

EXPERIENTIAL ENVIRONMENTAL EDUCATION: LOOKING AT THE SOCIO-CULTURAL
VARIABLES THAT AFFECT ATTITUDES AND BEHAVIOURS FOLLOWING A MARINE
CONSERVATION PROGRAM

by

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ABSTRACT

This study explores the impacts of an experiential, environmental school program (Intertidal Marine Biology) at the Vancouver Aquarium Marine Science Centre that is linked to the British Columbia Grade 11 Biology Curriculum. Little is known about the socio-cultural characteristics of participants that may influence their behaviours about, and attitudes towards, marine environmental issues after participation. This is reflected across the field of informal environmental education, and while this study is focussed on a unique program, the results offer insight into the field of experiential, informal, and environmental education in general.

This research is based on a two-stage, mixed methods approach. The first stage comprised of an assessment of students' environmental attitudes and behaviours using a specially developed questionnaire instrument that was administered to 129 students from three different schools. Those included were from the Vancouver School Board; Kitsilano Secondary School on the west side of Vancouver, Sir Winston Churchill Secondary School from central Vancouver, and Windermere Secondary School from east Vancouver. The students participated in the program in 2008/2009 or 2009/2010. The second stage involved face-to-face student interviews with a sub-sample of stage 1 students. Fourteen of the students (approximately 10%) were interviewed to gain deeper insights and explore emergent themes.

The variables that were examined included year of participation, school, gender, ethnicity, birthplace, parent's birthplace, hobbies, museum visitation, Ocean Wise™ use, most enjoyable component, and least enjoyable component of the program. These were broadly conceived to be socio-cultural variables that may have an impact on a student's attitudes and behaviours following engagement in the program. The results of this study were based on these independent socio-cultural variables, which were tested against the dependent measures of attitude and behaviour.

Many of the socio-cultural variables were demonstrated to be statistically significant in influencing students' perceptions of their own attitudes and behaviours after the program. Students consistently showed an increase in their positive environmental attitudes and behaviours after participation in the program. When measured against the socio-cultural variables, student attitudes and behaviours were influenced by factors including *school, gender, birthplace, parent's birthplace, parent's birth country, favourite hobbies, and museum visitation*. However, *ethnicity* and *year of participation* proved not to be significant in this study.

The results of this study indicate that socio-cultural variables play an integral role in the attitudes and behaviours of students. This knowledge is an important factor for informal educators to consider when designing experiential, environmental programs.

PREFACE

This research study was approved by the University of British Columbia's Behavioural Research Ethics Board on May 14th, 2010. The Certificate Number of the Ethics Certificate is H10-00645.

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DEDICATION

I would like to dedicate this work to all educators who strive to provide environmental education programs that inspire students to effect environmental change.

Chapter 1. INTRODUCTION TO THE STUDY

1.1. Prologue

I am drawn to the discussion of informal environmental education because I work in an educational institution (The Vancouver Aquarium Marine Science Centre) which values experience as a valid form of knowledge acquisition. I am also drawn to experiential educational opportunities that exist outside of school, for I have always felt that I remembered the most when participating in learning experiences outside of the classroom. These interests led me to ask questions about what makes experiential environmental education successful, and what factors educators should consider when creating such programs.

Through my Master's studies, I pursued research that investigates students' experiences after a two-hour, conservation and curriculum-based program featuring live animals. The two sample groups of students participated in this program on a field trip which was a component of their Grade 11 Biology class. Students participated in the program in either 2008/2009 or 2009/2010. The study investigated the impact of the program on the students' subsequent attitudes towards marine conservation and any associated behavioural changes.

The goal of this study is to address the gap in academic research around informal, experiential environmental education and the socio-cultural variables that impact the attitudes and behaviours of students. I hope to promote and support experiential environmental education, and the practical need in our society for a population that is not only more aware of environmental issues, but one that takes the next step to make the necessary behavioural changes. By making environmentally sustainable choices such as choosing sustainably caught seafood, students have the potential to become environmental stewards and have the power to act as role models for their peers and families (Blair,

2009). However, the challenge is not only to provide *sufficient* experiential education, as Blair believes, but to provide meaningful experiential education, to “cause measurable and observable changes in student achievement and behaviour” (Blair, 2009, p.16). This requires relevant environmental education for a population (such as the one here in Vancouver, British Columbia, Canada) that is increasingly made up of immigrants, the majority of whom are from Asian countries (BCStats, 2010).

For that reason, this study is focused on socio-cultural variables that include school, gender, ethnicity, birthplace, parent’s birthplace, hobbies, museum visitation, as well as variables driven by the program and questionnaire such as year of participation, Ocean Wise™ use, and the most and least enjoyable components of the program. All of these variables were chosen because they may influence students’ perception and reception of environmental issues in some way.

Experiential environmental learning is not a new topic in education. Since Victorian times, when the Sierra Club was founded and United States President Theodore Roosevelt introduced environmental concerns into the White House, environmental education has assumed a role in schools, albeit not under that title (Weilbacher, 2008). Bruce Beirsto (2009), a superintendent of schools in Richmond, B.C., Canada, believes that “[t]he real challenge is not merely to enable students to understand threats to the biosphere, but to prepare them for the individual and collective behavioural changes that will be required to survive them” (p.4). It is hoped that this research will highlight the power of culturally relevant informal, experiential environmental education to engage a diverse range of students and to help develop the attitudinal and behavioural changes necessary in today’s society.

1.2. The Problem

Experiential environmental education is a common topic of research today (Rickinson, 2003). However, the focus has slowly shifted from measuring environmental attitudes and awareness, to measuring the actual changes in behaviour, and the variables that link these two factors (Bogner & Wilhem, 1996; Kaiser, Wolfing & Fuhrer, 1999). Little is known about the links between attitudes and behaviour (Kollmuss & Agyeman, 2002), and yet the goal of most environmental education programs is to lead students to behaviour changes that will positively impact the environment (Heimlich & Ardoin, 2008). This study is focussed on one such program, and while this study is unique, the results may be used to identify similar issues broadly across the field of informal environmental education.

The Vancouver Aquarium Marine Science Centre has offered for sometime an experiential, environmental school program known as Intertidal Marine Biology (IMB). This program is linked to the British Columbia Integrated Resource Package (IRP) for the prescribed Grade 11 Biology Curriculum (BC Ministry of Education, 2006). Recent changes to this document by the Ministry of Education emphasize marine issues and the importance of conservation. However, based on my experiences as the IMB program coordinator, little is known about the socio-cultural characteristics of participants that may influence understanding of, behaviour about, and attitudes towards, marine environmental issues during and after participation in the IMB program. Moreover, there has been no investigative research conducted of the critical aspects of the students' experience that affect their impressions of the program and their future behaviours. Thus, this research study is designed to investigate and understand the unexplored factors that may shape participating students' attitudes and behaviours.

The program focused on in this research, Intertidal Marine Biology, highlights the diversity of life that can be found on the beaches of urban Vancouver. For students in such urban areas, studying

their local environment may foster a connection to nature as well as their community (Payle, 2002; Sobel, 2004). While environmental education is taught in many schools, it often lacks the experiential factor that is integral to the uptake and continued learning and stewardship that is the goal (Louv, 2008; Sobel, 2004). Local experiential environmental education has the power to engage schools in the local environmental issues and “act as agents of social change at the community level” (Duvall & Zint, 2007, p.21), empowering the students to act as “environmental steward[s], and fost[er] responsible environmental behaviour” (Bodzin, 2008, p.47).

I believe that participation in experiential environmental programs such as IMB can have far-reaching impacts that will help to protect the health of our environment. However, such educational programming must be designed to be culturally relevant for students; the current B.C. curricular framework does not always address the socio-cultural differences that exist in our schools, and the ways in which environmental education can be interpreted.

1.3. The Study

This study was based on research questions designed to identify the socio-cultural variables that impact students’ learning, and their associated attitude and behaviour changes in an experiential, environmental program at the Vancouver Aquarium. The following research questions guided this study:

What socio-cultural factors significantly influence urban high school students’ learning about and associated attitudes and behaviour change towards marine conservation issues mediated by participation in a conservation-based experiential program (Intertidal Marine Biology)?

What are the critical aspects of participation in the IMB program that influence or signpost their future behaviours and attitudes?

This study followed a two-stage approach in order to satisfy the research questions. The first stage was comprised of post hoc data collection from two groups of IMB participants; one group that

participated in 2008/2009 and one group that participated in 2009/2010. These data were collected using an instrument specially developed by the researcher to measure environmental attitudes and behaviours of students.

Stage two of the study was informed by stage one. After the data collected in stage one were compiled, analysed and interpreted, I conducted short, informal, face-to-face group interviews (stage two) to explore the characteristics of the students' survey answers. Using the data collected during stage one, the interview questions were crafted for a sub sample of 14 students (10% of the original sample). These students were purposefully selected based on their survey answers. In particular, students whose survey responses indicated extreme changes such as a large behaviour/attitude change were deemed suitable interview candidates.

This research design allowed for collection of reliable, quantitative data, as well as deep, rich, descriptions of the experience of the student participants' experiences. The design led to the interview questions which were based upon the data collected during the quantitative component of the study. The interviews allowed for exploration of issues that were beyond the scope of the survey. This method, the "Explanatory Mixed Methods Design," where the quantitative data are collected first and weighted more heavily than the qualitative data, was used to accurately investigate the research questions (Gay, Mills, & Airasian, 2009, p.463).

1.4. Significance of the Study

This research addressed a gap in the literature that calls for socio-cultural studies that investigate attitudes, behaviours, and the marine environment (Bamberg & Moser, 2007; Shultz & Zelezny, 1999). This research is significant because it demonstrates the need for culturally relevant education, specifically environmental education, at a time when global societies are beginning to acknowledge the degradation of the environment and to recognize the need for change. While this study focuses on one

unique experiential environmental program, the conclusions drawn from the results may help educators around the world to develop environmental programs that lead to behaviour change.

In a diverse population such as the one in Vancouver, BC, Canada, which is made up of immigrants from around the world (Government of British Columbia, 2008), I propose that educators must alter their approach to environmental education to deliver programming that will lead to attitude and behaviour change. While there is no universal formula for successful environmental education, this study offers insight into factors that educators should consider when creating environmental education programs.

1.5. Organization of the Thesis

This thesis has been organized to demonstrate problems that exist in the field of experiential environmental education, explore the socio-cultural variables that affect students' learning and subsequent attitudes and behaviours, and demonstrate the necessity for further research in the field. In Chapter One, the context of this study is described, as well as the problems that exist in the field of experiential environmental education. The research questions that guided this study are found in this section as well as a discussion of the significance of this research. In Chapter Two, the related literature is reviewed, and research projects focussing on attitude and behaviour changes are explored. Chapter Three presents the study's methods and methodologies. The theory behind the research design is also described, as well as the tools that were used to undertake this project. The data collection procedures and analysis steps are then described, followed by the study's limitations that were discovered as the research unfolded. In Chapter Four, the study's results are displayed and discussed. Chapter 5 discusses future research possibilities and suggestions for environmental educators.

1.6. Glossary of Terms

Attitude

A psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour (Bogner & Wilhelm, 1996).

Behaviour

Described here in relation to the environment. Actions that contribute towards environmental preservation and or conservation (Axelrod & Lehman, 1993).

Environmental Education

Learning that raises awareness about environmental issues and solutions, and motivates individuals to effect positive environmental change (Stapp, 1969).

Experiential Environmental Education

This term refers to environmental education (see above) that is experienced directly, without the mediation of a textbook, or other static learning tool.

Informal Education

Education occurring outside of the classroom; most often referred to in this study as occurring in cultural institutions such as aquariums, museums, science centres, art galleries and similar organizations.

Intertidal Marine Biology Program (IMB)

The focus of this study: IMB is a two-hour, experiential environmental school program offered at the Vancouver Aquarium Marine Science centre that is linked to the B.C. Grade 11 Biology curriculum.

Museums

Defined here as a general term for cultural institutions such as aquariums, museums, science centres, art galleries and other similar organizations.

Ocean Wise™

The Ocean Wise™ program was developed at the Vancouver Aquarium Marine Science Centre. The OceanWise™ logo indicates sustainable seafood, and in the Intertidal Marine Biology program it is offered to students as a tool to encourage them to choose sustainable seafood items.

Socio-cultural Variable

In this study, this term refers to some component of a student's cultural or educational background.

Chapter 2. REVIEW OF THE RELATED LITERATURE

Educational researchers suggest that “[w]orldwide, most learning . . . is acquired outside of school” (Falk, 2005, p.266). For this reason, many scholars have addressed the benefits of informal experiential education and as a result many researchers have studied learning in informal environments such as museums and aquariums. It is difficult to ignore the growing trend of informal environmental education, and the research that surrounds it (Digby, 2010; Rickinson, 2001). The Committee on Learning Science in Informal Environments from the National Research Council found that learners in informal settings are able to learn about the natural world in a way that incites interest, motivation and excitement about the subject (Bell, Lewenstein, Shouse & Feder, 2009).

Many teachers are making use of informal settings to solidify classroom learning, and researchers are studying the myriad aspects of the field trip experience in an informal setting (Falk & Adelman, 2003). Falk (2005) found that “[h]istorically, particularly in the developed world, the responsibility for educating people was delegated to schools, post-compulsory institutions and, to a lesser degree, the workplace and religious organizations” whereas now, “there has been a growing awareness amongst policy makers and educators alike that these learning needs are being met by a wide range of institutions and experiences” (p.266).

This shift towards informal, direct learning experiences that are not mediated by books, video or other second hand learning tools, has been embraced by the research community and there are many studies which focus on a myriad of aspects of the field trip experience and their positive effects on environmental awareness (Ballantyne, 2004; Falk & Dierking, 2007). This is critical at a time when environmental researchers and educators acknowledge and decry the degradation of the earth, and are calling for a New Environmental Paradigm (NEP), where society does not view nature as a commodity

to be used (Dunlap & van Liere, 2008). Experiential environmental education is supported by researchers who have identified the NEP in response to the state of our increasingly degraded planet where consumption of the earth's limited resources continues unchecked (Dunlap & van Liere, 2008). Studies on the New Environmental Paradigm reveal that there is an increasing global awareness in society that change is critical; however, the relationship between environmental attitudes and the behaviours that are expected to follow has not been adequately explored (Dunlap & van Liere, 2008). Environmental scholars and educators agree that research is required to explore this relationship, and the relationship between environmental education and any possible changes in attitude and behaviour (Dunlap & van Liere, 2008; Rickinson, 2001).

The literature reviewed here focuses on the importance of informal environmental education, and describes the critical factors of attitude and behaviour, and the socio-cultural variables that may impact these factors. The research addresses issues such as the knowledge gained by the students, the socio-cultural variables and behavioural barriers that exist, as well as the emotional connections which result from experiential learning and the behaviour and attitude changes of students after their IMB experience. Here I will discuss the research, and identify areas which require further investigation.

2.1. The Impact of Informal Environmental Educational Experiences

Informal educational experiences are defined in this study as the learning that exists outside of a school setting, often in cultural institutions such as aquariums and museums. Historically, environmental education has been defined as learning that raises awareness about environmental issues and solutions, and motivates individuals to effect positive environmental change (Stapp, 1969; Tsbilisi, 1977). For the purposes of this study, *experiential environmental education* was used to define the nature of the informal program highlighted in this study. This term was used to draw attention to the

focus on environmental education, as well as to the hands-on experiences in the program. Researchers have found that including an experiential component to environmental education programs may provide additional positive outcomes (Stepath, 2007).

Many researchers believe that it is important and necessary to provide experiences that have a unique meaning for the student (Anderson, Piscitelli, Weier, Everett & Tayler, 2002; Rennie & McClafferty, 1995). Informal spaces, which are most often the setting for a field trip, have the potential to provide such unique and relevant direct experiences for students. This belief is elaborated by Davidson, Passmore and Anderson (2009), who state that the goals, expectations and outcomes of a field trip must be in line with the student's own perceptions; without this alignment, students may not be actively engaged in the experience. This focus on student engagement drives the research in this area (Davidson et al., 2009); scholars are eager to pinpoint the critical factors of experiential, informal education which may determine the outcomes of students' environmental learning.

The research on informal environmental education has evolved over the years; originally, studies focused on researching the low level knowledge resulting from a visit to an informal setting, such as the name of an exhibit that was visited. The focus then moved to a more complicated examination of students' or visitors' experience (Koran, 1989). More recently, Ballantyne, Fien and Packer (2001) found that "[c]onservation messages could also be framed within an 'emotional' context" (p.30). Students could feel a range of emotions, such as "fear and respect as well as an interest in marine creatures and phenomena" while participating in informal aquarium programs (Ballantyne, 2004, p.166). Studies on emotional connections discovered the power of touch, and the resulting knowledge acquisition of experiential activities (Davidson et al., 2009; Myers Jr., Saunders, & Birjulin, 2004). The emotional connection that is possible in novel settings that incorporate artifacts or live animals can help students to make interdisciplinary connections in their learning journey

(Myers Jr. et al., 2004). Engaging students' emotions has proven to result in a more effective learning experience (Ballantyne et al., 2001). A student's emotions can be triggered by direct experiences, often more readily found in informal learning environments. This idea is supported by Anderson (2003) whose research indicates that visitors' memories were most clear when their experiences were culturally and personally significant.

The socio-cultural context of the field trip experience is a critical factor for a successful learning experience, and yet a limited number of studies focus on this aspect (Anderson et al., 2002). This important factor in fostering environmental attitudes has been addressed by other researchers such as Shultz and Zelezny (1999) who found that "although seldom studied directly...culture plays an important role in determining environmental attitudes" (p.258). This is another aspect of the informal learning environment that has the potential to make the learning experience relevant and result in more successful student engagement.

Researchers also found that field trips to informal settings have the potential to create meaning and lasting memories (Falk & Dierking, 1997). In one study, Falk and Dierking (1997) found that "even after many years, nearly 100% of the individuals interviewed could recall one or more things learned on the trip, the majority of which related to content/subject matter" (p.211). Additional research highlights emotional connections as the resonating factor, "suggesting that affective outcomes may be more resistant, a finding consistent with other research on what visitors remember from museum and similar visits" (Rennie, 1994, p.268).

These findings support the foundation of my study, which relies on the student's memories and emotional connections formed through experience with live animals, during their participation in the Intertidal Marine Biology program, an experiential, environmental program at the Vancouver Aquarium, an informal educational institution.

2.2. Impact in Terms of Attitude and Behaviour

Researchers have studied the connection between knowledge and environmental attitudes and behaviours for years (Rickinson, 2001). Many informal environmental education programs are based on the assumption that knowledge about the environment will result in positive environmental changes in attitude and behaviour. This has led to research that has “attempted to identify underlying values that provide a basis for environmental attitudes,” (Shultz & Zelezny, 1999, p.255) and explore their connection to environmental behaviours. While there are many ways to define both environmental ‘attitude’ and ‘behaviour,’ this literature review refers to them in the following manner:

Attitude: a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour (Bogner & Wilhelm, 1996).

Behaviour (described here in relation to the environment): actions that contribute towards environmental preservation and or conservation (Axelrod & Lehman, 1993).

Current studies have revealed that the link between attitudes and behaviours is weak; “despite an overall high concern and, sometimes, a willingness to act [there is a] rather tenuous link between behaviour and attitudes” (Bogner & Wilhelm, 1996, p.106). Axelrod and Lehman (1993) confirm “that attitudes are often incongruent with behaviour,” (p.150) despite peoples intention to act. Attitudes have been linked closely to awareness of environmental issues, and the prevailing opinion of environmental scholars and educators has historically been that awareness will lead to behaviour change (Grob, 1995). However, researchers are now finding that factual knowledge about environmental issues is one of the weakest links to behavioural change (Grob, 1995; Kollmuss & Agyeman, 2002).

Additional studies have found that “[t]he relation between environmental knowledge and environmental attitudes and behaviour proved to be very weak” (Kuhlemeier et al., 1999, p.4). Kuhlemeier et al. (1999) administered a survey to a sample of over 9000 Dutch secondary school

students, and found that even though students possessed environmental knowledge, they did not necessarily develop positive environmental attitudes or behaviours. Other researchers studied this link between attitudes and behaviours with similar results (Bogner & Wilhelm, 1996; Kaiser, Wolfing & Fuhrer, 1999; Shultz & Oskamp, 1996). These researchers found that there is a tenuous link between attitudes and behaviours, and “[t]his lack of a stronger correlation occasionally results in rather pessimistic views of the usefulness of environmental attitude as a predictor of ecological behaviour” (Kaiser et al., 1999, p.1).

For this reason, the link between attitudes and behaviours is the focus of many research projects (Grob et al., 1995; Kaiser et al., 1999; Kuhlemeier et al., 1999; Shultz & Zelezny, 1999). Since the “introduction of the attitude construct into social science literature, social psychologists have been interested in the link between attitudes and behaviours” (Shultz & Oskamp, 1996, p.375). Much of the relevant research has focused on environmental education programs that do not necessarily offer learning that is specific to the expected behavioural outcome. These studies target general environmental attitudes that have no obvious link to learner behaviours. This results in the very weak link between attitudes and behaviours as described above (Kuhlemeier et al., 1999).

However, some scholars argue that despite a lack of behaviour change, students believe in their own action possibilities as a result of environmental education (Mogensen, 2001). Therefore students have the knowledge and the desire to change their behaviour, and yet may fall short of actually changing. This is an interesting phenomenon that I will address in my research as it may be linked to socio-cultural variables that impact how knowledge is gained, perceived, and used by students.

Environmental researchers have also found that “[t]he strongest effect on environmental behaviour stemmed from personal-philosophical values and emotions. No effects on environmental behaviour stemming from factual knowledge were found” (Grob, 1995, p.209). With this finding,

many studies attempted to uncover the motivations for environmental attitudes and behaviours; researchers were puzzled to discover that simply transferring knowledge does not result in any changes (Grob, 1995; Kuhlemeier et al., 1999). Subsequent studies uncovered the *type* of knowledge necessary for behaviour change. Kaiser et al. (1999) found that it was “knowledge about an ecological behaviour (i.e. knowledge about what and how something can be one) rather than factual knowledge about the environmental that is related to ecological behaviour” (p.4) that could lead to behaviour change.

The most common environmental action reported in much of the literature is still basic recycling, despite people declaring their willingness to help the environment in additional ways (Axelrod & Lehman, 1993). While recycling is an important environmental action, it is a beginning, an initial first step towards a sustainable existence. Because it is very easy for most people, recycling may be used as a channel for environmental attitudes that is simple and requires little effort, and yet provides a feeling of environmental accomplishment. Shultz and Oskamp (1996) found that “[w]hen the amount of effort required to perform a behaviour is high, a strong attitude is needed if the behaviour is to occur. When the amount of effort required for a behaviour is low, a weak attitude may be sufficient for action” (p.376).

Many barriers exist when we look at positive environmental behaviours (Kollmuss & Agyeman, 2002; Scott & Willits, 1994). It differs for everyone and can be based on the willingness to change, the availability of environmental education, and the option of sustainable choices. One clear barrier to action is the connection between education about behavioural change and the environmental issues at hand (Kollmuss & Agyeman, 2002). Research has shown that a high level of concern for the environment may not be translated into environmental behaviours. While this could be due to the effort required to effect change, others have suggested that people “may lack information as to what specific things they can do to contribute to environmental protection” (Scott & Willits, 1994, p.255).

When the attitude towards a particular behaviour is targeted, there is often a high correlation between the two (Kollmuss & Agyeman, 2002).

However, many have found that despite strong links to the expected outcome, there are often barriers to positive environmental behaviours that are difficult to overcome. Shultz and Oskamp (1996) found that “the amount of effort required for a behaviour functions as an impediment to action – a behavioural barrier – and that overcoming higher barriers requires stronger attitudes” (p.376). These barriers can range in difficulty, from the availability of the resources, to convenience or cost. Another possibility may also be the availability of the infrastructure required to develop some environmental behaviours; despite strong attitudes, such barriers can prevent action (Kollmuss & Agyeman, 2002). However, Hwang, Kim and Jeng (2000) found that “the attitude level does change the intention to act” (p.24). Ergo with a successful program that results in very strong positive environmental attitudes, it may be possible to overcome the behavioural barriers if the targeted attitudes are strong enough.

Such studies led researchers to consider ways in which education can connect attitudes and behaviours and also predict environmental education outcomes. Shultz and Oskamp (1996) found that when people develop “models to explain when attitudes will predict behaviours, it is necessary to consider the context in which the behaviour is taking place, and that the effort required for the behaviour is one aspect of that context” (p.382). The learning situation context is also very important, and many factors can influence the understanding and reception of the information.

Researchers are now aware that a change in attitude and behaviour can only be expected if those attitudes and behaviours are targeted in the educational programming (Kollmuss & Agyeman, 2002). Studies have found that “[o]ften the measured attitudes are much broader in scope...than the measured actions” (Kollmuss & Agyeman, 2002, p.242). Johnson, Bowker and Cordell (2004) discuss Tarrant

and Cordell's (1997) reasons for the lack or correlation between attitudes and behaviours; they encompass "a lack of specificity between attitudinal and behavioural measures, [and] ... a failure to recognize the influence of external factors" (p.177). The specificity of the required environmental actions is being recognized by other researchers in the field. Kaiser et al. (1999) explored this aspect of environmental education and found that when a specific attitude is targeted, the specific behaviour associated with that attitude can be predicated. Therefore, the more specific the targeted attitudes are in a program, the more likely it is to see a measurable link between the attitudes and the resulting behaviours.

The common theme in this research is that people are "less likely overall to engage in environmentally protective behaviours than they are to express support for environmental principles" (Scott & Willits, 1994, p.241). This incongruence may exist for many reasons; some researchers postulate that "[g]iven the amount of media coverage devoted to environmental problems, it could be that many people have learned the language of environmentalism without developing a simultaneous behavioural commitment" (Scott & Willits, 1994, p.255). However, it may be more directly linked to the individual's willingness to make an effort, as proffered by Shultz and Oskamp (1996). This has been demonstrated by Bogner and Wilhelm (1996) in their research with adolescents. The authors found that adolescents will often declare their commitment to helping the environment and yet fall short of any action.

Informal environmental education can connect learners to opportunities that support attitude and behaviour changes (Digby, 2010; Kollmuss & Agyeman, 2002). Kollmuss and Agyeman (2002) have found that direct experience, such as experiencing the environment first hand, has a much stronger influence on students' behaviours than indirect experiences, such as learning about the environment from a textbook.

Although a review of the literature indicates support for experiential, direct learning experiences, there is a lack of research on emotional connection and environmental education that explores the link to changing attitudes and behaviours. Many scholars agree that “research has not yet satisfactorily identified the knowledge components that are the precursors to responsible environmental behaviour” (Hwang et al., 2000, p.20). It is these factors that are explored in this thesis, as well as an attempt to continue the discussion on how to successfully create a link among knowledge, attitude, and behaviour change.

2.3. The Potential Variables that Impact Attitudes and Behaviours

Within the realm of environmental education, extensive research has examined variables that impact the link between knowledge and environmental action. As previously discussed, targeted attitudes and behaviours can make a significant difference, but there are many other variables that impact an individual’s learning journey. The research discussed in Section 2.2 focused on the evidence that indicates that knowledge plays a very minimal role in the development of environmental attitudes and behaviours. I will now explore the literature that attempts to identify factors that influence positive environmental attitude and behaviour change.

Environmental education is a more recent focus in our education system (BC Ministry of Education, 2006; The Environmental Learning & Experience Curriculum Maps, 2008), and due in part to this relatively new trend, researchers have found that, “[t]he strongest and most consistent predictor of environmentalism is age or birth cohort” (Dietz, Stern & Guagnano, 1998, p.452). However, now that environmental education has come to the forefront of many educational discussions, it is a common theme in the literature and is consistently linked to positive environmental concern (Dietz, et al., 1998). While this link between education and environmental concern has been explored, some researchers recognize that learning about the environment does not lead directly to positive

environmental behaviours, as was discussed in section 2.2 (Johnson et al., 2004; Kollmuss & Agyeman, 2002). Therefore, there may be another step that encourages people to “think more critically about their own choices and provide the opportunities to apply the action skill that can be learned from education programs” (Hwang et al., 2000, p.24). Such programming has been studied but to a limited extent (Rickinson, 2001). Most studies looked at gender or education, and some have looked at the impacts of urbanity, such as Johnson et al. (2004), who found that “[u]rban residence was not associated with environmental belief,” and yet they are more likely to recycle than suburban or rural populations (p.180).

Dietz et al. (1998) claim that “[t]he relationship between gender and environmental concern has been more carefully theorized than other structural variations in environmental concern” (p.452). However, gender is but one small component of an individual’s identity. The changing demographics of North America add another dimension to the research. Shultz and Zelezny (1999) state that “to date, there have been very few cross-cultural studies of environmental attitudes or behaviors” (p.257). However, researchers often touch on the critical aspect of socio-cultural identity and discuss the need for further research in this area (Bamberg & Moser, 2007; Johnson et al., 2004).

The population of Vancouver, B.C., Canada is experiencing significant immigrant growth yearly (Welcome BC, 2006). And while “the various social and economic dimensions of the ethnic migration and immigration are well documented, there is much less scholarship on the differential environmental beliefs and behaviour of immigrating groups” (Johnson et al., 2004, p.162). Some studies touch on the issue that there are “different socio-cultural constraints beyond people’s actual control” that affect positive environmental attitudes and behaviours (Kaiser et al., 1999, p.7). Others recognize that concern for the environment does not rest on external factors alone, such as education, and they “support the conception of pro-environmental behaviour as a mixture of self-interest and pro-social

motives” (Bamberg & Moser, 2007, p.22). This message is consistent amongst the recent studies in North America. Researchers are calling for environmental education studies that focus on the immigrating populations and their attitudes and behaviours with respect to the environment (Dietz et al., 1998; Johnson et al., 2004; Shultz & Zelezny, 1999).

This area of research encompasses both education specialists and social psychologists who have “attempted to understand the forces that lead people to be concerned about environmental issues” (Shultz & Zelezny, 1999, p.255). Some researchers found that “[d]uring adolescence and early adulthood, education and friends were mentioned most frequently” (Kollmuss & Agyeman, 2002, p.251). However, most studies that have explored these issues consistently found gender to play the most significant role as a predictor of environmental attitudes and behaviours (Dietz et al., 1998). Kollmuss and Agyeman (2002) found that women are more willing to change their behaviours to help the environment, and they are more emotionally connected to the issues despite knowing less about the problems or believing in the possible technical solutions. However, a review of the literature indicates that the majority of these studies focused on adults, whereas there are very few studies that look at adolescents, and they rarely address any other personal identity factors.

Ballantyne (2004) found that “students approach a learning experience with their own models, theories, beliefs and values about the world,” (p.160) which can be translated into their socio-cultural backgrounds. This is supported by Kollmuss and Agyeman (2002) who confirm that “[c]ultural norms play a very important role in shaping people’s behaviour” (p.249). Such information is critical for environmental educators, due to their changing audience; immigration to North America has resulted in a huge demographic shift in environmental learners. Johnson, et al. (2002) found that in the [United States], the “majority of these more recent immigrants come from Asia and Latin America, where the romantic/preservationist and human-nature dichotomy are not a part of these respective culture’s

nature myths” (p.161). These values may be transferred from generation to generation despite emigration to a new country of residence. However, education can often impact this process, and some studies indicate that “value orientations take shape during the socialization process and are fairly stable in adults” (Stern & Dietz, 1994, p.67). It is important to note that many of these studies use sample populations that may not have the breadth or depth to examine each individual country; therefore there are often (as in this study) broad generalizations about cultures.

This research area is critical for environmental educators who want to develop successful programming, which is often measured by positive environmental attitudes or behaviours alone (Hungerford, Bluhm, Volk, & Ramsey, 2001). However, researchers are beginning to identify other variables that may impact environmental attitudes and behaviours. As explored above, gender, ethnicity and age have already been identified, but my review of the literature reveals a lack of information on other aspects of an individual’s socio-cultural identity.

Scholars agree that field trips to informal settings are not just about the curriculum (Falk & Balling, 1982; Falk & Adelman, 2003; Falk & Dierking, 2000). Many factors influence the students’ experience, and research “suggests that the socio-cultural context as well as the context of personal experience and the physical environment all interact to contribute to the learner’s experience” (Falk & Dierking, 2000, p.109). However, my review of the literature indicates that little has been done to isolate and discuss those socio-cultural variables that influence a student’s experience, or perception of their experience.

2.4. Sociocultural Theory for Understanding and Interpreting the Impacts of Attitude and Behaviour.

The theoretical framework for this study is based primarily on socio-cultural analysis due to the nature of the research questions being investigated. Socio-cultural analysis involves more than just a

learning event; it also considers the individual, their personal history and cultural background, and how this knowledge mediates their learning in many ways (Wertsch, 2002).

This theoretical framework is employed to “understand how mental action is situated in cultural, historical, and institutional settings” (Wertsch, 1993, p.15). Socio-cultural theory has been explored extensively by James V. Wertsch (2002), who argues that “to be human is to use the cultural tools, or mediated means, that are provided by a particular sociocultural setting” (p.11). Wertsch (2002) draws upon this approach to describe his theory of collective remembering, which is based on the assumption that the ‘remembering’ of an event is not an isolated action; it is based on the cultural background of the individual, and the social context in which the learning (or remembering) takes place.

The study described in this thesis is concerned with the variables that impact learning, and the resulting change in attitude and behaviour. Socio-cultural framework offered the ability to assess attitudes and behaviours from multiple perspectives; the acknowledgement that learning does not take place in a vacuum. There are always contextual variables and rich backgrounds that will alter how information is understood, learned and used. Here, the research is concerned with how the information is used in the form of attitudes and behaviours.

It was important to use this approach for the research described here, because the questionnaire in this study required students to remember their feelings with respect to the marine environment before and after participating in the Intertidal Marine Biology program. This theoretical framework is not only concerned with an isolated event, but the entire range of possible socio-cultural variables that could affect an individual’s experience. There are many factors to consider when one participates in a learning event; each participant brings with them their individual histories and socio-cultural backgrounds. These personal histories are unique, as is the context in which they learn. From the

initial learning event, to remembering it, “the parties who carry it out are inherently situated in a cultural and social context” (Wertsch, 2002, p.11).

Wertsch (2002) states that “cultural tools are neither independent inventions of the agents using them nor are they universally available” (p.12). Such variables are important to understand if educators hope to provide relevant experiential environmental education. In this study, such variables are explored and identified as critical to the learning experience.

2.5. Summary

The literature on environmental education explores many facets of the subject; the focus here was on the socio-cultural variables that researchers are beginning to discover, the emotional connections that foster environmental action, as well as the connection between knowledge, learning, and resulting attitudes and behaviours.

A common theme across the research is that “although people express a relatively high level of concern about the environment, they engage in few environmentally oriented behaviours” (Scott & Willits, 1994, p.240). Some studies have focused on environmental knowledge, and how it can contribute to behaviour or attitude changes (Hsu, 2009; Kuhlemeier et al., 1999). Traditionally, “researchers in the field of environmental education have claimed that they can change behaviour by making humans knowledgeable about environmental issues” (Hwang et al., 2000, p.20). However, researchers have now found that despite a knowledge base in environmental issues, students do not necessarily change their attitudes or behaviours with respect to the environment.

Theories for this phenomenon include outlining the effort required for the environmental behaviours as well as the appropriate infrastructure. However, many researchers agree “the more specific the attitude, the more specific the behavioural criterion should be” (Scott & Willits, 1994, p.250). The literature has evolved as environmental education developed over time; however, there is

an obvious lack of research that addresses the socio-cultural variables that impact students environmental learning. In addition, there is a disconnect between the measured attitudes and the resulting behaviours. Such studies are necessary to provide successful, culturally relevant environmental education. Researchers are calling for an increase in studies that address cultural differences in environmental education (Bamberg & Moser, 2007). To date, there has been “very little multinational environmental research” conducted, that scholars deem necessary for our shifting population (Shultz & Zelezny, 1999, p.264).

This research area requires further studies that examine the impact of socio-cultural variables as well as the outcomes of experiential learning in informal settings, and connect those experiences to future attitudes and behaviour. Future research could contribute to the field with studies that focus on such aspects of the field trip experience, and those that identify important variables such as the socio-cultural aspects that play in the perceptions of student’s view of environmental issues.

Chapter 3. METHODOLOGY

3.1. Context of the Study

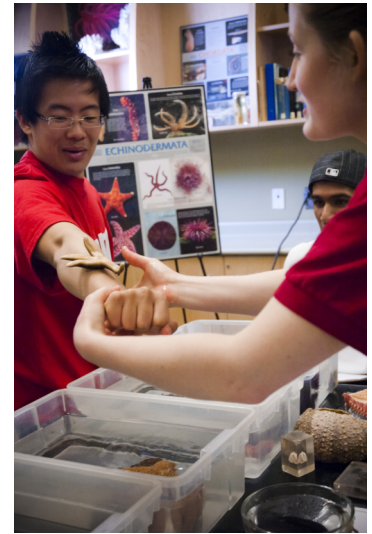
The Vancouver Aquarium Marine Science Centre is an educational institution that is committed to the environment. The Education department has delivered conservation-based, BC Ministry of Education curriculum linked school program for many years. School programs are offered from Kindergarten to Grade 12, and each one provides engaging, hands-on workshops that are focused on effecting positive environmental change. The most popular school program, Intertidal Marine Biology (IMB), is the subject of this research study. The IMB curriculum is linked to the B.C. Ministry of Education prescribed curriculum (BC Ministry of Education, 2006) for Grade 11 Biology.

The IMB program has evolved over the last three years to encompass a stewardship component based on sustainable fishing practices. This experiential, environmental program focuses on observational studies of four invertebrate phyla and, as stated above, incorporates sustainable fishing practices, as well as making connections between the students participating in the program and the health of the marine environment. The students have the opportunity to touch animals in each phylum, and explore their role in the ecosystem with the help of a volunteer educator.

The goal of this study was to gain insight on the behavioural and attitudinal differences among students who participated last year (2008/2009), and those that have participated more recently (2009/2010) in the program, and to identify critical socio-cultural variables that influence students' learning, and their subsequent attitudes and behaviours.

3.2. The Intertidal Marine Biology Program

Intertidal Marine Biology is an experiential, conservation-based and B.C. curriculum linked program that has been offered at the Vancouver Aquarium for over 20 years. The program takes place in a classroom situated behind the scenes apart from the public galleries called the Wet Lab, which has a bank of 12 habitats along the wall that represent the intertidal zone, from high to low. There are also four habitats that are connected to the main saltwater system, which can be unhooked to become free standing stations housing marine invertebrates *in situ* that students explore.



Photos by John Healey

Figure 1a and 1b Touching Sea Stars in IMB

This program is focused on four invertebrate phyla: *Echinodermata*, which includes sea stars, sea cucumber and sea urchins; *Arthropoda*, which includes crabs, shrimp and barnacles; *Cnidaria*, which includes anemones and coral; and *Mollusca*, which includes snails, clams, limpets, chitons, and scallops. These phyla are one focus of the BC Grade 11 Biology Curriculum (BC Ministry of Education, 2006), and this program is one way teachers can offer their students the opportunity to touch and observe these living animals.



Photo by John Healey

Figure 2 Touching the Moon Snail in IMB

There are five stations in the IMB program; one for each of the phyla, and one that explores the intertidal zone as a whole. Each of the stations has a number of live animals, from crabs to sea stars and sea cucumbers, to moon snails and sea urchins and sea anemones. Students have the opportunity to touch all of the animals under the guidance of a volunteer educator who has been trained extensively in marine, specifically intertidal, biology education.



Photos by John Healey

Figure 3a and 3b Learning About Sea Stars and Squid in IMB

The program begins with the coordinator's welcome, and a demonstration video of a predator prey relationship among a sunflower sea star and a sea cucumber, a sea urchin and a scallop. The volunteer educators then have 17 minutes at each station to amaze the students with the animals, engage them with stories and facts from that phylum, and inspire them to make a positive environmental change in their lives that could impact these animals' lives. The coordinator of the program gathers the class at the end of the program, and facilitates a discussion highlighting the connection between the animals the students touched and observed, and sustainable fishing practices. Students watch a short video clip on bottom trawling, a very destructive method of fishing, and discuss ways in which they could make a difference for these animals and their natural habitats, and for the sustainability of fish stocks. They are also challenged to choose a sustainable seafood item the next time they eat seafood. To help them find sustainable seafood items the Ocean Wise™ program, which identifies sustainable seafood items at select restaurants, is introduced (Refer to the Glossary of Terms in section 1.6). Students are also offered sustainable seafood guides, in the form of a wallet card, to help them find sustainable options at grocery stores and restaurants.

3.3. Methodology

In this 2-stage, mixed methods study, stage one informed stage two. The QUAN-Qual Model was used to investigate the research questions, which have driven the design of this project, and illuminated the results (Gay et al., 2009). The QUAN-Qual Model is often referred to as the “explanatory mixed methods design,” (Gay et al., 2009, p.463) where the quantitative data are collected first, and are weighted more heavily than the qualitative data (Refer to Figure 4 below).

Stage One: Hypothesis \Rightarrow Quantitative Data Collection \Rightarrow Analysis \Rightarrow Findings Inform Stage Two

Stage Two: Qualitative Data Collection \Rightarrow Analysis \Rightarrow Interpretation

Figure 4 QUAN-Qual Model

The quantitative part of the study (stage 1) focused on cross-sectional research, with sample surveys from the students who participated in the IMB program. These data were collected prior to the qualitative element of the research (stage 2), which focused on case studies from a sample of 10% (n=14) of the students who completed the surveys.

A two-stage, mixed methods approach was employed because it was not possible to identify all the issues before the survey was administered. Unexpected results and emergent themes and issues were discovered following analysis of the survey which led to the creation of the interview questions to be used in stage two. The stage one survey was also critical to the study because the collection of quantitative data reliably assessed the impact of the program, and the student's attitude and behaviour changes.

The interviews helped me to focus on issues around sustainable fishing and environmental attitudes behaviours and refine the questions that explored the students' impressions of the program, and their resultant behaviours and attitudes. This allowed for interpretation of detailed rich insights about the cases.

3.4. Methods

3.4.1. Questionnaire Design

The data for the quantitative portion of the study were collected from 129 participants at three Vancouver School Board secondary schools. One from the west side of Vancouver (Kitsilano Secondary School), one from central Vancouver (Sir Winston Churchill Secondary School), and one from the east side of Vancouver (Windermere Secondary School). The students completed the surveys based on their perceptions before and after the program, using a one-shot post-test only, which can be found in Appendix A (Campbell & Stanley, 1963). The advantage of a one-shot post-test was that we could administer a survey that asked students to consider their feelings both before and after the program, in the limited time that was available for the study.

The questionnaire consisted of 50 questions, which were a mix of Likert-scale questions, open-ended questions, and fixed-choice questions (Refer to Appendix A for the complete survey). It was a self-developed survey that was informed by literature in the field (Green, Camilli, & Elmore, 2006). The questionnaire was designed as a post-hoc, self report of attitudes and behaviours both before and after the program. The survey was administered to the students during class time at their secondary schools. Participants were asked to self-assess their attitudes and behaviours both before and after as well as their general environmental behaviours unrelated to the program.

Attitude:

All of us have a responsibility to future generations to help conserve ocean animals.
Marine animals and their habitats are threatened by human activities.

Behaviour:

I tell others about the problems our oceans face.
I try to eat seafood that is harvested in a way that does not harm the ocean environment.

General environmental behaviour:

Do you watch TV shows about animals/nature?
Do you pick up litter you see on the ground?

Figure 5 Example Questions

In this study, data were collected from students who participated in the school years of 2008/2009 and 2009/2010. At the time of the data collection, those students who participated in 2008/2009 were in Grade 12, their graduating year of Secondary School. The students from 2009/2010 were in Grade 11, and had participated in the program more recently. Data were collected from these two separate groups because it was important to identify any change in attitude or behaviour that may occur over time. The group that participated in the 2008/2009 school year had attended the IMB program at least one year prior to writing the survey, while the group that participated in the 2009/2010 school year attended the program less than three months prior to writing the survey.

The specially designed questionnaire in stage one of the study was comprised of 50 questions. The survey collected information on participants socio-cultural identity attributes including year of participation in the program, school, gender, ethnicity, birthplace, parent's birthplace, hobbies, museum visitation, Ocean Wise[™] use, most enjoyable part of the program and least enjoyable part of the program. The questions were designed by the researcher to meaningfully inform the study with regards to their attitudes and behaviours with respect to marine environmental issues. The results of this survey provided broad, quantitative data which contributed to the design of stage two.

3.4.2. Dependent Measures

Five dependent measures of environmental attitude and behaviours were included: attitude before (1) and after (2), behaviour before (3) and after (4), and general environmental behaviour (5). The items that made up each of the first four measures were based on survey questions that asked students to self-report their attitudes and behaviours with respect to the marine environment both before (recollected) and after (actual) the program at the time of administration (Refer to Appendix A). The items that made up the fifth measure were based on questions about their general environmental behaviours that were unrelated to the program (actual), such as recycling frequency, transportation choices, and concern for the environment.

The attitude section of the questionnaire contained 19 questions (Refer to Figure 5 above for examples), one of which did not load well in the factor analysis and was removed. Through the process, only those items that loaded on to a single factor with loadings above .4 were retained (this is described in detail in section 3.3.3). The behaviour section of the questionnaire comprised of six questions, and the general environmental behaviours section had seven questions (Refer to Figure 5 above and Appendix A for examples).

The independent socio-cultural variables were chosen based on gaps in the literature that called for studies to address the issues around socio-cultural differences in learning environments (Dietz et al., 1998), and some variables were chosen based on program driven questions, such as sustainable seafood consumption.

3.4.3. Factor Analysis

Question items were analyzed using factor analysis to be certain of the factor structure, and the assumptions that question items that were designated to form the five dependent measures were in fact a part of the designated constructs using Promax Rotation (Brown, 2006). Hence, the purpose was to

make sure that all of the items were related, in the bank of questions that were used to measure attitudes and behaviours of students.

All of the items assigned to the five dependent measures loaded at .4 or above into the factors, except for question two, from the dependent measure of behaviour before and behaviour after. The five factor loadings were consistent with the exception of this one question, and hence removed from analysis. A summary of the results can be found in Appendix B.

3.4.4. Internal Consistency of the Five Dependent Measures

Cronbach's Alpha was used to measure the internal consistency of the five dependent measures. Table 1 below illustrates that each dependent measure had a very high correlation coefficient, with the attitude questions resulting in a Cronbach's Alpha of .804 before the program, and .813 after the program. The behaviour questions produced similar correlation coefficients, with a Cronbach's Alpha of .904 before the program and .918 after the program. The measure of general environmental behaviour in relation to the students' own lives (and not the program in particular), produced a Cronbach's Alpha of .717. In addition, the items that constituted the five dependent measures were reviewed by three members of the supervisory team and deemed to be indeed measuring the same construct and in keeping with the measure of statistical internal consistency. Reliability above .7 is deemed to be acceptable within the social sciences for the reliable measure of a construct.

Therefore, with factor analysis and the determination of high internal consistency of the dependent measures, we can be confident that the items within the questionnaire are valid items within the construct for measuring attitude and behaviour.

Table 1

Cronbach's Alpha Summary

| Dependent Measures | Cronbach's Alpha | Alpha Based on Standardized Items | Number of Items |
|------------------------------------|------------------|--------------------------------------|-----------------|
| Attitude Before | 0.904 | 0.906 | 18 |
| Attitude After | 0.918 | 0.921 | 18 |
| Behaviour Before | 0.804 | 0.810 | 6 |
| Behaviour After | 0.813 | 0.817 | 6 |
| General Environmental Behaviour | 0.717 | 0.721 | 7 |

3.4.5. Defining Change with the Data

The research questions were intended to investigate change in attitude and behaviour, as a factor of socio-cultural variables. To accurately measure this change, an average was calculated from the questions relating to attitude, and the average before the program was subtracted from the average after the program. An identical calculation was done for the questions relating to behaviour. These new variables, of attitude change and behaviour change, were used to statistically investigate the impacts of socio-cultural variables on attitude and behaviour.

-
1. Attitude after (2) – Attitude before (1) = Attitude Change
 2. Behavior after (4) – Behavior before (3) = Behavior Change

In addition, a third measure was used to test the variables; however, this dependent measure of general environmental behaviour was based on one set of answers, and therefore no change calculation was necessary.

Figure 6 Attitude and Behaviour Change Calculation

While the majority of survey questions asked students to choose a numerical answer to demonstrate their feelings, there were some questions that had open-ended responses (Refer to Appendix A). Every

possible written answer that the students offered was awarded a value (Refer to Appendix C); this process began with many values, and as the data were analyzed, the number of values diminished as categories were aggregated. This was due to the fact that many of the original values were very similar in nature, and due to the small sample size of 129 participants, it was necessary for the statistical analysis. For the purposes of this study, all Asian ethnicities (for example, Chinese, Japanese and Korean backgrounds) were analyzed as one, as were Caucasian ethnicities (for example, European or North American backgrounds). Similar studies have resorted to this simplification of the data, because it would be impossible to gather any information about such a small sample size if each individual country of origin were acknowledged. While it would be ideal to look at each country (or even cultural affiliation) individually, it would be impossible to infer any statistical results from this sample size.

Once the values had been set, the data were transferred from an excel spreadsheet into a predictive analysis software program, Statistical Package for the Social Sciences, Version 18.0 (SPSS). Any unanswered questions were not included in the data used for the tests, and some sub-categories that were poorly represented were excluded. The data were analyzed using primarily paired *t*-tests, independent *t*-tests, and Analysis of Variance (ANOVA) tests. These statistical tests were chosen because they each had a different purpose when it came to analyzing the data. Paired *t*-tests were used to determine if there was a significant difference between two groups that are related; for example, the change in attitude (before and after) was analyzed using a paired *t*-test. Independent *t*-tests were used to determine differences between independent samples that were randomly formed without any sort of matching (Gay et al., 2009). This test was used for variables such as the change in attitude measured against gender. When the variables had more than two groupings, such as ethnicity, ANOVA tests were applied.

3.4.6. Interview Component

Stage two was comprised of a semi-structured interview. This included some questions designed to encourage students to share their whole experience of the program as well as the opportunity to investigate any emergent themes that arose during the interviews. The interviews were conducted at the students' secondary schools outside of class time (during lunch or after school) for 15-30 minutes, and students were encouraged to share their IMB program experiences. They were asked to describe their feelings with respect to the marine environment as well as their family's environmental commitment. There were 14 students in total who participated in the four interviews. Two interviews were conducted at Kitsilano Secondary, and one at each of Sir Winston Churchill and Windermere Secondary. This stage provided reliable information about the population of secondary students in Vancouver with respect to socio-cultural factors, attitudes and behaviours.

Table 2

Timeline of the Research

| Event | Program Delivery Date | Questionnaire | Interview |
|---------------------|---|---|--|
| Description | Teachers took their students to the Aquarium to participate in the Intertidal Marine Biology program. | The surveys were administered by the researcher at each school during class time. | The interviews occurred at each school outside of class time, and the researcher interviewed each group of students. |
| Participants | | | |
| Kitsilano | January 19 th , 2010 | May 26 th , 2010 12:35pm May 26 th , 2010 1:55pm | June 8 th , 2010 3:25pm Case # 102, 104 & 108 (Grade 12, all male) |
| | 2008/2009 | May 25 th , 2010 12:40pm May 25 th , 2010 1:55pm May 26 th , 2010 9:00am | June 9 th , 2010 3:00pm Case # 95 & 96 (Grade 12, both female) |
| Churchill | March 29 th , 2010 | June 2 nd , 2010 9:40am | June 10 th , 2010 11:45am Case # 12, 19, 3, 129, 2, 126, 127 & 128 (Grade 11, all female) |
| Windermere | March 4 th , 2010 | May 25 th , 2010 10:05am | June 9 th , 2010 11:40am Case # 55 (Grade 11, male) |

3.5. Data Collection Procedures**3.5.1. Surveys**

The surveys were administered at each school during class time. For each class, the researcher was introduced, and her affiliation with the University of British Columbia as a graduate student, and with the Vancouver Aquarium Marine Science Centre as a staff member. The purpose of the study was explained, in that the goal was to improve environmental education for students, particularly in relation to the IMB program. The length of the survey (15-20 minutes) was outlined, as was the student's role. It was clearly explained that their participation in the survey was for a graduate

research project and was not a test. The students were told that there were no right or wrong answers, and that the study was interested in their honest answers as their responses would help create an accurate picture of the program.

An envelope was provided for all completed surveys, and it was reiterated that their teacher would not see any of the results that could identify any individual student. The researcher remained in the classroom during the survey, and offered students the opportunity to ask questions at any time to clarify aspects of the survey. Finally, all of the students were thanked for their time, patience and participation.

Once the surveys were completed, the written answers were compiled in a Word document, and values were assigned to each group of answers. These values were later reassessed, and reduced in number twice over the course of the data analysis. Once each possible answer had a value, the researcher went through each survey and wrote the numerical value beside the written answer. All of the data were then input into an excel spreadsheet, which was later transferred to the statistical analysis program for testing.

3.5.2. Interviews

The last question on each survey asked students if they would be willing to participate in a follow-up interview. From those that checked ‘YES,’ 14 students were identified, with the help of their teachers, who had the time and the inclination to participate in the interview. The interviews were administered two to three weeks after the survey depending on the school. There were five students (three in one group, and two in the other) interviewed from Kitsilano Secondary, eight students in one group from Sir Winston Churchill Secondary, and one student from Windermere Secondary (Refer to Table 2 above for the timeline of this process).

The researcher visited the schools during lunch hour or after school to interview the students, and snacks were provided for the students to encourage participation. Each interview lasted from 15-30 minutes. All of the interviews were recorded, and the students were asked prior to the interview if they were comfortable being recorded. They were also told that they could answer any or all questions, and remove themselves from the interview at any time. The interview data were later transcribed into a Word document for analysis.

3.6. Data Analysis

Both phases of the study were analyzed separately. In stage one of the study, statistical analysis was used to analyze the survey data in a variety of ways. The relationship between the socio-cultural variables and the dependent measures of behaviour and attitude were analysed using paired and independent *t*-tests, and ANOVA tests. To further explore the data, a Least Significant Difference *t*-test was used for pairwise comparison. Please see Table 4 in Chapter 4 for a summary of the results.

In stage two of the study, the qualitative interview data were used to provide detailed case studies that highlight common issues, experiences, and socio-cultural factors. The interview questions were analyzed in a qualitative fashion; here, a more thorough explanation of how and why attitudes and behaviours may differ depending on socio-cultural backgrounds and prior knowledge/attitudes was explored. From this data, a few select cases were identified that represented the important factors, such as animal experiences, for the students. The interview data were analyzed to look for common emergent themes and provide specific case examples that offer deep insights about the students' experiences. The researcher chose key words, such as *animals*, *touching*, *family*, *connection*, and *environment*, and also looked for phrases that indicated attitudes or behaviours with respect to the marine environment. These words were used to identify phrases that were used in the results.

3.7. The Study Participants

The participants who were surveyed and interviewed for this study were all Grade 11 secondary school students who attended the Intertidal Marine Biology (IMB) program. They were accessed via the program because the researcher coordinates the IMB program and has developed a professional relationship with many of the teachers who return to the program each year. These teachers were contacted via email with a letter of invitation, and from a group of 20 teachers contacted, there was participation from three teachers at three different schools in the Vancouver School Board. Three different classes of Grade 11 students (IMB participation in 2009/2010) wrote the survey, as well as a range of students from three different classes of Grade 12 students who participated in 2008/2009 and are no longer in Grade 11 Biology. These three schools offer a snapshot of the full spectrum of Vancouver Schools, because they are from the west (high to middle socio-economic), centre (high to middle socio-economic) and east (low to middle socio-economic) of Vancouver.

Demographic and socio-cultural information about this sample of 129 participants is displayed below in Figures 7 through 11.

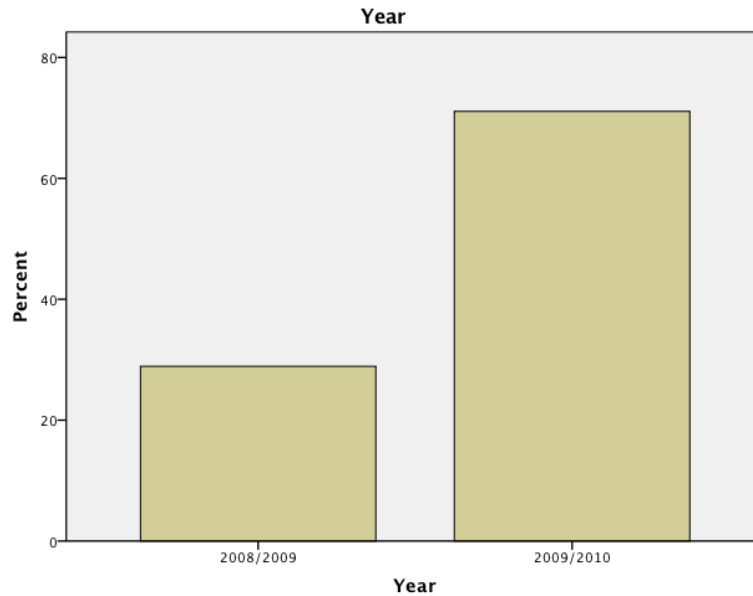


Figure 7 Participation by School Year

This figure illustrates the number of students who participated in the program in 2008/2009 (28.9% of the sample), and those that participated in 2009/2010 (71.1% of the sample). Both groups wrote the survey in May 2010.

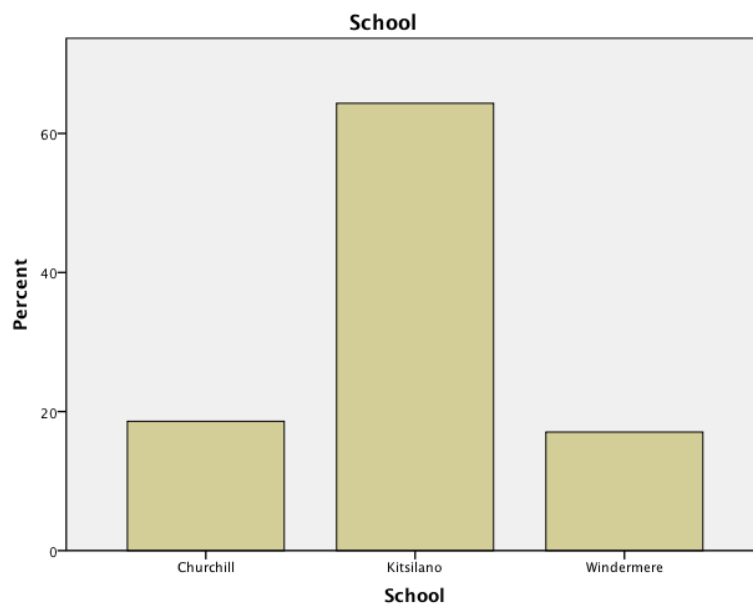


Figure 8 Participation by School

This figure demonstrates that 18.8% of the study sample came from Sir Winston Churchill Secondary School, 64.3% came from Kitsilano Secondary School, and 17.1% came from Windermere Secondary School.

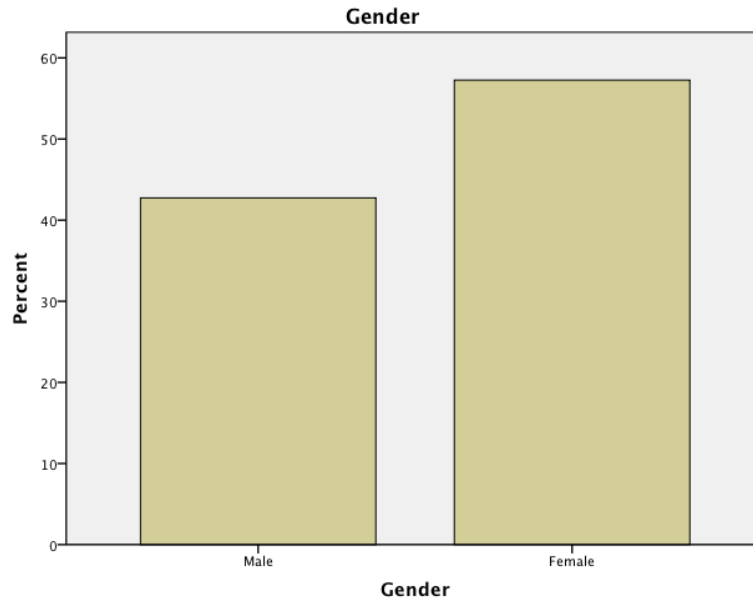


Figure 9 Participation by Gender

This figure illustrates that 42.7% of the sample were male, and 57.3% of the sample were female.

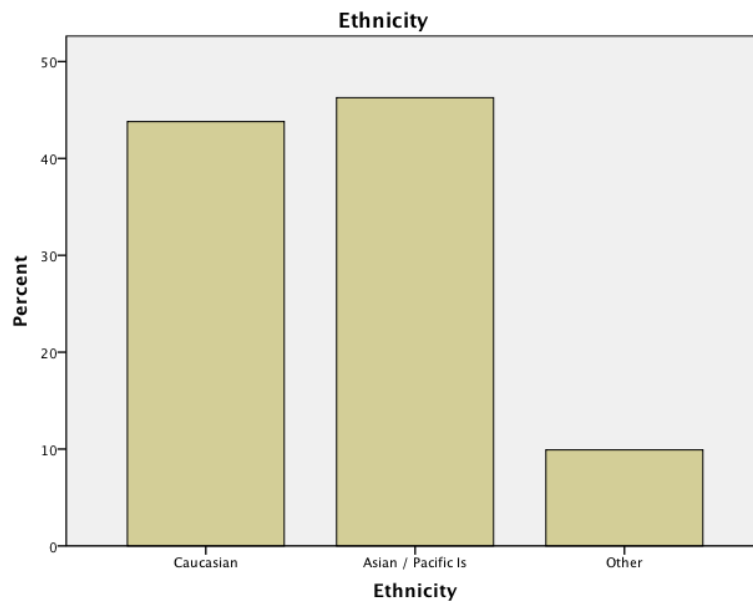


Figure 10 Participation by Self-reported ethnicity

Of the study sample, 43.8% of students were Caucasian (includes backgrounds from all of Europe and North America), 46.3% were Asian (includes all backgrounds from countries such as Japan, China, Korea, Malaysia, etc.), and 9.9% were from other ethnic backgrounds.



Figure 11 Student's Birthplace

This figure illustrates the origins of the participants: 68.2% were born in Canada, 13.2% have been in Canada for 1-4 years, and 18.6% have been in Canada for 5 or more years.

3.8. Limitations of the Study

Despite collecting a significant amount of data to reliably analyze the population of participants in the IMB program, the most obvious limitation was the sample size ($n=129$). Ideally, a much larger sample could have been surveyed and interviewed to produce more reliable data. The sample size was not suitable for MANOVA testing which would have provided a deeper analysis of the data; whereby we could compare the influence of multiple socio-cultural factors on attitude and behaviour. The sample population was also only taken from the Vancouver School District. A sample spanning the entire lower mainland may have produced results encompassing the differences between urban and suburban populations.

Students who participated in the program were taught by teachers who had the motivation to organize the field trip. Teachers may influence their students in so many ways; those educators who

participated were particularly driven; their enthusiasm and dedication may be translated in their teaching, and subsequently the attitudes and behaviours of their students. It would be interesting to survey students whose teachers had no interest in participating in the study. The classroom focus of each teacher is also different, and it is impossible to know if the teachers had done any pre or post activities based on the program, or possibly incorporated environmental education into the rest of their curriculum and made it a continuing topic of study for their students. Regardless of the teacher's focus, the news media is constantly producing stories about the environment, and the impact that students demonstrated in their surveys and interviews could be attributed to knowledge that they acquired outside of the program.

The survey questions, as well as the interview questions, were mostly related to the environment. It is difficult to collect completely unbiased answers when students are aware of the goals of the research. Alternately, due to the age of the students (15, 16 and 17 years old), it is possible that some students did not take the survey seriously, and may have chosen answers that were not based on their true feelings or experiences.

The students were asked to fill out the surveys based on their memories of the Intertidal Marine Biology program. While this program has the same structure each day, the different coordinators and volunteer educators who run the program may have different foci. Therefore, each student may not have had the exact same experience which may have affected their survey and interview responses.

The surveys and the interviews were administered during the last month of school, in June 2010. At this time of the year, students are generally focussed on their exams, and the upcoming summer vacation. This aspect of the timing may have impacted the responses somewhat. There are also limitations to the design of the survey. A one-shot, post-hoc survey is limited because it is not possible to know for certain if the participant's self-reported pre-program perceptions were accurate on

recollection. Between the student's participation in the program and the time of the survey, there could be many other factors that influenced their environmental attitudes and behaviours, including other experiential experiences since the IMB program that informed attitude and behaviour. This maturation cannot be measured by a one-shot, post-test only (Campbell and Stanley, 1969).

3.8.1. Ethical Considerations

To ensure this study followed appropriate ethical guidelines, I completed the Tutorial for the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS) on March 22nd, 2010. I then submitted an application for a Behavioural Ethical Review which was approved by the UBC Ethical Review Board on May 14th, 2010. As this study involved the Vancouver Aquarium Marine Science Centre School Programs, I received written approval from the Vice President of Education, Conservation and Research (Refer to Appendix E). The schools involved in this study were all from the Vancouver School Board, and to gain approval I submitted a detailed research plan that was approved on May 13th, 2010 (Refer to Appendix E).

The parental consent form and questionnaire cover letter in Appendix F were used to gain consent for the students to participate. The students were reminded before the survey and then again at the interview that they were not obligated to participate in the study and could withdraw at any time without academic penalty. To ensure anonymity and to maintain privacy and confidentiality, I did not use names in the data or any written document pertaining to the study.

3.8.2. Reflections on my Role as Researcher

I have been intimately connected to the Intertidal Marine Biology program for three years. I have trained the educators, taught and run the program, developed new material, and changed the focus from that of purely invertebrate phyla to a more holistic view of conservation and sustainable fishing.

I was aware when I started this study that I had many biases, both acknowledged and unseen. My connection to the program, and my enthusiasm for the subject could have influenced the students writing the surveys, or in the interviews. It was impossible not to impact them in some way, and I hope that my obvious love of the subject was not construed in such a way that students felt they must answer the questions in a certain fashion.

While my biases are clear, I entered into this project in the hopes of discovering the truth about the impact of the program, regardless of the outcome, and I have attempted to maintain this view throughout my research. It was during the interviews that I believe my impact could have been most evident, and as I was aware that this was a possibility I attempted to remain neutral during the process, and refrained from commenting on students' statements other than to encourage the flow of conversation.

As an insider in this study, I may not have had the same experience as an unbiased observer who had no connection or investment in the program. However, I endeavoured to maintain a balance between my role as coordinator of the IMB program, and as the researcher in this study. I believe that my dual roles added depth to the study and enabled me to approach the research from an inside, as well as an outside, perspective.

Chapter 4. RESULTS

In the Intertidal Marine Biology program highlighted in this study, the focus is on observing and touching the animals and making connections to marine environmental issues that affect the lives of these animals on a daily basis. The measures of attitude and behaviour are targeted very specifically, and students are explicitly told how they could help the environment (and these animals) with their individual actions. The positive impact of the program is demonstrated in the results, for attitude change $t(118) = 10.98, p < .001$, and behaviour change $t(116) = 13.60, p < .001$, were both significant after participation in the program (Refer to section 4.1.1 for a Description of Statistical Abbreviations). The literature has demonstrated that when environmental actions are targeted in educational programs, it follows that behaviours will change (Kollmuss & Agyeman, 2002). However, if the information is more general, it may increase positive environmental attitudes, but not result in any positive change in environmental behaviours. This study aimed to identify the socio-cultural variables that may impact changes in attitude or behaviour, and the critical factors of environmental programming that may influence the self-assessed changes in attitudes and behaviours.

4.1. Stage One – Quantitative Results

ANOVA and t -tests, both paired and independent, were used as the analysis tools for the quantitative analyses. The tests focused on the five dependent measures of attitude before and after, behaviour before and after, and general environmental behaviour, and their relation to the independent socio-cultural variables of year, school, gender, ethnicity, birthplace, parent's birthplace, hobbies, museum visitation, Ocean Wise™, and most and least enjoyable part of the program. These dependent measures, and the socio-cultural variables, are illustrated in Table 3 below.

Table 3

Tests and Socio-Cultural Variables

| Tests | By Independent Socio-cultural Variables | |
|--|--|------------------------|
| A. Attitude Change = Attitude (after) – Attitude (before) | a. Year | f. Parents Birth Place |
| | b. School | g. Hobbies |
| B. Behaviour Change = Behavior (after) – Behavior (before) | c. Gender | h. Museum Visitation |
| | d. Ethnicity | i. Ocean Wise™ Use |
| C. General Environmental Behaviour | e. Birth Place | j. Most Enjoyable |
| | | k. Least Enjoyable |

4.1.1. Description of Statistical Abbreviations

Sig.: Significant

n.s.: Not significant

F: Used to determine if variances are significantly different.

df: Degrees of freedom.

p: Probability of chance (*p* must be less than .05 to be significant).

ANOVA: Analysis of variance.

LSD: Least Significant Difference.

(Gay et al., 2009)

4.1.2. Change in Attitude and Behaviour

This study was driven by the research questions, which were designed to explore the independent socio-cultural variables that impact students' environmental attitudes and behaviours. The calculated change in attitude and behaviour after the program was used as the dependent measure in each test. The computation that resulted in the numerical value for change can be found in Figure 6. These new variables of Attitude Change and Behaviour Change were used to test the independent socio-cultural variables in the statistical analysis of the data.

Table 4

Summary of the Results

| No. | TEST | Analysis | Result | Description |
|-----|---|------------------------------------|--------|---|
| 1 | Attitude (before) – Attitude (after) | Paired sample <i>t</i> - test | Sig. | $t(118) = 10.98, p < .001$ |
| 2 | Behavior (before) – Behavior (after) | Paired sample <i>t</i> - test | Sig. | $t(116) = 13.60, p < .001$ |
| 3 | Attitude (before) – Attitude (after) * Year | ANOVA | n.s. | $F(1,115) = .70, p = .406$ |
| 4 | Behavior (before) – Behavior (after) * Year | ANOVA | n.s. | $F(1,117) = .01, p = .927$ |
| 5 | General Environmental Behaviour *Year | ANOVA | n.s. | $F(1,112) = .10, p = .762$ |
| 6 | Attitude (before) – Attitude (after) *School | ANOVA | Sig. | $F(1,116) = 2.66, p = .074$ LSD: Churchill – Kits, $p = .023$ (Kits MORE) |
| 7 | Behavior (before) – Behavior (after)*School | ANOVA | n.s. | $F(1,118) = .59, p = .554$ |
| 8 | General Environmental Behaviour *School | ANOVA | n.s. | $F(1,123) = .90, p = .411$ |
| 9 | Attitude (before) – Attitude (after) * Gender | Independent Samples <i>t</i> -test | Sig. | $t(113) = 2.94, p < .01$ |
| 10 | Behavior (before) – Behavior (after) * Gender | Independent Samples <i>t</i> -test | n.s. | $t(114) = .03, p < .974$ |
| 11 | General Environmental Behaviour *Gender | Independent Samples <i>t</i> -test | n.s. | $t(117) = 1.42, p < .160$ |

| No. | TEST | Analysis | Result | Description |
|-----|---|----------|--------|---|
| 12 | Attitude (before) – Attitude (after)*Ethnicity | ANOVA | n.s. | $F(1,109) = 0.26, p = .773$ |
| 13 | Behavior (before) – Behavior (after)*Ethnicity | ANOVA | n.s. | $F(1,111) = 0.03, p = .974$ |
| 14 | General Environmental Behaviour *Ethnicity | ANOVA | n.s. | $F(1,115) = 1.63, p = .200$ |
| 15 | Attitude (before) – Attitude (after) * Birth Place | ANOVA | Sig. | $F(1,116) = 2.15, p = .112$ LSD: Born in Canada – 5 or more years, $p < .047$ (5 or More Years MORE) |
| 16 | Behavior (before) – Behavior (after) * Birth Place | ANOVA | n.s. | $F(1,118) = 0.72, p = .491$ |
| 17 | General Environmental Behaviour *Birth Place | ANOVA | n.s. | $F(1,123) = 0.63, p = .532$ |
| 18 | Attitude (before) – Attitude (after) * Parent's Birth Country | ANOVA | Sig. | $F(1,115) = 1.96, p = .125$ LSD: North America-Europe, $p < .039$ (Europe MORE) |
| 19 | Behavior (before) – Behavior (after) *Parent's Birth Country | ANOVA | n.s. | $F(1,117) = 1.46, p = .230$ |
| 20 | General Environmental Behaviour *Parent's Birth Country | ANOVA | Sig. | $F(1,112) = 7.34, p = .001$ |
| 21 | Attitude (before) – Attitude (after)* Parents Birth Place | ANOVA | n.s. | $F(1,115) = 0.49, p = .596$ |
| 22 | Behavior (before) – Behavior (after)*Parents Birth Place | ANOVA | n.s. | $F(1,117) = 0.28, p = .596$ |
| 23 | General Environmental Behaviour *Parents Birth Place | ANOVA | n.s. | $F(1,112) = 2.63, p = .108$ |
| 24 | Attitude (before) – Attitude (after) * Hobbies 1 | ANOVA | Sig. | $F(1,111) = 2.29, p = .064$ LSD: Arts-Media/Games, $p < .032$ (Arts MORE) |
| 25 | Behavior (before) – Behavior (after) * Hobbies 1 | ANOVA | Sig. | $F(1,113) = 2.65, p = .037$ |
| 26 | General Environmental Behaviour *Hobbies 1 | ANOVA | Sig. | $F(1,118) = 2.58, p = .041$ |
| 27 | Attitude (before) – Attitude (after) * Hobbies 2 | ANOVA | n.s. | $F(1,112) = 0.39, p = .819$ |
| 28 | Behavior (before) – Behavior (after) * Hobbies 2 | ANOVA | Sig. | $F(1,114) = 1.45, p = .221$ LSD: Arts-Socialization, $p < .035$ (Socialization MORE) |
| 29 | General Environmental Behaviour *Hobbies 2 | ANOVA | Sig. | $F(1,119) = 4.30, p = .003$ |
| 30 | Attitude (before) – Attitude (after)* Museum Visitation | ANOVA | Sig. | $F(1,115) = 2.61, p = 0.078$ |
| 31 | Behavior (before) – Behavior (after)*Museum Visitation | ANOVA | n.s. | $F(1,117) = 2.18, p = .118$ |

| No. | TEST | Analysis | Result | Description |
|-----|---|--------------------------------------|--------|------------------------------|
| 32 | General Environmental Behaviour *Museum Visitation | ANOVA | Sig | $F(1,122) = 10.20, p = .001$ |
| 33 | Attitude (before) – Attitude (after) * Ocean Wise™ Use | Independent Sample <i>t</i> -test | Sig | $t(110) = 2.53, p < .013$ |
| 34 | Behavior (before) – Behavior (after) * Ocean Wise™ Use | Independent Sample <i>t</i> -test | n.s. | $t(112) = 1.61, p < .110$ |
| 35 | General Environmental Behaviour *Ocean Wise™ Use | Independent Sample <i>t</i> -test | Sig | $t(117) = 2.71, p < .008$ |
| 36 | Attitude (before) – Attitude (after)* Most Enjoy | ANOVA | n.s. | $F(1,113) = 0.89, p = .413$ |
| 37 | Behavior (before) – Behavior (after)*Most Enjoy | ANOVA | n.s. | $F(1,115) = 0.81, p = .494$ |
| 38 | General Environmental Behaviour *Most Enjoy | ANOVA | n.s. | $F(1,119) = 1.04, p = .357$ |
| 39 | Attitude (before) – Attitude (after) * Least Enjoy | ANOVA | n.s. | $F(1,83) = 0.57, p = .638$ |
| 40 | Behavior (before) – Behavior (after) * Least Enjoy | ANOVA | n.s. | $F(1,87) = 2.00, p = .121$ |
| 41 | General Environmental Behaviour *Least Enjoy | ANOVA | n.s. | $F(1,88) = .59, p = .626$ |

4.1.3. Socio-cultural Variables

The tests above overwhelmingly indicate that the Intertidal Marine Biology program, paired with the socio-cultural backgrounds of the students, led to changes in their attitudes, behaviours and general environmental behaviours. These results offer support for informal experiential environmental programs, and indicate the significant influence they can have on students' attitudes and behaviours. Refer to Table 3 and Table 4 when reading the following descriptions of the results.

Attitude and Behaviour Change: The students' perceptions of their attitudes and behaviours changed significantly after the program, with $p < .001$ for both groups of participants, from 2008/2009 and 2009/2010.

Year of Participation: The school year that the students participated in the program (either 2008/2009 or 2009/2010) was not significant for A, B or C ($p < .406$, $p < .927$ and $p < .762$ for attitude, behaviour and general environmental behaviour respectively). This is contrary to the natural expectation that the greater the time, the less the students will remember.

School: In tests 6-8, attitude change was significant ($p < .023$) when tested against the independent socio-cultural variable of school. Behaviour change ($p < .554$) and general environmental behaviour ($p < .411$) were not significant. These results are interesting because there is no actual change in action or behaviour, but students from Kitsilano Secondary School have higher positive environmental attitudes than those at Sir Winston Churchill Secondary or Windermere Secondary.

Gender: The results from the gender tests (9-11) show that attitude change ($p < .004$) is affected by gender, while behaviour change ($p < .974$) is not. There is no significant difference in behaviour, either in behaviour change after the program, or general environmental behaviour ($p < .160$). Females tended to have better positive environmental attitudes than males, across all schools and years of participation. This result is consistent with the literature (Kollmuss & Agyeman, 2002), and is interesting because there is no increased behavioural change in females associated with the attitude, highlighting the lack of connection between A and B.

Ethnicity: Ethnicity is not significant ($p < .773$, $p < .974$ and $p < .200$ for attitude change, behaviour change and general environmental behaviour respectively) when tested against A, B or C (Refer to Table 3). This result is inconsistent with the literature, for many scholars have speculated that environmental attitudes and behaviours may be approached in different ways by different cultures, and

therefore have discrepancies when tested by the same measures (Johnson et al., 2004). However, when birthplace (rather than ethnicity) is tested against A, B and C, the result is different, as explained below.

Birth Place: Participants who had been living in Canada for five or more years had significantly more positive environmental attitude change than those that had been born in Canada ($p < .047$). This result is not consistent with the last test, which found that ethnicity was not significant. Behaviour change and general environmental behaviour were not significant ($p < .491$ and $p < .532$ respectively). However, in the following tests that examined parent's birth country, the results are clarified with respect to the students' environmental attitude changes and behaviour changes and their cultural backgrounds.

Parent's Birth Country: When students indicated that one parent was born outside of Canada, and one in Canada, they were placed in the 'outside' category for simplicity. This only occurred in a handful of cases. Students whose parents were born in Europe had a significantly more positive environmental attitude change ($p < .039$) than those from North America or Asia. However, when it came to general environmental behaviour, students from Asia had significantly more positive general environmental behaviours than those from North America ($p < .005$) or Europe ($p < .013$). While these results are not mirrored in the tests below that examine a related factor (whether parents were born inside or outside of Canada) there remains a similar pattern.

Parent's Birth Place: Parent's Birthplace (either inside or outside of Canada) is not significant when tested against A, B or C ($p < .596$, $p < .596$ and $p < .108$ for attitude change, behaviour change and general environmental behaviour, respectively). Overall these results indicate that this socio-cultural variable is not significant; however, on closer inspection, students of Asian parents have greater general environmental behaviour ($p < .01$) than those from North America or Europe. On the attitude scale, students with parents from Europe had more attitude change ($p < .039$) than those from North America. See the results above from Parents Birth Country.

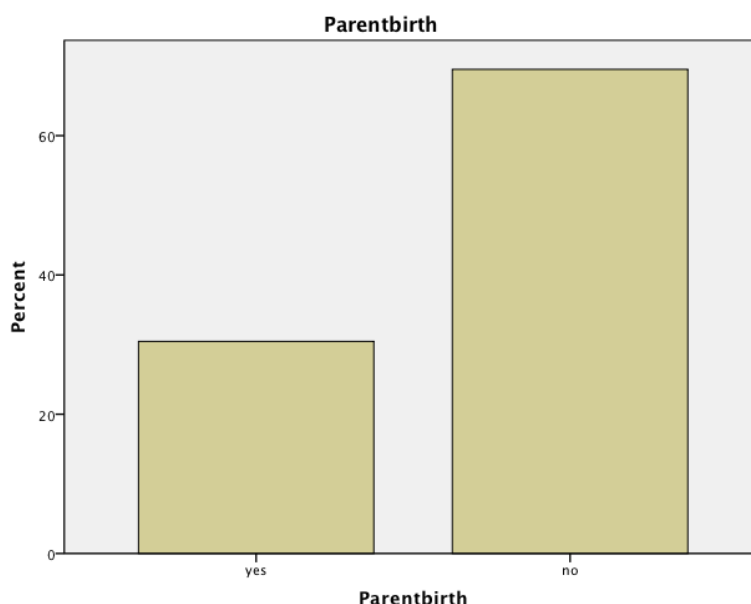


Figure 12 Parent's Birthplace

This figure demonstrates the percentage of students whose parents were born in Canada (YES) or outside of Canada (NO). Those whose parents were born in Canada made up 30.5% of the sample, with 69.5% having parents born outside of Canada.

Number One Ranked Hobby: Student's attitude changes ($p < .032$) and behaviour changes ($p < .037$), as well as their general environmental behaviours ($p < .041$) are significantly linked to their number one ranked hobby. Student's attitude changes were linked to their choice of The Arts over Media/Games, whereas their behaviour changes were significantly linked to Socialization when compared to all other choices (The Arts, Media/Games and Outdoor/Physical Activities).

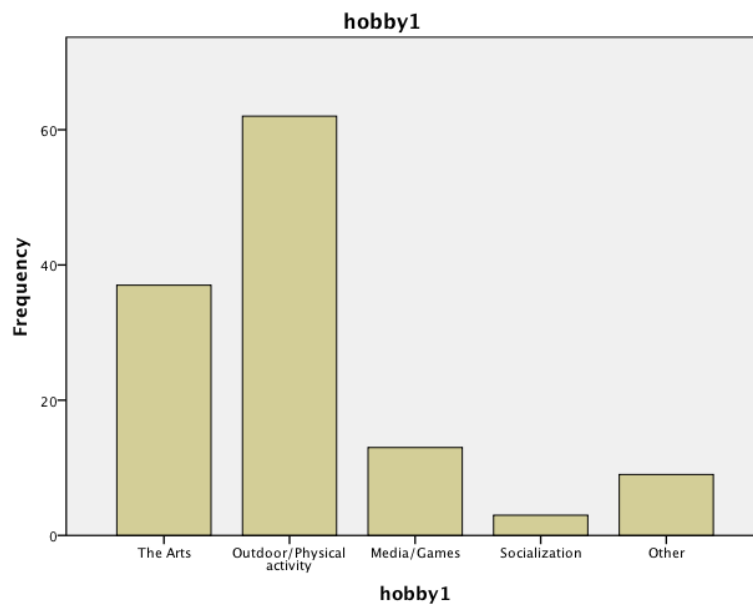


Figure 13 Number One Ranked Hobby

This figure illustrates a breakdown of the number one hobbies described by the participants. This question was open-ended, and their written answers were given values that fell into the following categories: The Arts (29.8%), Outdoor/Physical activity (50%), Media/Games (10.5%), Socialization (2.4%), and Other (7.3%).

Number Two Ranked Hobby: Similar to the student's 1st ranked hobby, their 2nd ranked hobby was also significantly linked to their behaviour change ($p < .035$) and general environmental behaviours ($p < .003$), but not their attitude change ($p < .819$). Socialization impacted behaviour change over the Arts ($p < .035$), and when general environmental behaviours were tested using LSD, the results indicated that they were significantly related to the Arts ($p < .001$) and Outdoor/Physical activity ($p < .002$) when chosen over Media/Games.

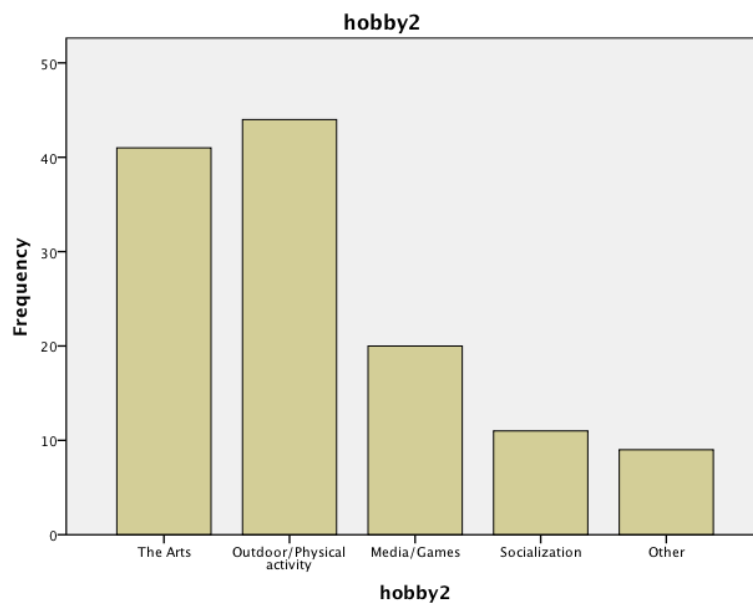


Figure 14 Number Two Ranked Hobby

This figure illustrates a breakdown of the number one hobbies described by the participants. This question was open-ended, and their written answers were given values that fell into the following categories: The Arts (32.8%), Outdoor/Physical activity (35.2%), Media/Games (16.0%), Socialization (8.8%), and Other (7.2%).

Museum Visitation: Museum visitation was very significant ($p < .001$) when tested against general environmental behaviours. This indicates that students who visit cultural institutions with their

families tend to have more positive general environmental behaviours than those who do not visit cultural institutions.

Museum Visitation was also a significant factor for attitude change, $p < .038$ (More than once per year demonstrated more change than Never – Once per year), when examined with the Least Significant Difference test. As museum visitation increased, so did the student's positive environmental attitude change ($p < .038$ – never to once or twice, $p < .026$ – once or twice to one or more times per year), and the student's positive general environmental behaviour ($p < .001$ – never to one or more times per year, $p < .001$ – once or twice to one or more times per year). This result is interesting because it appears that visitation to cultural institutions leads to increased general environmental behaviours and paves the way to increase positive environmental attitude change, but student's behaviour change is not significant ($p < .118$).

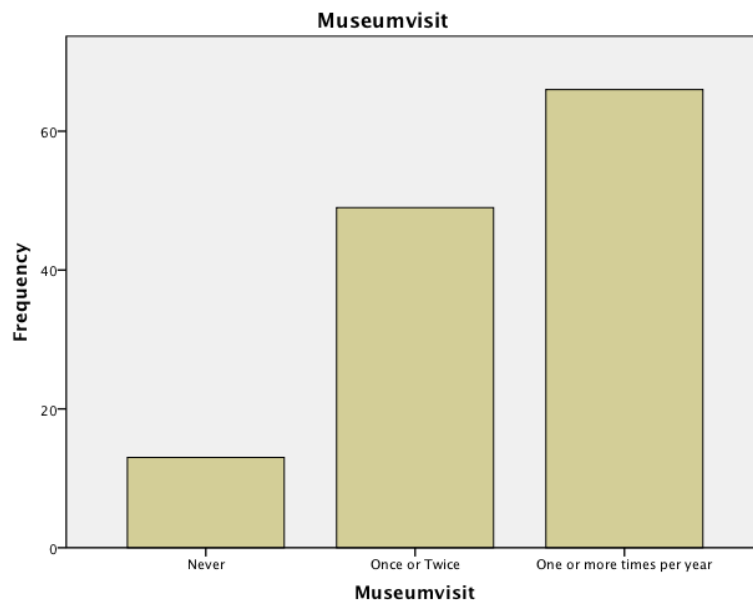


Figure 15 Museum Visitation

The following figure illustrates the self-reported visitation tendencies of the participants. They were asked to choose how often they visited cultural institutions such as museums or aquariums with their families. Some students had never visited (10.2%), others had been once or twice (38.2%), and the majority (51.6%) went one or more times per year.

Ocean Wise™ Use: During the program, students are challenged to choose a sustainably caught seafood item the next time they have the opportunity. This direct link to a positive environmental behaviour change is supported by the attitude changes fostered during the program. The literature has found that such direct links to behaviours are the only way to successfully measure behaviour change; whereas more general environmental education does not lead to any measurable behaviours change (Scott & Willits, 1994). In this case, student's Ocean Wise™ use was significantly linked to their attitude change ($p < .013$) and their general environmental behaviour ($p < .008$). There was no significance ($p < .110$) when compared to their behaviour change, because Ocean Wise™ use was one of the factors used to gauge behaviours in the survey, therefore it was a test against itself.

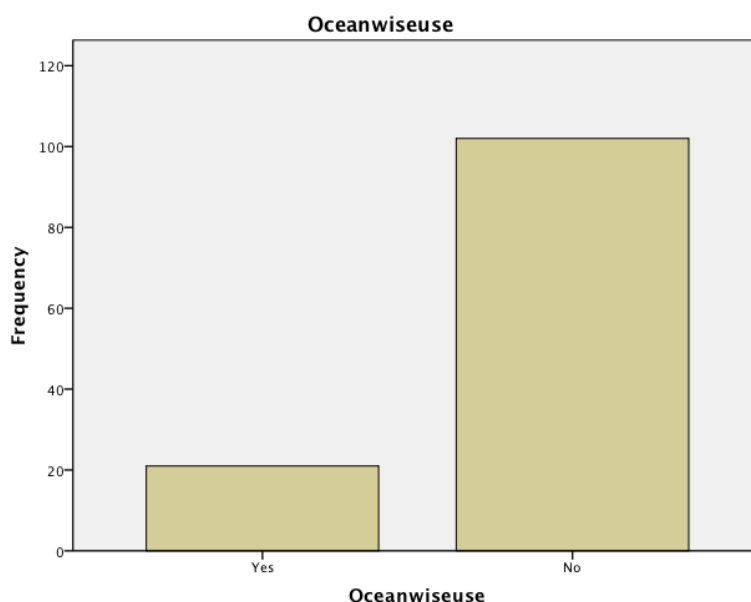


Figure 16 Ocean Wise™ Use

At the end of each program, the students are challenged to choose sustainable seafood (represented by the Ocean Wise™ program) the next time they eat seafood. Of the participants, 17.1% had chosen a sustainably caught seafood item, whereas 82.9% had not.

Most Enjoyable Part of the Program: The students were asked to write about what they enjoyed most during the program, and while the information shed light on the critical factors that the students remembered, their attitude change, behaviour change, and general environmental behaviours were not significantly linked to their choices in any way ($p < .413$, $p < .494$ and $p < .357$ respectively).

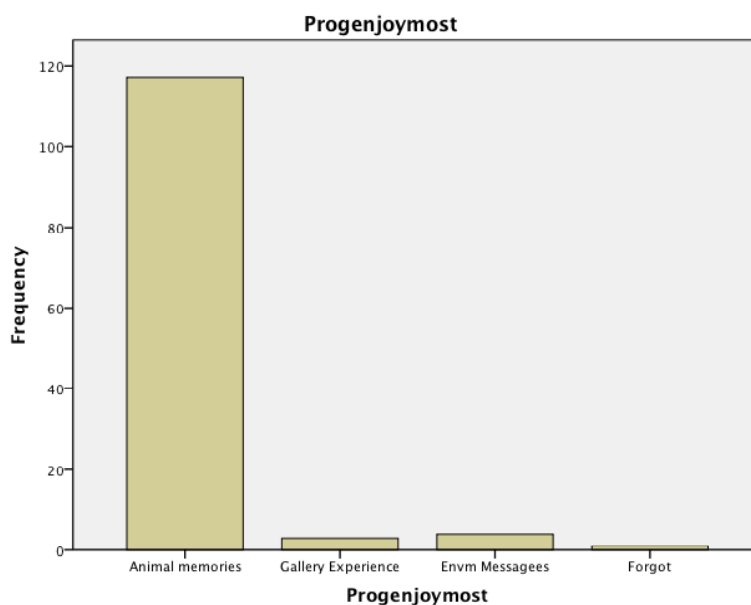


Figure 17 Most Enjoyable Part of the Program

The participants were asked to describe the most enjoyable part of the program. These responses could be divided into the following categories: animal memories (93.6%), gallery experience (2.4%), environmental messaging (3.2%), or they forgot (0.8%).

Least Enjoyable Part of the Program: The least enjoyable part of the program was not significantly linked to attitude change, behaviour change, or general environmental behaviours ($p < .638$, $p < .121$, and $p < .626$, respectively). However it is interesting to note in Figure 18 below, that almost half of the students chose to write about the worksheets or lectures as the least enjoyable component. This could be the worksheets from the IMB program, or worksheets that the teachers provided. During the interview component, many students indicated that they had referred to their teacher's worksheet on the survey, and not the worksheet from the IMB program.

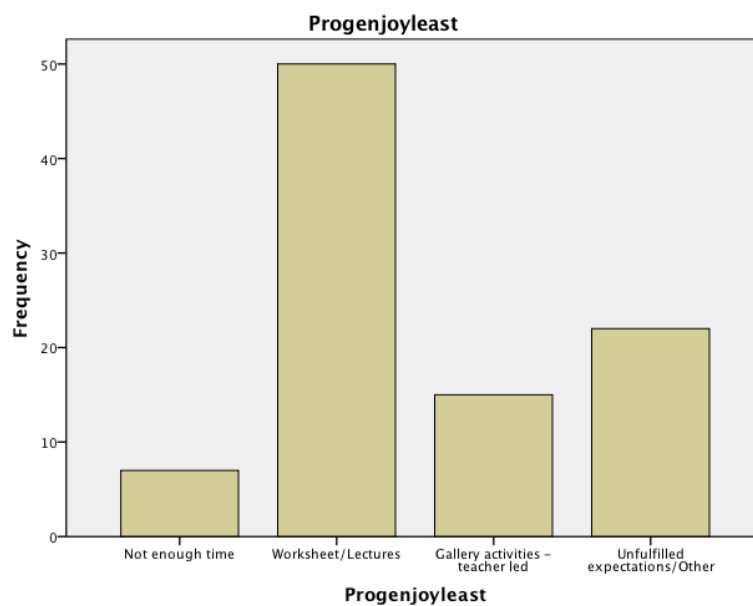


Figure 18 Least Enjoyable Part of the Program

The participants were asked to describe the least enjoyable part of the program. These responses could be divided into the following categories: not enough time (7.4%), worksheet/lectures (53.2%), gallery activities, teacher-led (16.0%), or unfulfilled expectations/other (23.4%).

4.1.4. Correlation between Attitude and Behaviour

The Correlation Matrix below (Refer to Table 5) indicates that all of the dependent measures have significant correlations. Some are stronger than others, as is indicated by the Pearson Correlation coefficients (r). Those r values closest to 1.0 have the greatest significance, and Table 5 below demonstrates that Behaviour Before and Behaviour After have the highest correlation, $r(117) = .854, p < .001$, followed by Attitude Before and Attitude After, $r(116) = .795, p < .001$, and Attitude After and Behaviour After $r(112) = 0.671, p < .001$. General environmental behaviour and Behaviour After are also correlated $r(113) = 0.578, p < .001$, which indicates that students who already participate in positive environmental actions are more likely to change their behaviours after participation in the program.

The Correlation Matrix in Table 5 demonstrates that all of the dependent measures are significantly correlated ($p < .001$) for all interactions. This supports the sustainable fishing component of the IMB program that targets specific attitudes and behaviours, and offers students the tools to change. In the literature, this direct link between attitudes and behaviours is rarely demonstrated (Bogner & Wilhem, 1996; Johnson et al., 2004). Researchers suggest that this is due to the lack of connection between the environmental attitudes that are taught, and the behaviours that are expected. Many environmental education programs do not offer specific behaviours for students to change, or the tools to make those behaviours a reality. The IMB program targets positive environmental attitude change and behaviour change with positive results; students will change if provided with the information and the tools they need.

Table 5

Correlations Between Dependent Measures

| | | AttBefore1 | AttAfter1 | BehvBefore1 | BehvAfter1 | EnvmBehv1 |
|-------------|---------------------|------------|-----------|-------------|------------|-----------|
| AttBefore1 | Pearson Correlation | 1 | .795 | .634 | .579 | .386 |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 |
| | N | 118 | 117 | 114 | 113 | 113 |
| AttAfter1 | Pearson Correlation | | 1 | .607 | .671 | .494 |
| | Sig. (2-tailed) | | | .000 | .000 | .000 |
| | N | | 119 | 115 | 114 | 115 |
| BehvBefore1 | Pearson Correlation | | | 1 | .854 | .494 |
| | Sig. (2-tailed) | | | | .000 | .000 |
| | N | | | 120 | 119 | 115 |
| BehvAfter1 | Pearson Correlation | | | | 1 | .578 |
| | Sig. (2-tailed) | | | | | .000 |
| | N | | | | 120 | 115 |
| EnvmBehv1 | Pearson Correlation | | | | | 1 |
| | Sig. (2-tailed) | | | | | |
| | N | | | | | 124 |

4.2. Stage Two: Qualitative Results

In Stage Two of the study, the interview data were analyzed to identify emergent themes and issues. To increase the credibility of the data, the sample participants were chosen based on their survey answers and gender (to provide an equal balance of males and females), from both Caucasian and Asian ethnicities (the two most prevalent ethnicities in the sample population). The interview questions were designed based on the results from the questionnaire, but the students were encouraged to discuss whatever they felt was important. To ensure credibility in the results member checking was used, where the researcher often asked the students to confirm their meaning by rewording the student's phrase and repeating it back. The researcher put participants at ease with small talk, treats, and reminders that there was no pressure to supply answers.

4.2.1. The Animal's Role

A common emergent theme on the survey which was followed up in the interviews was the animal's role in the program, represented quantitatively in section 4.1 in the tests for the most enjoyable part of the program (Refer to Figure 17). One question was included in every interview based on the student's feelings about touching the animals.

The researcher chose key words, such as *animals*, *touching*, *family*, *connection*, and *environment*, and also looked for phrases that indicated attitudes or behaviours with respect to the marine environment when coding the data. Below are select excerpts from the interviews.

Kitsilano Secondary, Grade 12 male students:

- Student 1:** Well, the touching kind of made it 'real.' It's no longer just an abstract fact, there's something that's actually being affected right in front of you. So, I think touching is really important.
- Student 2:** I think it was nice, like, to be able to touch them, rather than just have a pane of glass in between you and them, you got to like, actually feel them out and see what's going on.
- Student 3:** And [you can see] how delicate, how easy it is to hurt them.
- Student 2:**to destroy one of them.

Kitsilano, Grade 12 female student:

- Student 2:** It made you appreciate them a little bit more. You don't just think they are little slimy creatures.

Churchill Secondary, Grade 11 female students:

- Student:** It's really cool, but it's not every day that you get to you know, touch a little creature, but as well, it kind of, um, better understand what's actually going on when you can really look and feel something that's directly affected by pollution, polluted oceans, and stuff like that. When you can actually look at what you're killing, it makes you think twice.

Interviewer: *That emotional connection...*

Student: Like the 5 senses...you can see them, you can touch them, smell them....

Student: Very often you don't care about them as much, like if it's not present, you don't care so much, so like, when you see that stuff, and touch it, it's present.....

Student: Yeah, you forget they're like, living...

Student: when you touch them you like, understand a bit more, because it's different when you describe it, you learn about it in the classroom and then when you get to actually be there....

Student: ... to see ourselves in another creature really connects us to them, and can really help us understand, and be a little more willing to make those changes to help the environment.

The emotional connection to the animals during the program was evident in every student's description of their experience. It was often the only component that they remembered, and it somehow connected them to the environment and led them to comment on how their actions could impact these animals. This was an interesting factor to explore, because the statistical results indicated that students who chose the animals as the most enjoyable part of the program (Refer to Figure 17) were not significantly linked to any increase in positive environmental attitudes or behaviours, despite the student's insistence during the interview that their connection with the animals had inspired them to make positive changes for the environment.

4.2.2. Reflections on Family and Change

The conversations in each interview started with a question about the student's environmental beliefs, and the similarities and differences that exist between their own beliefs and their parent's beliefs, if such a link existed. Since all of the interviewees were still in secondary school, and between the ages of 15, 16 and 17, it is likely that many students still relied heavily on their parents for

guidance. The comments below indicate the students' dependence on their parents, and their difficulty in describing actions that can help the environment.

Kitsilano, Grade 12 male student

Interviewer: *Do you think that your parent's feelings towards the environment are the same as yours – and can you describe them if you think that?*

Student 1: Um, Yes, I would say that they're about the same as mine. But in a different sense that she, my mom, cares more about the general 'what is happening' and then I tend to go towards more of the facts in a scientific way. Mine is more of a long-term worry, where as hers is a 'oh BP oil spill' kind of worry.

Kitsilano Secondary, Grade 12 female students

Student 2: I guess it's a mixture. My parents taught me some stuff and then I teach them stuff from what I hear at school....

Student 1: I think about [sustainable seafood], but I'm not the one who buys it, so I don't really know what's going on.

The group below in particular (from Sir Winston Churchill Secondary) seemed to have discussed the program with their families, and asked about sustainable options, or introduced their concern for the environment. Convenience is the most common emergent theme here, and the parent's influences are heard through the students' responses, and their reasons (valid or not) for choosing less sustainable options.

Sir Winston Churchill Secondary, Grade 11 female students

Interviewer: *Do you have the same environmental values as your parents? Can you describe them?*

Student: I think that your parents worry more, they kind of don't organize their life completely around the environment, because it takes a bit more time. I guess composting doesn't, but in terms of grocery shopping and stuff, if you're going to go for the more sustainable choice, most of the time it's more expensive, and then I think it's harder if

you have more kids and stuff, to buy the more expensive kind, so I think parents tend to think less about it than the kids, cuz they just kind of suit out the best kind of option for the family's budget, all the time...but I think that if I were to go to a fish and chip shop I would go for the more sustainable one, if I was paying for it myself, as opposed to if my mom was paying for the whole family.

Student: After we went to the aquarium and they were talking about sustainable fishing, and then one day I asked my mom about it, and I think it's harder for her because she's the one who does the grocery shopping, and it's kind of out of her way, she'd have to drive farther to find places that actually say where the fish is from, because a lot of places don't. So it's not convenient for her.

Student: I guess it's like...we have the same idea...we both want to do something, but I guess it's easier for me to say 'oh, we should do this and that' but she's the actual one who has to go out and get this or that, so I guess it's harder.

Student: Well, for my family it's kind of harder because there are 7 of us living in the house, and one of them is my grandma, and she doesn't care AT ALL. But my parents, we kind of got them to get compost and start recycling more, because we started learning about it more at school and stuff so... we changed that, and now, when we have to get something from superstore my brother, he just goes on the bike, instead of driving there.

Student: kind of, like, I spoke to my mom about the pamphlet I got, and I told her about it, and I think she was like agreeing with it, but we haven't done much about it though...I haven't checked where we normally get our fish to see if they catch it that way...I think...

In Table 6 below, the results show that students from Kitsilano Secondary School show the most significant change in attitudes and behaviours, followed by Sir Winston Churchill Secondary School and then Windermere Secondary School.

Table 6

Attitude Changes and Behaviour Changes based on Secondary School

| School | | Attitude Change | Behaviour Change |
|------------|----------------|-----------------|------------------|
| Churchill | Mean | 5.4841 | 3.8636 |
| | N | 21 | 22 |
| | Std. Deviation | 1.44446 | 1.52374 |
| Kitsilano | Mean | 5.7835 | 4.1382 |
| | N | 77 | 76 |
| | Std. Deviation | .75749 | 1.20012 |
| Windermere | Mean | 5.2407 | 3.4470 |
| | N | 21 | 22 |
| | Std. Deviation | .72336 | 1.22192 |
| Total | Mean | 5.6349 | 3.9611 |
| | N | 119 | 120 |
| | Std. Deviation | .92628 | 1.28515 |

A common issue that evolved from the interviews was the subject of barriers, and what stopped people from participating in positive environmental behaviours. The vocabulary that emerged was similar in each interview group. They used words like ‘convenience,’ ‘cost,’ and ‘efficiency’.

[The extra time that you need to take to prepare for everything, like recycling for example, if you haven’t started recycling]

[And now that technology has advances, it’s like more convenient to use what’s not environmentally friendly, I find.]

[I think it’s mainly accessibility and if people don’t know where to find certain things, then its harder. Most people just stop when they can’t find certain things... if you have to go on a huge search parade, then that’s usually what stops everyone in their tracks right away.]

With all the discussion around convenience, the students had many reasons to explain why it is difficult to be environmentally friendly, and had very few ideas on what they could do to make a difference.

[Absolutely, yes. Um, wait.....you could, but I'm not really educated in the way that, HOW you could. But yes, I believe you can.]

[Just like, I don't know, in general, just be environmentally friendly, and don't produce so much gas, and instead of taking the car, like biking or something.]

It is this incongruence that is discussed in the literature between attitudes and behaviours (Bogner & Wilhelm 1996; Grob, 1995; Johnson et al., 2004; Kaiser et al., 1999); the students know that something should be done to help the environment, but they are not sure what to do, and therefore there is no resulting change in behaviour despite a change in attitude. This misalignment exists when attitudes are targeted (as in the news media) but they are not matched with the appropriate options for behaviour change (Shultz & Oskamp, 1996). The only consistent plans for improvement mentioned by the students included sustainable fishing options, which were the focus of the IMB program.

[Not just convenience, but the price, the stuff that is greener usually costs a lot more. Bottom trawling... is really harmful, but it's the most efficient way of catching a lot of fish. So, the fish can be sold for cheaper, and more people will buy it. And if it's caught one at a time, it's going to take a lot longer, and fewer fish on the market, and it's gonna cost a lot more. And also, with the convenience thing, is the bottom-trawling fish is everywhere. You're not going to go out for dinner and say I'm going to get some fish, I'm going to drive to, er, I'm going to take the bus to the fish market that sells Ocean Wise™ fish when I could just drive to Safeway and get just a regular fish.]

It may have been at the forefront of the discussion because the students believed the researcher/interviewer wanted to hear it; however, when the students were encouraged to think of other sustainable changes they could make, it was difficult for them to think beyond basic actions such as recycling. This is a common theme in the literature, for recycling is found to be the most common positive environmental behaviour documented, possibly due to the fact that it is easy to measure, and easy for participants to identify (Axelrod & Lehman, 1993). Below are some select excerpts that

demonstrate the other types of positive environmental actions the students thought they could do to make positive changes for the environment.

[Biodegradable soap.]

[I could unplug stuff.]

[I have to learn how to take shorter showers]

[I could use less water when I am washing the dishes.]

Kitsilano, Grade 12 males

Student 1: I definitely see room for environment, uh, improvement. It's not like I'm extremely environmentally conservative...I do separate my garbage and recycle, but I don't actually go out of my way to get out there out every Sunday, pick up trash, get a mop, go clean up the oil spill kind of thing.

Student 3: Yeah, um, I always used to go to that, there's always that one day a year where you go down to the beach, pick up the garbage, I used to do that, and get a huge garbage bag of broken glass, all that kind of stuff, um, I haven't done that in a long time though. But I think that, while the cleaning up bit is good, but I think if the Ocean Wise™ program because a lot more common, and popular in restaurants, it would become a lot easier.

Interviewer: *What stops you from making other changes?*

Student 2: I'd say, like, convenience, cuz it's like, you're going to like, a soccer game, a baseball game, and you could take public transit but you know you're going to be tired, and you would have to carry your bag and stuff, and I would rather just drive there, drive back, get it over with.

Student 3: Not just convenience, but the price, the stuff that is greener usually costs a lot more. Bottom trawling... is really harmful, but it's the most efficient way of catching a lot of fish. So, the fish can be sold for cheaper, and more people will buy it. And if it's caught one at a time, it's going to take a lot longer, and fewer fish on the market, and it's gonna cost a lot more. And also, with the convenience thing, is the bottom-trawling fish is everywhere. You're not going to go out for dinner and say I'm going to get some fish, I'm going to drive to, er, I'm going to take the bus to the fish market that sells Ocean Wise™ fish when I could just drive to Safeway and get just a regular fish.

4.2.3. Summary

The quantitative surveys led to data that allowed for statistical analysis and produced reliable results about the sample population. However, the student interviews provided insight into the real issues that concerned the students and explored their feelings, and their own actions that affect the environment. The strong results from the surveys indicate that the Intertidal Marine Biology program is making a positive environmental impact on students. The interviews indicate that there is so much more that can be done to offer students a holistic view of the environment and their role in the ecosystem. The interview component offered a deep, insightful reflection of the students' experience and was an integral component of this study. The animals' role in the program was demonstrated by the students to be the most important part of their IMB experience. This was a critical factor in understanding the impact of the program.

Chapter 5. SUMMARY OF THE RESEARCH QUESTIONS, FUTURE RESEARCH, CONCLUSION

5.1. Research Question 1

What socio-cultural factors significantly influence urban high school students' learning about and associated attitudes and behaviour change towards marine conservation issues mediated by participation in a conservation-based experiential program (Intertidal Marine Biology)?

The first research question was addressed primarily using statistical analysis of the survey data. Many socio-cultural variables were used when creating the survey, and using statistical analysis, a number of significant variables were identified: school, gender, birthplace, parent's birthplace, parent's country of origin, hobbies, museum visitation, and Ocean Wise™ use. Many of these socio-cultural variables were found to influence positive environmental attitude change, behaviour change or both, after participation in the Intertidal Marine Biology program. Students' positive environmental attitude changes may be influenced by their school, gender, birthplace, and parent's country of origin, as well as their hobbies, museum visitation and Ocean Wise™ use. Students' positive environmental behaviour changes were significantly linked only to their hobbies. General environmental behaviour was significantly linked to the parent's country of origin, their hobbies, museum visitation, and Ocean Wise™ Use. These results demonstrate that students' socio-cultural backgrounds play an integral role in their learning; environmental educators can use this information to develop programming that is relevant in today's society, and hopefully lead to successful outcomes such as positive environmental behaviour change.

Environmental education promotes awareness of an issue or a subject, and the expected outcome is that positive environmental attitudes will lead to positive environmental behaviours. The results of this study indicate that regardless of the content of an environmental program, students' learning is significantly influenced by their socio-cultural backgrounds. It is important that environmental

educators are aware of their audience, and consider the variables that will influence their programming. Clearly, socio-cultural variables impact attitude and behaviour change; the implications of this are discussed further in section 5.4.

The literature indicates that attitude change does not lead directly to behaviour change in studies that have examined general environmental education programs (Kollmuss & Agyeman, 2002). In this study, the results demonstrate the opposite; there is a significant correlation between attitudes and behaviours (Refer to Table 5 for the Correlation Matrix). These results can be explained by the nature of the IMB program; the focus is on sustainable fishing practices, and students are provided with the knowledge and the tools to make positive environmental change. Researchers have suggested that targeting specific attitudes and behaviours and providing students with the tools to effect positive environmental change in their lives could create a link between attitudes and behaviours, which is demonstrated by the results of this study.

I suggest that environmental educators offer students concrete examples of actions they can do on their own to help the environment. In the study described here, this approach has proven to be successful.

5.2. Research Question 2

What are the critical aspects of participation in the IMB program that influence or signpost their future behaviour and attitudes?

There were significant aspects of the program that students identified as critical to their experience that they indicated on the surveys and in the interviews. The majority of students felt that touching and observing the animals was the highlight of the program. Students mentioned during the interviews that after touching the animals they felt an empathy or connection that inspired them to think about their actions. However, in the statistical analyses that were used to identify these signposts

of the program, there was incongruence with what the students said in the interviews, and the statistical results from the questionnaires.

Despite the students' interest in the animals, the animals themselves were not the target of any specific behaviour after the program. The literature demonstrates that attitudes and behaviours are most often influenced by direct learning about the attitudes and behaviours being targeted, therefore the resulting mismatch between the students feelings and the data can be explained (Kaiser et al., 1999). While the animals create the emotional connection necessary for empathy, the information in the program about sustainable fishing is a critical component because the statistics demonstrate that students have significantly better attitudes and behaviours with respect to sustainable seafood practices, a targeted attitude and associated behaviour in the program.

Although the students' connections to the animals may not result in any direct measurable change in attitude or behaviour in this study, their position as 'most enjoyable' aspect of the program (Refer to Figure 17) and the continued discussion of their role during the interviews indicates that they are a critical factor in the student's learning journey, and may impact their attitudes or behaviours in an indirect way. Another critical factor was the sustainable fishing information that directly targeted attitudes and behaviours that the students could incorporate into their daily lives. Sustainable seafood was the one topic that students were eager to discuss, and quick to support. However, many students explained that they had very little choice when it came to choosing the types of groceries being purchased or the restaurants frequented by their families. They explained that despite conversations about sustainable fishing, their parents told them that the cost and convenience of sustainable seafood was too great a barrier. While this was discouraging to hear, I hope that the questions which were raised during the program and the questionnaire and interviews that followed will pave the way for behavioural change as the students gain independence.

5.3. Emergent Themes and Issues

During the course of the study, there were many emergent themes and issues that were critical to shaping the design of the study and the direction of the analysis. The survey analysis identified many issues that were not necessarily the focus of the study, such as parent's country of origin. While the survey asked many questions about socio-cultural factors, attitudes and behaviours, it was broad and general in many ways, so that the critical factors from the survey could be identified, and the results could drive the more focused interviews.

During the interview process, many common emergent themes were identified between the three schools, both grades, and a range of ethnicities. Regardless of any of those identifying factors, all groups mentioned the animals, and many reminisced about the events of the day, often with a story about an individual animal that had amazed them in some way. When environmental behaviours were discussed during the interviews, the focus was most often sustainable fishing, which was likely driven by the students' memories of the survey questions rather than their spontaneous thoughts regarding positive environmental behaviour change. Most students mentioned their parents as a barrier to their environmental behaviour change, mentioning convenience, cost and accessibility as critical factors that affected their ability to be environmentally friendly. This tendency to pass on their responsibility may be due to the age of the students, for they are dependent on their parents in many ways.

The themes that arose in the interviews were common across the different schools and different socioeconomic statuses of their associated areas of Vancouver. Regardless of the parent's origins, students from all schools mentioned 'cost,' 'convenience' and 'time' as the most critical barriers to positive environmental changes. These factors are critical to understanding what attitudes and behaviours can be targeted in future programming and the associated research.

5.4. Suggestions for Environmental Education Programmers and Practitioners

This study indicates that differences in a student's cultural background can play a critical role in their learning and subsequent attitudes and behaviours with respect to the environment. This information is important to consider when designing environmental education programs and delivering information about environmental issues. As the demographics of most large cities in North America are changing quickly, it is critical for educators to consider the diversity of their students. If educators are aware of the socio-cultural makeup of their audience, they can alter their approach accordingly to make their programming relevant and engaging. In practice, this may be a pre-program assessment of students' hobbies and interests, or the gender make-up of the class, that could provide insight as to what approach will lead to successful programming.

Acknowledgement of the necessity to change, and attention to what will produce positive outcomes may mean the difference between engaging and successful environmental education and programming that does not engage, inform and inspire learners to effect environmental change.

5.5. Future Research Directions

This study has identified many research possibilities that exist in the field of environmental education. The literature concurs, and calls for more ethnically diverse research, paired with a focus on attitudes and behaviours. The results here support and acknowledge that there is much to be learned in this area. Studies that look at the socio-cultural differences that influence attitudes and behaviours between countries, provinces or states and cities would be beneficial to the field and offer unique snapshots of the diversity and breadth of the possibilities.

If a researcher were to undertake a similar study, the next step would be to survey and interview a larger sample population and increase the length of the study to include pre and post data.

Identification of external factors such as news media, as well as the teacher's and peer's influences

which may affect the attitudes and behaviours of students before, during and after the program would be a critical next step. Also, the teacher's active participation in the survey and interviews could be used to gain a better understanding of their socio-cultural backgrounds, and the classroom atmosphere that is such a critical part of learning. There is always more that can be done; time limits every study, and in an ideal world we would be able to follow these students from adolescent to adulthood, and measure how the program may have influenced their attitudes, behaviours and choices in life.

5.6. Conclusion

The results of this study offer support for informal experiential environmental programs, and indicate the significant influence they can have on students' attitudes and behaviours. Socio-cultural theory was used to frame this study, and it offered a holistic view of the participants' experiences during the program. Socio-cultural theory acknowledges the context in which learning happens; the cultural backgrounds and personal histories included. This results in a real-life view of *how* and *what* people can learn and remember.

The results of this research identified a number of socio-cultural variables that have an impact on students' attitudes and behaviours in the Intertidal Marine Biology program at the Vancouver Aquarium. While school, gender, birthplace, parent's birth country, hobbies, museum visitation and Ocean Wise™ use significantly affected attitude change, behaviour change was only linked to the participants' hobbies. General environmental behaviour was significantly linked to parent's birth country, hobbies, museum visitation, and Ocean Wise™ use.

This example of experiential environment education is unique; however, the conclusions that can be drawn with regards to socio-cultural variables are important to acknowledge on a larger scale. Environmental education programs often measure success based on the resulting attitude and behaviour of their participants. This study has shown that those measures are significantly impacted

by socio-cultural variables. For environmental education to succeed by these measures in the diverse student population that we see today, it is critical that educators are aware of the socio-cultural variables and create programming that is relevant and engaging for all. This may be possible if educators are aware of their audience and the myriad of socio-cultural backgrounds that can exist in one class. Educators can adapt their environmental programs to encompass the needs of a diverse audience; pre-assessment of students' hobbies and interests, or the gender make-up of the class are just two examples of how to gain insight on a particular group. Awareness alone of the impacts of socio-cultural variables can offer environmental educators a new perspective, and possibly lead to the development of more relevant environmental education. With relevant environmental education, educators can inspire students to effect positive environmental change in attitude and behaviour, as demonstrated in this study.

The five dependent measures of attitude (before and after), behaviour (before and after), and general environmental behaviour were all significantly correlated (Refer to Table 5). The strongest correlation was between behaviour before the program, and behaviour after. This strongly suggests that students who already participate in positive environmental actions are more likely to change their behaviours as a result of the IMB program. Attitudes before and after the program were also strongly correlated, indicating that student's who have positive environmental attitudes are most likely to increase those attitudes after the IMB program. Contrary to much of the literature, the Correlation Matrix (Refer to Table 5) indicates that attitudes and behaviours are significantly correlated. This highlights the nature of the IMB program in that specific attitudes and behaviours are targeted, providing students with the tools to effect environmental change. The correlation between attitudes and behaviours in this study indicates that the IMB program is successful in targeting specific attitudes

and the associated behaviour changes, by providing the knowledge and the tools to effect positive environmental change.

The significant results of this study indicate that providing students with the tools necessary for environmental change, and targeting specific attitudes and behaviours can be successful if the goal is to effect positive environmental change.

Chapter 6. EPILOGUE: WHAT I HAVE LEARNED

This research project was driven by my experiences teaching an experiential, environmental program, and the questions that arose as I watched students connect with the animals, learn about the environment, and reflect on how they can be instrumental in creating change. I have learned so much along the way, about research, environmental education, socio-cultural aspects of learning, and myself.

I found that teachers were reluctant to participate in the research study, because of a lack of available time in their schedules. The actual data collection was the major challenge in this study, and it was undertaken at the end of the year, when students and teachers alike are short on time, and eager to begin summer vacation. If I were to continue with further research, I would consider undertaking the study at a less hectic time of the school year.

Going into this study, I felt that students would surprise me with their commitment to the environment, and yet I heard ‘recycling’ used over and over as their primary contribution to sustainability. While recycling is important, I expected more. Learning that our society has yet to move past the basics, to the more critical aspects of sustainability was illuminating.

As an environmental educator, I believe that the most important result I learned during this process is that the programs we teach must be socio-culturally relevant to students, and the behaviour and attitude changes that we hope to develop must be targeted directly by program activities and information. This connection between the environmental learning, and the targeted behaviour change must be clear to program developers and educators if the result is to be successful.

This experience has been challenging, rewarding and informative. The journey that brought me to the end of this thesis has been filled with learning that I will take with me throughout my career.

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APPENDIX A: Survey Questions

Hands-on learning: Remembering your visit to the Vancouver Aquarium

Are you MALE or FEMALE? Please circle one.

What part of Metro Vancouver do you live in?

- ☐ Vancouver
 - ☐ Richmond
 - ☐ Burnaby
 - ☐ Other: _____
-

What is your ethnic origin?

- ☐ First Nations
 - ☐ Asian/Pacific Islander
 - ☐ Hispanic/Latino
 - ☐ Caucasian
 - ☐ Other _____
-

If born in a country outside of Canada, how long have you lived here? _____ years

Were your parents born in Canada? YES or NO

If you answered NO to the last question, please tell us where they were born: _____

How often have you visited museums, aquariums, art galleries, etc. with your family?

- ☐ Never
 - ☐ Once or Twice
 - ☐ Once per year
 - ☐ Multiple times per year
-

Please list 5 of the things you like to do most (ie. Hobbies, activities....).

1. _____
2. _____
3. _____
4. _____
5. _____

| Does your family: | Never | | | | All the time | | |
|--|-------|---|---|---|--------------|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Recycle plastic | | | | | | | |
| Watch TV shows about animals/nature | | | | | | | |
| Get concerned about the state of the environment | | | | | | | |
| Encourage you to conserve energy (ex. Turn out the lights) | | | | | | | |
| Try to commute using a green method of transportation? | | | | | | | |
| Use reusable bags to carry lunch | | | | | | | |
| Pick up litter you see on the ground | | | | | | | |

Do you think that your daily actions and behaviours help the environment? YES or NO
How? _____

Have you told friends/family members about the Intertidal Marine Biology program?
YES or NO?

If you answered YES to the last question, what did you tell them?

For each statement below, please circle a number that describes how you felt BEFORE you participated in the Intertidal Marine Biology. Then, please circle a number that best describes how you felt AFTER the program.

"Before the program I....."

"After the program I....."

| NEVER | | | | | | | ALWAYS | | | | | | |
|-------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | | try to eat seafood that is harvested in a way that does not harm the ocean environment. | | | | | | |
| | | | | | | | watch TV shows about animals and the environment. | | | | | | |
| | | | | | | | tell others about the problems our oceans face. | | | | | | |
| | | | | | | | help to conserve the oceans through my behaviours and actions. | | | | | | |
| | | | | | | | am very concerned about the state of the oceans. | | | | | | |
| | | | | | | | often visit the beach to observe or interact with ocean animals. | | | | | | |

During the program, the thing I enjoyed the most was.....

During the program, I thing I enjoyed the least was.....

INSTRUCTIONS: Please circle one answer for each question.

Are you aware of any pamphlets the Vancouver Aquarium provides that help to make sustainable seafood choices?

YES or NO?

I have used a SeaChoice Card to order seafood at a grocery store or restaurant.

YES or NO?

If you answered YES, did you use the SeaChoice card BEFORE or AFTER (please circle one) your visit to the Aquarium?

Since participating in the program, have you chosen an OceanWise item on a restaurant menu?

YES or NO?

Since participating in the program, have you asked someone (ie. a server, deli staff...) where your seafood was caught/how it was caught?

YES or NO?

For each statement below, please circle a number that describes how you felt BEFORE you participated in the Intertidal Marine Biology. Then, please circle a number that best describes how you felt AFTER the program.

"Before the program I was aware...."

"After the program I am aware....."

| DISAGREE | | | | | | | AGREE | | | | | | | DISAGREE | | | | | | | AGREE | | | | | | | |
|----------|---|---|---|---|---|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|-------|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | there are problems in the ocean environment. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | the problems marine ecosystems face are caused mostly by other people, not me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | all of us have a responsibility to future generations to help conserve ocean animals. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | that my actions are part of the problem that marine ecosystems face. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | there are things I can do to help conserve the oceans. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | everyone should help to conserve the oceans. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | that I can make a difference for marine habitats or animals. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

APPENDIX B: Tables

Table 7

Attitudes Before the Program: Component Matrix

| Question | Component | | | | | |
|--|-----------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 5. There are things I can do to help conserve the oceans. | .774 | -.153 | -.179 | .015 | -.102 | -.062 |
| 9. I can make a difference in the lives of ocean animals. | .753 | -.303 | .024 | .384 | -.157 | -.070 |
| 10. I care about the problems marine animals have to face. | .748 | .010 | .070 | -.257 | -.229 | .117 |
| 7. I can make a difference for marine habitats or animals. | .725 | -.364 | -.035 | .369 | -.081 | .031 |
| 8. I can make a difference if I choose sustainably caught seafood. | .706 | -.096 | .099 | .467 | -.160 | -.040 |
| 14. There are many things I can do to make a positive difference for marine habitats. | .672 | -.060 | .179 | -.323 | .313 | -.289 |
| 15. The oceans are threatened by human activities. | .653 | .520 | -.062 | -.049 | -.225 | .150 |
| 11. I would like to spend more time at the beach or on the ocean to observe ocean animals. | .643 | -.163 | .456 | -.151 | .047 | .194 |
| 12. My actions demonstrate that I care for marine life. | .628 | -.156 | .463 | -.280 | .282 | -.026 |
| 6. Everyone should help to conserve the oceans. | .613 | -.098 | -.448 | -.119 | .279 | .005 |
| 19. I made changes in my life to help the oceans. | .606 | -.102 | .334 | .205 | .121 | -.204 |
| 18. It's important to buy seafood that is environmentally friendly. | .590 | .389 | .025 | .183 | .249 | -.300 |
| 4. My actions are part of the problem that marine ecosystems face. | .575 | -.285 | -.271 | -.200 | -.441 | .036 |
| 3. All of us have a responsibility to future generations to help conserve ocean animals. | .574 | -.076 | -.475 | -.296 | .379 | .141 |
| 1. There are problems in the ocean environment. | .495 | -.044 | -.410 | .111 | .269 | .363 |

| Question | Component | | | | | |
|--|-------------------|------|-------|------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 17. Bottom trawling is a destructive method of fishing. | .357 ¹ | .611 | -.079 | .220 | .185 | -.353 |
| 16. Marine animals and their habitats are threatened by human activities. | .583 | .605 | -.115 | .025 | -.278 | .150 |
| 2. The problems marine ecosystems face are caused mostly by other people, not me. | -.156 | .093 | .201 | .439 | .380 | .648 |

Table 8

Attitudes Before the Program: Reliability Statistics with Q 2 removed

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|--|------------|
| .904 | .906 | 18 |

Table 9

Attitudes After the Program: Component Matrix

| Question | Component | | | | |
|---|-----------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 |
| 10. I care about the problems marine animals have to face. | .808 | -.045 | .073 | .055 | -.285 |
| 5. There are things I can do to help conserve the oceans. | .760 | -.154 | -.194 | -.083 | -.163 |
| 14. There are many things I can do to make a positive difference for marine habitats. | .734 | -.063 | -.094 | .271 | .036 |
| 15. The oceans are threatened by human activities. | .725 | .460 | .085 | -.110 | .004 |
| 7. I can make a difference for marine habitats or animals. | .720 | -.312 | -.179 | -.270 | .197 |

¹ Although item 17 is slightly below 0.4 it was kept in the data analysis because of the importance of the item to the IMB program and the assessment of the supervisory team's agreement on the construct validity of the item (R.B. Darlington, 1973).

| Question | Component | | | | |
|--|--------------|--------------|-------------|--------------|-------------|
| | 1 | 2 | 3 | 4 | 5 |
| 9. I can make a difference in the lives of ocean animals. | .671 | -.411 | -.164 | -.365 | .099 |
| 18. It's important to buy seafood that is environmentally friendly. | .666 | .353 | -.025 | -.034 | .326 |
| 16. Marine animals and their habitats are threatened by human activities. | .656 | .516 | .057 | -.270 | -.056 |
| 12. My actions demonstrate that I care for marine life. | .637 | -.326 | .447 | .305 | .008 |
| 3. All of us have a responsibility to future generations to help conserve ocean animals. | .633 | .164 | -.302 | .470 | .194 |
| 6. Everyone should help to conserve the oceans. | .621 | -.085 | -.372 | .458 | .150 |
| 4. My actions are part of the problem that marine ecosystems face. | .606 | -.271 | -.269 | -.131 | -.408 |
| 13. I like ocean animals. | .602 | .276 | .505 | .042 | -.313 |
| 11. I would like to spend more time at the beach or on the ocean to observe ocean animals. | .600 | -.227 | .422 | .089 | -.348 |
| 19. I made changes in my life to help the oceans. | .581 | -.407 | .205 | .178 | .370 |
| 17. Bottom trawling is a destructive method of fishing. | .576 | .520 | -.037 | -.180 | .247 |
| 1. There are problems in the ocean environment | .484 | .338 | -.025 | .191 | -.129 |
| 2. The problems marine ecosystems face are caused mostly by other people, not me. | -.103 | -.080 | .594 | -.020 | .476 |

Table 10

Attitudes After the Program: Reliability Statistics With Q 2 removed

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|--|------------|
| .918 | .921 | 18 |

Table 11

Behaviours Before the Program: Component Matrix

| Question | Component |
|--|-----------|
| | 1 |
| 5. Am very concerned about the state of the oceans. | .844 |
| 4. Help to conserve the oceans through my behaviours and actions. | .812 |
| 3. Tell others about the problems our oceans face. | .757 |
| 2. Watch TV shows about animals and the environment. | .731 |
| 6. Often visit the beach to observe or interact with ocean animals. | .634 |
| 1. Try to eat seafood that is harvested in a way that does not harm the ocean environment. | .507 |

Table 12

Behaviours Before the Program: Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|--|------------|
| .804 | .810 | 6 |

Table 13

Behaviours After the Program: Component Matrix

| Question | Component |
|--|-----------|
| | 1 |
| 5. Am concerned about the state of the oceans. | .841 |
| 3. Tell others about the problems our oceans face. | .795 |
| 4. Help to conserve the oceans through my behaviours and actions. | .759 |
| 2. Watch TV shows about animals and the environment. | .696 |
| 1. Try to eat seafood that is harvested in a way that does not harm the ocean environment. | .630 |
| 6. Often visit the beach to observe of interact with ocean animals. | .611 |

Table 14

Behaviours After the Program: Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|--|------------|
| .813 | .817 | 6 |

Table 15

General Environmental Behaviours: Component Matrix

| Question | Component | |
|--|-----------|-------|
| | 1 | 2 |
| 3. Get concerned about the state of the environment | .768 | .126 |
| 4. Encourage you to conserve energy | .716 | -.338 |
| 5. Try to commute using a green method of transportation | .650 | -.336 |
| 6. Use reusable bags to carry lunch | .632 | -.032 |
| 7. Pick up litter you see on the ground | .565 | .449 |
| 1. Recycle Plastic | .512 | -.376 |
| 2. Watch TV Shows about Animals/Nature | .418 | .773 |

Table 16

General Environmental Behaviours: Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|--|------------|
| .717 | .721 | 7 |

APPENDIX C: Questionnaire Coding Scheme

Table 17

Question Value Labels

| Question | Value Labels | |
|----------------------------|--------------|---------------------------|
| School | 1 | Churchill |
| | 2 | Kitsilano |
| | 3 | Windermere |
| Year | 1 | 2008/2009 |
| | 2 | 2009/2010 |
| Grade | 1 | 12 |
| | 2 | 11 |
| | 3 | 10 |
| Gender | 1 | Male |
| | 2 | Female |
| Residence | 1 | Vancouver |
| | 2 | Richmond |
| | 3 | Burnaby |
| Ethnicity | 1 | Caucasian |
| | 2 | Asian/Pacific Islander |
| | 3 | Other |
| Birthplace | 1 | Born in Canada |
| | 2 | 1-4 years in Canada |
| | | 5 or more years in Canada |
| Parent's born in Canada | 1 | yes |
| | 2 | no |
| Parent's country of origin | 1 | North America |
| | 2 | Europe |
| | 3 | Asia |
| | 4 | Other |

| | | |
|----------------------------------|---|--------------------------------|
| Museum visitation | 1 | Never |
| | 2 | Once or Twice |
| | 3 | One or more times per year |
| Number 1 ranked hobby | 1 | The Arts |
| | 2 | Outdoor/Physical Activity |
| | 3 | Media/Games |
| | 4 | Socialization |
| | 5 | Other |
| Number 2 ranked hobby | 1 | The Arts |
| | 2 | Outdoor/Physical Activity |
| | 3 | Media/Games |
| | 4 | Socialization |
| | 5 | Other |
| General Environmental Behaviours | 1 | Never |
| | 2 | 2 |
| | 3 | 3 |
| | 4 | 4 |
| | 5 | 5 |
| | 6 | 6 |
| | 7 | All the time |
| Help the environment | 1 | yes |
| | 2 | no |
| Told your friends or family | 1 | yes |
| | 2 | no |
| Told what | 1 | Environmental Messages |
| | 2 | Fun and Interesting |
| | 3 | Animal Memories/Hands on |
| | 4 | General Field Trip information |
| Behaviour Questions 1-6 | 1 | Never |
| | 2 | 2 |
| | 3 | 3 |
| | 4 | 4 |
| | 5 | 5 |
| | 6 | 6 |
| | 7 | All the time |

| | | |
|-------------------------------------|---|----------------------------------|
| Program Enjoy Most | 1 | Animal Memories |
| | 2 | Gallery Experience |
| | 3 | Environmental Messages |
| | 4 | Forgot |
| Program Enjoy Least | 1 | Not enough time |
| | 2 | Worksheets/Lectures |
| | 3 | Gallery Activities - teacher led |
| | 4 | Unfulfilled expectations/Other |
| Pamphlet awareness | 1 | yes |
| | 2 | no |
| Pamphlet use | 1 | yes |
| | 2 | no |
| Pamphlet before | 1 | Before |
| | 2 | After |
| Oceanwise item | 1 | Yes |
| | 2 | No |
| Oceanwise use | 1 | Yes |
| | 2 | No |
| Attitude Questions 1-19 | 1 | Disagree |
| | 2 | 2 |
| | 3 | 3 |
| | 4 | 4 |
| | 5 | 5 |
| | 6 | 6 |
| | 7 | Agree |
| Want to help the ocean environment? | 1 | Yes+Recycle |
| | 2 | Yes+Sustainable seafood action |
| | 3 | More Aware |
| | 4 | Conserve Energy/Waste Reduction |
| | 5 | Other |
| | 6 | No |
| | 7 | Yes |

| | | |
|-------------------------|---|-------------------------------------|
| Best part of your visit | 1 | Animal Memories |
| | 2 | Gallery Experience |
| | 3 | Learning about environmental issues |
| | 4 | Other |
| Interview | 1 | Yes |
| | 2 | No |
| | 3 | Maybe |

APPENDIX D: Interview Questions

1. Do you think that your parent's feelings towards the environment are the same as yours? Can you describe them?
2. Why was it important to touch the animals? Do you feel that you learned more about the animals having had the opportunity to touch them?
3. Please tell me about the activity your teacher prepared for your gallery time. Did you feel that it was useful/educational?
4. If you eat seafood, have you found that you think about where it comes from after participating in the program?
5. Do you think that you can make changes in your life that will help marine animals and their environment? If so, what are the challenges/barriers to doing so?
6. Can you tell me anything about your experience that you did not share on the survey?

APPENDIX E: Permissions

E.1 Vancouver School Board Approval



May 13, 2010

Jennifer Kennedy
3119 West 7th Ave
Vancouver, BC,
V6K 1Z9

Dear Ms. Kennedy,

Thank you for your research proposal "Socio-cultural factors and environmental education". On behalf of the VSB Research Committee please accept this letter as approval for you to complete your research in Vancouver schools. You have permission to contact teachers, parents, and students in Vancouver schools. We request that you make your initial contact with the principal of the school to inform him or her of your study and provide him or her with a copy of this letter. Please note that teachers and administrators are very busy with many obligations and that schools have the right of refusal to participate in any research studies. Also, the Vancouver School District does not find subjects for researchers.

The VSB Research Committee would be very interested in learning of your results and its implications for students. When your research is completed, please send us an abstract of the results.

Thank you for focusing your work within the Vancouver School District. I wish you the best of luck as you proceed with your inquiry.

Sincerely,

Dr. Valerie Overgaard, Associate Superintendent
Learning Services

E.2 Vancouver Aquarium Marine Science Centre Approval for Research

PO Box 3232, Vancouver, British Columbia, Canada V6B 3X8
Telephone 604 659 3400 Facsimile 604 659 3515 www.vanaqua.org

Accredited by American Zoo & Aquarium Association
Alliance of Marine Mammal Parks & Aquariums
Canadian Association of Zoos and Aquariums

March 25, 2010

To Whom It May Concern:

The Vancouver Aquarium Marine Science Centre approves Jennifer Kennedy's research involving the Intertidal Marine Biology school program.

Eric Solomon

Vice President
Conservation, Research, and Education

APPENDIX F: Documents

F.1 Parental Consent Form

Experiential environmental education: Looking at attitudes and behaviours after participation in a marine conservation program.

Principal Investigator:

Dr. David Anderson, Faculty of Education, UBC

Co-Investigator:

Jennifer Kennedy, Faculty of Education, UBC

M.A. Candidate, Department of Curriculum and Pedagogy

Co-Investigator:

Dr. Sandra Scott, Faculty of Education, UBC

For the parent/guardian of the student:

This research is for a graduate degree in the faculty of Education at UBC. The data collected will be used as part of a thesis. Participants will remain anonymous in any publicly available documents relating to this study.

Your son or daughter is being invited to take part in this research study because they participated in a school program at the Vancouver Aquarium in 2008/2009 or 2009/2010. This study will investigate the sociocultural factors which influence the students' understandings, and their attitudes and behaviours after participation in the Vancouver Aquarium program *Intertidal Marine Biology*.

In this study, your son/daughter will be asked to complete a survey that will take approximately 10-15 minutes to complete. The survey questions have been designed to gain information on your son or daughter's understandings, attitudes and behaviours with respect to the marine environment, based on the program they participated in at the Vancouver Aquarium. Following the survey, a small number of students may be selected and invited to participate in 30 minute interviews a few weeks later. These students will be chosen based on their answers on the survey; the researchers hope to gain further insight by getting a more detailed description of the students responses though the interviews. If your son or daughter is chosen for an interview, they can withdraw at any time.

After completion of the survey, your son or daughter may benefit from an increased self-awareness of marine conservation issues, and an enhanced understanding of the B.C. Biology School Curriculum. The results of the study will assist both teachers and the aquarium staff to enhance the educational effectiveness of the *Intertidal Marine Biology* programming and the school curriculum for BC's students.

All documents will be identified only by code number and kept in a locked filing cabinet. Any electronic documents will be kept in a password protected file. Subjects will not be identified by name in any reports of the completed study.

If you have any questions or desire further information with respect to this study, you may contact Dr. David Anderson.

If you have any concerns about your son/daughter's treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598 or if long distance e-mail to RSIL@ors.ubc.ca.

Your son/daughter's participation in this study is entirely voluntary and they may refuse to participate or withdraw from the study at any time.

Your signature below indicates that you have received a copy of this consent form for your own records.

I consent / I do not consent (circle one) to my child's participation in this study.

Parent of Guardian Signature

Date

Printed Name of the Parent or Guardian signing above

F.2 Questionnaire Cover Letter

QUESTIONNAIRE

Behaviour change through experiential environmental education: Exploring the socio-cultural factors

**By Dr. David Anderson (Principal Investigator), UBC
Jennifer Kennedy (Co-Investigator), Vancouver Aquarium
Dr. Sandra Scott (Co-Investigator), UBC**

This questionnaire is part of a study aimed at understanding student's attitudes and behaviours after participation in the Vancouver Aquarium school program *Intertidal Marine Biology*. The questionnaire will help us determine your attitudes and behaviours with respect to the marine environment. There are no right or wrong answers to the questions.

You have been selected as a potential participant because you participated in the program in 2008/2009 or 2009/2010.

Your voluntary participation will be an invaluable contribution to the understanding of the impact of this program.

Completing this questionnaire will be considered as your assent to participate in the study.

There will be no consequences for not participating, or if you decide to withdraw at any time from this study.

There are no expected or known risks for participating in the study.

IT SHOULD TAKE YOU ABOUT 15 MINUTES TO COMPLETE THIS QUESTIONNAIRE.

IF YOU ARE WILLING TO PARTICIPATE IN A 30-MINUTE FOLLOW-UP INTERVIEW, please indicate this at the end of the survey, where you will find a box to check YES or NO. Put the completed questionnaire in the envelope provided and seal the envelope. The information from the survey and the interview will be input into a computer without any identifying information.

Personal Information:

Name of Your School _____ Your Name _____ Grade _____

F.3 Teacher Participation Invitation

Hello Teachers!

I have worked with many of you in the Intertidal Marine Biology program at the Vancouver Aquarium over the past 3 years, and I am contacting you because I want to conduct some research to make our programming better for you and your students.

I am currently doing a Masters in experiential environmental education at UBC, and for my thesis I am going to explore the behaviour and attitude changes of students after they have participated in the Intertidal Marine Biology program we offer here at the Vancouver Aquarium. I will investigate the socio-cultural factors that influence student's perceptions and understandings of the program, and I hope to create a more relevant, engaging program for your students.

If you have received this email, you previously attended Intertidal Marine Biology with your class in 2008/2009 or 2009/2010. I would like to survey the students who participated in the program over that time period. This survey is approximately 30 questions, and should not take more than 15 minutes. Following up the survey, I would like to interview a small sub-sample of students about their experiences of the Wet Lab. I hope to collect all data this May, 2010.

The study will have the approval of your districts school board and well as the [UBC Behavioural Research Ethics Board](#). If you are interested in participating in this study, I will provide consent forms for the students' parents to sign and return. The identity of the research subjects will be protected during the study by protection of the data. No names will be included in the thesis document, or any writing related to the study.

Please let me know if you are interested in participating in the study. You can contact me via email or by phone.

Thank you,

Jennie Kennedy
Coordinator, Curriculum Programs