudes occurred as a result of participation in a specific outdoor education programme. Eight groups of campers attended a 4H camp that included an outdoor education programme, which varied in length from three to five days. Six hundred and thirteen campers were involved in the study.

The experimental group consisted of four hundred and five campers who selected the

outdoor education programme as one of their options over the course of the summer. Another two hundred and eight campers, who did not select outdoor education as a programme option, made up the control group. The lack of significant difference between the experimental and control groups following treatment suggested that the experimental treatment had little effect upon environmental attitudes.

Their data also suggested that:

(1) there is a relationship between programme length and conservation attitude development, ie longer more positive,
(2) an initial acclimatization period for urban campers is desirable before implementing conceptual activities and
(3) there is a greater opportunity to develop positive conservation attitudes in first-time campers. ie. evidence that first timers changed more than repeaters.

Gross and Pizzini (1979) analyzed the effects of a treatment consisting of advance organizers and a one-day field experience on environmental orientations of upper elementary students. Environmental orientations are described as expressed responses of individuals to both general and specific areas of their environments and reflect both affective and cognitive inputs; their interactions are involved in making environmental decisions in an integrated manner. The results of this study indicated an observable change in the environmental orientations of fifth-and-sixth-grade students, which the authors attributed to the combination of advance organizers and field experience.

Kalla (1972) undertook a study to determine the effects of an interdisciplinary outdoor education programme by determining changes in student attitudes and values. Treatment of the experimental group was done by participation in a four day off-campus outdoor educational experience. One pre-test and two post-tests were given with the evaluative instrument being the

Education Attitude Index. He found that the programme contributed significantly and favoured changes in the participants attitudes on three of the four developed scales. The programme did not alter or affect attitudes concerned with student to student relationships. Positive changes were both short- and long-term, with some regression occurring when students re-entered the classroom. The control group showed less favorable attitudes.

A summary of the affective research findings is presented in Table 2.4.

Table 2.4

Summary Of The Affective Research Findings

Author	Grade Level	Results
Shepard and Speelman (1986)	4H Campers (Elementary)	Experimental treatment had little effect upon environmental attitudes.
Gross and Pizzini (1979)	Elementary	Observable change in the environmental orientations as a result of the field experience and advance organizers.
Kalla (1972)	Elementary Teachers	Participation in the programme resulted in significant changes in attitudes.

Cognitive And Affective

In a longitudinal study conducted by Hanna (1995), the similarities and differences between adventure and ecology education programming with respect to participants' wilderness knowledge, attitudes, intentions and behaviour were compared. The Audubon Field Ecology Camp participants significantly outperformed the Colorado Outward Bound (Adventure) School participants in basic ecological testing and minimal-impact knowledge testing. Hanna (1995) concluded that this study gave further support to the belief that a well-defined outdoor education

programme, like the Audubon Field Ecology Camp, can have a significant impact on participants' knowledge and attitudes. Hanna (1995) contends that the Outward Bound programme did not perform well on the cognitive tests because the programme leaders at Outward Bound did not give the participants an adequate introduction to the ecology of the mountain environment, despite the fact that the participants indicated in an initial interview that they wanted and expected this sort of information.

In addition, the Audubon group consistently reflected a substantially stronger eco-centric attitude toward wilderness preservation than did the Outward Bound population. The data from the study suggested that the relatively strong relationship between basic ecological knowledge/minimal impact knowledge and wilderness-issue attitudes indicates that it is important to develop positive, eco-centric wilderness attitudes through cognitive channels as well as through affective and physical channels. The more one knows about a given object, Hanna (1995) argues, the more strongly one is likely to feel about it.

Keen (1991) studied the influence of a five-day residential outdoor education programme called Sunship Earth on ecological knowledge for 27 fifth and sixth-grade classes. Ecological concepts were taught to children in small groups. The method of teaching the ecological concepts involved structured and participatory learning activities on concept trails. The activities involved the students in learning experiences that illustrated seven ecological concepts. The concepts were reinforced through activities that encouraged the children to apply the concepts to different examples. It was found that students who attended the programme increased their ecological knowledge significantly. Students who did not attend the Sunship Earth programme did not increase their ecological knowledge scores significantly over the study period. Further, Keen (1991) also found that participation in the programme did not result in more positive environmental attitudes.

Henderson (1986) reviewed 36 abstracts, doctoral dissertations and journal articles dealing with cognitive and affective learning in outdoor education. He noted the lack of consensus on the

question of outdoor education's impact on the cognitive domain. The general agreement that outdoor education promotes affective development was also revealed. The lack of standard ways to evaluate outdoor education programmes was cited as a problem to be addressed. Several doctoral dissertations reviewed by Henderson (1986) have been included in this chapter.

The District Of Columbia Public School System (1985) has evaluated cognitive and affective learning at its Nature-Computer Camp for sixth-grade students in Maryland. The purpose of the camp is to provide economically disadvantaged students, who are residents of Washington, D.C., with the opportunity to reinforce their knowledge of environmental science and to acquire skills in computers. Six 5-day sessions were held with an average of 80 students per session.

The results of the science test scores analyzed on 424 pre-and post-tests showed a significant increase in knowledge acquired ($p < .001$). Results of the attitude scale scores indicated only a modest increase in mean score from pre-to post-test. Post assessment scores on teacher checklists on the participants showed a mean score approximately equivalent to mastery of 94.8% of the designated computer and science skills.

The study would have been more reliable had controls been used, and an economically diverse student population been involved.

Stronck (1983) investigated attitudes and learning of school children from grades 5 to 7 ($n = 816$) in 31 museum tours. He concluded that students made greater cognitive gains, but demonstrated less positive attitudes, when participating in structured tours led by museum personnel. Conversely, less cognitive gains but more positive attitudes were found when students participated in less-structured tours led by their classroom teachers. Although museum education is a field in itself, the results from this study reinforce the conclusion by Falk and Balling (1982a) that out-of-classroom learning is most effective when pre-planned and conducted by the classroom teacher, rather than by specialized resource staff.

Conry and Jeroski (1982) have reported on a major evaluation of an environmental

education programme called Project Learning Tree in British Columbia, that involves both in-class instruction and field trips to natural areas. Both cognitive and affective dimensions were assessed for potential impact of the instructional intervention on students from two school districts in grades 3, 5, and 7. At each grade level, individual item and subtest results for pre- and post-tests were examined to determine areas where exposure to the Project Learning Tree units had had the greatest effect.

The results indicated that for each of the three grades, student achievement test scores improved significantly between pre- and post-testing. Results of the affective instrument were less consistent, with students in grade 5 showing the most significant change in attitude towards trees. No controls were used in this study to compare the effectiveness of the treatments with other programmes.

Morton (1981) has investigated the influence of a winter interdisciplinary outdoor education programme on a sample of middle school students' knowledge about the outdoor environment. The study employed a pre- and post-test non-equivalent control design. Subjects were not randomly selected. The Millward-Ginter Outdoor Attitude Inventory was administered to 254 subjects. The experimental group attended a residential camp while the control group remained in the regular classrooms during the course of the study.

One week prior to students attending the camp, both groups received the pre-test. One week after returning from camp both groups received the post-test. Results revealed a significant increase in the experimental group's scores between pre-and post-tests. In contrast, the control group had declining attitudes.

Meadors (1979) investigated the effects of an interdisciplinary outdoor education programme on selected grade twelve students' attitudes and cognitive knowledge. He compared the influences of the outdoor programme with those of a traditional education approach.

The experimental group included 35 students enrolled in "Unified Studies", containing an

interdisciplinary outdoor educational programme in which the emphasis was on science and language arts. The control group consisted of 35 students enrolled in comparable science and language arts courses in the traditional educational system. Both groups were pre-tested and post-tested.

The students' cognitive knowledge skills were evaluated on the basis of grade point averages and scores in the Comprehensive Test Of Basic Skills (CTBS). The student attitudinal changes were assessed on the basis of four of the components associated with an educational setting: teachers, peers, classroom procedures, and curriculum.

No significant difference was found in cognitive knowledge growth between the programmes. However, this result was not unexpected since the CTBS does not measure science skills. Student attitudes toward the educational setting changed positively in the experimental group and negatively in the control group. Finally, a high correlation was found between negative student attitudes and a decline in academic achievement.

A summary of combined cognitive and affective research findings is presented in Table 2.5.

Table 2.5

Summary Of Combined Cognitive And Affective Research Findings

Author	Grade Level	Results
Hanna (1995)	Mixed	A well-defined outdoor education programme does have a significant impact on participants' knowledge and attitudes. The more one knows about a given object, the more strongly one is likely to feel about it.
Keen (1991)	Elementary	Participation in the 'Sunship Earth' programme resulted in increased cognitive scores but no changes in attitudes.

Table 2.5 (cont.)

Summary Of Combined Cognitive And Affective Research Findings

Author	Grade Level	Results
Henderson (1986)	Mixed	40% of studies found no significant differences in achievement.
District of Columbia (1985)	Elementary	Participation resulted in significantly increased cognitive scores, but only modest increases in attitude change.
Stronck (1983)	Elementary	Students made greater cognitive gains, but demonstrated less positive attitudes, when participating in structured tours led by museum personnel.
Conry and Jeroski (1982)	Elementary	Student achievement scores increased significantly as a result of participation in the outdoor education programme. Results of the affective measures were less consistent. No control group was used in this study.
Morton (1981)	Junior High	Participation resulted in increased cognitive scores and positive changes in attitudes.
Meadors (1979)	High School	Participation did not result in changes in cognitive scores. Student attitudes changed positively.

This review of the literature suggests that there is a definite need to have more substantial evidence to demonstrate whether outdoor education has a more positive impact on affective and cognitive learning of a student than a traditional classroom setting. If the evidence from research is not forthcoming soon, the field of outdoor education is likely to fade away. Research in the cognitive area of outdoor education seems to be inconclusive as to whether students have

attained a better grasp of environmental concepts in an outdoor education centre. The affective research indicates that outdoor education does contribute to positive attitude change. However, the studies are often dated and the field of outdoor education that was evaluated in the seventies has seen some dramatic changes in programming.

The reader should note that earlier in the chapter, the holistic and psychomotor benefits of outdoor education were discussed (Cobb, 1977), (Raffan, 1993), (Wilson, 1995) and (Davies, 1996). Surprisingly, none of these critical studies reviewed later in the chapter measured the holistic or psychomotor impacts of outdoor education programming. Gardner's identification of an eighth 'naturalist intelligence' has also not been investigated by researchers in outdoor education. This is an example of where research in outdoor education has not investigated a potentially positive motivation for justifying outdoor education in the school system. The lack of a theoretical justification for outdoor education has contributed, in part, I believe, to the current demise in outdoor education in Ontario.

More studies and research are needed before any conclusions can be drawn as to whether a student does grasp concepts and fundamentals better in an outdoor educational learning system as opposed to the traditional setting. In addition, further research will be required to determine if current programmes in outdoor education have a positive effect on student attitudes. It is to this end that this study is directed.

Research Questions And Predictions

The goal of this study was to determine whether an outdoor education experience at the Nonquon Outdoor and Environmental Education Centre would have a more positive impact on the cognitive and affective domains of junior-level students than a traditional classroom setting. My research questions and hypotheses were:

(1) Will outdoor education programmes have a greater impact on cognitive achievement, compared to programmes in the traditional classroom? I anticipated that cognitive gains would be greater in an outdoor education setting compared to the traditional classroom setting. The novel setting and the experiential nature of the learning activity (ie. visiting a beaver colony) at an outdoor education centre would contribute to the increased cognitive achievement. Although Henderson's (1986) review of the research indicated that approximately 40 % of major studies found no significant differences in student achievement, his studies did seem to indicate that a more conducive atmosphere to learning was promoted by an outdoor education centre because of the enthusiasm of the students and the uniqueness of the instructional setting. He attributed these discrepancies in part to a lack of set standards, procedures, objectives or evaluative methods for comparing and contrasting student achievement. This researcher believes that the evaluative methods and procedures used in this study will permit the reader to have confidence in the data that was generated concerning cognitive changes. For example, I will establish the precise links in the next chapter (Tables 3.3 and 3.4) between the objectives (outcomes) of the programmes, both experimental and control, and the content of the test.

(2) Will outdoor education programmes have a greater impact on the affective domain, compared to programmes in the traditional classroom? I anticipated that the programmes offered by the Nonquon Outdoor and Environmental Education Centre would have little impact on the affective domain of the visiting students compared to the traditional classroom setting. Shepard and Speelman's (1986) research has indicated that environmental attitude changes as a result of outdoor education programmes has been limited and generally inconclusive. They concluded that a residential outdoor education programme should be able to produce a positive attitude change. I predicted that since day-use outdoor education programmes are not designed to overtly influence environmental attitudes, they would contribute to negligible

changes in the affective domain. I also believe that the shortness of the programme and the small sample size will also contribute to a negligible change in attitudes.

CHAPTER 3

Methodology

Sample

The Victoria County Board of Education and the Durham Board of Education are adjacent legal educational bodies. Students in border communities can attend either board, depending on the convenience and walking distance of nearby bus routes.

The cooperation was obtained of six teachers (from six different elementary schools) from the Durham Board of Education whose classes were scheduled to attend the Nonquon Outdoor and Environmental Education Centre for a beaver ecology programme during the months of May and June of 1997. The Nonquon Centre staff always contacted the teacher in private, prior to my contact, to ensure that the teachers wished to be contacted by this researcher.

The principals of six elementary schools in Victoria County (control group) were then contacted to obtain their recommendations for six teachers who

(1) had an interest in outdoor education, and

(2) who would be interested in participating in this study.

The principals were encouraged to identify teachers from classes that closely paralled the grades and demographics of the students from the Durham Board of Education (experimental group). Following contact with each potential teacher by the principal, this researcher then contacted each teacher to seek his/her cooperation and to give further information about the study.

Split classes caused the greatest difficulty to match. Not only was it more difficult to find matching classes in Victoria County, but it was often more difficult to find equivalent numbers of students from both grades in the same class.

The treatment group (Durham classes) was scheduled (signed up by the teacher one year in advance) to visit the Nonquon Outdoor and Environmental Education Centre for a half-day programme on beaver ecology in the spring of 1997. During the same time period, the control group (Victoria County classes) completed a half-day programme on beaver ecology produced by the Ontario Ministry of Natural Resources (1987) called the The Resource Kit. The final sample was made up of six control classes and six treatment classes (N=184 students). Further information concerning the treatment and control groups is provided in Table 3.1.

Table 3.1

Summary Of The Study's Experimental And Control Groups

Condition	Teacher Identification	Location	Grade
Treatment	T-1	Oshawa	6
Treatment	T-2	Oshawa	Split 5 & 6
Treatment	T-3	Uxbridge	Split 5 & 6
Treatment	T-4	Oshawa	Split 4 & 5
Treatment	T-5	Oshawa	5
Treatment	T-6	Beaverton	4
Control	C-1	Lindsay	Split 5 & 6
Control	C-2	Omemee	6
Control	C-3	Lindsay	6

Table 3.1 (cont.)

Summary Of The Study's Experimental And Control Groups

Condition	Teacher Identification	Location	Grade
Control	C-4	Cameron	4
Control	C-5	Lindsay	Split 5 & 6
Control	C-6	Woodville	4

Development Of The Test Instrument

The test instrument was constructed in the winter of 1996, and consisted of four sections. The first section asked students for demographic information such as name, age, gender, grade, teacher's name and the school's name. Age and grade information were collected in this study because Falk and Balling (1982b) were able to demonstrate in their study that age (grade) differences did have a measurable effect on cognitive achievement in outdoor education.This section was included to describe the sample and to establish pre-test equivalence of the groups.

The second section consisted of survey items that derived information from the student about his/her prior experience with nature (eg. "How often do you watch nature programs on TV?"). Tanner (1980) has clearly identified that frequent contact with natural habitats is the single most significant life experience for people becoming informed and active on behalf of the environment. As a result of this research, several prior experience survey items from Tanner's (1980) study were included in this study to reveal the degree to which a child's cognitive achievement and environmental attitudes were influenced by prior experience..

Section three consisted of Likert-style items selected from Shepard and Speelman (1986),

and measured attitudes towards nature (eg. "I think that snakes are neat. I like to watch them."). This section provided data on research question #2.

Section four of the test instrument measured cognitive achievement, and consisted of questions on the topic of beaver ecology (eg. "How do beavers comb their fur?"). Studies by Falk (1983), Falk and Balling (1982b), Lisowski and Disinger (1992) and MacKenzie and White (1981) have shown that outdoor education experiences are effective at promoting cognitive gain. Using Bloom's (1956) taxonomy of educational objectives, the cognitive test items in this study were classed as knowledge and comprehension items that represented a low level of understanding. The learning objectives for the Nonquon Outdoor and Environmental Education Centre's beaver programme did not demand a high level of student understanding. The test items were constructed to reflect this low level of understanding, and mirror the level of difficulty that was expected from the learning objectives.

The instrument was then examined by two highly respected outdoor educators during a joint interview at the Leslie M. Frost Natural Resources Centre near Dorset for content validity, the appropriateness of the wording of the test items and the equivalence of the two versions (A and B) of the test instrument. After their recommendations were incorporated into the next draft edition of the test instrument, three junior-level teachers in Victoria County that I have worked with on various committees, etc. examined the third draft of the instrument and made suggestions concerning the appropriateness of item wording, test length and clarity of the instructions. The recommendations of the junior-level teaching staff were incorporated into the fourth draft of the instrument, which was pilot tested in three junior-level classes to obtain critical information on the appropriateness of the test item wording, the clarity of the instructions and the time required by students to complete the test.

A summary of the teachers and classes involved in this study's pilot testing is presented in Table 3.2.

Table 3.2

Summary Of The Teachers And Classes Involved In This Study's Pilot Testing

Name Of School	Teacher Identification	Location	Grade
Southwood Park	P-1	Ajax	Split 3 & 4
R. H. Cornish	P-2	Port Perry	Split 3, 4 and 5
Leslie Frost	P-3	Lindsay	5

The two classes from Port Perry and Ajax had just recently visited the Nonquon Outdoor and Environmental Education Centre during the past two months and had participated in the beaver ecology programme. Their experience with the programme was a definite asset in terms of determining the appropriateness of the test questions.

During the pilot-testing session, I led the class through the test. I fielded their questions and noted any difficulties the students were having with particular questions. During this time, the classroom teacher was asked to review the test and note difficult wording, test items not covered during their visit to the centre and poorly worded instructions. The time taken to complete the test was also noted. It had been suggested to this researcher prior to the pilot testing that the test should not exceed 45 minutes in length.

The results of the the pilot test clearly indicated a need to reduce the test-taking time by eliminating certain questions and to replace several words with more appropriate ones for junior-level students. In addition, it was clear that the centre had not covered some material mentioned in the programme's learning objectives. The fifth and final edition of the test instrument consisted of six demographic items, six survey items on prior experience, twelve Likert-style environmental

attitude questions and twelve cognitive test items on beaver ecology. Most students completed the test in less than 45 minutes. (see the Appendix A and B for copies of the test instruments).

The test blueprint for the cognitive items on beaver ecology is presented in Table 3.3. Question #1 on the cross-section was the same for both versions of the test because one of the centre's learning objectives for beaver ecology very clearly stated that students must be able to construct a cross-section diagram of a beaver lodge including 3 rooms, a breathing hole and 2 entrances. The learning objective left very little room for variation. The remaining questions were often mirror images of each other between the two forms. For example, question #8 reads "Why do beavers have a split toenail on their hind feet?" on Form A, and question #8 on Form B asks students "How do beavers comb their fur?". Sample answers for all questions are provided in the Appendices E and F.

Experimental Conditions

During the spring of 1997, six classes of junior-level students attended a half-day programme on beaver ecology at the Nonquon Outdoor and Environmental Education Centre near Uxbridge (treatment group). The beaver programme has been developed and extensively field-tested by the Durham Board of Education (see Appendix G). The same staff member at the Nonquon centre taught the programme to all the students and efforts were made to ensure that as little variation occurred between sessions as possible. Each classroom teacher accompanied their students during the visit. However, once the beaver programme began, the classroom teacher was primarily responsible for behaviour management and providing students with extra assistance.

Although the impression is left with the reader that the programme delivery was identical for all six classes, in reality, the sessions would not always be delivered in a similar manner. Factors such as mosquito problems, rain, cold temperatures, wildlife sightings and

Table 3.3

Cognitive Test Blueprint (Beaver Ecology)

OBJECTIVE	FORM A QUESTIONS	MARK VALUE	FORM B QUESTIONS	MARK VALUE	TOTAL MARK VALUE
Objective 1	Q. 1 - Cross-Section Of Lodge	6	Q. 1 - Cross-Section Of Lodge	6	12
	Q. 2 - Water Plants	2	Q. 2 - Favorite Food	2	4
	Q. 3 - Location Of Food Piles	2	Q. 3 - Why Store Branches	2	4
Obj. 1 Total	**3 Questions**	**10**	**3 Questions**	**10**	**20**
Objective 2	Q. 4 - Rodent Characteristics	2	Q. 4 - Two Other Rodents	2	4
	Q. 5 - Adapted For Swimming	2	Q. 5 - Adapted For Feeding	2	4
	Q. 6 - Mark Territories	2	Q. 6 - Purpose Of Castor Glands	2	4
	Q. 7 - Purpose Of Tail Slap	1	Q. 7 - Purpose Of Oiling Fur	1	2
	Q. 8 - Split Toenail	2	Q. 8 - How Fur Is Combed	2	4
Obj. 2 Total	**5 Questions**	**9**	**5 Questions**	**9**	**18**
Objective 3	Q. 9 - Problems For Humans	2	Q. 9 - Problems For People	2	4
	Q. 10 - Prevent Damming	2	Q. 10 - Stop From Flooding	2	4
Obj. 3 Total	**2 Questions**	**4**	**2 Questions**	**4**	**8**
Objective 4	Q. 11 - Beaver Is Present	3	Q. 11 - Lodge Is Occupied	3	6
	Q. 12 - Limited Colonies	2	Q. 12 - Too Many Beavers	2	4
Obj. 4 Total	**2 Questions**	**5**	**2 Questions**	**5**	**10**
Test Total	**12 Questions**	**28**	**12 Questions**	**28**	**56**

numerous other distractions will affect the students' attention, and consequently, affect fidelity implementation.

Six classes of junior-level students were taught a half-day programme in beaver ecology in Victoria County classrooms (control group). This programme has been developed and extensively field-tested by the Ontario Ministry Of Natural Resources (1987) for classroom teachers (see sample programme sheets in Appendix H). In addition to the extensive written programme provided in The Resource Kit, the classroom teacher was also provided with a 20 minute videotape on beaver ecology (Beaver - Builder Or Destroyer), available from the Victoria County Board of Education to all teachers and a taxidermy model of a real beaver generously donated by a local taxidermy shop. These additional items were supplied to the classroom teacher because the control group was unable to experience directly a live beaver. The videotape and 'stuffed beaver' ensured that all students in the control group would be able to identify a beaver and its lodge.

Both programmes were similar in terms of time for delivery and stated learning objectives, and differed only by location and delivery. The programme in the control group was delivered by six different teachers and the quality of instruction would certainly be dependent on their teaching ability.

This researcher believes that the test instrument was fair to both groups. However, it should be noted that the programme facilitator at the Nonquon Outdoor and Environmental Education Centre objected strongly to these learning aids and felt that the study was biased in favour of the control group.

The learning outcomes for both programmes were very similar. The Durham Board published learning outcomes for their beaver programme as a separate document (see Appendix). The learning outcomes for the Ontario Ministry of Natural Resources (1987) programme were published as objectives in a binder called the The Resource Kit.

The learning outcomes for both programmes are presented in Table 3.4.

Table 3.4

Comparison of Programme Learning Outcomes

Nonquon Outdoor And Environmental Education Centre Treatment Learning Outcomes (Durham Board, 1994)	Ontario Ministry of Natural Resources "Resource Kit" Control Learning Outcomes (1987)
1. The student will know and experience the beaver's food and habitat requirements.	1. Describe the general life history of the beaver.
2. The student will learn the beaver's structural and behavioural characteristics.	2. Describe how the beaver is adapted for life in or near water.
3. The student will respond to measures that control the beaver's activities.	3a. Describe the relationship of beavers to Canadians past and present.
	3b. Describe generally the principles involved in managing furbearers.
4. The student will appreciate the beaver and its environment.	4a. Describe the relationship of the beaver to its environment.
	4b. Better appreciate one of our very special Canadian mammals.

Pre- and post-test questionnaires were administered to the students one day before they participated in the programmes (pre-test), one day after they had finished the programmes (post-test) and two weeks later (retention). Teachers administered the tests to their own students and were given very clear written instructions on testing procedures (Appendix I).

Two forms (A & B) of the cognitive test were administered to the students. The tests were randomly distributed to the students during the pre-test. Half the students received Form A for the pre-test, Form B for the post-test and Form A for the retention test (A-B-A). The remaining students received the B-A-B sequence. Students were randomly assigned to each test sequence within experimental conditions so that proportions of each sequence were the same in the treatment and control groups.

Two different forms of the cognitive test (A & B) were administered to the students to reduce the 'memory effect' of repeated testing. If students had written identical pre-tests and post-tests within 72 hours of each other, their resulting cognitive scores might have been higher due to student familiarity with the questions. To reduce this possibility, two versions of the cognitive were used.

A total of one hundred and eighty-four students participated in this study. Dozens of additional test booklets were discarded because the students had

(1) failed to complete the demographic information correctly,

(2) not completed a total of three test booklets (eg. absent during one of the testing periods),

(3) incorrectly followed the test form sequence (eg. A-A-B), and

(4) failed to submit signed permission forms (Appendix K).

All incomplete data sets were eliminated from this study.

Analysis

Descriptive statistics (means, standard deviations, reliabilities) for all student variables were compiled using SPSS, a statistics software programme. Prior to inferential statistics, all variables were normalized using log transformations to reduce distributional problems. The procedure did not improve the distribution. The analysis of variance was sufficiently robust against distributional abnormalities in this data.

A four-way (factorial) ANOVA procedure was employed, since four independent variables (grade, gender, method and prior experience) were investigated. The four-way ANOVA was done to study the interaction of the four factors and the effect of each of the four factors on each of the four dependent variables (post-test environmental attitudes, retention environmental attitudes, post-test cognitive achievement and retention cognitive achievement). Three- and four-way interactions were suppressed to increase statistical power. The power refers to the ability of a test to find a difference if it is really there. A test of low power would arise under conditions of small sample size, wide within-group standard deviations and small expected effect size. A test of low power would be unable to detect a difference even when one exists, and would lead to the conclusion that a difference is due to chance when it really is not due to chance (Type 2 error). The alpha level was set at $p<.01$ to reduce type 1 error (to reject the null hypothesis when it is true).

Before the ANOVA procedure was carried out, a series of t-tests were conducted to determine whether there were any significant differences between the four independent variables prior to the intervention (pre-test).

Analysis of Variance

This section on analysis of variance was developed from information provided by numerous general statistical textbooks, including Meddis (1973), Nunnally (1975) and Rowntree (1981). I have included an overview of the procedure below because it represents the focus of my statistical analysis and it is important that the reader have a general understanding of how the data were analyzed.

Analysis of variance is a statistical procedure for evaluating the significance of the differences among several means, all at the same time. It answers the following question: Is the (variability) variance of the means obtained in the study too great to permit the conclusion that they are all the means of random samples drawn from the same population? The null hypothesis is that the variance among the means is not too great. If the null hypothesis can be rejected, this means that the independent variable in the study, in effect, has created different populations from which the sample means were drawn.

The basic concept underlying the analysis of variance procedure is that of consistency of scores within the sample. If the sample scores within each group show marked fluctuations, then this reduces the significance of small differences between the mean scores for the two samples. In other words, if the variability of the scores within the sample is small, then a small difference in the overall mean might be impressive. It could then be inferred that this is a reliable effect and that the treatment programme has more impact than the control programme.

The mean and variance are the two vital measures in analysis of variance. Usually, two or more groups are involved, with scores which have different means. The means are tested to see if they are statistically different and not trivially different. To do this, the variance of the individual scores is taken into account. If the two groups have different mean scores, then the spread of scores is examined. If the spread is not the same, the first step in measuring spread or variance is

to treat each score as a deviation from the mean. The bigger the spread, the larger the value of the variance.

Analysis of variance is the technique which allows the researcher to test the significance of a difference between variances, so it helps to test the difference between a set of means. The purpose of analysis of variance, then, is to reduce problems to two variance estimates which can be compared using the F-ratio. The F-ratio may be expressed simply as:

$$F = \frac{\text{Between groups variance estimate}}{\text{Within groups variance estimate}}$$

If the F-ratio is significantly large, then it is concluded that the differences between the means are significant. In other words, the difference between the means is due to something other than random sampling fluctuations.

For a simple analysis of variance, there are three basic assumptions:

(1) First, it is assumed that an individual's score is independent of any other score.
(2) Second, the variance within each treatment group is assumed to be equal to the variance of each of the other treatment groups in the study.
(3) Third, the population from which the samples were randomly drawn is assumed to be normally distributed.

In this study, a significance level of .01 has been used throughout the analysis. The significance level statement expresses the likelihood that the researcher has made a mistake in rejecting the null hypothesis (it is expected that the groups will yield equal scores). If the null hypothesis is rejected at the .01 significance level, the researcher recognizes that there is a 1 in 100 chance that differences discovered are not real. The null hypothesis can be rejected more confidently when the difference is significant to the .01 level, compared to 0.05.

CHAPTER 4

Results

Data will be presented in this chapter to establish the equivalence of the two test forms, determine the reliability of the instruments used in the study, estimate the equivalence of the two samples prior to instruction, display additional descriptive statistics and determine the effects of the treatment on affective and cognitive outcomes.

Equivalence Of Test Forms

T-tests for independent samples were used to estimate the equivalence of the treatment and control groups, and for both versions of the test at the beginning of the study. Table 4.1 shows data on the equivalence of test forms and indicates that the two versions of the test were not significantly different on most comparisons (alpha=.01). There was a statistically significant difference between versions of the cognitive measure on the retention occasion. But the proportions of students taking each version were identical in both groups based on my procedures for distributing the forms so that the two forms were aggregated in subsequent analyses.

Ninety-one students in the study were assigned the A-B-A sequence of tests forms. Ninety-three students followed the B-A-B sequence of testing. During the pre-test for both the treatment and control classes, the teachers were asked to ensure that half the students in each class were randomly assigned Form A and the other half were randomly assigned Form B. Teachers recorded the names of the students receiving each form. This process ensured that during subsequent testing at a later date, the appropriate forms were distributed to the students (eg. A-B-A sequence).

Table 4.2 shows the means and standard deviations for the aggregated measures on the

Table 4.1

Means And Standard Deviations For All Student Variables By Version

VARIABLE	FORM	MEAN	STD. DEV.	RELIABILITY	t	p
PRIOR EXPERIENCE - 6 ITEMS						
	A	10.33	3.34	0.44	0.77	0.44
	B	9.92	3.78	0.54	"	"
ENV. ATTITUDES - 12 ITEMS						
Pre-test	A	39.43	5.38	0.78	0.62	0.54
	B	38.92	5.62	0.80	"	"
Post-test	A	38.98	6.93	0.87	-0.09	0.93
	B	39.06	5.81	0.84	"	"
Retention	A	39.12	5.98	0.84	0.72	0.47
	B	38.47	6.26	0.86	"	"
COG. ACHIEVEMENT - 12 ITEMS						
Pre-test	A	6.74	3.94	0.50	1.49	0.14
	B	5.92	3.42	0.31	"	"
Post-test	A	10.62	3.82	0.28	0.07	0.94
	B	10.57	4.56	0.53	"	"
Retention	A	12.12	4.59	0.57	2.65	0.01
	B	10.32	4.60	0.50	"	"

Note (N)

91 students wrote Form A
93 students wrote Form B

Table 4.2

Means And Standard Deviations For All Student Variables By Experimental Condition

VARIABLE	METHOD	N	MEAN	STD. DEV.	F	p
PRIOR EXPERIENCE						
	TREATMENT	85	10.46	3.35		
	CONTROL	99	9.84	3.73		
ENVIRONMENTAL ATTITUDES						
PRE-TEST	TREATMENT	85	39.54	4.05		
	CONTROL	99	38.86	6.49		
POST-TEST	TREATMENT	85	39.20	5.96	0.86	0.36
	CONTROL	99	38.87	6.73	"	"
RETENTION	TREATMENT	85	39.22	4.35	0.11	0.74
	CONTROL	99	38.42	7.30	"	"
COGNITIVE ACHIEVEMENT						
PRE-TEST	TREATMENT	85	6.40	3.67		
	CONTROL	99	6.26	3.74		
POST-TEST	TREATMENT	85	11.24	4.47	1.66	0.20
	CONTROL	99	10.04	3.88	"	"
RETENTION	TREATMENT	85	12.55	4.47	9.11	0.00
	CONTROL	99	10.06	4.56	"	"

three test occasions within each treatment.

Reliability of the Instrument

Table 4.1 also displays the reliability of each of the three instruments on each test occasion. The internal consistency of the environmental attitude scale was adequate (Cronbach's Alpha =.78 -.87). The other measures were less so. The low internal consistency measures may also indicate that the test was multi-dimensional. This test investigated several dependent variables (post-test and retention environmental attitudes and post-test and retention cognitive achievement), and examined the effects of four independent variables (method, gender, age and prior experience) using analysis of variance. The following strategies were employed to improve the study's reliability.

(1) Two items (# 6 and # 8) from the cognitive test were dropped for the analysis of variance.
(2) Several junior-level teachers and their students reviewed the test instrument prior to the formal testing to identify poor wording, confusing instructions and questions not covered during the beaver programme.
(3) Test-taking time was reduced to eliminate test fatigue.
(4) Recognized leaders in outdoor education reviewed the questions.
(5) The treatment and control were both well-established programmes that had been delivered to thousands of students prior to the study.

This researcher made the decision not to cut other items in order to maintain validity. It was important that the instrument measure different types of cognitive outcomes even though they correlated weakly with each other because the study was aimed at measuring the programme established by the governing curriculum guideline. Generally low reliability decreases the

likelihood that you will find relationships. However, I will show that there were significant relationships despite the low reliability.

The instrument used to measure attitude change had acceptable reliability.

Equivalence of the Two Samples Prior to Instruction

The data in Table 4.3 indicates that there were no significant differences between treatment and control groups for age, gender and grade.

A series of t-tests were conducted to demonstrate whether there were any significant differences between the treatment and control groups for method, age, gender and prior experience before the intervention (pre-test). The results of these t-tests are presented in Tables 4.4 to 4.11. The results indicated that there were no significant differences between attitude and cognitive pre-test means and method and gender. There were two significant differences uncovered by the t-tests. There were significant differences between environmental attitude pre-test means and age, and between environmental attitude pre-test means and prior experience. The differences were noted, but they did not ultimately affect the analysis of variance.

Descriptive Statistics

Table 4.12 displays the Pearson correlations for all variables in the study. The table shows that the pre-, post- and retention test scores correlated moderately within domains and to a small degree between domains. Cohen's (1988) convention[1] was used in this study to report Pearson

Note.

[1] The convention used in this study to report Pearson correlation values is based on Cohen (1988)
<.2 = weak
.2 - small
.5 = moderate
.8 = strong

Table 4.3

Means And Standard Deviations For Grade, Gender And Age By Experimental Condition

	METHOD	N	MEAN	STD. DEV.	t	p
ALL GRADES	Treatment	85	5.15	0.81	-0.49	0.63
	Control	99	5.21	0.84	"	"
ALL GENDER	Treatment	85	1.41	0.50	-0.99	0.32
	Control	99	1.48	0.50	"	"
ALL AGES	Treatment	85	10.55	0.81	-1.46	0.19
	Control	99	10.75	0.97	"	"

Table 4.4

Group Statistics: Pre-test vs. Method

	METHOD	N	MEAN	STD. DEVIATION
ENVIRONMENTAL ATTITUDES	TREATMENT	85	39.5	4.0
	CONTROL	99	38.9	6.5
COGNITIVE ACHIEVEMENT	TREATMENT	85	6.4	3.7
	CONTROL	99	6.3	3.7

Table 4.5

Independent Samples Test: Pre-test vs. Method

	F	Sig.	VARIANCE ASSUMPTION	t	df	Sig. (2-TAILED)
ENVIRONMENTAL ATTITUDES	10.0	0.0	equal variance not assumed	0.9	167.0	0.4
COGNITIVE ACHIEVEMENT	0.1	0.8	equal variance assumed	0.3	182.0	0.8

Table 4.6

Group Statistics: Pre-test vs. Age

	AGE	N	MEAN	STD. DEVIATION
ENVIRONMENTAL ATTITUDES	9 & 10	75	40.5	4.1
	11 & 12	109	38.2	6.1
COGNITIVE ACHIEVEMENT	9 & 10	75	6.7	3.7
	11 & 12	109	6.1	3.7

Table 4.7

Independent Samples Test: Pre-test vs. Age

	F	Sig.	VARIANCE ASSUMPTION	t	df	Sig. (2-TAILED)
ENVIRONMENTAL ATTITUDES	6.3	0.0	equal variance not assumed	3.0	181.9	0.0
COGNITIVE ACHIEVEMENT	0.0	0.9	equal variance assumed	1.2	182.0	0.2

Table 4.8

Group Statistics: Pre-test vs. Gender

	GENDER	N	MEANS	STD. DEVIATION
ENVIRONMENTAL ATTITUDES	MALE	101	38.7	6.0
	FEMALE	83	39.7	4.7
COGNITIVE ACHIEVEMENT	MALE	101	6.3	3.8
	FEMALE	83	6.4	3.6

Table 4.9

Independent Samples Test: Pre-test vs. Gender

	F	Sig.	VARIANCE ASSUMPTION	t	df	Sig. (2-TAILED)
ENVIRONMENTAL ATTITUDES	2.1	0.1	equal variance assumed	-1.2	182.0	0.2
COGNITIVE ACHIEVEMENT	0.5	0.5	equal variance assumed	-0.2	182.0	0.8

Table 4.10

Group Statistics: Pre-test vs. Prior Experience

	PRIOR EXPERIENCE	N	MEAN	STD. DEVIATION
ENVIRONMENTAL ATTITUDES	1 to 10	96	37.8	5.9
	11 to 18	88	40.7	4.6
COGNITIVE ACHIEVEMENT	1 to 10	96	6.1	3.7
	11 to 18	88	6.6	3.7

Table 4.11

Independent Samples Test: Pre-test vs. Prior Experience

	F	Sig.	VARIANCE ASSUMPTION	t	df	Sig. (2-TAILED)
ENVIRONMENTAL ATTITUDES	3.1	0.1	equal variance assumed	-3.8	182.0	0.0
COGNITIVE ACHIEVEMENT	0.0	1.0	equal variance assumed	-1.0	182.0	0.3

Table 4.12

Correlation Matrix Of Student Variables Across Experimental Conditions (N=184)

	Env. Attitudes Pre-test	Env. Attitudes Post-test	Env. Attitudes Retention	Cognitive Pre-test	Cognitive Post-test	Cognitive Retention	Prior Experience	Age	Gender
Env. Attitudes: Pre-test	-								
Env. Attitudes: Post-test	0.72**	-							
Env. Attitudes: Retention	0.76**	0.74**	-						
Cognitive: Pre-test	0.25**	0.25**	0.29	-					
Cognitive: Post-test	0.23**	0.32**	0.24**	0.51**	-				
Cognitive: Retention	0.26**	0.24**	0.34**	0.57**	0.64**	-			
Prior Experience	0.48**	0.40**	0.38**	0.17*	0.08	0.14	-		
Age	-0.21**	-0.18**	-0.20**	-0.16	-0.07	0.06	-0.06	-	
Gender	0.09	0.02	0.09	0.02	0.06	0.09	0.02	-0.03	-

Note

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

correlation values. The attitude scores correlate in the .70's and the cognitive scores correlate in the .50's and .60's. In contrast, the between-domain correlations are in the .20's and .30's. The correlation matrix provides evidence of the convergent and divergent validity of the instruments.

Table 4.12 also shows that prior experience predicts environmental attitudes and to a lesser degree cognitive outcomes. The data indicate that there is a moderate positive relationship between the level of prior experience with nature and the number of positive environmental attitudes that they hold. There is a positive, although weaker relationship between the level of prior experience with nature, and their cognitive scores. There is also a moderate relationship concerning environmental attitudes between the student scores and the ages of the students. Younger students had more positive attitudes.

Tables 4.13 to 4.15 summarize the means and standard deviations for the environmental attitude outcomes on the pre-test (Table 4.13), post-test (Table 4.14) and the retention test (Table 4.15). Each table displays data for males and females within age groups (9 and 10 year olds, 11 and 12 year olds and combined).

Tables 4.16 to 4.18 summarize the means and standard deviations for the cognitive outcomes on the pre-test (Table 4.16), posttest (Table 4.17) and retention test (Table 4.18). Each table displays data for males and females within age groups (9 and 10 year olds, 11 and 12 year olds and combined).

Effect Of Treatment On Environmental Attitudes

The means in Table 4.2 and displayed in Figure 4.1 show that neither treatment nor the control programmes had an impact on changing environmental attitudes.

Effect Of Treatment On Cognitive Outcomes

The cognitive achievement results in Table 4.2 and displayed in Figure 4.2 show differences. Both the control and treatment groups made large gains in cognitive learning. However, the programme offered by the Nonquon Outdoor and Environmental Education Centre (treatment) made a greater contribution to cognitive learning compared to the classroom programme (control).

Analysis of Variance - Environmental Attitudes

To determine the effects of the treatment on environmental attitudes, I conducted two analyses of variance in which the dependent variables were post-test and retention means, and the independent variables were method, gender, age and prior experience. Table 4.19 presents the results for the post-test means. There were significant interactions for METHOD*AGE [F (1,184)=9.001, p=.003] and AGE*PRIOR EXPERIENCE [F(1,184)=7.757,p=.006]. The results indicated that for the METHOD*AGE interaction, younger students benefitted more from the control programme while the older students benefitted more from the treatment programme. For the AGE*PRIOR EXPERIENCE interaction, the results in Table 4.19 indicated that the younger students with less prior experience had more positive environmental attitudes than older students with the same prior experience with nature.

Table 4.20 presents the results for the retention means. There was a significant interaction for METHOD*AGE [F(1,184)=9.740,p=.002]. This interaction also appeared on the post-test results and indicated that younger students benefitted more from the control programme while the older students benefitted more from the treatment programme.

In summary, the analyses of variance procedures indicated that the treatment programme did not affect environmental attitudes.

Effect Size - Environmental Attitudes

The effect size of the treatment programme on environmental attitudes was calculated using the formula of Glass et al (1981). The effect of the treatment on post-test scores was calculated to be .-05 (ES=-.05). Using Cohen's (1988) convention for reporting significant values, the effect size is considered weak. The effect of the treatment on retention scores was calculated to be .02 (ES=.02). Using Cohen's (1988) convention, this effect size is also considered weak in significance.

Table 4.13

Pre-test Environmental Attitudes: Means And Standard Deviations By Gender And Age

METHOD	GENDER	STUDENT AGE	MEAN	STD. DEV.	N
TREATMENT	MALE	9 & 10	38.8	3.9	25
		11 & 12	40.3	4.2	25
		TOTAL	39.5	4.1	50
	FEMALE	9 & 10	40.1	4.1	12
		11&12	39.3	4.1	23
		TOTAL	39.6	4.1	35
	TOTAL	9 & 10	39.2	4.0	37
		11 & 12	39.8	4.1	48
		TOTAL	39.5	4.1	85
CONTROL	MALE	9 & 10	41.4	5.0	17
		11 & 12	36.2	7.9	34
		TOTAL	38.0	7.5	51
	FEMALE	9 & 10	42.2	2.8	21
		11 & 12	38.0	5.9	27
		TOTAL	39.8	5.2	48
	TOTAL	9 & 10	41.8	3.9	38
		11 & 12	37.0	7.1	61
		TOTAL	38.9	6.5	99

Table 4.14

Post-test Environmental Attitudes: Means And Standard Deviations By Gender And Age

METHOD	GENDER	AGE	MEAN	STD. DEV.	N
TREATMENT	MALE	9 & 10	38.80	3.94	25
		11 & 12	41.24	4.59	25
		TOTAL	40.02	4.41	50
	FEMALE	9 & 10	39.00	4.51	12
		11 & 12	37.52	8.81	23
		TOTAL	38.03	7.57	35
	TOTAL	9 & 10	38.86	4.07	37
		11 & 12	39.46	7.11	48
		TOTAL	39.20	5.96	85
CONTROL	MALE	9 & 10	41.65	4.68	17
		11 & 12	35.97	8.21	34
		TOTAL	37.86	7.67	51
	FEMALE	9 & 10	42.48	3.22	21
		11 & 12	37.96	6.02	27
		TOTAL	39.94	5.44	48
	TOTAL	9 & 10	42.11	3.90	38
		11 & 12	36.85	7.33	61
		TOTAL	38.87	6.73	99

Table 4.15

Retention Environmental Attitudes: Means And Standard Deviations By Gender And Age

METHOD	GENDER	AGE	MEAN	STD. DEV.	N
TREATMENT	MALE	9 & 10	39.0	4.0	25
		11 & 12	39.9	5.4	25
		TOTAL	39.5	4.7	50
	FEMALE	9 & 10	38.8	4.4	12
		11 & 12	38.9	3.5	23
		TOTAL	38.9	3.8	35
	TOTAL	9 & 10	39.0	4.1	37
		11 & 12	39.4	4.6	48
		TOTAL	39.2	4.4	85
CONTROL	MALE	9 & 10	40.8	5.7	17
		11 & 12	35.3	8.2	34
		TOTAL	37.2	7.9	51
	FEMALE	9 & 10	42.5	4.0	21
		11 & 12	37.7	7.2	27
		TOTAL	39.8	6.5	48
	TOTAL	9 & 10	41.7	4.9	38
		11 & 12	36.4	7.8	61
		TOTAL	38.4	7.3	99

Table 4.16

Pre-test Cognitive Achievement Scores: Means And Std. Deviations By Gender & Age

METHOD	GENDER	STUDENT AGE	MEAN	STD. DEV.	N
TREATMENT	MALE	9 & 10	5.6	4.1	25
		11 & 12	7.8	3.5	25
		TOTAL	6.7	3.9	50
	FEMALE	9 & 10	5.5	2.8	12
		11 & 12	6.2	3.6	23
		TOTAL	5.9	3.3	35
	TOTAL	9 & 10	5.6	3.7	37
		11 & 12	7.0	3.6	48
		TOTAL	6.4	3.7	85
CONTROL	MALE	9 & 10	7.3	4.1	17
		11 & 12	5.1	3.3	34
		TOTAL	5.8	3.7	51
	FEMALE	9 & 10	8.3	2.9	21
		11 & 12	5.5	4.0	27
		TOTAL	6.7	3.8	48
	TOTAL	9 & 10	7.8	3.5	38
		11 & 12	5.3	3.6	61
		TOTAL	6.3	3.7	99

Table 4.17

Post-test Cognitive Achievement Scores: Means And Std. Deviations By Gender & Age

METHOD	GENDER	STUDENT AGE	MEAN	STD. DEV.	N
TREATMENT	MALE	9 & 10	9.7	4.2	25
		11 & 12	12.6	4.4	25
		TOTAL	11.2	4.5	50
	FEMALE	9 & 10	10.0	4.1	12
		11 & 12	12.0	4.6	23
		TOTAL	11.3	4.5	35
	TOTAL	9 & 10	9.8	4.2	37
		11 & 12	12.3	4.5	48
		TOTAL	11.2	4.5	85
CONTROL	MALE	9 & 10	10.5	3.8	17
		11 & 12	9.1	3.5	34
		TOTAL	9.6	3.6	51
	FEMALE	9 & 10	12.0	3.7	21
		11 & 12	9.4	4.2	27
		TOTAL	10.5	4.1	48
	TOTAL	9 & 10	11.3	3.8	38
		11 & 12	9.2	3.8	61
		TOTAL	10.0	3.9	99

Table 4.18

Retention Cognitive Achievement Scores: Means And Std. Deviations By Gender & Age

METHOD	GENDER	STUDENT AGE	MEAN	STD. DEV.	N
TREATMENT	MALE	9 & 10	10.3	4.0	25
		11 & 12	14.2	4.1	25
		TOTAL	12.2	4.5	50
	FEMALE	9 & 10	10.0	5.4	12
		11 & 12	14.6	3.0	23
		TOTAL	13.0	4.5	35
	TOTAL	9 & 10	10.2	4.4	37
		11 & 12	14.4	3.6	48
		TOTAL	12.6	4.5	85
CONTROL	MALE	9 & 10	9.3	4.6	17
		11 & 12	9.6	4.1	34
		TOTAL	9.5	4.3	51
	FEMALE	9 & 10	11.7	4.3	21
		11 & 12	9.9	5.2	27
		TOTAL	10.7	4.8	48
	TOTAL	9 & 10	10.6	4.5	38
		11 & 12	9.7	4.6	61
		TOTAL	10.1	4.6	99

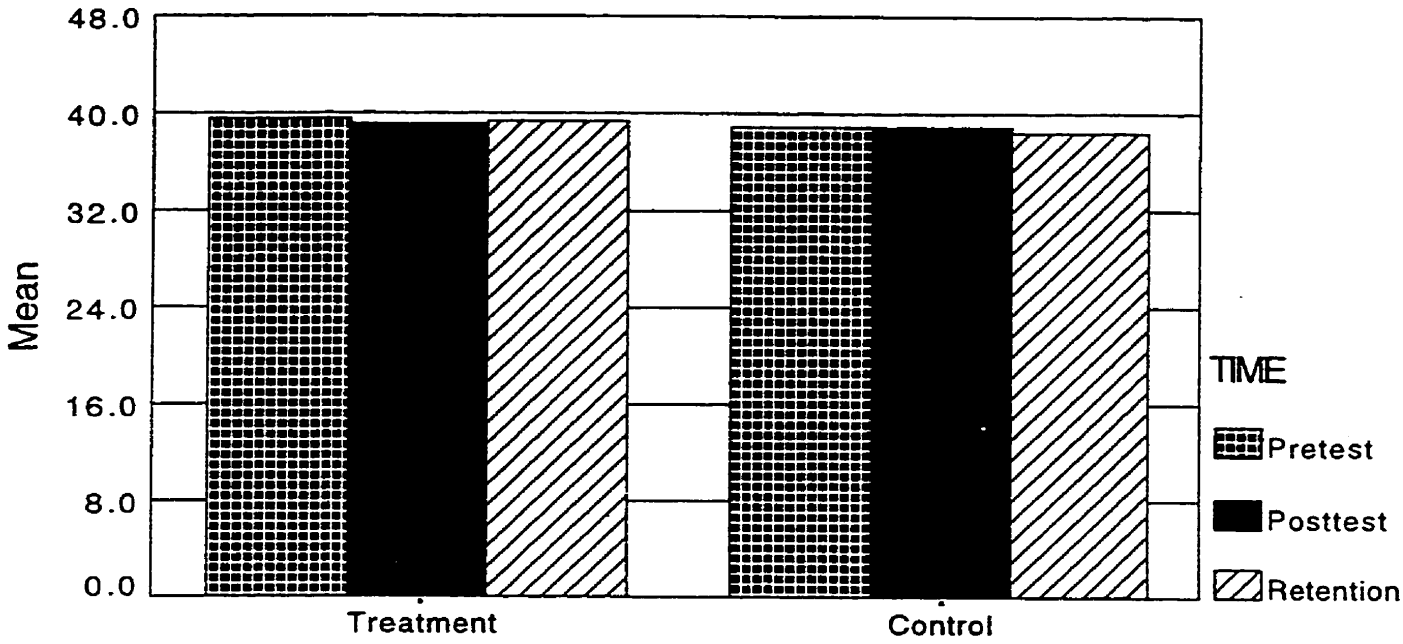

Figure 4.1: Mean Env. Attitude Scores By Exp. Condition

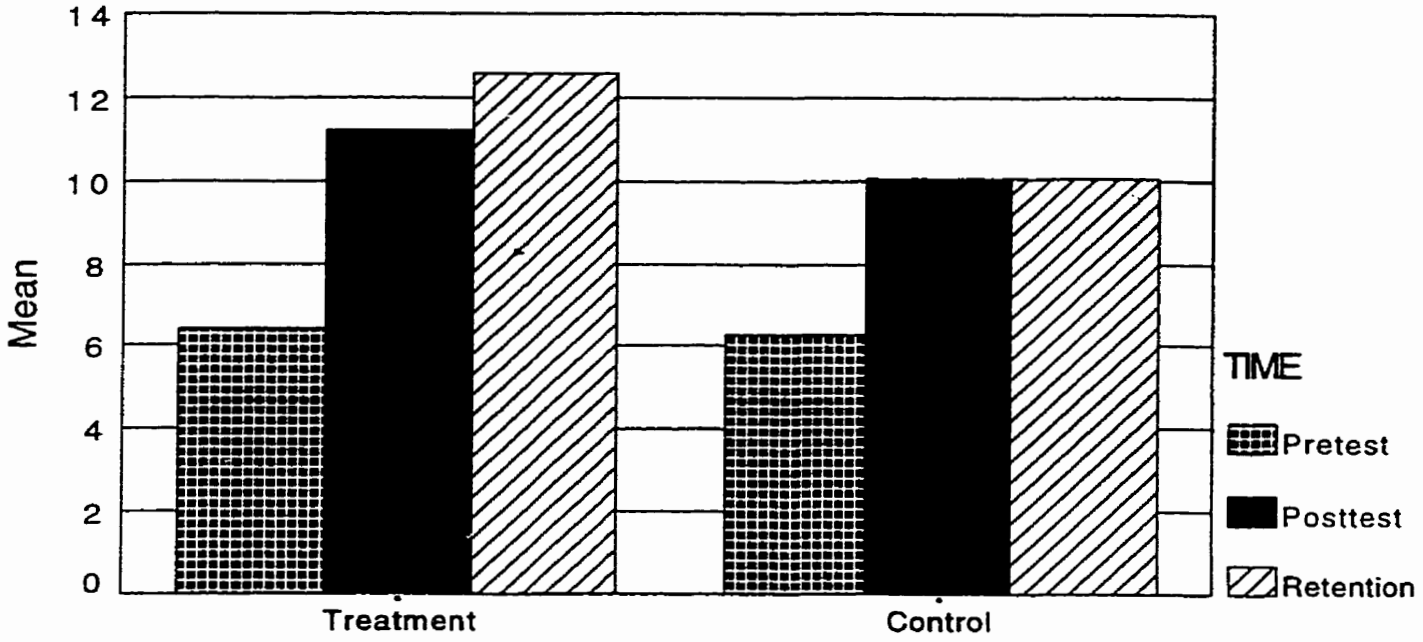

Figure 4.2: Mean Cognitive Scores By Exp. Condition

Table 4.19

Analysis of Variance: Post-test (Environmental Attitudes)

METHOD	GENDER	AGE	PRIOR EXPERIENCE	MEAN	STD. DEVIATION	N
TREATMENT	TOTAL	9 & 10	TOTAL	38.9	4.1	37
		11 & 12	TOTAL	39.5	7.1	48
CONTROL	TOTAL	9 & 10	TOTAL	42.1	3.9	38
		11 & 12	TOTAL	36.9	7.3	61
TOTAL	TOTAL	9 & 10	1 to 10	40.7	4.2	37
			11 to 18	40.3	4.4	38
		11 & 12	1 to 10	35.6	8.2	59
			11 to 18	40.9	4.8	50

Table 4.20

Analysis of Variance: Retention (Environmental Attitudes)

METHOD	GENDER	AGE	PRIOR EXPERIENCE	MEAN	STD. DEVIATION	N
TREATMENT	TOTAL	9 & 10	TOTAL	38.9	4.1	37
		11 & 12	TOTAL	39.4	4.6	48
CONTROL	TOTAL	9 & 10	TOTAL	41.7	4.9	38
		11 & 12	TOTAL	36.4	7.8	61

Analysis of Variance - Cognitive Achievement

To determine the effects of the treatment on cognitive achievement, I conducted two analyses of variance in which the dependent variables were post-test and retention means, and the independent variables were method, gender, age and prior experience. Table 4.21 presents the results for the post-test means. There was a significant interaction for METHOD*AGE [$F(1,184)=11.326, p=.001$]. The results indicated that the younger students benefitted more from the control programme while the older students benefitted more from the treatment programme. Older students achieved higher cognitive scores with the treatment condition. Younger students achieved higher scores during the control programme.

Table 4.22 presents the results for the retention means. There were significant interactions for METHOD [$F(1,184)=9.111, p=.003$], AGE [$F(1,184)=7.436, p=.007$] and METHOD*AGE [$F(1,184)=13.263, p=.000$]. The results for the METHOD interaction showed that the treatment programme had a greater effect on cognitive achievement than the control programme. The AGE interaction indicated that cognitive scores were significantly higher for older students. The METHOD*AGE interaction indicated that younger students benefitted more from the control programme while the older students benefitted more from the treatment programme.

In summary, the analyses of variance procedures demonstrated that the treatment programme had a greater effect on cognitive scores than the control programme. However, the effects of the treatment were moderated by age.

Effect Size - Cognitive Achievement

The effect size of the treatment programme on cognitive achievement was calculated using the formula of Glass et al (1981). The effect of the treatment on post-test scores was calculated to be .28 ($ES=.28$). Using Cohen's (1988) convention for reporting significant values, the effect size is considered small. The effect of the treatment on retention scores was calculated to be .63

(ES=.63). Using Cohen's (1988) convention, this effect size is considered moderate to strong in significance.

In the next chapter, the significance of the results and the implications for outdoor education will be discussed.

Table 4.21

Analysis of Variance: Post-test (Cognitive Achievement)

METHOD	GENDER	AGE	PRIOR EXPERIENCE	MEAN	STD. DEVIATION	N
TREATMENT	TOTAL	9 & 10	TOTAL	9.8	4.1	37
		11 & 12	TOTAL	12.3	4.4	48
CONTROL	TOTAL	9 & 10	TOTAL	11.3	3.8	38
		11 & 12	TOTAL	9.2	3.8	61

Table 4.22

Analysis of Variance: Retention (Cognitive Achievement)

METHOD	GENDER	AGE	PRIOR EXPERIENCE	MEAN	STD. DEVIATION	N
TREATMENT	TOTAL	9 & 10	TOTAL	10.2	4.4	37
		11 & 12	TOTAL	14.4	3.6	48
		TOTAL	TOTAL	12.6	4.5	85
CONTROL	TOTAL	9 & 10	TOTAL	10.6	4.5	38
		11 & 12	TOTAL	9.7	4.6	61
		TOTAL	TOTAL	10.1	4.6	99
TOTAL	TOTAL	9 & 10	TOTAL	10.4	4.4	75
		11 & 12	TOTAL	11.8	4.8	109

CHAPTER 5

Summary And Discussion

The goal of this study was to determine whether an outdoor education experience at the Nonquon Outdoor and Environmental Education Centre would have a more positive impact on the cognitive achievement and affective learning of junior-level students than a traditional classroom setting. My research questions and hypotheses were:

(1) Will outdoor education programmes have a greater impact on the affective domain, compared to programmes in the traditional classroom?

(2) Will outdoor education programmes have a greater impact on cognitive achievement, compared to programmes in the traditional classroom?

Environmental Attitudes

The first major finding of the study is that neither the treatment nor the control programmes had an impact on changing environmental attitudes. This is an important finding. The frequent claim by numerous Outdoor Education Centres across North America that their programmes have a major impact on environmental attitudes was not confirmed by this study.

The results of this study, concerning environmental attitudes, differ from some published studies. There are several possibilities why this occurred. For example, the treatment duration was quite short. Hattie et al's (1997) study found that outdoor education had a positive effect on student attitudes towards the environment. However, the programmes reviewed lasted between 1 and 120 days, with a mean of 24 days. The finding for this thesis is a more generalizable one because many outdoor education centres in Canada, the U.S.A. and Europe offer day-long programmes only,

due to trends described in chapter 1.

Another possibility is that the Nonquon programme lacks some factors that influenced environmental attitudes, resulting in little or no impact. The published outcomes for the beaver ecology programme make no official attempt to directly influence attitudes towards the natural environment. However, there is an underlying assumption held by the staff at the Nonquon Outdoor and Environmental Education Centre that their programmes influence student attitudes.

Gross and Pizzini (1979) attributed observable changes in the environmental orientations of elementary students to a combination of advance organizers and field experience. The staff at the Nonquon Centre do not prepare students in advance for their visit to the centre, which might account for the programme's lack of effect on environmental attitudes.

Another possibility why there was no significant impact on attitudes might be differences between the generality of the attitude measures and the aims of the programme. The attitudes selected for the instrument were very general.

Another feature of my study that may have contributed to the null result was the limited sample size. Although a larger sample size might have detected small differences, the practical significance of the finding would be negligible. Students rarely attend an outdoor education centre more than once a year and then typically for only a few hours. During the planning of the study with the staff in February, the researcher was assured that beaver ecology was the centre's most popular programme, with the expectation that numerous classes would be available for testing. It was disappointing to discover that only six classes signed up for the programme during the two spring months. The results would have been more conclusive if a larger sample of students had been available.

One interaction that did turn up in the between-subject analysis for the post-test and retention test was METHOD*AGE. The interaction suggests that the younger students benefitted

more from the control programme while the older students benefitted more from the treatment programme. I believe that this unexpected result is due to the learning aids which were made available in the control programme. A beaver obtained from a local taxidermy shop, along with an excellent videotape from the board office called Beaver - Builder or Destroyer, were made available to control teachers. These learning aids may have provided more positive assistance to the younger students than was anticipated. This unexpected finding needs to be investigated further through qualitative techniques including interviews with the students.

Another interaction that was corollary to the main finding was AGE*PRIOR EXPERIENCE. The interaction indicates that the younger students with less prior experience had more positive environmental attitudes than older students with the same prior experience with nature. This finding suggests that younger students are less likely to have formed an attitude towards the environment than older students. This finding is similar to one reported by Conry and Jeroski's (1982) study of Project Learning Tree in British Columbia that showed the attitude changes were influenced by student grade.

It is important that a brief review of the pertinent literature be undertaken to look at how my results compare to the results in the published literature.

For example, outdoor education is often looked upon as a champion of the environmental cause. A number of assumptions appear to be made to this end. Yet, many of these assumptions, Morgan (1994) argues, may be based on mythology.

For example, one common assumption is that outdoor education centres provide an ideal setting that places the student in direct contact with the natural environment. This aesthetic experience results in an increase in the basic level of regard students hold for the environment. The results of Morgan's (1994) study do not support this assumption.

Shepard and Speelman's (1986) research has indicated that environmental attitude changes, as a result of outdoor education programmes, have been limited and generally inconclusive. They

concluded that a residential outdoor education programme should be able to produce a positive attitude change. However, their data suggested that there is a direct relationship between programme length and attitude development (eg. longer programmes have more effect).

The results of Gross and Pizzini's (1979) study indicated that observable changes in the environmental orientations of fifth - and sixth - grade students did take place as a result of participation in a one-day field experience. The beaver ecology programme at the Nonquon centre is delivered during a much shorter duration than the programme evaluated by these researchers.

Stronk's (1983) study showed that students who attended a one-day museum tour did not change their attitudes in a positive direction unless the tour was led by their classroom teacher.

Cognitive Achievement

The second major finding of the study is that both the control and treatment programmes made large gains in student cognitive achievement. The programme offered by the Nonquon Outdoor and Environmental Education Centre (treatment) made a greater contribution to cognitive learning compared to the classroom programme (control).

An interaction that was corollary to the main finding on cognitive achievement that turned up in the between-subject analysis for the post-test and retention test, was METHOD*AGE. The interaction was similar to one found for environmental attitudes and suggests that the younger students benefitted more from the control programme while the older students benefitted more from the treatment programme. Older students achieved higher cognitive scores with the treatment condition. Younger students achieved higher scores during the control programme. Although both programmes are designed for junior students, I believe these results demonstrate that the two programmes are more age sensitive than the developers are aware.

Another interaction on the retention test that was corollary to the main finding for between-

subject effects was AGE. Cognitive scores were significantly higher for older students. It is possible that both the treatment and control programmes were designed with older junior-level students in mind. This finding may also suggest that curriculum designers should be more specific about the ages of the students that their programmes are targeted for. It may not be sufficient to design programmes that are geared simply for junior-level students. Similar results were reported by Falk and Balling (1982b) and Falk (1983). However, Hattie et al (1997) reported that effects were not moderated by age.

I anticipated that cognitive gains would be greater in an outdoor education setting compared to the traditional classroom setting. The novel setting, the experiential nature of the learning activity (ie. visiting a beaver colony) at an outdoor education centre and the centre's stated mandate to support and enhance the classroom curriculum outcomes would contribute to the increased cognitive achievement.

Research by Hattie et al (1997), Hanna (1995), Lisowski and Disinger (1992), Keen (1991), District of Columbia (1985), Stronck (1983), Conry and Jeroski (1982), Falk (1983), Falk and Balling (1982b) and MacKenzie and White (1981) indicate that significant cognitive changes can occur as a result of outdoor education experiences. The programmes studied varied from short day-long activities to residential experiences of varying length.

Although Henderson's (1986) review of the research indicates that approximately 40% of major studies found no significant differences in student achievement, his review did seem to indicate that a more conducive atmosphere to learning was promoted by an outdoor education centre because of the enthusiasm of the students and the uniqueness of the instructional setting. He attributed the failure to find cognitive effects in part to a lack of set standards, procedures, objectives or evaluative methods for comparing and contrasting student achievement. This researcher believes that the evaluative methods and procedures used in this study will permit the reader to have confidence in the data that was generated concerning cognitive changes.

It is important that the issue of fidelity of implementation be addressed for the cognitive portion of this research. The pilot testing of the instrument was undertaken using standard procedures to ensure the cognitive test instrument would be reliable. However, the programme facilitator admitted to me that fidelity of implementation suffered during the delivery of the beaver ecology programme at the Nonquon centre. Despite the centre's best efforts, each class likely received a slightly different beaver ecology programme for any one or more of the following reasons listed below. These factors affect all outdoor education programmes and are very difficult or impossible to control. It remains a difficult challenge to researchers to overcome these factors to increase reliability.

Some of the factors that likely influenced implementation fidelity included:

(1) weather
(2) mosquitoes
(3) wildlife sightings having little to do with beavers
(4) student behaviour
(5) programme delivery length depended on the arrival time of the students
(6) cooperation of the local beaver colony
(7) number of student questions during the presentation
(8) ability and interest of the students

The implementation issue in outdoor education will continue to challenge researchers and must be accepted as an intrinsic problem in this field. Further research on the issue of implementation fidelity in outdoor education is imperative if we hope to improve confidence levels with future studies.

Implications Of This Research

The results of this study indicate that outdoor education programmes are effective at promoting cognitive changes in students. This finding has been reported by numerous researchers but further rigorous studies are needed to ensure confidence in the data. It is vital to the future of outdoor education that practitioners provide this much needed evidence to educational administrators, to show that outdoor education is at least as, or more effective than classroom instruction and offers advantages over classroom instruction due to the novel setting and the experiential nature of the instruction.

Further research needs to be conducted on the issues of implementation fidelity in outdoor education programming and delivery, the comparative effectiveness of residential and day-use programmes and the effects of age, prior experience and gender. Another issue not addressed in current or past research should be the comparative effectiveness of private- versus publicly-funded outdoor education programmes. Outdoor education centres will likely become privately operated during the next few years and the impact of these for-profit programmes should be evaluated.

Most outdoor educators continue to believe that their programmes have a positive impact on environmental attitudes. The results of this study and numerous other investigations have been unable to confirm this interaction. In this era of performance standards and accountability, I strongly believe that outdoor educators should discontinue the common practice of making this claim because it is damages the credibility and the educational value of outdoor education. Outdoor educators should focus on what they appear to do best, which is promoting cognitive changes in students. Any secondary effects involving improving environmental attitudes should be considered an unexpected but worthwhile benefit.

Numerous studies have been conducted on the impact of outdoor education on environmental attitudes. The inconclusive evidence from these studies suggests further research is

required, using scientific procedures for data collection and analysis.

Epilogue

During the last three years, I have travelled across Ontario to interview outdoor educators about their vision for the future of outdoor education. I have also asked them to identify the characteristics of effective outdoor education programmes.

The current funding problem in outdoor education is the result of a troubling perception in the political and educational community that outdoor education is irrelevant. Outdoor educators have failed to recognize that their most pressing priority is to demonstrate the educational value of outdoor education, rather than finding alternative sources of funding. Earlier in this study, I argued that outdoor educators abdicated their responsibility in the 80's by encouraging classroom teachers to teach environmental knowledge and awareness in the schools, rather than at an outdoor education centre. As a result, they now have little to offer the classroom teachers to assist them in meeting their curriculum outcomes. Far too many outdoor education programmes in Ontario focus their attention on leisure skills like orienteering, cross-country skiing, snowshoeing, canoeing, initiative tasks and rock climbing. Although these programmes are popular with students, they have little value to educational administrators in an outcome-based learning environment, in which 75% of the new Ontario elementary school timetable will focus on mathematics, language arts and science.

I believe that outdoor educators need to go back to the fundamental goals of outdoor education, to recalibrate their programmes to give explicit attention to cognitive outcomes. This study reported that many outdoor education programmes are focused on influencing students' environmental attitudes. However, my research indicates that they are unlikely to be successful in meeting this goal. Outdoor educators need to continue to improve the quality of their programming, by ensuring that cognitive and to a lesser extent, affective outcomes, are successfully achieved. In

addition, outdoor education programmes should clearly state to the user group the learning outcomes that will be achieved. Every effort should be made to achieve these outcomes for each and every class that arrives at an outdoor education centre. Failure to be accountable will leave the field of outdoor education vulnerable to budgetary reductions and loss of educational credibility. There should also be some form of assessment that takes place after the outdoor education experience, to evaluate the success of the programme. If there are no visible benefits to the school system, the programmes will die. The burden of proof is on the programme. The outdoor education activity should be an integral part of a unit of study in the classroom and an important and recognized component of the students' performance assessment. A superintendent I spoke to recently went as far as to suggest that the students' performance during an outdoor education experience should be reported on the next report card.

Credible action research studies in outdoor education are vital. Glowing programme satisfaction surveys will have little value in ensuring the continued existence of an outdoor education programme. What will strengthen the case for outdoor education in the future, will be research which clearly demonstrates that a few specific compulsory learning outcomes, from the current curriculum guidelines, will more likely be achieved during an outdoor education experience than in the classroom.

In closing, I would like to share with the reader a quotation credited to Baba Dioum who best describes for me why outdoor education is important. "In the end, we will conserve only what we love, we will love only what we understand and understand only what we learn".

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APPENDIX A

UNIVERSITY OF TORONTO

BEAVER ECOLOGY

Program Evaluation - FORM A
(5th Edition)

Name: _____ **code =** _____

School: _____ **code =** _____

Teacher: _____ **code =** _____

Class: _____ **code =** _____

Male/Female: _____ **code =** _____

Age (as of May 1, 1997): _____ **code =** _____

PART A - CONTACT WITH NATURE QUESTIONNAIRE:

This questionnaire contains 6 questions . Read each question and then CIRCLE the response which best describes you.

1. **Do you belong to any of the following outdoor groups ? Circle the clubs you belong to.**

   4-H Club, Junior Naturalist Club, Wolf Cubs, Boy Scouts, Brownies, Girl Guides, Other (please specify)_____, _____

2. **How often do you watch nature programs on TV?**

   once a day, once a week, once a month, once a year, never

3. **How often do you read books or magazines about nature or animals?**

   once a day, once a week, once a month, once a year, never

4. **How often do you visit a provincial park, national park or conservation area?**

   once a day, once a week, once a month, once a year, never

5. **How many days during the past year did you go camping?**

   0 days, 1 to 5 days, 6 to 10 days, 11 to 15 days, more than 15 days

6. **How often do you help with gardening or composting?**

   once a day, once a week, once a month, once a year, never

PART B - ENVIRONMENTAL ATTITUDE QUESTIONNAIRE:

This survey contains 12 statements. Read each statement and then circle the number which best shows how you feel.

SD = Strongly Disagree

D = Disagree

A = Agree

SA = Strongly Agree

		SD	D	A	SA
1.	I think that recycling paper is important.	1.	2.	3.	4.
2.	I think that tree trunks are a good place to carve my initials.	1.	2.	3.	4.
3.	I enjoy the different sounds I hear in the woods.	1.	2.	3.	4.
4.	I think that drawing pictures and writing poems about nature is a nice way to show my feelings.	1.	2.	3.	4.
5.	I think that learning about the environment is boring.	1.	2.	3.	4.
6.	I think you should plant new trees when you cut down old ones.	1.	2.	3.	4.
7.	I think that nature walks are a waste of time. I'd rather stay home and watch TV.	1.	2.	3.	4.
8.	I like to look for wildflowers growing, but I never pick them.	1.	2.	3.	4.
9.	I don't worry very much about the environment.	1.	2.	3.	4.
10.	I think that snakes are neat. I like to watch them.	1.	2.	3.	4.
11.	I think ponds are full of bad things.	1.	2.	3.	4.
12.	I always look for a wastebasket to throw my candy wrappers into.	1.	2.	3.	4.

PART C - PROGRAM EVALUATION: BEAVER ECOLOGY

Answer all questions in the spaces provided.

1. **Draw a cross-section of a beaver's lodge. In your diagram, illustrate and label three rooms, a breathing hole, and two entrances.**

2. **What "water plants" are eaten by beaver?**

_____

_____

3. **Where are the beaver's food piles located in relation to the lodge?**

_____

_____

4. **Give two reasons why the beaver is a member of the rodent family?**

   a) _____

   b) _____

5. **Why do beavers slap their tails on the surface of the water?**

_____

6. **Humans build fences to mark their property or territory. How do beavers mark their territories?**

_____

_____

7. **How are beavers adapted for swimming?**

a) _____

b) _____

8. **Why do beavers have a split toenail on their hind feet?**

_____

_____

9. **Beavers dam local streams. What problems does this cause for humans?**

a) _____

b) _____

10. **What 2 things can be done to prevent beavers from damming streams?**

a) _____

b) _____

11. **How can you tell a beaver lives in a pond?**

a) _____

b) _____

12. **Why are there only a few beaver colonies in an area?**

a) _____

b) _____

APPENDIX B

UNIVERSITY OF TORONTO

BEAVER ECOLOGY

Program Evaluation - FORM B
(5th Edition)

Name: _____ **code =** _____

School: _____ **code =** _____

Teacher: _____ **code =** _____

Class: _____ **code =** _____

Male/Female: _____ **code =** _____

Age (as of May 1, 1997): _____ **code =** _____

PART A - CONTACT WITH NATURE QUESTIONNAIRE:

This questionnaire contains 6 questions . Read each question and then CIRCLE the response which best describes you.

1. **Do you belong to any of the following outdoor groups ? Circle the clubs you belong to.**

   4-H Club, Junior Naturalist Club, Wolf Cubs, Boy Scouts, Brownies, Girl Guides, Other (please specify) _____, _____

2. **How often do you watch nature programs on TV?**

   once a day, once a week, once a month, once a year, never

3. **How often do you read books or magazines about nature or animals?**

   once a day, once a week, once a month, once a year, never

4. **How often do you visit a provincial park, national park or conservation area?**

   once a day, once a week, once a month, once a year, never

5. **How many days during the past year did you go camping?**

   0 days, 1 to 5 days, 6 to 10 days, 11 to 15 days, more than 15 days

6. **How often do you help with gardening or composting?**

   once a day, once a week, once a month, once a year, never

PART B - ENVIRONMENTAL ATTITUDE QUESTIONNAIRE:

This survey contains 12 statements. Read each statement and then circle the number which best shows how you feel.

SD = Strongly Disagree

D = Disagree

A = Agree

SA = Strongly Agree

		SD	D	A	SA
1.	I think that recycling paper is important.	1.	2.	3.	4.
2.	I think that tree trunks are a good place to carve my initials.	1.	2.	3.	4.
3.	I enjoy the different sounds I hear in the woods.	1.	2.	3.	4.
4.	I think that drawing pictures and writing poems about nature is a nice way to show my feelings.	1.	2.	3.	4.
5.	I think that learning about the environment is boring.	1.	2.	3.	4.
6.	I think you should plant new trees when you cut down old ones.	1.	2.	3.	4.
7.	I think that nature walks are a waste of time. I'd rather stay home and watch TV.	1.	2.	3.	4.
8.	I like to look for wildflowers growing, but I never pick them.	1.	2.	3.	4.
9.	I don't worry very much about the environment.	1.	2.	3.	4.
10.	I think that snakes are neat. I like to watch them.	1.	2.	3.	4.
11.	I think ponds are full of bad things.	1.	2.	3.	4.
12.	I always look for a wastebasket to throw my candy wrappers into.	1.	2.	3.	4.

PART C - PROGRAM EVALUATION: BEAVER ECOLOGY

Answer all questions in the spaces provided.

1. **Draw a cross-section of what you think the beaver lodge would look like. Include in your diagram 3 rooms, a breathing hole, and 2 entrances. Label your diagram.**

2. **What are the beaver's favorite foods?**

_____

_____

3. **Why do beavers store branches underwater near a lodge?**

_____

_____

4. **The beaver is a rodent. List 2 other rodents common to where you live.**

   a) _____

   b) _____

5. **Why do beavers oil their fur?**

_____

6. **What do people use beaver castor glands for?**

_____

_____

7. **How do beaver feed underwater without drowning?**

a) _____

b) _____

8. **How do beavers comb their fur?**

_____

_____

9. **Beavers are now very common in Ontario. Most people are pleased, but there are times and places where beavers cause problems. Describe 2 problems that beavers can create for people.**

a) _____

b) _____

10. **What 2 things can be done to stop beavers from flooding areas important to humans?**

_____

_____

11. **By looking at a beaver lodge, how can you tell that the beaver lodge is occupied?**

a) _____

b) _____

12. **What happens when there are too many beavers living in an area?**

_____

_____

APPENDIX C

MARKING SCHEME - PART A: CONTACT WITH NATURE

1. Do you belong to any of the following outdoor groups ?

   The number of groups indicated by the student was recorded as their mark.

2. How often do you watch nature programs on TV?

CHOICE	# OF MARKS
once a day	4
once a week	3
once a month	2
once a year	1
never	0

3. How often do you read books or magazines about nature or animals?

CHOICE	# OF MARKS
once a day	4
once a week	3
once a month	2
once a year	1
never	0

4. How often do you visit a provincial park, national park or conservation area?

CHOICE	# OF MARKS
once a day	4
once a week	3
once a month	2
once a year	1
never	0

5. How many days during the past year did you go camping?

CHOICE	# OF MARKS
O days	0
1 to 5 days	1
6 to 10 days	2
11 to 15 days	3
more than 15 days	4

6. How often do you help with gardening or composting?

CHOICE	# OF MARKS
once a day	4
once a week	3
once a month	2
once a year	1
never	0

APPENDIX D

MARKING SCHEME - PART B: ENVIRONMENTAL ATTITUDE QUESTIONNAIRE

	MARKS			
Question #	SD	D	A	SA
1	1	2	3	4
2	4	3	2	1
3	1	2	3	4
4	1	2	3	4
5	4	3	2	1
6	1	2	3	4
7	4	3	2	1
8	1	2	3	4
9	4	3	2	1
10	1	2	3	4
11	4	3	2	1
12	1	2	3	4

APPENDIX E

MARKING SCHEME - PART C: BEAVER ECOLOGY

FORM A QUESTIONS		MARKS
1.	Room # 1	(1)
	Room # 2	(1)
	Room # 3	(1)
	Entrance # 1	(1)
	Entrance # 2	(1)
	Vent	(1)
		(6)
2.	Duckweed Water Lily Grasses Sedges Willow	Any two for (2) marks
3.	Underwater	(1)
	Near the lodge	(1)
4.	Plant eater Chisel-like teeth Teeth grow constantly	Any two for (2) marks
5.	To warn other beaver of danger	(1)
6.	Castor glands Their scent	Any one for (1) mark
7.	Stream-lined shape Can stay underwater for 15 minutes Oil glands Flat tail Webbed feet Valves	Any two for (2) marks

8.	To comb	(1)
	its fur	(1)
9.	Flooding of roads Valuable trees lost Blocks water supply Beaver fever Loss of fishing Floods homes	Any two for (2) marks
10.	Trap them Screened drain pipe Move them	Any two for (2) marks
11.	Dam Pond Lodges Tracks Trees cut down See beaver	Any two for (2) marks
12.	Limited food supply	(1)
	Beavers are territorial	(1)

APPENDIX F

MARKING SCHEME - PART C: BEAVER ECOLOGY

FORM B QUESTIONS		MARKS
1.	Room # 1	(1)
	Room # 2	(1)
	Room # 3	(1)
	Entrance # 1	(1)
	Entrance # 2	(1)
	Vent	(1)
		(6)
2.	Red maple Aspen Birch Bark and plants	Any two for (2) marks
3.	Source of food in winter	(1)
	Safe from predators while eating	(1)
4.	Rat Mouse Squirrel Muskrat Woodchuck Porcupine Chipmunk	Any two for (2) marks
5.	To make the fur waterproof	(1)
6.	Perfume	(1)
7.	Close lips	(1)
	behind teeth	(1)

8.	Split toenail	(1)
	on hind foot	(1)
9.	Flooding	(1)
	Killing trees	(1)
10.	Trap the beaver	(1)
	Fenced culvert	(1)
11.	Lodge top is free of vegetation Mud on sides Beaver sound from vent Wood chips on ground near lodge Freshly chewed sticks	Any two for (2) marks
12.	Food runs out Disease may spread Beavers may move away	Any two for (2) marks

NONQUON ENVIRONMENTAL EDUCATION CENTRE

BEAVER STUDY

CURRICULUM CONNECTIONS: Junior Science

ABSTRACT:

The beaver is a fascinating rodent that is well suited both structurally and behaviourally to its habitat.
The beaver's energetic modification of its environment affects both wildlife and humans. People face decisions when the beavers cause flooding and harvest trees in their areas.

PREREQUISITE KNOWLEDGE:

(a) characteristics of the beaver
(b) characteristics of the lodge
(c) habitat
(d) diet
(e) problems for people

ENVIRONMENTAL IMPLICATIONS:

(a) Human - animal relationships.
(b) Habitat importance and dynamics.
(c) The role of trapping in population control.

THE DURHAM BOARD OF EDUCATION

Nonquon Environmental Education Centre
Durham Board of Education

Program Title: BEAVER STUDY **Time:** 1/2/ day

Objectives:

1. The student will know and experience the beaver's food and habitat requirements.
2. The student will learn the beaver's structural and behavioural characteristics.
3. The student will respond to measures that control the beaver's activities.
4. The student will appreciate the beaver and its environment.

PROGRAM CONTENT	TEACHING STRATEGIES
1. Classification - define rodent and give examples - second largest rodent in the world	1. Through activity centres, students will respond to questions on skulls, scats, trees, lodges, problems associated with beavers.
2. Food - 'water veggies' and specific trees	2. Conduct a hike to view and discuss beaver activity.
3. Habitat - water and specific trees	3. Brainstorm advantages and disadvantages of beaver actions. Through questioning or role playing, examine possible solutions.
4. Lodge - distinguish between a lodge and a dam	
5. Characteristics - structure and behaviour	
6. Beavers and People - problems - solutions	

Nonquon Environmental Education Centre
Durham Board of Education

Performance Criteria: Evaluation opportunities at Nonquon are limited. The following are suggested criteria for teachers to use when evaluating student performance.

1. Verbally or in writing, the student will list any three structural, and three behavioural characteristics of the beaver.
2. The student will draw a cross-section of a lodge, illustrating and labeling three rooms, breath hole, and two entrance ways.
3. The student will accurately describe, either verbally or in writing, two ways to stop beavers from causing flooding.

EQUIPMENT AND RESOURCES	EVALUATION
Stuffed beaver, skulls, scats, sticks, branches, article, activity cards, and worksheets	1. Student (a) Formative evaluation by Nonquon staff through questioning. (b) Teacher to choose the summative method for use at the school. 2. Program Visiting teacher to complete the evaluation on the back of the booking sheet.

Mammal Study Body Structure and Function

'Amazing Mr. Submarine'

Concept

Like all animals, mammals have special physical adaptations which enable them to survive in their habitat or niche.

Objectives

Using the beaver as an example the student should be able to:

- describe the characteristics of a mammal;
- name some parts of a mammal and describe the function of each;
- describe how the beaver is adapted for life in and near water.

Background

The beaver is a mammal. So are you! Like all mammals the beaver is warm blooded and has a backbone. Its body has true hair and the female produces milk from mammary glands for feeding its young.

Beavers belong to the largest family of mammals, the rodents. Rodents are plant eaters or herbivores. They have two pairs of sharp chisel-like incisor teeth which grow constantly. Squirrels, mice, muskrats and woodchucks are also rodents.

The beaver is a rodent.

The beaver is well adapted for life in and near water. It has a streamlined shape for swimming. Its efficient lungs and ability to direct oxygen-filled blood to its brain allows it to stay underwater for up to 15 minutes. A beaver's fur has 2 layers. The coarse outer layer of guard hairs is for protection. Underneath, thick, wooly underfur traps air to insulate the beaver against cold.

Mammal Study Life of the Beaver
'Beaver Tales'

Concept

The beaver is one of the best known of Canadian mammals. Beavers have an important and long-standing relationship with Canadians. The life of our renewable natural resources must be understood if they are to be effectively managed and conserved.

Objectives

On completion of this study, the student should be able to:

- better appreciate one of our very special Canadian mammals
- describe the general life history of the beaver
- describe the relationship of the beaver to its environment

Background

It is hard to believe that 50 years ago people worried that beavers might become extinct. Today due to management and favourable habitat conditions there are more beaver than when explorers first visited Ontario. In spite of this, many people still incorrectly think that the beaver is an endangered species.

Beavers now live over all of Ontario, even on rivers flowing through large cities like Toronto. They are most numerous on the Canadian Shield due to the excellent habitat conditions found there. Beavers are difficult to observe as they are mainly active from dusk to dawn. Signs of their activity can be seen everywhere suitable habitat exists and include dams, ponds, lodges, tracks, and cut trees.

Mammal Study The Beaver and Man
'The Beaver's Legacy'

Concept

It was the fur trade for beaver pelts which resulted in the early exploration and settlement of Canada. The relationship of beavers and Canadians has changed over time but remains strong to this day.

Man can conserve and enhance wildlife through a process known as wildlife management. The beaver is a good example of a mammal which has increased due to wildlife management.

Objectives

On completion of this study the student should be able to :

- describe the relationship of beavers to Canadians past and present;
- list several other fur-bearing mammals which live in Ontario;
- describe generally the principles involved in managing furbearers.

Background

Beavers have had an important and long-standing relationship with Canadians. The search for beaver pelts in the 1600's-1700's resulted in the exploration and settlement of Canada. Beaver trapping was Canada's first industry. Wars were fought over beavers.

The serious decline in beaver populations in the 1800's and early 1900's from over-trapping showed the consequences of not managing renewable resources wisely. The concern for beavers in this century contributed greatly to the development of wildlife management practices which have conserved beavers and other wildlife. Now there are more beavers in Ontario than when the explorers first visited.

APPENDIX I - Treatment Programme Instructions

Dear Teacher,

1. Please administer the two forms (A and B) of the pre-test to your students in a random manner, one school day before you visit the Nonquon Outdoor Education Centre. The test will take approximately 35 minutes.

2. Please record on a class list which students completed Form A, and which students completed Form B.

3. Please feel free to help your students with wording and understanding. Please do not assist them with answers to the questions.

4. On the school day following your Nonquon visit, please administer the post-test. Please ensure that the students who completed the Form A pre-test do the Form B post-test (and vice-versa).

5. Please call me at 705-3243585 (School) or 705-3244210 (Home) when you are finished. Please leave a message if I am not available. I'll pick up the two tests and deliver the two-week post-test.

6. I'm grateful for your co-operation. Thank you for your help.

Dennis Eaton
I. E. Weldon Secondary School
R. R. # 6
Lindsay, Ontario
K9V 4R6
705-324-3585

APPENDIX J - Invitation To Teachers

May 26, 1997

Dear Teacher;

The Nonquon Outdoor Centre has recommended that I contact you to see if you would be interested in permitting your class to participate in field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting. I am currently teaching science in Lindsay, and completing my Doctorate in Education at the University of Toronto. My teaching career spans 19 years at both the elementary and secondary panels.

Twelve junior-level classes will participate in this study, which will be conducted in June of 1997. Half the classes will attend a selected ecological program at the Nonquon Outdoor Education Centre. The other six classes will be taught the same ecological program in a classroom setting. All participating instructors will receive prior training in the program before the study begins.

The ecological program selected for this research will focus on beaver ecology. This half day-long program was developed by the Durham Board of Education and has been extensively field-tested.

Pre-tests and post-tests will be administered to the students, one day before they participate in the program, one day after they have finished the program, and two weeks later. Participating teachers will be provided with a summary of the research findings at the conclusion of the study. You may withdraw from this field investigation at any time, and you can be assured that the results of this study will not be used for teacher evaluation. All results will be blinded to ensure confidentiality: the names of all students, teachers and schools participating in this research will be replaced by numeric codes.

If you would like to participate in this field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting, would you please sign the attached form, and send it to the address below. Thank you for considering this request.

Sincerely yours,

Dennis Eaton
I. E. Weldon Secondary School
R. R. # 6, Lindsay, Ontario, K9V 4R6
705-324-3585

cut along this line

I would like to participate in this field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting.

signature	please print your name
school	date
school telephone #	grade taught

APPENDIX K - Invitation To Parents/Guardians

May 26, 1997

Dear Parent/Guardian;

Your son's/daughter's teacher has offered to participate in field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting. The purpose of this letter is to inform you of this study, and to ask your permission to allow your son/daughter to participate in this research. This study has been officially approved by your child's Principal and the Durham Board of Education's Research Advisory Committee. I am currently teaching science in Lindsay, and completing my Doctorate in Education at the University of Toronto. My teaching career spans 19 years at both the elementary and secondary panels.

Twelve junior-level classes will participate in this study, which will be conducted in June of 1997. Half the classes will attend a selected ecological program at the Nonquon Outdoor Education Centre. The other six classes will be taught the same ecological program in a classroom setting. All participating instructors will receive prior training in the program before the study begins.

The ecological program selected for this research will focus on beaver ecology. This half day-long program was developed by the Durham Board of Education and has been extensively field-tested.

Pre-tests and post-tests will be administered to the students, one day before they participate in the program, one day after they have finished the program, and two weeks later. Your son/daughter may withdraw from this field investigation at any time, and you can be assured that the results of this study will not be used for student evaluation. All results will be blinded to ensure confidentiality: the names of all students, teachers and schools participating in this research will be replaced by numeric codes.

If permission is granted for your son/daughter to participate in this field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting, would you please sign the attached form, and return it to your son's/daughter's teacher. Thank you for considering this request.

Sincerely yours,

Dennis Eaton
I. E. Weldon Secondary School
R. R. # 6, Lindsay, Ontario, K9V 4R6
705-324-3585

_____cut along this line_____

I hereby give my son/daughter ,_____, permission to participate in this field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting.

_____ _____

parent/guardian signature **please print your name**

_____ _____ _____

school **date** **grade**

APPENDIX L - Invitation To Principals

June 2, 1997

Dear Principal;

The Nonquon Outdoor Centre has recommended that I contact you to see if you would permit your students who will be visiting the Centre soon, to participate in field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting. This study has been officially approved by the Durham Board of Education's Research Advisory Committee. I am currently teaching science in Lindsay, and completing my Doctorate in Education at the University of Toronto. My teaching career spans 19 years at both the elementary and secondary panels.

Twelve junior-level classes will participate in this study, which will be conducted in June of 1997. Half the classes will attend a selected ecological program at the Nonquon Outdoor Education Centre. The other six classes will be taught the same ecological program in a classroom setting. All participating instructors will receive prior training in the program before the study begins.

The ecological program selected for this research will focus on beaver ecology. This half day-long program was developed by the Durham Board of Education and has been extensively field-tested.

Pre-tests and post-tests will be administered to the students, one day before they participate in the program, one day after they have finished the program, and two weeks later. Participating teachers will be provided with a summary of the research findings at the conclusion of the study. Your students and teachers may withdraw from this field investigation at any time, and you can be assured that the results of this study will not be used for teacher evaluation. All results will be blinded to ensure confidentiality: the names of all students, teachers and schools participating in this research will be replaced by numeric codes.

I would be grateful if your school would participate in this field research to compare cognitive learning at an Outdoor Education Centre and in a traditional classroom setting.

Thank you for considering this request.

Sincerely yours,

Dennis Eaton
I. E. Weldon Secondary School
R. R. # 6, Lindsay, Ontario, K9V 4R6
705-324-3585