A CASE STUDY OF ONE SPECIAL INTEREST GROUP MOULDING STUDENT ATTITUDES THROUGH ITS SCHOOL PROGRAM:

SALMONIDS IN THE CLASSROOM

By

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B. Sc. California State Polytechnic College, 1968

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

MATHEMATICS AND SCIENCE EDUCATION

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

October 1988

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Abstract

In public education, it is not possible to present school programs that will satisfy all the external groups from society. When an outside interest group perceives a need that is lacking in the schools' curriculum, it may petition the ministry of education or the local school board to include its need into the curricula. Another method to influence or insert its point of view is for the interest group to produce its own curriculum for a school program. This study investigated the impact of one outside interest group as it attempts to modify students' attitudes through its school program, *Salmonids in the Classroom.* Werner's description of editorial criticism permitted examination with a political perspective, of the resource package, *Salmonids in the Classroom.* The methodology of this analysis permitted a view of the goals and values espoused and hidden in a school program and how those goals and values were modified as they are passed from the program sponsors through the developers to the teachers. To determine the effects of the *Salmonids in the Classroom Program* upon student attitudes toward the salmonid resource, a Likert-type instrument using a slide show was used. To understand children's beliefs and attitudes about the salmonid resource, student interviews were conducted with some students after they were exposed to the *Salmonids in the Classroom Program.* This study confirms that a special interest group can sponsor a school program and modify student attitudes to be more supportive of the interest group's programs and goals. This study may be useful not only to teachers to assist in clarifying their role with the special interest group's school program, but it may also be useful to special interest groups who may be planing ways to influence the public through the school system.

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Acknowledgement

When a composing thesis absorbs one's summer, certain people are responsible and should be thanked:

- My advisor, member of the committee, and friend, David Bateson, who started me early on this project and enriched my year with many learning experiences, from computers to CSSE in Windsor. Thanks for being so helpful.
- The rest of my helpful committee: Robert Carlisle and David Blackmore.
- Walt Werner who stimulated my mind about teaching and education during his classes, and stimulated four sections of this thesis.
- Gaalen Erickson who stimulated my mind about thinking about thinking, and the qualitative aspects of this thesis.
- Jose Aguirre who helped me relocate my focus during a dark moment.
- Gary Taccoyna, Head of *PIP*, who spent so much time and energy with myself, even if we never made it sailing. I was very impressed with Gary's dedication to the *Salmonid Enhancement Program* and to education.
- Linda Bermach, *PIP*'s Education Coordinator, who initiated the research in measuring students' attitude change and came to UBC for a researcher. Linda helped with her time, information, and materials. I hope the study was useful to you and the *Salmonid Enhancement Program.*

- Russ Selwood, Science Coordinator, for assisting with and organizing parts of the study in the Vancouver school district. His excitement with the salmonid school program was inspiring and his eventual *letting me lose* in the classrooms was very much appreciated.

- Anne Marie Mol, my classmate, my confidant, and my wife, for making life easier at home and encouraging me while she was *under the gun* too. Thanks for giving up the study and the word processor when I was on a roll.

- Kirsten and Clayton Wolthers, our children, who grew up and took care of themselves this summer so Dad could complete this thesis.

Chapter 1

The Problem

1.1 General Problem

This thesis is a case study of how a special interest group was established and how it found its way into the classrooms of British Columbia and affected students' learning outcomes for the purpose of gaining support to the special interests of that group. One purpose of this special interest group was to inform and then influence students to support its goals and objectives when the prescribed and authorized public school curriculum of B.C. omitted the necessary content. This study therefore explored the roots of a special interest group, school program, and how that program can effect students' attitudes and behaviors that support the group's goals and objectives. This study then measured how the program effected student attitudes toward the group's goals and objectives. Finally, this study examined and explored the sense students have made of the program in light of the program's goals and objectives as defined by the special interest group. By participating in this particular school program, many students have experienced positive attitude changes toward the goals of the interest group. In addition, by participating in the school program, students have automatically performed some behaviors that are supportive of the goals of special interest group.

The central problem investigated in this study was to examine possible attitude changes and the circumstances surrounding those possible changes toward the Pacific

salmonid resource by primary students who have studied the *Salmonids in the Classroom Program* (*SICP*). *SICP* is a school program that can be classified as an environmental education program about the Pacific salmon and trout. *SICP* was developed in 1979 by the Government of Canada through the *Department of Fisheries and Oceans* (*DFO*) for specific use in the schools of British Columbia [1]. *SICP* is now available for students from grades 1 to 10 and is usually taught by interested teachers who volunteer to implement the program on a yearly basis. *SICP* has now completed 10 years of implementation in various classrooms across the province and it appears to be expanding and gaining in popularity.

This study originated from the development of a simple quantitative instrument for the *DFO* (the client) that would measure student attitude changes that might result from exposure to *SICP* in ten primary classes using the program in the Vancouver School district. The target students had wide ranges in ability and social background, and many were classified into the English as a Second Language program. The original contracted study expanded its bounds for the purposes of this study. It did so by analyzing the roots, goals, and curriculum materials themselves in order to explore the possible impact *SICP* was having on students' attitudes and behaviors after studying salmonids. It was realized that other forms of research would be desirable to achieve the goals of this study. Therefore, the data from the simple quantitative measure were triangulated with a detailed editorial examination of the curriculum and with data from a limited number of student interviews conducted to explore the sense children were making of the salmon in the classroom and the sense they were making of the goals and objectives of the *DFO*.

Both the *DFO* and the Vancouver School district were interested in the results of the original study in order to evaluate the affective outcomes of *SICP*. In this study, the

[1] details of this program are discussed in Section 1.3.1 and Section 2.2

DFO is considered to have the developers' interest and point of view and the district is considered to have the implementers' interest and point of view. Neither this type of evaluation, nor in fact any other type of evaluation attempting to determine student learning outcomes, had been formally undertaken on *SICP*. This situation allows this study to set the foundation for future salmonid school program research studies.

This study may provide supporting evidence and clarification to fisheries personnel, salmonid developers, and users of *SICP* about student attitudes toward the salmonid resource and potential behaviors in support of *DFO* goals. These people have made many informal observations of students in action with *SICP*, and have probably formed some realistic ideas about student attitudes and behaviors toward the salmon resource.

For the purposes of this study, it is assumed that an evaluation of students' attitudes toward the salmonid resource should correspond with the goals of the *DFO*. That is, the learned attitudes, at a minimum, should not contradict the stated salmonid goals, but in fact should support the *DFO* goals. In addition, it was assumed that the Vancouver School district was most interested in the pedagogical attributes of *SICP* that include students' interest, enthusiasm, and other related learning outcomes that resulted from the use of the program. However, one of the major purposes of this study was to examine the fit of students' learned attitudes to the goals of the *DFO*.

A more fundamental and important concern for educators is the potential political power that special interest groups (in this case the *DFO*) have within the schools and classrooms. *SICP* has primarily an explicit economic mandate for its foundation with secondary environmental and societal considerations. How and if this mandate is mediated to students is not known. However, hypotheses about how the goals are transferred to students can be constructed by analyzing the curricula materials, the context which the teachers bring to the materials, the measured student attitudinal outcomes, and the affective expressions from the students themselves. It is imperative

that educators understand the potential importance, value, and inherent control a special interest group may affect when it finds its way into the classroom. However, with an understanding of the program and the special interest group itself, an educator can bring valuable educational benefits to the classroom.

This study used the Fishbein and Ajzen [2] model to explain the nature of attitudes and the potential for corresponding behaviors to occur as a result of the intervention by a special interest group into classrooms as it introduced its set of values to the students [2]. Although this theory does not exist without challenges to the model, still, it is commonly thought that attitudes do greatly effect future corresponding behavior, and this could explain the vast amount of research done in the area of attitudes [79]. If attitudes do precede corresponding behaviors and *SICP* changes student attitudes toward the salmonid resource, and since the future of the salmonid resource will be partially determined by today's students learning about salmonids in their classrooms, this study may have significant importance in explaining and predicting the future of the resource in terms of its valuable components of economics, environment, and societal structure.

This study does not attempt to examine the technical and educational success of *SICP*. Questions regarding these aspects of the program could have different answers depending upon one's viewpoint. For the most part, *SICP* is being freely implemented by increasing numbers of teachers [94] and is creating enthusiastic interest in the classroom [90]. However, the central questions of importance to educators that this study considers are whether or not the goals and values espoused from the curriculum and the *DFO*'s *Salmonid Enhancement Program* are worthy, whether or not the goals are being met, and what might be the future consequences of attitudes of students that accept or reject the goals.

[2]details of this model are discussed in Section 1.3.3 and in Section 2.3

1.2 Definitions of Terms

The *SALMONIDS* are those species of salmon, trout, and char belonging to the family *Salmonidae.* The *Salmonid Enhancement Program* is concerned with enhancing the five species of Pacific salmon and searun rainbow and cutthroat trout [61].

The *SALMONID ENHANCEMENT PROGRAM* (*SEP*) is a federally funded program in British Columbia with the goal of restoring stocks of Pacific salmonids to historic numbers. This program is managed by the federal Department of Fisheries and Oceans (*DFO*).

The *SALMONIDS IN THE CLASSROOM PROGRAM* (*SICP*) is the school program about the salmonids. It is sponsored by *SEP.*

SALMONIDS IN THE CLASSROOM:PRIMARY PACKAGE (*SIC*) is a curriculum resource binder, sponsored by *SEP*, and used in the primary classes. *SIC* is the primary source of lessons, activities, and background reference information available to the teacher.

ENHANCEMENT is a fishery resource management tool for controlling or modifying environmental conditions to improve survival of immature salmonids in fresh water in order to increase the overall abundance of harvestable salmonids [61].

PRIMARY STUDENTS, for the purposes of this study, are those children enrolled in grades one, two or three, and does not include Kindergarten since *SICP* was not designed for Kindergarten pupils.

MANAGEMENT is the encouragement of natural habitat, the utilization of artificial reproduction techniques, and the enforcement of regulations to produce salmonids.

SALMONID RESOURCE is a complex concept that encompasses the use and management of salmonids. The use of salmonids includes the following aspects: economic, cultural (recreational and traditional), and appreciation (environmental and aesthetic).

ATTITUDE is a learned predisposition of an individual to respond, in a consistently favorable or unfavorable way, to performing behaviors related to an attitude object. [2]. The primary interest and concern of this study are the salmonid resource-related attitudes of primary students that have studied *SICP*.

BEHAVIOR refers to any activities related to corresponding attitudes. Unlike attitudes that are internal, not directly observable, and must be inferred from verbal remarks or responses to questionnaires, behavior can be observed directly [53]. The primary interest and concern of this study are the future salmonid resource related behaviors that students may exhibit as a result of participating in *SICP*.

1.3 Background of the Study

1.3.1 Context of the Study

The *Salmonid Enhancement Program* is a federally funded program in British Columbia, administered by the Department of Fisheries and Oceans, with the primary purpose of restoring the stocks of Pacific salmon to historic levels. This program started in 1975 with a series of studies and public hearings [12]. The most frequently expressed message in the hearings was that fisheries' laws should be enforced and that the public should be educated in the importance, proper care, and wise use of the resource. Overfishing, illegal fishing and damage to habitat were cited as the main causes for the decline of the salmonids. The participants in the hearings expressed a desire for a change in the attitude and behavior of individuals, corporations, and other organizations to protect and enhance the salmonids. The public hearings declared that the least important enhancement technique was the hatchery [88]. However, the Federal Government was already committed to the development of large hatchery facilities.

The *DFO* announced phase I of the program in 1977 with an operating budget of

$150 million. To answer the need for public education, 3.7% of the budget was set aside for public involvement. This would include an education subcomponent for the public schools of British Columbia [41].

The Federal Government decided that the basic thrust of the program would be aimed at economic development through the application of proven fish culture. All methods and projects were to be evaluated with a benefit-cost analysis recognizing a multiplicity of goals. The goals were summarized into five broad categories:

- National Income,
- Regional Development,
- Native People,
- Employment, and
- Environmental Preservation [75, pp.34-35].

Clearly these goals did not provide the basis for significant funding of public involvement and education. In addition, achievement of the goals would not completely answer the problem of human behavior in the form of greed and other damaging activities that were causing the decline of stocks. However, $5.5 million over the next five years was a seed of assistance to the public's request. The *Public Involvement Program* (*PIP*), a department directed by *SEP* which involves the public, including school children, with salmonid enhancement, administered this budget. The *PIP* budget is now down to 2% of the annual *SEP* budget, which means approximately $854,000 will have been spent by *PIP* during the 1987-88 budget year [25]. A significant portion of that budget has found its way into educating children about salmon.

Education for the public which is funded by the *DFO* has to continually justify its expenditures. The school projects do not produce enough fish, according to the *DFO*'s

policy of benefit-cost, to justify continuing the school programs. Therefore, the value of the school program has to be found by the Federal Government in public acceptance and support of the goals and expenditures of the *SEP*. Without this acceptance and support, *SEP* could not exist.

1.3.2 Educational Context of the Study

Environmental Education

> ... What's at stake today is more than the commodity called fish... What's at stake now is our own attitudes, our hopes, our vision and all of it regarding a very rich, but fragile, environment. What's at stake is our determination to live up to our responsibility as guardians of the world we use. What's at stake is our ability to see beyond the stretch of our own greedy arms. What's at stake is our chance to demonstrate that we are able to reject the easy way, the quick way, in favour of what we know in our hearts to be the right way ... Vancouver Public Inquiry [88, no page number].

"Environmental education (EE) has been used as a synonym for nature study, conservation education, and outdoor education activities" [28, p.1]. Whiteford [107] states that "environmental education, in its broadest sense, includes a study of conservation, preservation, ecology, and resource management" (p.25), and Swan [93] claims that "environmental education is concerned with developing informal attitudes of concern for environmental quality" (p.28). Since the study of salmonids includes these elements, which are grounded in an appreciation and value of the environment, the *Salmonids in the Classroom Program* could be classified as an environmental education program, even though its sponsor, the Federal Government, may not have had this intention.

The importance of the few existing environmental school programs cannot be understated. Stapp [91] claims that:

> there can be no hope of finding viable solutions to environmental problems unless and until education at all levels is also suitably modified to enable people from all walks of life to comprehend from childhood the fundamental interactions and interrelationships between humans and their environment (p.37).

According to Wood [110] environmental education should convey at least three aspects of environmental awareness:

- Exposure to knowledge concerning the man-environment relationship.
- Development of skills and abilities.
- Development of attitudes of responsibility and appreciation toward the environment (pp.50-52).

Tanner [95] continues this theme by stating: "the ultimate goal for environmental education is the maintenance of a varied, beautiful, and resource-rich planet for future generations." And thus the "penultimate goal of environmental education, especially in a democracy like ours, must be the creation of an informed citizenry which will work actively toward this ultimate goal." (p.20).

Swan [93] recognized as did the participants of the salmonid public hearings that many of our environmental problems are actually problems of human behavior. And Ames [4] concludes that "... in the final analysis the success of environmental education will be measured in terms of its ability to change the behaviour of society" (p.92).

The *Salmonids in the Classroom Program*

Educating the public about the salmonid resource was based upon two concerns of the Federal Government. During the public inquiries on *SEP* in 1976, many participants indicated that there was a need for young people's education on this subject. [61, p.53]. Secondly, the Federal Government sought to gain public acceptance of its goals for fisheries, by providing the public with information and opportunities to participate and become educated [75]. The Federal Government answered the educational concerns by developing a school salmonid program (*SICP*) for the students of British Columbia. This resulted in the Federal Government taking a position as an outside special interest group to public education in British Columbia. The British North American Act directed that the Federal Government has jurisdiction over the oceans, including the salmon, but that the Provinces have jurisdiction over education. This political jurisdictional tension has probably resulted in the absence of a provincial marine science curriculum from the elementary and secondary schools in British Columbia. This situation seems to disregard the major economic, environmental, and cultural importance of the extensive British Columbia coastline. The result is that *SICP* has not been mandatory or prescribed for the schools in British Columbia.

SEP contracted Dr. Glenn Sinclair's educational consulting company, G.W. Sinclair and Associates, to produce the Educators' Package *Salmonids in the Classroom.* With the assistance of teachers and fisheries staff, two versions of the package, *Salmonids in the Classroom* were produced for grades 6 and 9 by 1979. The approach was multidisciplinary in that science and social studies lessons could be taught from the same reference materials [89]. A third package, *Salmonids in the Classroom: Primary Package* (*SIC*), was produced in 1983 and appears, to this researcher, very "teacher friendly". It was designed for primary students and is, in the *SEP* Education Coordinator's opinion,

probably the best organized and most popular package [10]. *SEP* claims that the packages can be used by both the novice and experienced salmonid teacher [46]. Teacher volunteers are still recruited to assist the Education Coordinator in the on-going modification and reorganization of the packages.

The primary *SICP* consists of four basic instructional components. The central component is a standard classroom incubator (30 gallon aquarium) that contains approximately 200 salmon eggs. The second component is a set of multi-disciplinary resource lessons and reference materials contained in a three-ring binder entitled *Salmonids in the Classroom: Primary Package* (*SIC*). The third component consists of audiovisual materials including videos provided by the (*DFO*). The last component consists of field trips to hatcheries, streams or other fish habitat, and resource utilization sites. The field trip considered most central to the *SICP* is the release of the classroom hatched fry into a local stream or other fresh water system that had been selected for artificial enhancement.

For a school program, *SICP* provides opportunities for teachers and students to actively observe and care for a wild animal inside the classroom. It also leads to opportunities to leave the classroom to observe and to make changes to the local environment. There are many minor variations of *SICP* across the province. Through *SIC*, and guided by each teacher's perspectives and interests, children are taught many technical facts about salmonids. To any individual program, each child brings a foundation of individual past experiences and values to interpret that program and make sense of it. The result is that each child can construct a unique set of attitudes toward the salmon resource.

SICP has now been in British Columbia classrooms for ten years. Because the program permits adaptation by the teachers, the intended *DFO* goals from the *Salmonid Enhancement Program* may not always be achieved. For example, if the salmon fry in

the classrooms are raised as "pets" rather than as a resource with multiple uses, it is conceivable that students may develop narrow empathic attitudes toward salmon. These attitudes may create future opposition to economic use of the resource or even result in campaigns to remove the salmon's natural predators. These outcomes would be contrary to *SEP* goals. However, such a strong protectionist attitude could result in a positive demand for a clean environment and an appreciation of the aesthetic values of the resource. Certainly, *SEP* should prefer individuals with balanced perspectives.

1.3.3 Theoretical Context of the Study

Special Interest Groups

Since *SICP* represents an external influence on the curriculum of public schools in British Columbia, the Federal Government, because of its lack of jurisdiction in provincial public schools, can be classified as a special interest group. Using Roald's [72, p.122] minimum qualifications for an interest group, the Federal Government has:

- a viewpoint or program to advance. Example: investment of funds into programs designed to increase salmon stocks and therefore economic development [61, p.63].
- a minimum quantity of necessary resources such as people, ideas, and materials. Example: the Department of Fisheries and Oceans with an annual budget of $42 million for salmonid enhancement of which a minimum of $90,000 is directed annually into education [25].
- possession of a curricular mission. Example: "involvement provides an information and education function that leads to public acceptance of the Federal government's goals for fisheries" [75, p.7].

Special interest groups usually attempt to gain public acceptance for their programs through so called "neutral information campaigns" which includes public education programs. Gaskell [40] reports that the technical information from the experts (in this case the fisheries technicians) is assumed to be neutral. However, because the information is itself part of a political point of view, the uses to which it is put are not neutral.

> This argument rests on the assumption that the production and presentation of scientific information inevitably involves political and moral judgments about what questions are important to ask, what information is important to include in a presentation and what constitutes an acceptable interpretation of the evidence [40, p. 36].

As previously documented in this section, teachers have been credited for much of the development of the *SICP* curriculum. However, this has not corrected the selective information generated from the *DFO*. Gaskell [40] also reports in the same article that science teachers have worked hard to avoid controversy in the curriculum, with a classic example being the avoidance of teaching sexual reproduction. In addition, Werner [106] points out that teachers not only avoid innovations with perceived controversy but those with perceived costs. If a program is loaded with complex issues, then the teacher may have cost concerns in terms of time, energy, and risk in trying to bring the program into practice. Therefore, special interest school programs, that can usually be taught with little risk and cost to the teacher, often leave out important issues and content as other content, often claimed to be neutral, is selected. The success of implementing *SICP* may rest in its simplicity, yet the resulting public attitudes are formed from the selective nature of information. Showers [83] cautions educators about this practice in the statement, "The judicious selection of information in any classroom has attitudinal

implications, and teachers should be open about accepting this social responsibility" (p.11).

The resulting attitudes may influence future behaviors that lead to acceptance or acquiescence of a political decision which may have negative impacts on the resource, environment, and social structure. The future citizens, mirroring the educators, will not have learned to search for, understand, and decide upon the critical issues, which is necessary before the environment can be protected from other special interest groups.

The Nature of Attitude and the Attitude-Behavior Relationship

> Attitude is a psychological construct, and like all psychological constructs, it is hypothetical. Attitudes cannot be observed or measured directly. Their existence must be inferred from their consequences [64, p.1-2].

The construct attitude needs to be defined first before it becomes useful. Many social scientists have lent their intellect to this task resulting in a variety of definitions, but with some basic agreements. As Mueller [64] has stated, one common critical component of the definitions is the affect "for or against".

The construct attitude is often used as a variable to determine patterns in social behavior. The socialization process produces the attitudes indirectly, which then influence human responses in the environment. If attitude is known, it can be used to predict and explain reactions or be used to manipulate the individual's reactions [81].

One useful model for understanding attitudes and the attitude-behavior relationship, as it applies to the learning outcomes of *SICP* is Fishbein & Ajzen's [2] theory, the *Theory of Reasoned Action.* This theory has the ultimate goal of understanding and predicting an individual's behavior. The basic assumption of this theory is that people are rational and not uncontrolled, capricious or thoughtless. They seek information

about their environment and make use of it systematically to evaluate a considered behavior. The theory defines attitude as the accumulation of an individual's set of evaluated beliefs with respect to a given attitude object. The belief associates some attribute or characteristic with an object. The object can be something physical, an event, or an activity and the attitude is usually expressed as negative or positive. Whether one has a positive or negative attitude toward the object is determined by the set of corresponding beliefs which are evaluated positively or negatively, and the strength with which the individual holds those beliefs. The link between the attitude and the corresponding behavior is the behavioral intention. Intention is only an estimation of how likely the individual is to perform the actual behavior, and is no guarantee that the behavior will actually be performed. The difficulties associated with the prediction of individuals' behaviors, based on their attitudes toward an object, is the low empirical relationship between measured attitude and actual behavior. Still, most attitudinal researchers consider that there is a close association between attitude and behavior. In summary, the concept of attitude has been described by many writers as a mosaic of the individuals' beliefs about the object, feelings toward the object, and behavioral inclinations attending to the object. [2].

Wicker [108] concluded, from his search of the literature that there is very little relationship between measured attitudes and behavior. The problem with using the Azjen & Fishbein model for this study is that the generalized attitudes of students toward the salmonid resource will not necessarily engender the appropriate behaviors even if the students are knowledgeable about the salmonid resource. However, some researchers believe that attitudes can be enduring over time [19] and may eventually lead to appropriate behaviors in the future. Certainly this is the ultimate purpose for studying attitudes and their relationship to behaviors [53]. Shaw & Wright [81] summarize this debate by claiming that the attitude makes it more likely, but does

not ensure, that the behavior will take place. The Fishbein & Ajzen model may well serve the function for helping to identify and explain the nature of attitude and the attitude-behavior relationship.

The Fishbein & Ajzen model can also be useful since it specifies how attitudes can be acquired and changed. The model states that if attitudes are the accumulation of an individual's evaluative beliefs, and individuals are rational, then new information that is evaluated can change attitudes positively or negatively.

> When people generate new favorable information about an issue, attitudes are likely to become more positive, but when people generate new unfavorable information about an issue, attitudes are likely to become more negative [19, p.359].

Therefore, students learn to like and dislike objects as a continuous process. To instill either positive or negative attitudes in students, there has to be something in the program that interests and motivates a student.

Many environmental education programs seem concerned with the development of proper attitudes of students toward general aspects of the environment. Lucas [56] reports that the major goals of most programs in education *for* the environment focus on the development of attitudes. The attitude theme is important because the assumption is that people with positive attitudes to some environmental referent will support that referent with appropriate behaviors. As Lucas [56] states: "it is not the attitude itself that is considered important, for what is desired is action to produce the desired environmental conditions" (p.13).

A main interest of teachers, employers, governments, etc. is to motivate people to perform certain activities (behaviors) by having them develop the "proper" attitude. There is also an ethical issue to be considered when dealing with endeavors which

attempt to change people's attitudes. Any program, especially one sponsored by an outside interest group, that is directed to changing attitudes, has to justify its purpose. Educators participating in such programs should also be able to clarify and justify their involvement. Program developers and educators must consider the ethics of controlling people's behavior, starting with such questions as: "For what purpose and in whose interest and benefit is this control over people's attitudes being conducted?"

1.4 Specfic Problems of the Study

1.4.1 The Vancouver School District Salmonid Program

Although *SEP* introduced its educational salmonid program in 1979, School District No. 39 (Vancouver) did not implement *SICP* until 1988. Many school districts and classrooms (numbers not available) throughout the Province have implemented various forms of *SICP*. In Vancouver, a total of twelve primary teachers had volunteered and qualified to teach *SICP* by attending the required workshops. These teachers implemented *SICP* in their classes during the 1987-88 school year. The Vancouver primary salmonid school program consisted of the four basic components from *SICP* previously noted.

The Vancouver *SICP* began February 1988 and concluded May 1988. The salmon eggs were delivered to the twelve primary classes the second week of February, at which time the instruction of the curriculum commenced. The salmon eggs, which hatched in March, were monitored by the students. The salmon fry were reared by the students within the incubator until their release in late April and early May. The course instruction on salmonids concluded at that time.

1.4.2 The Research Problem

Roth [74] recognized the need for reliable and valid evaluation in environmental education programs to provide maximum contribution to the achievement of educational goals. Attitude change was one of Roth's listed concerns that required evaluation. The common problem has been that many programs and materials provided specific objectives and goals representing the affective and behavioral domains, but few programs had been measured for the required outcomes.

This lack of formal student evaluation of *SICP* has made planning for the curriculum developers a narrow game of guesswork. Individual teachers have described their individual programs in small scale, informal studies of particular teaching techniques and lessons. These teachers have met and, with their informal classroom evaluations of *SICP*, have formulated new curricula [10]. This process has resulted in the development of a curriculum that is "teacher friendly" for even the novice teacher. Lucas [56] claims that science teachers reporting on their environmental education programs follow this same program develoment pattern. In this same paper, *Science and Environmental Education: Pious Hopes, Self Praise and Disciplinary Chauvinism*, Lucas [56] asks "how successfully do science topics meet the goals of educating for the environment?" (p. 12). By rephrasing Lucas's question, the most important questions, can be asked: not "how successful is *SICP*?", but "how successfully does *SICP* meet the goals of educating for the *Salmonid Enhancement Program*?" and "how global are the environmental perspectives that result from *SICP*?"

Since the Vancouver school district had never implemented a salmonid educational program, the *DFO* considered the district to be an ideal choice to measure possible student attitude changes resulting from *SICP*. The *DFO*, through their Education Coordinator, commissioned a study on the attitude changes of the primary students

from the twelve primary classes. The study proposed to measure the changes in the primary students' attitude toward the salmonid resource after they have studied *SICP*. This study has expanded that original commissioned study.

The problem of this study was focused by the following specific research questions:

1. How does one special interest group construct an educational program designed to effect students' attitudes and behaviors that are supportive of the interest group's goals and objectives?

2. What effect does the study of the *Salmonids in the Classroom Program* have on attitudes of students toward the salmonid resource?

3. What goals and objectives of the *Salmonid Enhancement Program* are being supported or rejected by students after they have studied *Salmonids in the Classroom* Program?

4. What factors from the *Salmonids in the Classroom Program* influence the resulting attitudes of students who have studied the salmonid program?

1.5 Overview of Methodology

In order to address the research questions, this case study progressed in three parts. Part one was an exercise that analyzed the content of the curriculum material, *Salmonids in the Classroom: Primary Package* (*SIC*) and other *DFO* information sources to discover the explicit and implicit goals and objectives of the *Salmonid Enhancement Program* and the context of the developers. The purpose of this exploratory exercise was to lay bare the actual goals and objectives of *SEP* and *SICP* to determine not only the congruence of goals but also how the curriculum can effect student attitudes and behaviors toward the salmonid resource. Part two was a quantitative attitude study using a

Likert type instrument test that attempted to determine the effects of the *SICP* on student attitudes toward the salmonid resource. Part three was a qualitative exploratory study in which some of the students were interviewed in order to determine not only the sense that students made of *SICP*, but to determine specifically what aspects of the salmonid resource and goals of the *Salmonid Enhancement Program* students were supporting and rejecting.

1.6 Significance of Proposed Research

The *Salmonid Enhancement Program* has invested only a small portion of its allocated funds into education. However, even this small amount has been important in bringing the study of salmonids into many classrooms. The Federal Government understands that its mandate is to produce more fish and, while the few fish incubated in most classrooms is not significant compared to the cost of materials and fisheries staff time, there are other indirect benefits. For the Federal Government, the stated goals for their educational programs refer to the hope that future citizens will come from these classrooms with appropriate values and attitudes that will ensure that the salmon resource is maintained and utilized.

If the Federal Government, a special interest group, knows that students are developing attitudes that reflect the goals of the *Salmonid Enhancement Program*, then, in light of their interests, the cost of *SICP* may be justified. If the desired student attitudes are not being developed or attitudes are being developed that are contrary to the goals of the *Salmonid Enhancement Program*, then the government may have to reevaluate *SICP* and/or *SEP*'s goals. *SICP* may be faulty in being able to produce the intended attitudes or *SEP*'s goals may be unacceptable to the children who are rejecting them.

A study such as the present one can only be one piece of evidence to indicate whether or not *SICP* is achieving its intended purpose. If results show that the affective part of the program is successful, then continuation and even expansion and elaboration of the present program might be in order. If the study indicates no change or a decrease in positive attitudes to the salmonid resource, then it may be unwise for *SEP* to continue investing large amounts on *SICP* until it is reevaluated to ensure that it is fulfilling its intended purpose. On the basis of such a reevaluation, *SEP* may wish to alter or even curtail the program [3].

Other special interest groups may find this study a useful example as they attempt to use the school system to influence the public and communicate their goals. This study may assist those groups as they attempt to clarify their goals and transfer them into appropriate curricula that can produce the intended affective outcomes.

The teachers involved in salmonid studies might find this research useful to learning applications in their classrooms. This study should help teachers realize that affective variables can be just as important as cognitive variables in influencing learning outcomes, careers choices, and use of leisure time [53]. They should also understand that special interest groups can be an excellent source of educational materials, resources, and expertise if used wisely and critically in the classroom. By taking a political perspective on a curriculum, teachers can discover the potential impacts that interest groups can have upon the beliefs, values, and attitudes of their students. They may also come to a realization that the perspectives fostered by these groups need to be balanced and questioned, but not necessarily rejected. Interest groups can be encouraged

[3] At the time of the preparation of this thesis (August, 1988), and one month after this writer submitted the original study to the *DFO*, the Head of *PIP*, Mr. G. Taccoyna, called this writer and informed him of changes to *SIC*. The changes to the package were made in response to original study and were concerned with addressing the environmental and economic goals of *SEP* by modifying some of the content.

with constructive feedback so that they have a better understanding of program implementation and program processes which will assist them in producing more successful curricular materials. Students studying salmonids should be exposed to the different perspectives of the salmonid resource and be guided to intelligently construct their own opinions and attitudes based upon a variety of viewpoints.

Chapter 2

Review of the Literature

2.1 Introduction

This chapter reviews the literature relevant to the general problem area discussed in Chapter I. The review begins with a detailed discussion of the *Salmonid Enhancement Program* (*SEP*) and the educational salmonid program, *Salmonids in the Classroom Program* (*SICP*), it has developed. This section is followed by an elaboration of the Fishbein and Ajzen model to explain the importance of the nature of attitudes and the attitude behavior relationship as it would apply to this study. This chapter continues with a discourse on environmental education with attention to environmental values, teachers' context and ability to teach environmental education, the need for children to become aware of the natural environment, and the significance of environmental education to *SICP* and the problem of this study. Finally, this chapter considers from the literature the necessity of triangulating the data from the quantitative experiment with qualitative research in order to enrich this study.

2.2 *Salmonid Enhancement Program*

2.2.1 The Program and Goals

The Federal Government's first five year phase of the *Salmonid Enhancement Program* (*SEP*), which began in 1977, started with a 150 million dollar budget [75]. Its major objective was to double the catch of Pacific salmonids to 300 million pounds annually

by 1990. This objective was to be reached by a variety of methods that ranged from major hatchery construction to small stream enhancement [42]. As stated in Chapter I, all methods and projects were to be evaluated with a benefit-cost analysis recognizing a multiplicity of goals. The government summarized these goals into five broad categories:

- National Income,
- Regional Development,
- Native People,
- Employment, and
- Resource and Environmental Preservation

  [75, pp.34-35].

The intention of the program was economic development through the application of proven fish culture technology. The increase in the salmonid resource would contribute to the government's five major goals.

"These five accounts (goals) are the bottom line by which *SEP* is judged. ...The expenditures under *SEP* are expected to contribute to one or more of these accounts" [76, p.3].

2.2.2 The Problem

The above goals state the political justifications for the huge expenditures of money. People realized that maintaining the abundant salmonid resource should remain a primary concern of past, present and future societies [61]. However, through lack of proper management, the salmonids were declining drastically and the government had to step

in to save an economic resource and a way of life. Overfishing, illegal fishing and damage to habitat were cited as the main causes for the decline in stocks. Watersheds were so depleted of fish that the argument of preserving watersheds for their potential value in the production of salmonids was being lost to other interests and developments[1] that would destroy the streams [61]. It appears one sector of society has been destroying the resource while another sector has been demanding it to be saved.

2.2.3 Finding a Solution

The Federal Government, in a joint agreement with the Province of British Columbia, began *SEP* in 1975 with a mandate to study pilot projects and prepare for a diverse enhancement package in the next two years [41]. Part of this preparation was a public inquiry that involved hearings to be held in eighteen different locations around British Columbia where salmon were an important resource. The summary of the inquiry analyzed the concerns of the public [88]. In ranking the frequency of twenty-seven major concerns, (200 mile limit, no more dams, more field staff, etc.) "more enforcement" and "more education" ranked first and second respectively. These two basic concerns of the inquiry participants are directed at changing human behavior potentially harmful to salmon. The concern "in favor of hatcheries" ranked last. People were not convinced technology would bring the best solution unless proper human attitudes and behavior could first be managed.

A major concern from some participants of the inquiry was that the DFO would spend vast amounts of money on hatcheries and technologies, yet ignore the public's

[1] An example of losing a salmon depleted stream is found in the recent agreement among the Provincial Government, the Federal Government, *DFO*, and Alcan. The agreement turns over control of the Nechako River to Alcan in return for Alcan's claim to water rights on the Nanika River [67] . The Nechako has lost most of the spring salmon runs because of low water levels that have been caused by Alcan's dams. Instead of restoring the stocks of salmon, the DFO gave away all rights to the river in order to protect another river that still has significant runs of salmon [47].

need to be educated and involved. The problems of the declining salmonids were seen to be correlated to human greed and ignorance [12]. There were three basic concerns with public education that can be summarized with these questions:

- Why build up the resource by natural and technical methods and then let ignorance and greed destroy it?
- Why not let the public help by giving them the knowledge and skills pertaining to salmonid enhancement?
- Why not give the public information about the fisheries and an opportunity to help decide policy?

The hearings demonstrated the general approval of the *Salmonid Enhancement Program* by the participants from the inquiry. However, it also demonstrated the participants' lack of trust in a Federal Government that had not protected the resource in the past, the participants' disagreement with the government's method to increase stocks, and the participants' sense of futility in increasing fish production if people did not learn to value and protect the resource.

2.2.4 The Plan

When *SEP* was launched in 1977 with a proposal to spend $142 million over the next five years, the budget listed eight broad categories for program spending. *Public Involvement Program* and *Major Hatcheries Facilities* were two of those budget categories. Public involvement, which included the education factor, was projected to receive $1.9 million, or only 1.3% of the total budget. Major hatcheries were to receive $81 million, or a massive 57% of the total budget [75]. There appeared to be a lack of congruity

between the expressed needs and desires of the public and the political agenda from the federal government.

The public education program, which eventually became a component of the *Public Involvement Program* (*PIP*), was earmarked to receive $550,000 the first year and to be reduced gradually each year thereafter until it was to receive $250,000 the fifth year. The rationale was to provide an educational program to interested sectors from the public with higher initial costs for minor projects, seminars and workshops in the first year of operation. In the following years, it would be a basic program of "information in, information out" with no significant costs for development [75].

However, over the next five years, *PIP* received over twice the projected amount from the budget (3.6%), and the amounts increased each year from $505,000 in the first year to $1,278,000 in the fifth year. Major hatcheries ended up costing $55,808,000, down to 35% of the total budget [22]. Although the amounts to *PIP* were increasing, the actual amount directed to public school education was declining from 28% to 15% of the *PIP* budget [30].

2.2.5 *PIP*: Objectives and Structure

PIP, as one of the components of the *Salmonid Enhancement Program*, has the responsibility to link the public to the resource and to the Government's program. It allows concerned citizens to have an opportunity to actively contribute to the salmonid resource. In addition, the program disseminates information and education, and permits the public to input advice [78].

The original four objectives of the 1977/78 public participation program were stated in the *Salmonid Enhancement Program.* These objectives were based on the need to increase the understanding of the problems of salmonid survival, to promote awareness of solutions to these problems, and to strengthen the role of the public in helping to

conserve the salmonid resource. The objectives are:

- To promote public awareness of concerns for and commitment to the protection of stream systems and estuaries as essential elements of a long term program of salmonid enhancement.
- To provide the concerned public with factual information on the goals, strategies, methods, implementation plans, costs, benefits and administrative organization of the *Salmonid Enhancement Program.*
- To develop a communication system to ensure that plans for salmonid enhancement reflect the reasonable views and desires of those citizen groups who will be affected by the program.
- To provide opportunities for the public to participate in salmonid enhancement projects. [75, p.84].

Public participation was designed to encourage interested individuals to interact with the technical planners. The public included school children from primary through senior secondary schools [75]. Obviously, the survival of *PIP* depends upon public participation, not only for funding, but for the hard work involved in enhancing streams and building and maintaining small hatcheries. Many school children have contributed in these ways.

PIP has now been placed under the Special Projects Division of *SEP* and is still responsible for public involvement. *PIP* is subdivided into four components. The components are the *Salmonid Enhancement Task Group* (*SETG*), *Education, Information,* and *Participation* [78].

SETG is composed of members from the user groups of the resource which include representatives from tourism, commercial fishing, native people, educators, consumers,

and the general public. This group has access to information from *SEP* and in turn advises *SEP* about concerns from the public [78].

The Education component is responsible for the Educators Package, *Salmonids in the Classroom*, which was designed for use in British Columbia classrooms. This element is maintained and revised by the Education Coordinator who also gives workshops to interested groups, mainly teachers [77].

The Information component is responsible for the publication of the Annual Reports and Summaries, *PIPnews*, and various documents, fact sheets, manuals, and pamphlets. These information components are designed for all concerned and interested citizens, including teachers [78]. The information department also maintains a library of films, videos and slide shows which are available to teachers and community groups. The information publications and the library form the basis of support for the audio-visual component of *SICP*.

The Participation component is administered by nine fisheries-trained employees who are classified as community advisors (CAs). They are assigned to nine geographic areas in B.C.. *SEP* hired the first four advisors to work with volunteers throughout the province in 1979. The groups of volunteers have included school children and teachers, conservation clubs, community service groups, native communities, and many individuals. The CAs provide the technical expertise and funding to develop the projects [42]. The CAs also attend public fairs (e.g., P.N.E., Salmon Fests) and advertise *SEP* from display booths. With thousands of volunteers to be coordinated, the CAs were expanded to nine. *SETG* is presently requesting the services of four more CAs, knowing that this number is still not enough to serve all the communities of B.C. [94].

Present funding for the nine CAs is $450,000 a year. This gives each CA $50,000 per year to spend on projects and associated costs such as transportation. Separate contracts with various volunteer groups are drawn up and the funds allocated are used

for materials, supplies, and transportation. The funding is not adequate to cover the expenses for all the projects in public participation. Many individuals, organizations, and companies have donated materials, supplies, and transportation. Private organizations (e.g., the Vancouver Sun's Save the Salmon Campaign) have raised significant funds [44]. British Columbia Corrections undertakes construction of equipment such as the classroom incubators. The CAs distribute much of these material resources, as well as their own expertise, to classrooms implementing *SICP*.

2.2.6 Aspects of the *Salmonids in the Classroom Program*

The basic element of the *Salmonids in the Classroom Program* (*SICP*) is *Salmonids in the Classroom* (*SIC*). *SIC* is found in three versions appropriate for grades in the primary, elementary, and secondary schools. These packages will not be described in this section except to say that they are published in three-ring binder format for easy photo-copying of activities, lessons, and lesson aids. In addition, the binder contains overhead transparencies and other teacher resource materials.

Other materials produced by *SEP* for use in the classroom were:

- Badges and stickers to award volunteers. These are obtained free from the local CA.
- Posters of salmon and life cycles. These can be purchased through British Columbia Teachers Federation (BCTF).
- Videos, films, and slide shows. These are available free from the DFO and PEMC. New features are produced annually.
- *PIPnews* and *Pacific Tidings* are free newsletters that provide technical, administrative, classroom, and special project information.

- A variety of free brochures (e.g., Home Tips for Clean Streams, Stream Care).
- A manual for classroom incubation that can be purchased from the BCTF.
- Other documents.

SEP hired their present Education Coordinator, Ms. Linda Bermbach, one of the original developers of *SIC*, in 1981. Her major responsibilities are writing and editing materials for the curriculum package, conducting inservice sessions for the users of the package, providing input into the development of *SEP* information materials, and maintaining a liaison between DFO staff and the educational community [22].

The original secondary and elementary packages were each revised to a single binder in 1982. Ms. Bermbach recruited teacher volunteers to assist in the rewriting with *SEP*; paying for teacher release time, food, travel, and accommodation. The two packages underwent revisions during the 1987-88 school year. The primary package was produced in 1983 and was also being revised in 1987-88 to include new and updated supplementary materials [10].

The educational materials are produced for the *DFO* and are sold at cost to teachers or other individuals through the British Columbia Teachers' Federation (BCTF). The Ministry of Education does not carry these materials or prescribe their use, but does list them as supplementary materials suitable for use in British Columbia schools [89]. *SEP* does make the claim that the packages were prepared for the Ministry of Education and developed in concert with the objectives of its Core Curriculum [13].

The CAs contact with the school is technical in nature. They help teachers and students set up egg incubators in the classrooms, arrange and lead expeditions to hatcheries or streams, assist in surveys and other enhancement techniques, demonstrate dissections, and provide appropriate AV materials from the *DFO Information Branch.*

They may give presentations, but they do not instruct classes or try to implement *SIC*. Since the CAs are also involved with other community groups, very little time and money is available for any particular group. CAs usually assist groups in their own style and some may include more school contacts than other CAs [94].

In remote regions of British Columbia , such as the Queen Charlotte Islands, the CA deals directly with the teacher. In areas such as this, the CA may become a "fond fixture" around the school as his dripping hip waders leave a moist trail to the salmonid classroom. In the large metropolitan areas, the CA does not have the time or other resources necessary to deal with all the teachers and classrooms that request assistance. In these cases, the usual practice is for CAs to work with a school district coordinator who then works with individual teachers and classes. CAs usually do not recruit schools and teachers into the program, but rather by word of mouth and by workshops, more and more teachers learn about *SEP* and approach the CAs for assistance in implementing *SICP* into the classroom [94].

2.2.7 Extent of Implementation

Since *SICP* is not prescribed, adopted, or implemented by the Ministry of Education, the task of determining the scope of implementation across B.C. would be difficult. All school projects assisted by the CAs are recorded. 130 schools were involved in 1986 [71] and there were probably another 35 involved in 1987 [94]. However, some districts, such as Campbell River and Port Alberni, deal directly with the local hatchery, so determining the actual number of classrooms working with salmonids is not known [10].

The distribution of the *SIC* packages can only be estimated. The DFO and the BCTF have not tabulated individual records of the sales and the distribution of *SIC* packages. However, if one had the time, a search could possibly be made through all

the sales receipts. An evaluation report by DPA Consulting Limited [30] states that the BCTF records show that *SIC* had been purchased by 133 schools from 52 of the 75 school districts. However, the 1981 Annual Report Summary states that 53 school districts have purchased the reusable *SIC* packages. Most of the packages went to B.C. coastal or salmon producing areas [44]. It appears that elementary packages accounted for approximately seventy-five percent of sales. *SIC* was also distributed to the CAs and other officials and about a dozen were sold outside of the province. A reasonable estimate is that 200 copies of *SIC* were produced through 1982.

The DFO has records of orders to the printers that indicate 275 primary packages have been ordered since the first edition in 1984 and an additional 50 packages were ordered for 1987. Since 1982, 300 elementary and 180 secondary packages have been printed.

A survey of all the school districts would be necessary to determine the extent of distribution as well as the extent of the implementation of *SIC*. Most coastal schools and resource centers probably have copies available to teachers. The materials are designed for easy reproduction and reproduction is encouraged, so individual teachers may have reproduced all or parts of the package for their own files. The 1982 Annual Report claims that the packages are heavily used [45]. However, no supporting evidence for this statement was given.

2.2.8 The Nature of Implementation

To bring *SICP* into the classroom, the primary teacher is expected to have access to *SIC* and a CA. There is no set curriculum although there is a variety of materials and lessons. If the full picture of the implementation of salmonids could be exposed throughout British Columbia, it would probably show many individual teachers sampling and adapting the program to the needs and interests of their students and communities.

The level or extent of use of the materials necessary to determine if implementation has occurred has not been defined, but because of the variety of teacher implementations, probably only the character of each implementation could be described. What teachers are doing is not always standardized with *SEP* productions and much of it is undocumented. There are as many different forms of implementation as there are teachers who have brought salmonids into the classroom [10].

Teachers have been creative with their use of salmonids due to the flexibility of the program. The Federal Government through *SEP* has provided some materials, guidance and assistance, but the individual teachers have brought their own meaning to the classrooms.

2.2.9 Examples of Implementation

A case example of *SICP* recruitment and implementation occurred in Burnaby School District [39]. Ms. Gaetz is a primary teacher at Stoney Creek Elementary. As a class project, she and the local CA became involved with enhancing Stoney Creek several years ago. Her students studied salmonids in the classroom using the primary kit. When other teachers saw the results and excitement of the activities, they also wanted the salmonids and a CA in the classroom. The area CA, Mr. Gary Taccoyna, was called to assist with the extra teachers. Since Mr. Taccoyna could not accommodate all the individual requests for assistance and eggs from the Burnaby teachers, he and Ms. Gaetz petitioned the School Board to assist Ms. Gaetz with implementing a district program. Their request was to have the Board appoint Ms. Gaetz as the district *SICP* coordinator and allow release time for her to assist teachers through workshops and other organizational activities. Although she was not given a formal title or extra monetary compensation by the Board, she did receive the authority and the release time to work on the project.

Ms. Gaetz advertised *SICP* to all the teachers in the district after explaining the program to the principals. Teachers were invited to a workshop explaining *SICP* and the "how to's" for applying the program. The incubators for the district classrooms were built by inmates at Alouette Corrections Center and the necessary funds were raised by the *Save the Salmon Society.* With twelve incubators available and approximately 20 teachers requesting boxes, Ms. Gaetz had to devise criteria for selecting classrooms in which to place the incubators. The criteria were as follows:

- completed application,
- attendance at workshops,
- the school has an appropriate copy of *SIC*,
- the school has committed funds for travel (fry release),
- teacher experience with salmonids, and
- consideration to an even distribution of incubators throughout the district and grades.

Some teachers wrote long statements on why they wanted the salmonids in their classrooms. The unsuccessful teachers were put on a waiting list.

Very little technical assistance was required from the coordinator during the incubation period. She thought that the workshops fully explained the operations of the incubator. Each teacher had to assemble the incubator before taking it to their class. There was no monitoring of the *SIC* package to determine the extent of use. However, at the end of the term, the teachers involved met to share their experiences. They brought samples of work that showed evidence of program use and adaptation.

Much of the adaptation was the integration of *SIC* into the normal curricular areas of language arts, art, and music.

The 1987 Stoney Creek Elementary School graduation ceremonies were devoted to the release of the fry into Stoney Creek. Officials from DFO, the School Board, *Save the Salmon Society*, and BCTV, were present. The children gave valedictorian and farewell speeches and sang the school cohoe song.

The implementation of *SICP* was limited in Ms. Gaetz's district and was an example of "bottom-up" implementation. That is, the direction of implementation started with teachers and travelled to the school board. The energy and enthusiasm of this salmonid coordinator has promoted the implementation process while, at the same time, she had to contend with a full time teaching assignment. The district and teachers received good publicity in the local press, radio, and T.V. regarding the salmonid activities and it may be only a matter of time before the district fully supports *SICP* and directs the implementation from the board office.

Mr. Taccoyna, now the Acting Head of *PIP*, stated that it was impossible for the two Lower Mainland CAs to meet personally with each interested teacher. The number of involved classrooms in the Lower Mainland was increasing exponentially each year, and numerous requests for aid were coming from the teachers. Not wanting to lose this human resource and enthusiasm from the classrooms, Mr. Taccoyna sought out experienced and dedicated salmonid teachers (e.g. Ms. Gaetz) and recruited them as district coordinators. These coordinators in turn recruit and organize their district teachers. The CAs in the Lower Mainland now use this expanding method of disseminating their technical expertise. Although the CA seldom works directly with individual teachers in the lower mainland, implementation of salmonids is increasing through teacher to teacher communication and assistance.

Another interesting but different example of implementation has occurred in the

Campbell River School District. This community is world famous for its recreational sports fishing. The local economy depends extensively upon the salmonid resource. Assistant Superintendent, Mr. L. Nash [65], explained how implementation occurred from "bottom-up" to "top-down". Many teachers within the district had been using *SICP* for a number of years and there was good contact with the local Quinsam Hatchery and the *SEP* education coordinator. However, not all the teachers were using the program. Some students were left out and there was no scope and sequence to the individual programs. The teachers using *SICP*, through committees, went to the Board and petitioned for formal implementation. This resulted in the district implementing a local salmonid program. It is now mandatory that every grade 2 and 5 student be exposed to salmonids as part of the elementary science program of studies. The components of the program are a trip to the local hatchery, raising salmonids in the class or a stream study, and a set of lesson plans and resource materials which are similar to the *SICP* but specific for that community. In addition, the district has also been expanding its marine studies by using monies from the Ministry of Education's Funds for Excellence. Curriculum additions of marine studies target secondary levels in Science 10, Biology 11, and Science and Technology 11. *The Kingfisher Creek Society*, in memory of Roderick Haig-Brown, is building a laboratory for use by all the students.

As another unique example of implementation, Ms. Ruth Foster, the Biology 11 teacher from Centennial Secondary School, Coquitlam school district, started a small hatchery on Mossum Creek in 1976. With volunteer students, the hatchery has grown in size. Production of fry is well over 100,000 per year with an return in 1987 of 800 spawners to a creek that had not had salmon in many years. Volunteer students from many different grades and classes learn technical skills while the secondary biology classes at Centennial Secondary School study the results. Meanwhile, this hatchery is a significant producer of fish. In addition, eight of the former student volunteers are

now employed by fisheries and parks. Some have attended BCIT for further technical training. From a small beginning, this project has grown over the years to produce some very significant outcomes [37].

Prince Rupert School District has formally adopted a Pre-employment Program for students. One component of the Pre-employment Program is the maintenance of a hatchery by students. The *Prince Rupert Salmonid Enhancement Society* raised money and helped organize the construction of a 1,000,000 egg hatchery for the district which includes a display area and a classroom. Many people in the community contributed to the hatchery's success [68]. This school hatchery will not produce significant numbers of salmon, but will directly train students for the job market.

As documented in Chapter I, the largest school district in B.C., Vancouver, did not implement *SICP* into its classrooms until 1988. There were requests from some teachers, but there was no coordinator. Other groups, such as North Vancouver with strong administrative support [90], were organized and put strong demands on the CA's services. The Vancouver District Science Coordinator, Mr. Russ Selwood, volunteered his time and energies to organize the implementation of the *SICP* for the 1987-88 school year. Approximately 20-25 teachers had requested salmonid incubators for their classrooms.

2.2.10 Communication Sources for Users of *SICP*

SICP teachers do not have a formal network for sharing ideas. The transfer of information is mostly informal and the connectors between the districts are through the CAs. With limited funding, *SEP* prints literature to assist teachers in their isolation. There is, however, the annual *PIP Project Directory* that lists the CAs and the projects in their area. Each classroom incubation or stream enhancement project lists the name of the teacher and school along with the district *SICP* coordinator. These guides are

available from the *DFO*, and teachers can use this directory to contact each other and share information. Evidence of direct teacher to teacher communication with the use of the *PIP Project Directory* is not known, although this writer found the directory to be a very useful tool for conducting this research.

PIPnews is a *DFO* newsletter provided for the public participant. It provides technical and administrative information as well as news on small stream enhancement. The first issue, July 1984, lacked news about school projects. However, the September 1987 issue had articles on school children activities. The April 1987 issue devoted fifty percent of the space to school projects. Two of the articles shared ideas with other teachers. One article was on integrating salmonids with computers and the other explained how to make a scale press. Both articles invited readers to write for more details. It appears that *PIPnews* has been focusing more of its reportage on what is happening in the classroom.

The original *SEP* newsletter was *Salmonid.* The issues were colorful and often carried school news. The February 1983 issue entitled, *Discovering Salmonids*, was a special edition for classrooms. It has been so popular that teachers still request back issues [94]. *Salmonid* was discontinued because of a Federal Government restraint program [23].

The *DFO* has just published another newsletter entitled *Pacific Tidings.* The intended audience for this newsletter is more broadly based than *PIPnews* and *Salmonid* and the articles are to report on other marine organisms and resources besides salmonids [23].

The annual reports (now name changed to *Update*) also review project highlights, including *SICP* projects, for the year and forecast *SEP*'s direction for the next year.

A search for salmonid articles in Canadian educational journals exposed only a few published papers. The *British Columbia Science Teacher* has had several articles,

but none since 1979. It appears that *SEP* is the major source of information on the salmonid resource and on the salmonid enhancement projects.

2.2.11 Future Directions

The Federal Government reduced funding to *SEP* in 1983. The first five years of Phase I had ended and the government decided to continue with all existing *SEP* facilities and operations, including *PIP*. The last of the major projects was completed and emphasis was switched to less expensive habitat improvement projects [22]. The costs of habitat improvement would be far less in the long term (no permanent staffing needed as in the hatcheries) and the production of salmon would become stabilized.

This emphasis, however, required more participation from the public. Many creeks ran through backyards or had easy access by the public. Human behavior would now have a bigger impact on the success or failure of the program. The grade 2 children of Stony Creek Community School proved that they could make a difference. Their creek was polluted and unfit for salmonids. By campaigning in the local shopping mall, these children helped spread the word to the neighborhoods about how people could stop polluting the stream and killing "their baby fish" [24]. The news media has documented some of these stories in both video and print, thus giving salmonid enhancement a big boost. Members of the community have not only contributed to a resource but have helped to clean up their environment. As the CA from Terrace explained, "When people see healthy fish in the neighborhood streams, that's a good indication that the local environment is healthy"[69].

Still, there were individuals in *SEP* who felt the public should not be involved. Despite this attitude, more funding and participation for the public was allowed. In an address to *PIP*, ten years later, the Minister of Fisheries reflected on the efforts of the *SEP* volunteers.

> Ten years ago, when *PIP* began, there were many who did not believe that ordinary people could make a meaningful contribution to the future of a complex, living resource. They were mistaken. ...you fought pollution and the ignorance and indifference that fertilize it. You believed in restoring small creeks to life... [86].

SEP's future is now secure for the next five years. Minister of Fisheries, Tom Siddon, announced in June 1987, that more than $40 million per year in funding is guaranteed to *SEP*. Not only will all *SEP* programs continue, but *PIP* has been included in *SEP*'s base. The implications of this bureaucratic shuffling means that the government has made a commitment to *PIP* that will guarantee public involvement projects, including those of the classroom [25].

The original Public Inquiries of 1976 recognized the need for education if the fisheries resource was to have a continued existence. The level of education needed was massive and the realization was that: "The kids are our real hope for saving the fish resource." And that, "The best protection that our salmon and steelhead resource can possibly have is an informed, aware and sympathetic public" [88, p.106].

Since those hearings, much has been accomplished in terms of enhancement and the changing of peoples attitudes and behaviors. However, the conflict between Federal and Provincial jurisdictions over the resource and education has been a restraint on the full implementation of *SICP*. The benefit-cost ratio (money spent to fish produced) has also provided low fiscal support for salmonid education. Because of incomplete support on the part of both governments, the real solutions to restoring the stocks to original levels may never be achieved. The hatcheries are technical inventions that often create more problems and do not answer the question of human behavior as expressed in the public inquiry. The real measure of salmonid enhancement will continue to be people's actions

and the products of their efforts. The future direction of *SEP* should be guided by a continual effort assist the education and involvement of the public.

2.3 The Nature and Relationship of Attitude and Behavior

2.3.1 Introduction

This section proposes to examine and explore the nature of attitude and the relationship between attitude and behavior, especially as it applies to education and the *Salmonids in the Classroom Program* (*SICP*). The first part of this section reviews the necessity for understanding attitude and the attitude-behavior relationship. This is followed by the attitude-behavior model proposed by Ajzen and Fishbein. The section culminates with a discussion and exploration on the nature of attitudes and behavior, the development of attitude, and attitude change.

2.3.2 The Nature of Attitudes and Importance of Attitudes

One of the main interests of educators, coaches, employers, governments, and special interest groups is to motivate people to perform certain activities (behaviors) in the interest of society or some group in society. The first step is often a linear solution which attempts to have the target people attain certain attitudes which will be supportive of the activities of interest. As Lucas [57] states, "it is not the attitude that is important, for what is desired is action..." (p.35). Even though educators may claim that a student has the appropriate attitude, they know very little about this commonly mentioned concept, which cannot be easily defined or measured. In addition, it cannot be known for certain whether the specified attitude will produce the corresponding behavior. Shrigley and Koballa [84] recognized that attitude needs a valid definition and that researchers are obliged to search for means to measure it even though the concept is

difficult to measure. The causal relationships are not clear. Does positive attitude produce higher achievement or does higher achievement produce the positive attitude? Usually ignored are the internal processes that create the attitude. Educators may also wonder if students' positive attitudes are the result of teaching methodology, childhood experiences, the individual's personality, or some combination of these factors.

Koballa [53] reports that recent attention by researchers examining affective variables seems to stem from the belief that these variables are as important as cognitive variables in influencing learning outcomes, career choices and the use of leisure time. The importance of determining attitude then, is primarily its usefulness as a tool for educators to use in helping the students learn. Just as teachers should question students to understand their ideas and concepts about a learning activity, they should question students to understand how they feel about the learning process and what they have learned. Students have already constructed many concepts and ideas about subjects and curricular topics from a variety of sources, and these concepts and ideas will affect their learning of new materials. This constructivist view of learning is summarized by Driver and Oldham [31] in the following statement:

> ...the sense made of any event is seen to be dependent not only on the situation itself but also on the individual's purposes and active construction of meaning. These constructions are seen as tentative models which are continually tested against experience and if necessary modified. This tradition is concerned with the intents, beliefs and emotions of individuals as well as their conceptualisations, and recognises the influence that prior experience has on the way phenomena are perceived and interpreted (p.2).

Attitudes are learned from experience [53]. Therefore, attitudes are not innate, but, like knowledge, they must also be constructed or learned by individuals, and to

do this, individuals use a variety of sources to assist the construction. Other students, parents, school context, activities, etc may help this construction. An educator who knows and understands these attitudes can be of more assistance in guiding students through learning activities than one who does not.

Another important reason for determining attitude is that attitudes are considered to be enduring. People's feelings toward objects and issues are relatively stable over time [70]. The implications of this endurance is that attitude learned in the primary grades can persist into adulthood. However, enduring does not mean that the attitude cannot be changed. It means that strategies have to be planned and implemented, taking into consideration as many of the attitude variables as possible, so that the attitude can be modified or so that the individual will at least be able to see another perspective to the attitude object.

A study of attitude may also reveal some important relationships useful for understanding and predicting behavior. Wicker [108] considered that the popularity of studying the attitude concept was due to the fact that social scientists have assumed that attitudes have something to do with social behavior. Cialdini, Petty & Cacioppo [70] report that the prevailing view of the ability of attitudes to predict and cause behavior has been more positive. However, Fishbein and Ajzen [2] claim that experimental evidence is not clear on the stimulus-response issue of the attitude relationship to behavior. The number and variety of theories and experiments having to do with attitude are too extensive to make consensus among educational theorists and researchers possible. Investigations diverge as researchers point their activities at different theoretical aspects of attitude and behavior. However, there are similarities with some basic assumptions and approaches. Much of the research effort has been devoted to measurement of attitudes and theoretical writings, without unifying the results of these

two aspects. The end products of the researchers' efforts are numerous theoretical descriptions and experimental scores, but no precise methods for attitude measurement.

2.3.3 The Fishbein and Ajzen Model

There are two major schools of thought for most attitude theories. These schools are the *behavioral*, and *cognitive consistency*. Behavioral theories emphasize a stimulus-response association, whereas the consistency theories suggest that individuals desire to be consistent among beliefs, cognitions and behavior within their social experiences [54]. The Fishbein and Ajzen [2] model used in this study to explain the attitude-behavior relationship is derived from the behavioral school. The basic introduction to this theory is found in Chapter I, section 1.3.3. Fishbein and Ajzen do not subscribe to the view that human social behavior is controlled by unconscious motives or overpowering desires, nor do they believe that it can be characterized as capricious or thoughtless. They believe that people consider the implications of their actions before they decide to engage or not engage in a given behavior [2].

As previously stated, the *Theory of Reasoned Action* [2] defines attitudes as the accumulation of an individual's evaluated beliefs with respect to a given attitude object. A belief links an object to some attribute and a set of beliefs form the basis of one's attitude. The object can be something physical, an event, or an activity, and the attitude is usually expressed as negative or positive to that object. The strength of the attitude would be determined by the number and strength of the evaluative concepts or beliefs formed [81]. The determinant of action to perform (or not perform) the behavior is the person's intention. However, the behavior of interest must be clearly defined, and only then it is possible to ask what decides or determines the behavior. A belief associates an "object" with some "attribute". As for behavioral beliefs, the object is the behavior of interest and the associated attribute is usually a consequence

or outcome of the behavior [2].

Thus the theory claims that behavior can be explained by reasoned action. The type of behavior appears to be of utilitarian benefit to the individual. Herek [48] claims that there are other behaviors that do not fit well into this *Theory of Reasoned Action.* "Short-term instrumentalities for satisfaction of one's current private needs" (p.101) are his description of the behaviors that fit the Fishbein and Ajzen model. He argues that symbolic attitudes, which are "formed mainly in congruence with long-standing values about society and polity" (p.100) can better explain the other behaviors. This could explain why people's voting behavior is based less for reasons of expected direct benefit and more on ideological considerations.

Fishbein and Ajzen claim that their multicomponent view of beliefs, attitude, and behavior cannot provide an adequate explanation of the low attitude-behavior relationship, and that separate assessment of all three components is unlikely to lead to improved behavioral prediction. Still, the Fishbein & Ajzen theory attempts to explain how attitude, along with the other components, could be used to better understand and predict behavior in specific situations. That is, there is a stronger relationship between attitude and behavior when the attitude is very specific to the object of concern.

This presents a problem for determining the attitude-behavior relationship with regard to the salmonid resource since the attitudes are not necessarily specific to the object of concern. Lucas [57] also realized this unfortunate implication of the Ajzen & Fishbein model in that environmental educators are not able to rely upon the inculcation of general attitudes toward the environment to engender appropriate actions. He considered that developing general attitudes is a waste of time. However, there must be variables other than just attitudes which are necessary to predict behaviors. Hines, Hungerford & Tomera [49], have created a model to explain environmental behaviors. It classifies attitudes as one of the personality factors which may indicate the person's

willingness to act. However, no matter how strong the attitude to act, there is a need for knowledge of issues, knowledge of solutions, personalty factors, and skill in acting (p.6). These four variables influence the intention to act. This model for predicting behavior obviously requires more variables than that of the earlier Fishbein & Ajzen model. In addition, the intended behavior still needs to be triggered by situational factors that will present the individual with the opportunity to act. Obviously, this model can enhance behavioral prediction by including more variables, but attempting to synthesize all the variables into a meaningful predictor could be an enormous task.

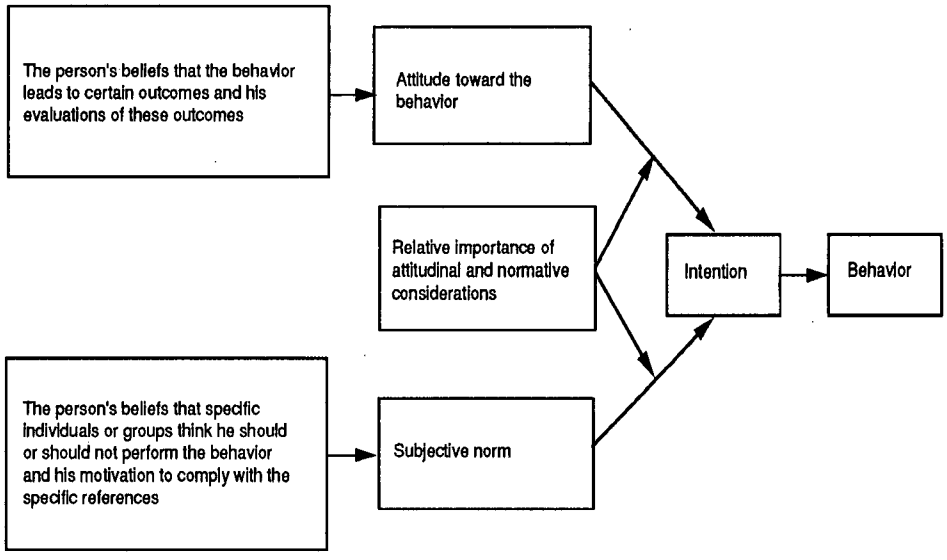
The *Theory of Reasoned Action* views attitude as separate from the other components of beliefs and behaviors including what Fishbein and Ajzen term "intention". They claim their method of measuring attitude toward the behavior provides the best means of understanding and predicting that behavior. Figure 2.1 [2, p.8] illustrates the relationships among the components and tries to explain the causes underlying the potential behavior of an individual.

The model is based on successive steps from beliefs (4) to behavior (1). The steps are analyzed from right to left numerically to relate to the cause or explanation of the behavior. According to the theory, a person's intention to perform a behavior is based on two determinants, one personal and the other social. The individual's attitude to the behavior is based on the positive or negative evaluation of performing the behavior. This judgment views the activity in terms of *good-bad, favorable-unfavorable.*

2.3.4 Attitude-Behavior Relationships

The unpredictability of the attitude-behavior relationship can be found in the following example for the first determinant of intention: Two children with different behaviors to monitoring and caring for the classroom incubator could both have an overall positive attitude to the care of the salmon fry, but may differ on specific aspects of care. The

Figure 2.1: Factors determining a person's behavior.



result of an attitude score would be the same for each child although these attitudes are reversed. One child may evaluate that feeding the fry is an enjoyable activity to perform whereas cleaning up the dirty water is not a good activity. The other child may evaluate the two activities in an opposite manner. These responses may be judged unlikely until one understands the independent personal beliefs and concerns each child has constructed about the outcomes. The children's past experiences add to their beliefs and help determine which activity will be most rewarding. Lucas's [57] research discovered that pupils' environmental attitudes tend to be positive, except when the object of concern impinges on their own lives. Wicker [108] considers that the attitude-behavior consistency can be explained by verbal and overt behaviors. Both are triggered by the same mediation, positive and negative to an object, but expressed differently in behavioral outcomes. Therefore, even though both children may verbally

support the feeding of fry, one child could terminate the action at the verbal stage.

The second determinant of intention is the person's perception of real or imagined social pressures to act or not to act on the object. This external factor is named the "subjective norm". To continue the above example, a parent of one of the two children may visit the classroom and the classroom incubator. If the parent shows very positive affection and care for the fish, then the prior negative behavioral intentions to certain caring functions may be weighed against what the child perceives these "important people" think that they should perform. The determinant with the greatest relative weight helps to predict the resultant behavior.

For an understanding of the intentions, it is necessary to explain why people hold on to specific attitudes and subjective norms. In examining the model, attitudes are viewed as a function of beliefs. The beliefs that underlie an attitude toward the behavior are named "behavioral beliefs". These beliefs are based on the idea that performing a given behavior will result in either more positive outcomes or more negative outcomes. Again, which has more weight will lead to a favorable or unfavorable attitude. To illustrate, consider the fry feeding behavior again. The first child may see the feeding experience leading to a happy time when some of the larger fry jump after the food. The second child may have an unpleasant outcome by seeing the larger fish as greedy and the smaller hungry fry at the bottom not getting a fair share.

The beliefs that underlie the "subjective norm" are named "normative beliefs". Individuals believe that "important others" think they should or should not perform the behavior. This perception of what others believe creates social pressure to comply with those perceived beliefs of the "important others". If the children perceive that caring for the fish will give status within the class and/or at home, then the pressure to perform the feeding behavior will increase. Shaw and Wright [81] described this type of situation as one of "affiliative motive" (p.11). As an individual forms interpersonal

ties to a group, it is expected that many of the attitudes taken on by the individual are the price of admission into the group or the cost of enhancement of status.

Other factors such as personality traits (e.g., authoritarianism); demographic variables (e.g., sex, age); and such factors as social role, intelligence, and socialization, may also help to explain resultant behavior. These are termed "external variables" to the model and may influence the beliefs a person holds or the relative importance attached to attitudinal and normative consideration. However, the theory's validity depends on empirical support for relationships illustrated in Figure 2.1 and not on new hypotheses concerned with the external variables [2].

2.3.5 A Limitation to the Fishbein and Ajzen Theory

One limitation of the theory is that the attitude and object of behavior must be so specific that one cannot expect a high correlation between generalized favorable attitudes and behaviors to any general concepts (e.g., the environment). For example, an individual's generally strong positive attitude to the conservation of salmonid resources may be inconsistent with a specific behavior that permits the individual to catch more fish than the legal limit.

An explanation of why people behave contrary to their declared attitudes might be understood if we consider that a specific attitude for a specific behavior belongs to at least one larger domain (e.g., salmon conservation is a much broader domain than catching just a few extra fish for one's needs). This broader attitude domain is composed of many specific attitudes. A person can have a negative attitude to performing a specific behavior if the attitude is within a subset of many attitudes that are in turn part of the larger attitude domain that has an overall positive rating. The sum total of positive and negative subset attitudes produce the overall domain attitude. This could explain the inconsistencies in behavior sometimes displayed by the usually

conservation-oriented fisherman.

2.3.6 Development of Attitudes

All behaviors have the potential to result in outcomes (forces external to the model) which are significant enough to be evaluated, and if the reward for the behavior is worth more than the cost of effort, then this information may be reevaluated to alter beliefs, and thus attitudes. This evaluative feedback will also have to be emotional (e.g. the experience was exciting), and rational (there is a correct way to feed the fish so that most can be fed at the same time). Old beliefs may be reformulated, modified, reaffirmed, or removed at this time. After repeated successful activities, the child may develop a commitment to the once undesirable task. It might be said that the attitude did not lead to the specific behavior, but the behavior led to a corresponding change in attitude.

The significance of the outcome can affect the depth or strength of the attitude. If the child received considerable rewards and more classroom responsibility, then the positive attitude might become stronger. However, if the teacher reprimanded the child for feeding the fish incorrectly, then the task may be considered unpleasant and the resulting attitude would likely be less positive or even negative.

The outcomes of these experiences can help educators to modify existing attitudes. Every day some teachers attempt to do this by involving their students in activities with student interactions, learning by doing, and other inquiries. The salmonid classroom incubator lends itself to these kinds of experiences. These methods are considered more effective to learning and forming positive attitudes than teacher dominance and dry presentations of facts in which students are inactive and subjected to the teacher's attitudes.

2.3.7 Attitude Change

Fishbein and Ajzen's model becomes more useful when it suggests how attitudes can be acquired and changed. If attitudes are the accumulation of an individual's evaluated beliefs, and individuals are rational, then new information that is evaluated should change attitudes positively or negatively. Therefore, it appears that if evaluation is lacking, even though new information is presented, the present attitudes will not change. The new information can be facts, knowledge, and experiences and the interpretation of the new information will be based upon individuals' present beliefs and values. The outcome of the interpretation may lead to evaluation.

Showers [83] claims that new information only changes attitude if evaluated as positive or negative and that neutral information will not affect attitudes. His study demonstrates that knowledge toward a controversial subject such as nuclear energy can be increased without effecting attitudes. If evaluation or reflection is absent, then the input will be neutral and no new attitude can be expected. The critical factor for attitude formation appears to be evaluation as a person can use his or her already existing knowledge framework and construct new meaning from it.

Herek's [48] argument regarding attitude change is that attitudes are strategies for satisfying psychological needs. Attitudes help form the individual's character which tends to be stable over time. Therefore, attempts to change attitudes would require changing a person's character; a difficult task indeed. Instead, Herek advises that persuasive efforts should focus on changing perceptions of the attitude domain and creating situations that foster such change. The strategies for changing attitudes in Herek's theory are based upon perceived utility and consequences for the changed attitude.

It appears that the individual must make meaning of new information and integrate

it into present knowledge, concepts, theories, and beliefs before attitude changes can occur. "This implies that in order to influence behavior, we have to expose people to information which will produce changes in their beliefs." [2, p.81]. This input of information cannot be sterile but must carry some emotional message to cause an evaluation of the feelings one has experienced.

Another way to influence attitude change is through other people. Kegan [51] explains how some individuals, in need of assistance, look up to others for guidance and often seek them out for "recruitment". A cute, but helpless baby is an example of a "recruiter". There is a relationship between Fishbein and Ajzen's "the important other" and Kegan's [51] "recruiter". Individuals in need of belonging to a group (one or more people) will be in a position to have their beliefs formed or changed. They are at a point in their cognitive development where they are in a state of uncertainty about some part of their environment. They find their progress part way between "not having beliefs" and "having beliefs" about the object. This incomplete development results in a feeling of doubt which may motivate a person to reflect, evaluate, and judge or recruit an "important other". The recruiter may seek out someone with prestige, status, and trust for guidance through the uncertainty of the change. In the classroom, this "important other" could be the teacher, aide, or another student. These people may pattern their attitudes about the salmonid resource after these "important others".

Educators can take advantage of this recruitment phenomena and bring attitudinal changes in their pupils. But Showers [83] cautions that teachers should be both open and deliberate in the teaching of attitudes. If a teacher has the qualities of credibility, [70] his or her messages (e.g., study habits, writing skills) can arouse, challenge previously held beliefs, and create doubt, which is the first step in bringing attitude change. In the classroom, Showers [83] believes that teachers play a major role in students attitude change, and thus determine to a large extent students' favorable and unfavorable

attitudes toward school, subjects, etc..

A way to formulate beliefs and the resulting attitudes is by the messages from "important others", the media and the school. Claxton's [20] concepts about "mini-theories" can be used to explain this phenomena. These theories are built into the child's beliefs about the world. Some are formed by actual experimentation (which he names "gut science") and some are constructed from messages (which he names "lay science"), which mostly originate in the child's home. If these theories can be challenged by a mediator, they can be changed through subsequent and successful activities and experiments.

One problem with modifying lay science is that some of the old theories are still attached to prior important others. Lay science is not opportunistic in searching for new theories unless permission is given by the important other. Denouncing the old lay theories may also imply a denunciation of the important others. Achieving new beliefs may be seen as repudiating some important groups of people. For example, a teacher blaming overfishing on commercial fishermen, may find hostility and thus rejection of conservationist attitudes in a child whose parents are fishermen. Another child in the class may accept this belief from the teacher, who is an important other, and develop future attitudes against commercial fishing that can be enduring.

Instead of focusing on the uncertain process of directly changing attitudes in order to produce some desirable behavior, an educator should allow individuals to experience the desired behavior with appropriate guidance and modeling. A child's cognitive development occurs when there is direct interaction with the environment. Learning then results from direct exposure to environmental stimuli. However, Feuerstein [34], believes that the differential cognitive development of individuals is not the result of the direct exposure to the environment, but is the result of the mediation of the child's interaction with the environment by a mediating agent who or which may be

present or absent. This mediating agent is very powerful in the sense that it can direct the cognitive development of an individual's attitudes. After such mediation, an evaluation should follow to discover what meanings the subjects have constructed from the mediated activities. These meanings can form the beliefs that result in the attitude change.

Attitude appears to be a sign or indicator more of past behavior than of future behavior. In addition, measurement of the attitude may be only a measure of the prints of previous behavior. If this is true, then the focus should be on the evaluation of what caused the attitudes and on planning the direction we should lead students in educational activities. The message to educators then, is that they should ensure the activities in which students participate are meaningful and have the potential to develop positive attitudes.

2.4 Environmental Education and the Teacher

2.4.1 Introduction

This section begins by briefly reviewing the literature that discusses the relationship between attitudes and values. The concept *values* is inherently central to the study of environmental education (EE), and therefore to *SICP*. *SICP* must teach values for the environment to ensure that salmon are able to survive in the wild and teachers who volunteer to teach *SICP* must value something about the program since they have chosen to bring it to their classrooms. Some individuals in society value the natural environment and therefore it becomes important to study so one knows how to not only appreciate it but to protect it. Each teacher who implements *SICP* has a context, which includes a set of values that may affect student attitudes. Just as *SIC* influences people's beliefs and attitudes about salmon and the environment with its selection

of content, so too, the environmental values a teacher stresses or omits in the class may influence students' beliefs and attitudes. Young students are at the stage in their life where they are learning most of their values. Therefore, it is necessary to review values, the importance of the teachers' context in determining students' attitudes, and the implications for the students in order to understand *SICP*'s potential to effect students' attitudes toward the environment and the salmonid resource.

2.4.2 Attitude-Value Relationship

Allport [3] postulates that "since attitude is always directed toward some object, it may be defined as a state of mind of the individual toward a value" (p.6).

Value is also an important construct with an even wider application than attitude. However, there is even less consensus among social scientists as to what it is. Rokeach [73] defines value as "...an enduring belief that a specific mode of conduct or end state of existence is personally or socially preferable to an opposite or converse mode of conduct or end state of existence" (p.5).

Values are thought to be more enduring than attitude. It is also thought that values cause attitudes, but that there is no simple one-to-one relationship between attitudes and values [64].

Each social value will no doubt be tied to many attitudes and likewise there would be numerous possible values tied to any single attitude. A person's attitude toward an object will be determined by a hierarchical ordering of beliefs and values that the person has constructed and believes will fulfill each value. For example, if a person values salmon, meat products, and natural foods, then the expected attitude to eating salmon would be favorable in order to fulfill those values. However, the same value of salmon, combined with the empathetic value for animal life may lead to a negative attitude toward eating salmon as the individual evaluates these combined values into

the attitude. The value of natural foods could be supported by negative attitudes to additives and processed food and positive attitudes regarding the sea.

2.4.3 The Social Context

"The concept and the word *values* represent a recent (about a hundred years ago) invention by which philosophers might analyze and synthesize the personal and social qualities of mankind" [100, p.23].

The values a person has created are normally common to the social milieu for that person. The members of a group of people from a certain region, culture, occupation, or institution share common values which have been cultivated through experiences within their group. The beliefs learned and situations lived within the group are taken as normal and rational, and are rarely open to question. However, some of the normal beliefs and circumstances of other groups may be judged as slightly wrong to very immoral [102]. Therefore, peoples' values, attitudes, and behaviors can be considered in light of their context. Different groups, having conflicting values, are often in contention with each other over limited resources or other interests. In addition, it is realistic to believe that a person's membership to a variety of groups (e.g., school, church, family) may produce contradicting values and attitudes within that person. There are probably some students observing salmon in the classroom who feel the tension between the conflicting attitudes that wild animals should be free and yet be studied in the classroom.

To implement a version of *SICP*, which is strong in environmental values that have a reverence for all wild organisms, would be difficult. Caduto [16] has identified possible conditions within schools that act as barriers to implementing an environmental values education program. Those conditions that particularly concern the teachers are:

- lingering doubts about using the classroom for values education,
- inadequate teacher training in values education,
- exclusive concentration on *subject matter*,
- fear of community reaction to the explicit handling of values education issues in the classroom, and
- a great influx into environmental values education of inexperienced people who nevertheless conduct workshops and develop materials

  (pp.30,31).

Caduto [16] asserts that a major element of an environmental values program should be to state clearly the expected role, responsibilities, and limits concerning a teacher's involvement in the values education process. However, as it now stands, the responsibility to design and implement environmental programs falls heavily on to the classroom teacher.

2.4.4 Promotion of Environmental Values and Attitudes

Teachers implementing *SICP* should realize that his or her context will help to determine the values and attitudes that are eventually fostered in the classroom. Each teacher's values are different by varying degrees from the people in the community, *SICP* developers, and other teachers. However, as a group, teachers should expect to have many values in common. For example, Gabel et al. [38] reports that studies have shown that teachers value some forms of instruction more than others. In their study of science education research interests for elementary teachers, they concluded that *hands-on* experiences are most important. Staniforth's [90] study of the implementation of *SICP* supports the *hands-on* conclusion. Kellert's [52] research indicates

that the teachers have reason to support the *hands-on* approach. He discovered that children who had direct contact with animals, rather than just studying about them, were more appreciative, knowledgeable, and concerned about the animals.

What most teachers value in the classroom is not EE, but the study of the core topics from the curriculum. McCaw's [60] survey of teachers from Columbus, Ohio found a common attitude that EE should come only after basic academic requirements are met (e.g., reading and math). *SICP* is unique in that it integrates into the science curriculum as well as other classroom subjects. This allows the teacher to implement *SICP* (an EE program) and to also continue teaching some of the core topics (science and language arts). What is not known is whether or not teachers value EE more than the core or arts-related activities from *SICP*. If teachers value the core and the arts related activities and have very little concern for the EE aspects, then students from those teachers may not learn to value salmon in the environment. Students may simply value what they learn as something important for later on. Teachers, like most groups of people, also value time, and since *SICP* is complete and well organized, teachers do not have to spend much effort or time in learning about the *SIC* package when they implement the program. A time-saving innovation takes much of the planning responsibility and justification for implementing a new program away from the teacher. The teachers of *SICP* may not have EE goals for implementing the program. *SICP* also does not clearly state the expected role, responsibilities, and limits concerning a teacher's involvement in the values education process.

Wilke [109] claims that the key to successful K—12 EE is the classroom teacher. "If teachers do not have the knowledge, skills, or commitment to environmentalize their curriculum, it is unlikely that environmentally literate students will be produced" (p.1).

The assumption is that teachers, who are environmentally literate, would best be able to instill environmental literacy in their students, and, of course, it is hoped

that if people are environmentally literate, they will attain responsible environmental behaviors. Sia, Hungerford, and Tomera [85] claim that the variables that would foster environmental literacy could very well predict a responsible environmental behavior. They identified the following variables:

- knowledge of issues,
- *beliefs* concerning issues,
- *individual values*,
- *individual attitudes*, (this writer's italics for emphasis)
- locus of control,
- environmental sensitivity,
- knowledge of and skill in the use of environmental action strategies, and
- ecological concepts (p.32).

They further postulate that these variables interact with each other . Wilkes [109] research and study of Wisconsin teachers determined that not only did the vast majority of teachers feel that EE was important for every student, but that most teachers realized that EE was not occurring and that few teachers were adequately trained in EE.

The teachers from Vancouver, in the context of their urban schools, are probably no more environmentally literate than the Wisconsin teachers. They are not expected to be environmentally literate and teacher training programs are lacking in this regard. However, the teachers of *SICP* might be expected to be more environmentally literate since they appear to value a form of environmental education by simply volunteering to teach *SICP*. The *Salmonid Enhancement Program* offers workshops for teachers, but

these sessions only stress the mechanics for the use of the program and maintenance of the classroom incubator, and are not designed to increase the teachers' environmental literacy.

> Most sessions follow the same pattern. The workshop familiarizes participants with *Salmonids in the Classroom* (*SIC*) curriculum materials, provides *hands-on* activities for participants, presents various teaching strategies, introduces supplementary resource materials (audio visual presentations, posters, games, puppets, displays) and discusses the benefits of and requirements for utilizing classroom incubators [77, p.9].

The *SIC* Primary Package itself does list some environmental cognitive and affective objectives which appear to be consistent with some of Sia, Hungerford, and Tomera's variables, but few of the *SIC* activities are explicitly concerned with the environment and resource management. *SIC* is probably the major source of salmonid information for teachers who are generally not knowledgeable about salmonids and the salmonid resource.

If EE is going to be taught using *SICP*, teachers need to become more environmentally literate as defined by Sia, Hungerford, and Tomera and to become more aware of their own values and attitudes as they teach *SICP*. For example, Kellert's [52] study of urban and rural children's attitudes toward wild animals, also discovered that male-female differences were very pronounced in knowledge and attitudes toward predators. Kellert found that female children were significantly less knowledgeable about predators and had a more negative view of predator animals. If these attitudes continue into adulthood and most primary teachers have been female, then overcoming the metaphor that equates predators with enemies may become a sizable task. Until this metaphor is stopped, negative attitudes toward the environment will unintentionally be promoted.

The point is, teachers need to be prepared and equipped before they teach.

It appears that most teachers and the *SICP* materials do not instill strong environmental values in students that will ensure the future survival of salmonids in the natural environment. The effects that teachers untrained in environmental issues, however well intentioned, could be having on students in *SICP* has not been studied or researched. Student beliefs, values and attitudes developed from *SICP* are unknown. What appears to be known is that "a majority of an individual's basic attitudes, and, therefore, behavioral tendencies, are formulated between the ages of seven and twelve" [96, p.85]. In addition, the transition from six to nine years of age is primarily involved with major changes in affective, emotional relationships to animals [52]. Since this is the critical target age for the primary *SICP*, it is crucial that teachers and developers understand the potential long term implications for children's values and attitudes and ultimately the resource.

2.5 Supporting Evidence

This study should not use data just from its quantitative experiment and claim that the research is complete. Miles and Huberman [63] believe that validity can be improved by using the strategy of triangulation. This study uses two sources of qualitative data to explore the affective learning outcomes of the *SICP*. These sets of qualitative data are derived from students' interviews and a critical editorial analysis of the curriculum. The interviews attempted to determine the sense students were making of the test instrument and the salmonid resource after studying *SICP*. The exploratory editorial analysis of *SIC* took a political perspective to examine not only the content chosen but why it was chosen in order to expose possible values and attitudes the *SIC* package may be engendering with teachers and students. These qualitative data were combined

with the quantitative results for the purpose of offering explanations to support the conclusions of this study. This strategy is described by Eisner [32] as establishing structural corroboration, which is "...a process of gathering data or information and using it to establish links that eventually create a whole that is supported by the bits of evidence that constitute it" (p.215).

2.5.1 Triangulation

Mathison [59] states that:

> The value of triangulation is not as a technological solution to a data collection and analysis problem, it is as a technique which provides more and better evidence from which researchers can construct meaningful propositions about the social world. The value of triangulation lies in providing evidence —whether convergent, inconsistent, or contradictory— such that the researcher can construct explanations of the social phenomena from which they arise (p.15).

Mathison [59] believes that several levels of evidence are required for the researcher to construct plausible explanations. The levels she describes are: "data on hand, a holistic understanding of the project itself, its history, the intentions of the developers, and the ongoing relationships within the project"(p.16).

There is a debate about whether one should combine qualitative and quantitative data since there is a sense that they are incompatible. Firestone [35] claims that while the methods are rhetorically different, "the results of the two methodologies can be complementary" (p.16). Firestone continues by stating:

> ...each method type uses different techniques of presentation to project divergent assumptions about the world and different means to persuade the

> reader of its conclusions. Yet, they are not antithetical. They present the reader with different kinds of information and can be used to triangulate to gain greater confidence in one's conclusions (p.16).

The problem of qualitative research is that there "is an insufficient corpus of reliable, valid, or even minimally agreed-on working analysis procedures for qualitative data"[62, p.22], whereas quantitative research gives the impression "that the whole study is a disciplined exploration of a preexisting conceptual framework" [35, p.18]. The levels of evidence gathered for this study are intended to create a structure that will provide good explanations about the effects of *SICP* upon student attitudes. The purpose of the quantitative research is to explain the causes of students' attitude change to the salmonid resource while the qualitative research is intended to provide an understanding of the causes of the attitude changes. For example, the treatment of *SICP* may explain the cause for students becoming happier about salmon eggs, while the qualitative data allows an understanding of the beliefs students have created about salmon eggs that promotes their happiness. This research technique may not be traditional since a true quantitative researcher may distances him or herself from the source of data to remove bias. However, this is a small scale case study from a restricted population of primary students examining not only the students affective responses to a valuable resource but how the special interest group that sponsored the school program communicated the messages to obtain those responses. Therefore it was necessary to obtain all pertinent data to understand this process and its outcomes.

Chapter 3

Methodology

3.1 Introduction

To accommodate the reader, the specific research questions that focused the problem are restated here as they were listed in Chapter I:

1. How does one special interest group construct an educational program designed to effect students' attitudes and behaviors that support the interest group's goals and objectives?

2. What effect does the study of the *Salmonids in the Classroom Program* have on attitudes of students toward the salmonid resource?

3. What goals and objectives of the *Salmonid Enhancement Program* are being supported or rejected by students after they have studied the *Salmonids in the Classroom Program*?

4. What factors from the *Salmonids in the Classroom Program* influence the resulting attitudes of students who have studied the salmonid program?

To address the above research questions, this case study progressed in three parts. Part one was an exercise that critically analyzed the content of the curriculum material, *Salmonids in the Classroom: Primary Package* (*SIC*) and other salmonid information sources to discover the explicit and implicit goals and objectives of the *Salmonid Enhancement Program* and the context of the developers. The purpose of this exploratory

exercise was to lay bare the actual goals and objectives of SEP and *SICP* to determine not only the congruence of goals but also how the curriculum can effect student attitudes and behaviors toward the salmonid resource. Part two was a quantitative attitude study using a Likert type instrument with a slide show that attempted to determine the effects of the *SICP* on student attitudes toward the salmonid resource. Part three was a qualitative exploratory study in which some of the treatment (8) and control students (9) from the quantitative study were interviewed after the posttest. In addition, five students (three primary and two intermediate) from another district in the Lower Mainland, who were studying *SICP*, were interviewed. The purpose of the interviews was to determine not only the sense that students made of *SICP*, but to determine specifically what aspects of the salmonid resource and goals of the *Salmonid Enhancement Program* that students were supporting and rejecting.

3.2 The Qualitative Studies

3.2.1 Editorial Criticism

Introduction

Salmonids in the Classroom: Primary Package (*SIC*) is one of the four basic components identified by this study as integral to the *Salmonids in the Classroom Program* (*SICP*). *SIC* is the cornerstone for *SICP* since it provides the major content for students as well as teachers as they attempt to interpret the program and develop beliefs about and attitudes toward the salmonid resource. For example, *SIC* explains to the class what happens in the classroom incubator and what will happen to the fry after they leave the classroom for a new life in a local stream and eventual migration to the ocean. In addition, *SIC* lists appropriate audio visual programs to supplement the *SIC* activities and classroom observations of the fry. *SIC*'s content even extends

to providing teachers with supplementary background material for their own interest. Most teachers are probably not that knowledgeable about salmon, the salmon's environment, the salmon resource, or the *Salmonid Enhancement Program* (*SEP*), so the *SIC* resource binder is considered to be most important educationally as it is generally the sole guide for the teacher teaching *SICP*.

Because the *SIC* document is so influential to the program, it cannot, in this study, be left without a careful scrutiny to determine what effects it may ultimately be having upon students' learning outcomes. An analysis of the document may assist this study with a better interpretation of all data.

Methodology

A useful method to understanding *SICP* and its implications for determining students' attitudes, is to critically analyze the curriculum material, *Salmonids in the Classroom: Primary Package* (*SIC*). The type of critique chosen for this study was not intended to examine *SIC* for its technical quality, content, or organization. Instead, the type of critique chosen to assist this study, named *editorial criticism*, does not criticize a work in the usual sense by finding faults, but it looks to the roots of the program to explain its origins.

Editorial criticism, as defined by Werner [101],

> ... is an attempt to illuminate a work by exploring the process of its creation, examining the sources and perspectives available to the writer (or developer) in arranging the parts to form a whole (p.144).

Werner summarizes this definition by explaining that "editorial criticism is essentially a description and judgment of the editorial perspective through the which the documents are compiled from sources" (p.144). He further states that the developers'

stance in composing, inferred from the finished curriculum, is made explicit by the critic. The critical endeavor of *SIC* is by its very nature colored by this researcher's own biases, not only because of the chosen purpose of the exercise, but for the specific selection and interpretation of the content (data). One danger to the validity of this analysis is that it may tell more about the critic than the curriculum.

Werner explains that although the word criticism has negative connotations, he bases the use of the term from its technical sense:

> *Krisis*, the Greek root from which the word criticism is derived, means *judgment*. This judgment is in the sense of *radical*— that which is connected with the root (Latin *radix*). In other words, radical criticism is a judging of the roots or foundations of something. By implication, a critic is one who makes a root judgment, and criticism becomes at the same time a judging (in the sense of a process, a method of systematic analysis) and a judgment (in the sense of an end product, a public description) providing a broadened view of some thing or event (p.143).

The unique qualities of this form of qualitative research also places limits upon its practice. Werner states that there are no recipes or formulas as each case will have a different setting. However, he does suggest two analytical steps which are summarized as follows:

"The critic should ascertain the internal arrangement of the curriculum" (p.149). The critic should become acquainted with the material, and understand as many aspects about its framework as possible such as the major themes chosen or neglected.

"The critic should select a central critical problem" (p.150). This guideline will focus the criticism and the critical problem becomes bare by the criticism. For this study, the critical problem was an examination of the stated goals from the curriculum

and the sponsor followed by a search for congruence of those goals in the content of the *SIC* package in light of the context of the sponsors and the developers. The question was concerned with what values were ultimately pursued as exposed in the curriculum. Since there were numerous developers and numerous people involved in the sponsorship, there are expected contradictions in the values promoted.

Significance

This study has examined appropriate background documents and the curriculum materials in an attempt to not only match the product of the developers with the intended goals of the *Salmonid Enhancement Program*, but also to determine the assumptions and values of both the political directors and the developers of the program. This type of analysis took a political perspective and was concerned with the content selected for *SIC*. It attempted to determine who chose the material and for what purpose.

As stated in Chapter I, *SIC* was developed and is presently sponsored by the Federal Government and has been introduced by them to the schools in British Columbia. Of central importance to this analysis was the understanding that the Federal Government, extending through the *Department of Fisheries and Oceans* (*DFO*) and then through the *Salmonid Enhancement Program* (*SEP*), was considered to be a special interest group trying to influence the public with its point of view and goals (see Roalds's description of special interest groups in Section 1.3.3).

There is one other kind of interest group that is involved in the curriculum, and that group is an internal group. This group is represented by subgroups from teacher organizations, administrators, parents and civil servants from the ministry of education [104, p.96]. For example, teachers may sit on curriculum development and selection committees to ensure their point of view is included. Ad hoc groups of teachers whose special personal interests are salmon studies in the classroom, have also had significant

input into the development of the *SIC* curriculum.

SIC was authored and is maintained by two "groups that have their own world views and social interests" [101, p.149]. One group is the fisheries officers and technicians from the *DFO* and the other group is the volunteer teachers. Each group has their specific interests, beliefs, values, and assumptions that originate from their place of participation in society as well as from society in general. The choice of specific content from a large universe of knowledge for the curriculum reflects the developers' context since some themes have been stressed while others have been neglected or omitted. The content is often unquestioned by the developers and the users of the program since it seems common sense to them. That is, the chosen content is not the result of a conspiracy or plot, but it only represents the dominant views in society. However, these values that worked through the developers may be those that represent the powerful interests in society that would have the most to gain from the present economic investment and management policies of the salmonid resource. This issue is explored in Apple's [7] Chapter, *On Analyzing Hegemony*, which argues the position that specific curriculum is saturated with political and economic practices which relate to social and cultural control in society. According to this theory, certain vested interest groups stand to benefit materially and financially from the investments and management practices of the *Salmonid Enhancement Program.* Werner [105] points out, that school programs and the teachers are not neutral. The programs they present are either:

> supporting and legitimizing the status quo or are helping students to critically understand and confront it. ... They support one set of values or another simply by taking a course of action in the classroom (p.5).

The quality of the materials as well as the editorial perspective taken by the developers will help to determine the classroom experiences of the students and therefore

the implications not only for daily classroom activities but future beliefs and attitudes about the management of the resource and protection of the natural environment. If students have opportunities to participate in the decision-making processes they can learn to be critical thinkers and criticizers of the *Salmonid Enhancement Program* and thus be prepared as the future guiders and supporters of the program.

> Competent citizenship implies the concept of the citizen as social critic. ... Democracy works best when people know the most—both intellectually and practically [97, p.110].

The failure of this process occurs, even against our best intentions and consciousness, when society has already acquiesced to a program. If students do not have opportunities to critically analyze, then all that is left is their indoctrination with society's underlying values and principles. Students are then treated as passive recipients of the selected knowledge. They can be "moulded and shaped into some *useful product*" [105, p.2], for someone and for some interest.

3.2.2 The Interviews

Interviews Using the Slide Show Instrument

After the posttests, it was learned that the reliability of the instrument was too low to be useful; the scale had collapsed. The analyses utilizing the total scale score were therefore deemed to be unsuitable and each slide was analyzed separately. To obtain an understanding and possible explanations for what the children were seeing in the individual slides, it was necessary to visit a minimum number of classes and to interview some of the students. When the scale collapsed and it was explained to the client and the school district science coordinator in charge of *SICP* that it was necessary to

interview students to obtain data on individual slides, access to the classrooms for the intention of interviews was permitted.

The methodology of the interviews was very simple. It was decided to conduct interviews from three of the treatment classes that had also been pretested and also from classes where this researcher had supervised the posttests so that the students had some familiarity with him. Teacher permission was also necessary. The same criteria was also required of the control classes. Since the interviews took up to 30 minutes each, only 2 to 4 students from each class could be interviewed without creating too much disturbance to the routine of the classroom.

The teachers selected the students that were to be interviewed so as not to impinge upon the teacher's lessons. The requirements requested of the teacher were that the student had taken both the pretest and the posttest, was able to communicate verbally, and was representative of what the teacher believed to be representative of a typical student from that classroom.

The format for questioning the students was based upon the slides used in the original instrument. Each student was taken to a quiet place away from the classroom (usually out in the hall or a smaller empty room) and given the same instructions for taking the original slide show. Instead of seeing the slides, the students looked at photos printed from the slides. The student responded to each photo by marking the appropriate face that corresponded to how the child felt about the photo. When the child was finished, he or she was asked to explain the reason given for each answer by stating what was in the photo that prompted him or her to mark a happy or a sad face. The student was given time to express all ten answers before probing questions were used. The students' verbal responses were recorded in note form and checked with the student for accuracy of recording. Only when the student had a chance to respond to all ten photos, were probing questions used to obtain more information. The probing

questions, if asked, were based upon each student's previous answers.

The second set of interviews was conducted during mid-treatment with five students from one school in another school district. Three primary students and two intermediate students were interviewed. All five students had experienced the classroom incubator and were studying *SICP* in their classes. The selection of students to be interviewed was made through the classroom teachers. The teachers selected the students based upon the same criteria used in the previously described interviews. These students were not shown the slides or photos but were interviewed with the use of a six question interview guide (see Appendix C). The guide was followed as closely as possible while allowing for flexibility to follow the students' beliefs. These interviews were taped and then transcribed only partially. The purpose of the interviews with these students was to determine the sense they were making of *SICP*, the sense behind why they were studying *SICP*, and the sense behind why they were raising salmonids in the classroom.

3.3 The Quantitative Study

3.3.1 Population

The target population of this study included students from grades 1,2, and 3 from twelve primary classes and eleven schools. Two of these classes had to be dropped just before commencement of the study when it was learned that one of the classes had started studying salmon and environmental education earlier in the year and the other class was going to have to share the classroom incubator with the rest of the school. The control classes were from the same district but obviously from different schools. The ten control classes came from ten different schools and like the treatment classes, there were four grade 1 classes, four grade 2 classes and two grade 3 classes. A total of

461 students completed the posttest; 239 from the treatment classes and 222 from the control classes. All of these classes were spread around the Vancouver school district and appeared to have a mix of children according to cultures and economic status. Since the entire group of classes implementing *SICP*, except for the two eliminated, were included in the study, the sample was considered to be the population.

3.3.2 Treatment

The components of the *SICP* have already been described in Chapters 1 & 2. The four basic components were implemented by the Vancouver teachers and these components were considered to be the treatment. The components were: the standard classroom incubator with approximately 200 salmon eggs; the *SIC* package of resource lessons, worksheets, and teacher background material; the audiovisual materials with several appropriate videos selected; and the field trip to release the salmon fry in a local creek. Teachers were free to adapt to the program and use as much of the curriculum as they wished.

In preparation for implementing *SICP*, the participating teachers attended two workshops similar to the format described in Section 2.4.4. The first workshop was to explain the program and was directed toward informing teachers about the technical aspects of *SICP* and what was required of the teachers who intended to implement it. The second workshop instructed the teachers on how to assemble and care for their classroom incubators, which they then took back to their classes. Teachers were not taught about the importance of the resource in terms of economics, environment, and society. In addition, teachers were not taught to engender certain attitudes with their classes. Classes were not monitored to ensure that all the components were covered or given a minimal amount of attention.

Since the Vancouver school district had never implemented *SICP*, it was assumed

that none of the teachers had taught *SICP* before. This writer's informal posttest interviews with several of the teachers indicated that the program was novel to their teaching experience. Because of their lack of salmonid experience, it was believed that these teachers were dependent upon the *SIC* package for lessons and background information, and thus their programs were highly reflective of the *SIC* package.

3.3.3 Instrumentation

In developing an affective measure for grades one, two, and three, several decisions were reached:

- a single test would be developed for all three grades,
- the measure should focus on general attitudes toward the salmonid resource,
- verbal skill requirements should be minimized for both stimulus and response, and
- administration time for each measure should not exceed 15 minutes.

The use of pictorial stimuli was suggested during a November 1987 meeting with the *Department of Fisheries and Oceans* client and the school district representative. This pictorial technique for measuring attitude was not an original invention as it was used previously by Conry and Jeroski [21]. Their study was also commissioned by special interest group clients, the *Canadian Forestry Association* and the *Weyerhauser Foundation.* For the evaluation of *SICP*, the client preferred the pictorial measure and the quantitative study was limited to just this measure. Some students studying *SICP* are classified English as a Second Language (ESL) and some were enrolled in French Immersion, so the nonverbal pictorial measure appeared to be appropriate to the subjects. The contract with the client did not initially allow or encourage observations

or interviews of students and teachers from the Vancouver school district. The agreement made with the client limited the extent of the quantitative study and therefore its usefulness to the *Salmonid Enhancement Program* and the teacher-users.

A practical format was selected to accommodate the use of the pictorial stimuli. It included a set of 35mm slides, accompanied by individual pictorial response scales (see Appendix A). Originally, a list of stimulus-subjects was developed to elicit both positive and negative responses. For example, a school of spawning sockeye should elicit a positive response just as well as a dead spawned-out sockeye since both represent successful stages in the salmon's life cycle. The strength of the positive responses in this example was expected to vary as the aesthetics of some slides were more appealing and the theme of some of the positive slides would carry a sadder message (the salmon had to die after spawning). In addition, slides displaying legal fishing and approved enhancement techniques should also elicit positive responses as these themes represent accepted human use and management techniques. Again, the positive strength of these types of slides may have been colored with a negative message as the enhancement techniques and use of the salmon may result in an unpleasant display of dead salmon. Negative responses were obviously expected to be elicited from a prematurely dead fry, oil pollution, garbage pollution, and mechanical damage to streams.

The *Salmonid Enhancement Program* provided the slides from an extensive collection. From this library, 220 slides were chosen that clearly displayed the salmon and salmon habitat in different settings and forms from which positive and negative responses might be expected. These slides were then reviewed and it was concluded that several guiding rules would be necessary in the selection process. The guidelines were as follows:

- the main theme of each slide should be about some aspect of the salmonid resource,
- an equal number of positive and negative situations should be presented ,
- slides which were particularly aesthetically pleasing should not be included,
- slides which were confusing because the student could not focus on the attitude object or recognize the object should not be included,
- slides which consistently elicited only strong positive responses from students when the desirable response is positive should not be included,
- slides which consistently elicited only strong negative responses when the desirable response is negative should not be included, and
- no more than 25 slides would be included in pilot testing.

Student responses to the slides were recorded on a nonverbal Likert-type scale of *happy faces* (see Appendix B). Students were told that the alternative response modes to the happy faces could be thought of as: *happy, a little happy, uncertain, a little sad,* and *sad.* The scoring for each alternative was assigned a weight from 1 (happy) to 5 (sad)

Using these selection guidelines, the number of potentially acceptable slides was reduced to 40. These slides were then piloted with three neighborhood children. Using the "happy face" response scale with the slides, and in-depth discussions about what the children saw and why they felt happy or sad about certain pictures, the number of slides was reduced to 25. The remaining slides were piloted in another district using two primary classes totalling forty-two students. Slides were then eliminated for a variety of reasons. For example, a picture of a young girl cutting off a piece of salmon in a

natural setting produced concern that the little girl should not have a dangerous knife. In this case, students were not reacting to the intended attitude object. Some positive slides were rejected on the basis of high positive responses (e.g. leaping salmon). All the negative slides were rejected on the basis of extreme negative responses (so that any attitude change could not be detected) or the realization that the pictures were not clearly understood.

The results of the pilot tests indicated that a maximum of ten slides could be used in the final instrument. These ten slides, which were all positive to the salmonid resource according to *SEP* and *SICP* goals, had mean scores close to the scale midpoint and the highest intercorrelations. The slides were of salmonid scenes that could elicit negative responses since the scenes also depicted possibly unfavorable aspects of a positive situation (e.g. egg take, commercial catch). The final set of 10 slides is illustrated in Appendix A. Analysis of the pilot test data produced a Hoyt reliability estimate of 0.81 and a total mean of 28.88 on a range of 10 to 50 for the final ten slides.

3.3.4 Methodology

The experimental design for the quantitative study was the Solomon Four-Group [18]. The independent variable was *SICP* consisting of: the salmon hatchery in the classroom, a stream fry release field trip, a set of salmonid videos, and the availability of *SIC*. The dependent variable was the attitude scale. Ten of the twelve primary classes were included in the research as treatment classes. Borg and Gall [15], state that volunteer samples are likely to be biased. However, in this research, random selection was not practical and seen as necessary since all the teachers of *SICP* were volunteers and volunteers are typical of those teachers implementing the *SICP* in British Columbia. Except for two classes that had to be eliminated, no random selection could be made as the entire population of classes were from volunteer teachers. The control classes

were not randomly selected, but were selected on criteria that would match the control groups as closely as possible to the treatment classes, and yet be as far removed as possible from the *SICP* influences. The criteria for selecting the control groups were: grade level, socio-economic status, ability levels, and teacher-type, which could be described as volunteers in district programs (including some future volunteers for implementing *SICP*). The assignment of the experimental groups for pretest and posttests was done by random selection. Since the instrument, the media, the regular curriculum, the maturing student, and the teacher might influence the student attitudes, the Solomon Four-Group design, displayed in Figure 3.2 appeared most appropriate.

Figure 3.2: The design for Solomon Four-Group

Group I	(Treatment)	Pretest (01)	Treatment	Posttest (02)
Group II	(Control)	Pretest (03)		Posttest (04)
Group III	(Treatment)		Treatment	Posttest (05)
Group IV	(Control)			Posttest (06)

3.3.5 Analysis

Analysis of variance procedures as suggested by Campbell and Stanley for Solomon Four-Group design was to be employed on the pretest and posttest scores of the scale [18]. However, the total scale scores became very unreliable when the instrument was administered to the treatment and control groups. As shown in Table 3.1 the unstable total scores produced low Hoyt estimates of reliability, and factor analysis determined that there was more than one factor present in the scale. These factors were not consistent across the control and treatment groups nor were they consistent across the pretests and posttests for the same groups.

Because of the collapse of the scale, total scale scores were abandoned and individual slides were examined using the 2 X 2 analysis of variance design suggested by Campbell

Table 3.1: Hoyt Estimates of Reliability

Group	*N*	Alpha
Pilot	42	.81
Pretest treatment (01)	116	.61
Pretest control (03)	109	.66
Pretest total (01+03)	225	.64
Posttest treatment (02+05)	239	.43
Posttest control (04+06)	222	.61
Posttest total (02+04+05+06)	461	.54

and Stanley.

Disregarding the pretests, except as another treatment coordinate with X, one can treat the posttest scores with a simple 2 X 2 analysis of variance design as displayed in Figure 3.3 [18, p.25].

Figure 3.3: Groups use in the 2 X 2 analysis of variance

	Control	Treatment
Pretested	04	02
Not pretested	06	05

From the column means, one estimates the main effects of the treatment X, from row means, the main effect of pretesting, and from cell means, the interaction of testing with X (treatment) [18, p.25] .

Chapter 4

Results

4.1 Introduction

This chapter is sectioned into two parts. The first section presents the analysis of *SIC* using editorial criticism as described in Chapter 3. The second section presents the quantitative data from the Likert-type instrument blended with the qualitative data from the interviews. By presenting the results from editorial criticism of the *SIC* package first, it is intended that the reader will have better understanding of, and appreciation for, the rest of the data presented in the second section of this chapter.

4.2 Editorial Criticism

4.2.1 The Developers

Salmonids in the Classroom: Primary Package (SIC) has been prepared under the joint sponsorship of the Federal-Provincial *Salmonid Enhancement Program (SEP)*[1] and the Department of Fisheries and Oceans (*DFO*). The primary package was designed, developed, field tested and finally produced between 1982-1984 under the direction of James Boland, Head of Public Involvement, *Salmonid Enhancement Program* (*SEP*), and Linda Bermbach, Project Coordinator and Chief Curriculum Writer. Credits are given to two teachers who made major contributions to the initial draft and four other

[1] The extent of the Provincial involvement can best be described as token, as the relationship is more an agreement to implement *SEP* than to actively participate as equal partners.

teachers who also made contributions. Twenty-two teachers who participated in field testing the materials are listed. *SIC* claims that teachers throughout the province were involved in the writing and development. The teachers received technical assistance from a former community advisor (fisheries technician) and from the Bio-coordinator for *SEP*. The developers claim assistance with the development, design, and field testing from educators throughout the province. No claim is made that the package is endorsed by either the Ministry of Education or the British Columbia Teachers Federation (BCTF), although *SIC* is distributed through the BCTF.

4.2.2 Overview of *Salmonids in the Classroom* (*SIC*)

The primary *SIC* material is attractive, has an appealing method of presentation, and is packed with information about salmonids and related salmonid activities. The subject matter contains a collection of scientific and technical information about the salmon and its life-cycle. The *SIC* binder is organized into sections with clearly marked dividers. Starting from the front of the binder and progressing to the back, the sections are divided as follows: Rationale and Introduction, Chapters 1 to 10, Glossary and Reference Material, Enrichment and Integrated Activities, A/V Catalogue and Guide, and Bibliography.

The Rational-Introduction section lists the credits for the development of the package, the rationale statements, and itemized learning outcomes followed by evaluation instruments, both cognitive and affective. There is also a primary science curriculum cross match for teachers who wish to integrate the *SIC* lessons into their science studies. These words of advice summarize the educational philosophy of the program: "The activities suggested for use in the teaching of the ideas presented are *multi-disciplinary*. The main focus, however, is on *science*" [14, Rational-Introduction].

Eight pages of introductory technical background material summarizes the life cycle

of the salmon for the teacher. A detailed table of contents is the last insert into this section.

The ten chapters center around a short story that is intended to be read orally to the students. The story is about Chuck E. Chum, a cartoon type hero fish, who tells his life story, a story of the chum salmon's life cycle. Each chapter also contains technical reference information and explanations for the teacher, a student learning outcomes list, a vocabulary list, a teacher resource materials guide, and suggested student activities.

The glossary contains additional salmonid background and related information for the teacher in the form of vocabulary lists and references. The Enrichment and Integrated Activities include fourteen enrichment activities and many integrated activities for art, music, language arts, arithmetic, and cooking. The A/V catalogue lists approximately 70 films, each with a synopsis. The bibliography has over 75 listings.

Teachers should find the package easy to use and interesting for their students. There is probably no control in most districts as to what content teachers select from *SIC* for their classrooms. Teachers are free to choose not only what is to be taught but how it is to be taught. The criteria teachers use when selecting content are probably based upon the individual time and interests of teachers and the teachers' perceived needs of their students. For a primary teacher, much of this curriculum appears to offer an uncomplicated and rewarding experience in teaching science. Standforth's [90] study of the process of implementation of an environmental program (*SICP*), claimed that, 30% of the teachers teaching *SICP* from another Lower Mainland school district had no background in science or environmental studies. Her study also reported that none of the teachers surveyed used much of the original elementary and secondary *SIC* materials and that the classroom incubation of salmon eggs was the main focus of the teachers' program. The point to be made (as it was done in Chapter II) is that *SIC* is probably the major source of salmonid information for most primary teachers

(whether they use it or not) who are generally not knowledgeable about salmonids and the salmonid resource. In addition, the amount of teacher use of the primary package is unknown, but appears to be in greater use than either the elementary or secondary packages.

4.2.3 Stated Goals, Rational & Objectives from *SIC*

Salmonids in the Classroom: Primary Package (SIC), was produced in 1984, five years after the original elementary and secondary *SIC* packages were introduced into B.C. classrooms. Initially, *SIC* was developed for intermediate and secondary students, but later it was believed that students' attitudes toward the salmonid resource could be developed in the earlier years [10].

The package describes itself as a "comprehensive collection of curriculum resource materials" to "assist in the study of the life and being of Pacific salmon in British Columbia" [14, Introduction]. The rational for *SIC* is derived from the goals of *SEP* which originated from the desire to restore the salmonid stocks which had declined drastically over the previous decades. Accordingly, the Federal Government funded the information and education for the public:

> about the salmon resource, the reasons for its decline, and the ways in which *SEP* was attempting to improve productivity. Program planers reasoned that the more knowledgeable the public became the more involved they would be with salmon conservation. School age children were identified as a receptive and responsive *target* group [14, Rationale].

The rationale, specific for the primary package, states that the prepackaged set of primary curriculum materials is designed to be taught as a science unit.

> Teaching about the world in which children live is vital; and perhaps, it has never been more important than it is in British Columbia today. It is only fitting that the children of British Columbia know as much as possible about our dynamic aquatic environment. They should be aware of its complexities, its subtleties, and its aesthetic and economic importance. *The children of this province will have a part in the decision making processes of the future* (author's italics for emphasis) and the more knowledgeable they are, the more effective their participation will be [14, Rationale].

Within *SIC*, under the title of *Evaluation*, consideration is given to reviewing the rational and philosophy of the package. The authors claim that:

> The rationale for *Salmonids in the Classroom* stresses that, due to the major importance of the salmonid resource, this program has been assembled to provide a better fundamental awareness and understanding of it and the relationship of salmonids to societies' overall resources environment [14, Introduction].

Given this rationale, it is interesting to note that the introduction states that "the purpose of the curriculum materials is to help classroom teachers in interpreting both the freshwater and the marine environments of salmon to their students" [14, Introduction].

Finally, there are three lists of teaching objectives in *SIC*'s introduction. No claim is made as to the origin of these lists. One list has eleven cognitive *SIC* objectives (e.g., knowledge of life cycle of the salmon) and the second list has six affective *SIC* objectives (e.g., gain an awareness of the environment). The third list of objectives has five science skills and processes and six other general skills and processes (e.g., observing — special emphasis on use of all senses).

4.2.4 Review and Discussion of *SEP*'s Goals and Perspectives

It is clearly stated in *SEP*'s first annual report that the economic perspective is the foundation of the *Salmonid Enhancement Program.* As already stated in Chapter I, Section 1.3, the program originally recognized that "society has a multiplicity of goals" [61, p.iv], which *SEP* categorized into the *Five Account System.* "The impacts of salmonid enhancement projects are analyzed on the basis of their contribution to:

- national income
- employment
- regional development
- native people and
- resource and environmental preservation". [61, p.iv]

The first three impacts are economic and one would think that the rank order of the impacts would suggest a higher degree of importance for those at the top of the list. It is also reasonable to assume that the preamble phrase to the five impacts, "society has a multiplicity of goals", is a political statement made by the politicians to justify their actions.

There is a questionable assumption in the use of the term *society* as an identifiable group that is in agreement to certain beliefs that forgoes any decisions. Society is composed of many interest groups that do not always agree with the plans and decisions of the ruling government. "Society is simplistically represented as a value consensus" by program policy planners [105, p.3]. This kind of statement omits rational argument about the reasons for choosing these impacts, and transfers the *society's goals* from the politicians to the public, whether the public wants it or not and whether the action is

right or wrong. Thus, the issues of the impacts of an economic plan for *SEP* that are intended to bring a solution to the declining stocks, are glossed over with meaningless slogans.

Politically, the government decided that the program should demonstrate the potential for government cost recovery in the enhancement program. In other words, if the catch doubled because of the enhancement efforts and there was no appreciable increase in harvest cost, then the extra benefits would be felt through the economy, which would generate more revenue for the government [75, p.57].

Ten years later, this economic perspective is still firmly embedded into the Program's philosophy. The first issue of *Pacific Tidings* Vol. 1, No. 1, Jan. 1988, published by the *DFO*, includes an interview with the Fisheries Minister, the Hon. Tom Siddon. The interview discussed the economic implications for the continued funding of *SEP*.

> We were also able to get support of the Prime Minister because he is really committed to seeing the Western economy grow. He knows that *SEP* is an engine of growth. The government understands that this funding is an investment in B.C.'s future [27, p.4].

The Minister also sees this economic viewpoint reaching into the classroom to the student and resulting in specific educational outcomes favorable to his viewpoint.

> I also feel that the educational activities of *SEP* over its first ten years are paying dividends. More and more people now recognize the importance of the resource. That means we can produce more fish with an assurance that there will be an environment to support them in the future [27, p.5].

Mr. Siddon's choice of vocabulary (paying dividends) reflects his personal economic perspective and redefines the goals of *SEP*. Are salmon no longer to be studied for

aesthetics, cultural importance, general interest and importance to the environment? Mr. Siddon neglected to mention these aspects of the resource. The prime objective of Mr. Siddon's statement appears to seek support from the public for the salmon industry which has to compete against other B.C. resource sector companies that also use fish habitat, often to the detriment of the salmon and the environment. If salmon are just another product from industry, is the environment to be treated like a factory?

This stance by the Minister of the *DFO* combined with *SEP*'s goals is automatically rejoined by many pertinent questions that also concern educational outcomes. What are the future implications for school children to whom this economic perspective is directed? Is *SIC* informing students and teachers of the *importance of the resource*? Will the government be able to demonstrate a cost recovery from *SICP*, and if so, how? Is *SIC* consistent with the goals of *SEP*? Is *SIC* just an interesting collection of science and multi-disciplinary classroom activities that avoids the real economic and environmental issues, thus allowing the politicians a free-hand to decide upon the goals and management of the salmonid resource? Mr. Siddon replys: "The effort to provide educational programs for school children who will be the guardians of the resource in the next generation ...will continue" [27, p.5].

The intent is overt. The federal government, a vested interest group, perceives the salmonid fishery to be important economically, and children educated about the resource in schools will help ensure that this economic activity will survive. Children are to be moulded into guardians of the resource, and are expected to perform the duties of the guardian. How does Mr. Siddon define guardian?

The Federal Government supports other resource industries, such as mining, under the Department of Energy, Mines and Resources, with school programs. The Federal Government assists with the production and implementation of school curricula under the banner of economics (exploration of minerals for maintenance of our life style).

For example, *Geology: Unlocking the Future*, a booklet produced by the Department of Mines and Energy in 1983, has interesting technical information about geology for secondary students, but it also covers potentially controversial topics such as the need to search for new energy sources (e.g.,building dams) and the disposal of radioactive wastes [33]. The industries associated with this type of resource utilization have many negative impacts upon the environment such as the creation of air, ground, and water pollution. This makes these industries potentially controversial with the public, and apparently at odds with the *DFO*'s goals of a clean environment for the salmonids. However, the *DFO*'s significant investment in hatcheries and spawning channels [75, pp.16-17] and their potentials to produce many more fish for the fishing industry, could be nothing more than the creation of a technical factory model that has replaced the original natural model, the environment with its clean undisturbed streams. If the *DFO* can replace the environment with a hatchery, is it not giving up on the environment and giving in to competing resource industries? Can it still claim to be environmentally oriented when it uses the latest fish technology to twist and squeeze, to open and close systems in the environment to produce the maximum amount of salmon? It would appear that the dominant economic perspective taken by the Minister of the *DFO* may have no more respect for the environment than the other resource industries that the Federal Government supports have. This narrow economic perspective for the salmonid resource will probably continue to have harmful effects on the total environment which includes not only salmon, but a multitude of other organisms from the rivers, oceans, and adjoining lands. The salmonids are an important link for many organisms' survival.

The first issue of *Pacific Tidings* completely omitted all reference to the fourth and fifth impacts developed by the original *SEP* planners leaving only the first three economic impacts and the unanswered question, *What are* SEP *'s new impacts*?

4.2.5 Evidence of *SIC*'s Goals and Economic Perspective

SIC does not enhance the *SEP*'s image or explicitly promote *SEP*'s economic program, except in the opening credits. This omission from the curriculum suggests that the *DFO* has not been trying to enhance its image or economic program through the developers to primary teachers and their students. Explanations for this absence would indicate that the *DFO* is not competing publicly with other interest groups, where each needs to promote itself at the expense of the other. Publicly, *SEP* stands for clean rivers and more salmon, a position an opposition interest group would not want to vocally criticize. However, a recent series of news articles about salmon and *SEP*, questioned the success of the program [50]. *SEP* may need to consider its image in the future, but it has generally gained acceptance with the public, considering that over 7500 volunteers assist each year [27]. If *SEP* did promote its image, then it may have to politically defend its position, so it may be best to leave the topic alone.

A lack of the economic perspective in the curriculum materials may leave this knowledge in the hands of powerful interests in society that would have the most to gain from an economically ignorant public. According to Anderson [6], materials distributed by interest groups are biased, they all seek support for what they are doing. In the case of *SIC*, the biased materials may be a distorted picture of reality since the content has been narrowly selected. This distortion may allow the *DFO* to make controversial decisions, which pass unchallenged by a public who believe they are informed but still remain ignorant of the critical issues.

SIC, was examined for explicit statements similar to those made by the Minister of the *DFO* and found in the *SEP* documents that would support the economic perspective. They were not present. In fact, for the amount of content assembled, very little had to do with economics or even the human use of the resource. The perspective taken

by *SIC* developers is not congruent with *SEP*'s stated goals and the present policies of the *DFO*. For primary students and teachers, *SIC* will not provide an opportunity to understand the importance of the resource. The amount of implicit evidence supporting the economic perspective was insignificant compared to the amount supporting the technical perspective.

The background rationale for *SEP* states that the purpose of the program is: "to inform and educate the public about the salmon resource ... and the ways in which *SEP* was attempting to improve productivity, ...", [14, Rationale] and, specifically for the primary children studying *SICP*, "They should be aware of its (aquatic environment) complexities, its subtleties, and its aesthetic and economic importance".

Since this rationale statement lists economic importance last among three other general concepts that had not been stated before, one can only assume that the economic perspective may be downplayed in importance. In addition, it is not necessarily the economics of salmon, but the economics for the entire aquatic environment, which might include any economic activity upon the salmon's environment. These sections of the rationales from *SEP* and from *SIC* appear to contradict each other or at least stress different themes. Finally, the rationale for *SIC* stresses the awareness, the understanding, and the importance of the salmonid resource. However, this statement from *SIC*'s rationale is not reflected by any congruent content in *SIC*.

In surveying Chucky's story, the activities, and teacher information sections of the package, the following evidence for possible support of the economic perspective was found: Page 1 of Chapter 8, is the first introduction (assuming the teacher follows the curriculum in sequence) students and teacher will have for an example of human use of the resource. The following quote is taken from Chucky Chum's dialogue.

> I'm still alive. I've actually seen some close friends, a few relatives and

> hundreds of strangers swept up in huge nets by commercial fishermen. You don't have to be an A student to realize that they will end up on a sandwich, in a casserole or as the main attraction at a barbeque later this summer [14, Chap. 8, p.1].

The bottom of the page has a cartoon diagram of a boy rubbing his stomach and licking his lips in obvious enjoyment of a salmon dinner. Chapter 8 continues the story on predators, fishermen, maturity, homing, and the migratory return. Humans are viewed as another obstacle in the salmon's life cycle.

> The *natural* hazards ... are tough enough to overcome without people adding to our problems . ... The more you over-fish and the more you use our rivers as dumping grounds, the less chance we have [14, Chap. 8, p.6].

If *SIC* was to promote an economic perspective, it would probably stress the financial gains and losses of the resource use and not just the environmental predator-prey relationships, a category into which Chucky has lumped humans. So what appears potentially as an economic perspective, is really an environmental perspective in which people are both another group of predators appreciative of the salmon and another group of animals competing with the salmon for the same environmental space ("you use our rivers as dumping grounds").

This brief quote of Chucky's is probably one of the most important contradictory statements in *SIC*'s content. The *DFO* manages the fishery behind the banner of economics and conservation, yet it is the *DFO*, as directed by the Federal Government, that is responsible for allowing the over-fishing and the dumping in the rivers. Will Mr. Siddon's future young guardians be as responsible as today's guardians who have permitted the abuse of the resource? Young primary students and their teachers need

answers to questions that ask why destructive practices such as pollution and overfishing have occurred, and why they are still occurring. *SIC*'s introductory comments to the teacher, suggests that while reading the story, "Every opportunity for discussion about or elaboration on, any aspect of Chucky's life should be encouraged" [14, Introduction].

However, the teacher has not been given information or guidance on such issues from any part of *SIC*. In case a primary teacher ever wonders about this contradiction, the package has inserted a political reply in Reference # 21. The government's policy is to optimize the resources. Reference # 21 will be discussed further in this section.

The salmon's high mortality rate throughout its life cycle is a reoccurring theme in the Chucky Chum story. There is a continual reduction in the number of surviving salmon at each stage of the life cycle. This reduction starts with the eggs in Chucky's gravel (some did not get enough oxygen) and continues through to that of a returning friend of Chucky's being caught by a bear. This huge loss of potential salmon production could be interpreted indirectly as an economic perspective. However, if the suggestion was made that hatcheries could decrease the loss of eggs and fry, or if there was concern about the lost value of the resource, then an economic perspective could be claimed. However, these concerns do not arise, and neither does the global environmental concern that the loss is really not a loss but a necessary redistribution of food energy and nutrients to a wider variety of important organisms. Instead, predators are portrayed as obstacles and not as necessary components of the environment. The emphasis is that the odds are against the survival of any one fish. This concept, along with the life cycle, appears to be part of the salmon's mystique that has captured the imagination of the developers, teachers, and students. Classrooms that raised salmonids this year (1988) are probably anticipating the fall of 1991 when the few survivors return to their creek to spawn.

Chapter 9 of *SIC* contains a special issue of *Salmonid*, Vol. VIII, No. 1, February

1983. *Salmonid* is a newsletter produced by a different group of writers contracted to the *DFO*. This issue is special[2] because it was published specifically for school children and contains classroom activities. The purpose of the issue is stated clearly on its front cover.

> ...elementary school children can discover fascinating facts about salmonids, the food fish that forms a vital part of British Columbia's cultural and economic fiber [14, Chap.8, SA 37].

However, the *economic fiber* viewpoint is not stressed in this issue, and neither is the cultural. Commercial fishing of salmon is mentioned incidentally in two activities. One activity is a game of survival where landing on squares of pollution, dams, bears, etc. results in loss of points in a race to the finish line (spawning grounds). The other activity is a math exercise where numbers of fish are tabulated to ensure correct numbers of eggs and fish are to be released for the fishermen to catch. The focus, in both activities, is on rolling the dice and calculating the numbers, not on the economics of the salmon resource, which appears incidental to the activities.

No other evidence from the story and the forty-two activities in the ten chapters expresses or suggests the economic viewpoint.

SICP's reference # 15, entitled, ...*And Then There were Two*... (Edited summary by D. Alderdice, Pacific Biological Station, Fisheries and Oceans), is supplementary teacher information. It is about "man-made problems" for the salmon resource with a focus on the slim chances a salmon has for survival. The dominant perspective appears to be environmental with a listing of the damages human activity has inflicted upon the environment with the resulting harmful effects upon the salmon. Four industries which

[2]Normally *Salmonid*, which ceased publication in 1984, was published for all interested members of the public.

compete with the salmon for environmental space are listed along with descriptions on how each takes it's toll on the salmon resource. The industries are logging, dams, pollution (industrial waste) and overfishing (especially foreign). After each industry heading, statements are listed under the caption that describe associated harmful environmental effects on salmon. Yet within each category, at least one statement refers to the underlying economic tension between the two industries, which reduces all previous environmental statements into the economic domain. These statements question the power or will of the fishing resource to survive. The tone of the first three statements convey a resigned attitude to the eventual loss of even more salmon habitat to a stronger economic base:

- *Logging* — The number one industry in B.C..
- *Dam Construction* — Dams should not be built on important salmon run rivers, BUT ... as the demand for electricity increases, how will *important* be defined?
- *Pollution* — In all of the situations mentioned above, the question remains: how much will all this pollution protection cost?
- *Over-fishing and Non-selective Fishing* — How can Canadians, traditionally meat eaters, influence the Japanese fishery, Japan being a fish-eating nation? [14, reference # 15, pp.1-2].

If the dominant perspective is economic, then the final argument is economic, and not environmental. If logging is number one, then why should a lesser industry be given preference? Increasing financial gains for logging may result in decreasing harvests of salmon. Is electricity more valuable than fish? Does the factory responsible for the pollution produce more jobs and wealth than the salmon resource? Why does the *DFO* blame overfishing on the Japanese and why should the Japanese cooperate with

Canadian fish managers when Canadian decisions about the resource are grounded solely upon economics and not on protecting the environment from competing resource industries? The answers for the survival of the salmon, which should also be considered important culturally and environmentally, has been reduced to dollars and cents. This dominant economic perspective of *SEP* is hidden in this obscure reference material for the teacher, who has probably never read it.

4.2.6 Examples of Lessons with an Economic Perspective

Examples of activities for the students with an explicit economic theme are found in Enrichment Activities #'s 7,8, and 9. This series of enrichment activities was developed and prepared solely by several primary teachers from School District No. 61 (Victoria). Of the fourteen activities, three are mostly concerned with economic and resource use. Activity # 7 is an art lesson in which students construct a "diorama" that contains such components as a marina, a fish shop, a cannery, etc.. Activity # 8 is a ten question interview schedule for a commercial or sports fisherman. However, the questions are already provided for the students and none of the questions ask about the economic or resource aspects. The activity could easily be modified, but no changes are suggested . For urban and suburban students this activity might prove to be impractical. Activity # 9 is more practical for most students. It directs the child to complete a price chart which is a check list of the different kinds of salmon present in a store. These activities contain the strongest economic components in the entire primary package. Since they are located in the enrichment section, one can only wonder how many teachers will use these activities. From the Integrated Activities, only the music section has economic themes. Two of thirteen songs contain economic elements. The rest of the integrated section (art, language arts, arithmetic, and cooking recipes) omit the economic viewpoint.

4.2.7 The Environmental Perspective

The environmental viewpoint is also minimal in *SIC* activities and teacher information. However, five of the six affective objectives are strong environmental statements and five of the eleven cognitive objectives are environmental statements. The intent is there, but the teachers and the fisheries technicians could not or would not transfer these statements into appropriate activities. If an ecologist had been consulted in the development, one could expect that the salmon would be treated as an important organism, but so would the other animals. For example, Chapter 8, Activity # 32, question 7, *sea gull* answers the blank to the question that asks for the *enemy* of the salmon. An environmentalist probably would say that these creatures are also important to the balance of nature and would not label animals harshly with the metaphor *enemy*. The type of attitudes that this kind of labelling can provoke is one where humans view some animals as good and some as bad, especially bad when they prey on animals we classify as good. The wolf has been termed bad in Northern B.C. since it competes with humans for elk. The seal and sea lion will probably soon be classified as bad since they are also *enemies* of the salmon and thus *enemies* of humans. These categories could assist the legitimization of management techniques that permit the culling of certain animals for immediate economic benefit. Certainly the environmental perspective taken by *SIC* is so narrow that it borders on actually endangering the environment it is supposed to protect.

4.2.8 The Technical Perspective

There is an abundance of interesting technical information in this package. In fact, *interesting* seems to be the catch word why teachers teach salmonids. Stanbridge [90], in her study of teachers implementing the *SICP*, claims that this is the main reason

why teachers chose this program. Teachers report that students enjoy these activities, especially the salmon in the incubator. Primary children may not be learning about the importance of the resource or the importance of the environment, but their activities (e.g., counting thermal units, noting the changes in the salmon eggs and fry) in class have been enjoyable and interesting (which is extremely important) and along the way they have learned something about the salmon, which is a good example of a wild animal.

4.2.9 Summary of Perspectives in *SIC*

The fisheries technician does not gain financially with an increase in salmon, that is, more salmon does not mean more pay, the salary is set. Fisheries personnel are skillful in both the technical and the interpersonal aspects of their jobs. Naturally, their perspective on the resource is not oriented to economics as is the commercial fishermen's perspective. If commercial fishermen had been consulted regarding the development of *SIC*, the themes and activities of the package would probably be different. However, it was the fisheries officer-technicians, who know the life cycles of all the salmon species, the optimum conditions for producing salmon, and the rules of management, that were consulted in the development of the package. This could explain the overwhelming attention given to the life cycle and other technical aspects of the salmon to the neglect of the other important aspects of the salmon resource. Since teachers developed and selected most of the content, it is only natural that so many activities are patterned for the typical primary classroom, or teacherized, and so become irrelevant to the salmon resource. The lessons generally require little planning and are easily implemented. Most of the resource information for the teacher is selected from the fisheries library, which is too technical for student activities and is also devoid of the environmental perspectives. The mode of operation of these two groups (teachers and fisheries technicians) will

naturally result in content that will represent each group's strengths or experiences.

A review of the student activities from chapters 1 to 10 and from the Enrichment and Integrated activities produced four categories for the basic orientations that each activity takes as defined below:

- *Technical* — basic information about the salmon, life cycle, etc..
- *Environmental* — the salmon's place in nature, interactions among living and non-living elements.
- *Economic* — forms of use of the resource by people.
- *Teacherized* — A classroom activity that uses the salmon theme, but the activity is an art, math etc. lesson and the salmon often appears incidental to the activity. Most of these activities were considered irrelevant to the above three categories.

Within any given activity, some of these themes over-lapped. In such cases the dominant theme from each activity was counted. The activities from the Integrated Section appeared to be contributions from many teachers, and the majority of the activities were defined as teacherized, therefore this section was excluded from the count. Table 4.2 summarizes the results.

Table 4.2: Numbers of *SIC* Activities in Each Category

	CHAP. 1-10	ENRICHMENT	TOTALS	%
TECHNICAL	14	5	19	34
ENVIRONMENTAL	3	4	7	19
ECONOMIC	0	3	3	5
TEACHERIZED	25	2	27	48

4.2.10 Chucky Chum and Empathy for Salmon

"Stories can be powerful things. They give shape to our reality" [58, p.39] .

The Chucky Chum story would be much more difficult to sort out for perspectives than the individual activities. The teacher reads the humorous and entertaining story to the students so the activity has to be teacherized to an extent. However, the focus of the *science* story is technical followed by environmental, with just a *taste* of economics. Since the story is Chucky's autobiography, it's basically the technical aspects of the life cycle that are constructed into a very readable format. However, predators, pollution, and conditions of the water and gravel are discussed and add to the environmental viewpoint. One attitude instilled is empathy for the salmon through the animated hero, Chucky Chum. The reaction is to cheer for Chucky's survival against predators, including the fishermen's nets, as one swims with Chucky to his next destination. This orientation, of placing oneself in the position of the salmon may be purposeful rather than coincidental since such empathy is listed as one of the six affective objectives in the rationale:

> It is also intended that the children should have the opportunity to: ... develop an empathic attitude toward many aspects of the salmon's constant struggle for survival [14, Rationale].

Sigel and Johnson [87] summarize the definition of empathy and its use in society in their discussion of child development.

> If empathy is held to involve some affective response to the emotional state of another, then empathy is more than a cognitive skill. In this sense the observer must be capable of and willing to vicariously experience the emotion of the other in addition to being cognitively aware of what it is.

> If one defines empathy in this way it is easy to realize how empathy may be a motivator for many different kinds of behavior. Empathy can then be viewed as an inhibition of antisocial behaviors such as aggression and as a facilitator for prosocial behavior, including altruism (p.183).

Kellert's [52, p.33] opinion is that educational efforts among children, 6-10 years of age should focus on the affective realm, mainly emphasizing emotional concern and sympathy for animals.

Apparently, the use of empathy with young students in *SICP* can assist fisheries management in that children might become less destructive to salmon in local neighborhood streams. However, it can only be hoped that the concern and sympathy for salmon will carry over to other animals.

However, this moral perspective appears too limited. Respect for the environment and treating it and all the living beings within it with a moral sense is lacking within *SIC* and the stated *DFO* policy. Could the use of empathy be a substitution for this lack of environmental ethics? The use of empathy may have a practical benefit since students may exhibit behaviors to protect the salmon in local streams, but the contradiction is that empathy may protect the salmon to the extent that students may exhibit behaviors that prevent the use of salmon as a resource.

In this study several intermediate students were interviewed to discover what sense they were making of the salmon in their classroom. One student thought the alevins (recently hatched eggs) should be in the creek and not in the classroom, because if she were a fish she would want to be free, yet she enjoyed observing and learning about the young fry. Another student thought that we should not produce more salmon since the fishermen would go out to catch them, and that was not a good thing to do to the fish since they had to die. He expressed the view that we did not need to eat salmon and

that there were other foods we could eat although this boy has eaten fish and other meats, which he enjoyed. Both children felt the tension of the contradiction between empathy and the desired use of the resource.

4.2.11 The Informed and Active Citizen

SIC's rationale makes the claim that the more knowledgeable the students are, the more effective they will become in future decision making processes. The important salmonid decisions, usually involve knowledge about economics and the environment, but these subjects are not treated to any extent in the program. Whether the student is feeding the fry or completing a vocabulary worksheet, these activities (although educationally worthwhile) do not lead to an informed person who can make judgments about the use of the resource. The student is not involved in activities that discuss problems and search for solutions. This type of instruction is probably absent from most classrooms, so it is to be expected that it would be absent from *SIC*. But this important skill, which was recognized in the rationale, needs to be included in the classroom. What kind of future citizens is SEP preparing from today's students? Dutiful *guardians* or *competent citizens*?

4.2.12 The Problem of Operating with One Perspective

If the *DFO*'s economic policy was balanced with environmental or cultural perspectives, it would not be so reliant on the financial argument. Cost would not be the deciding factor. Safety and security for all organisms and communities would have equal considerations. Pollution, dams or intensive clear-cuts that damage salmon habitat would not be as acceptable as they are at present.

Recent news and an advertisement by the *DFO* in *The Vancouver Sun* [66] demonstrate the dilemma of the Minister of Fisheries as he attempts to conserve the number

of declining chinook stocks (and declining image) by implementing his stated environmental actions and arguments with his inflexible economic perspective. The sports fishing industry has not been accepting his arguments that introduce new regulations cutting back on the sport catch and at the same time increasing revenue to fisheries through hidden tagging fees. The *DFO* has been responsible for past mismanagement. Sport fishing guides are also arguing against the new regulations from an economic perspective, citing the loss income due to fewer customers. Since Mr. Siddon's philosophy and mode of operation is based upon the economic perspective, he is not believable when he attempts to defend the stocks from an environmental position. There has never been a honest environmental position in the management plan so the stocks will decline regardless of Mr. Siddon's new regulations. The sports fishermen naturally see their economic loss as a gain for some other interest.

4.2.13 Contradictions in Policy as Stated in *SIC*

Reference # 21, "Federal Fisheries Officer and Provincial Conservation Officer", lists the duties of these officers. This section exposes the basic contradiction that occurs when the fisheries officer protects the environment and the resource (e.g., against pollution) while the provincial and federal governments pass laws that allow industries or persons to damage the same environment and the salmonids. One can hear again our animated hero Chucky warning us about over-fishing, pollution, and not giving the salmon a chance. But now we discover that the two governments have approved the over-fishing, the pollution, and other destructive activities on the environment. These actions are justified with the following contradictory statements:

> ...each government has multiple goals and is prepared to trade off in order to optimize", for example:

- ...encourage new industry and thus must consider enforcement of anti-pollution legislation;
- ...encourage new port facilities and thus must consider enforcement of habitat protection;
- ...aid to agriculture production and thus permits water to be taken out of creeks [14, Reference #21, p.2].

There appears to be an absence of moral responsibility toward protecting the environment while the *DFO*'s stated goal is to protect the salmonid environment. The ethics of destroying habitat is clinically replaced with the concept *to optimize.* One's conscience does not have to wrestle with this issue when it possesses just the economic perspective. Chinooks are conserved for either present or future economic use, and most competing investors only consider the present, which is known. The runs of the Gulf of Georgia chinook will continue to be in jeopardy as long as the economic perspective dominates political decisions and optimizes the resource.

The argument for destruction of the environment is glossed over with another slogan, *the people want*, which avoids the real issues and questions of the cost this will be to the environment and local cultures. In who's interest will the environment be destroyed? Who stands to lose? Who stands to benefit? The following quote gives the impression that the public approves (in its silence?) and is responsible for the decisions that continue to lead to the destruction of the environment.

> It must be recognized that these decisions or policies are determined by the politicians, and put into law; the Fishery Officer/Conservation Officer must then carry them out. Furthermore, the politician operates in response to the perceived desires of his/her constituents. Therefore, if *the people want*

> (author's emphasis) certain policies implemented they must impress the politicians [14, Reference # 21 p.2].

In this quote, the *DFO* attempts to absolve itself for its lack of environmental ethic and for the mismanagement of the depleted resource which allowed the pollution and overfishing of Chucky's salmon run. What is the primary teacher to think of such a claim? Will the contradiction be obvious? Anyone with an environmental perspective will not find this statement personally acceptable but anyone with a dominant economic perspective probably finds it acceptable to destroy valuable environment if there are profits and jobs. Intellectually, the statement is just not acceptable. Any fisheries officer with a technical perspective is expected to claim neutrality (which is impossible to do) and to blindly accept all duties assigned to him or her. How many fisheries personnel have a strong moral responsibility blended with a strong environmental perspective and are tempted to resign or counter with appropriate appeals when directed by the politicians to allow higher levels of pollution, to allow over harvesting, or to not prosecute offending industries? How many fisheries personnel mouth the *DFO*'s position (e.g., the public wants) to keep the public off the real issues while they acquiesce to the destruction of the environment? Dr. David Suzuki, in a parallel argument against the economic perspectives of the professional foresters, has just this year chastised the foresters for their contradictions, who "...have a special responsibility to speak out. It's a self-serving copout to put the blame for forestry mismanagement on the public" [92, p.18].

The fisheries personnel should have the insight as to what is happening to the resources and the environment and should be in a position to do something about it. They have access to important information relevant to the issues that is denied the public, yet they blame the public for the mismanagement. What is a child to think

when his local fisheries officer allows a large company or city to pollute the rivers, yet advises the child to care for a small stream or storm sewer? How does a teacher explain the actions of the politician who legalizes the destruction of the environment and resource in order to *optimize* wealth?

4.3 Quantitative and Qualitative Results from the Students

The format and order of presenting the following results is to review each slide, one by one, beginning with a description of the slide. The F-table and a table of mean scores for each group is then presented. It should be noted that since the analyses of variance were run on an IBMpc using the SPSSpc+ program in single precision, the total sums of squares in the F-tables will never exactly equal the sum of the other reported sums of squares due to rounding error. This problem is not, however, of such magnitude as to influence the significance of any of the effects. Based on the tradition of educational research, a value of .05 for F was selected as the cut-off value for judging significance. Depending on those F values, the appropriate cell means are then compared for differences to evaluate the effect of the treatment. The results are finally summarized with conjectures, supplemented by student interview data, as to why the students may have reacted to the picture in a specific way. Following this discourse from each slide, samples of dialogue, recorded after the posttest from eight treatment students from three different schools, are displayed. The students were responding to the basic question, "Why do you feel happy or sad about what you see in the picture?" Each response is preceded by the slide number and the student's scale score (Happy=1,2,3,4,5=Sad) for the slide. Only after the child volunteered as much information as possible for each slide, were probing questions used to obtain more information. The verbal answers should allow a better understanding of each student's

feeling about what they saw in the slide as well as to their attitudes about the salmonid resource. Some students had mixed feelings about what was happening in the slides and therefore they were reacting to two or more scales (e.g., salmon for food and killing salmon, artificial reproduction and killing salmon) and trying to answer in one scale, thus probably creating a tension.

Slides one and two showed significant pretest by treatment interactions and slides four and five had significant pretest effects. The posttest only group scores were therefore used to evaluate treatment effects for these slides. For the other six slides, the entire treatment and control groups were used and an analysis of change was possible.

4.3.1 Results from Slide # 1

Slide one depicts commercial fishermen on a seine boat unhooking their catch of salmon. The dead salmon are very visible on the deck of the boat. This slide was selected to represent an acceptable use of the salmonid resource.

Table 4.3: F-Table for Slide # 1

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	44.508	1	44.508	24.597	.000
Occasion	10.996	1	10.996	6.077	.014
Interaction Effects					
Group X Occasion	12.252	1	12.252	6.771	.010
Residual	826.944	457	1.810		
Total	896.833	460	1.950		

As shown in Table 4.4 the mean for the posttest only treatment classes was 3.81 and the mean for the posttest only control classes was 2.86. These results indicated that students studying *SICP* were more negative toward salmon being caught than students

Table 4.4: Group Means for Slide # 1

Group	Pretest	N	Posttest	N
Treatment Pretested	2.84	116	3.18	114
Treatment Not Pretested			3.81	125
Total Treatment	2.84	116	3.51	239
Control Pretested	2.62	109	2.89	116
Control Not Pretested			2.86	106
Total Control	2.62	109	2.87	222

not studying *SICP*. Pilot and posttest interviews with students suggested two concerns. One was that the boat prevented escapement for spawning fish and the second was a strong empathy for the prematurely dying fish. At the same time, the students realized that salmon are a food source. If *SICP* was designed to enhance students' empathy and protective nature to salmon, this result indicated program success. If, however, *SICP* was to assist students in understanding and accepting the importance of salmon as a resource to be utilized, the results indicated that *SICP* had not accomplished that goal. In fact, the reverse is true, Students participating in *SICP* are much less happy about salmon being caught than students not exposed to *SICP*.

Comments from Slide # 1 included:

- (5)[3] Makes me sad because they are fishing for fish, they probably going to eat them, eating fish makes me sad. PROBE: *Why?* They kill them, not so much the eating. (She says she loves fish.) PROBE: *What makes you sad about killing fish for food?* (Her main concern was that they may kill all the fish, "then less food for people, its OK to eat, but..." This student reached an impasse with the tension between killing and eating the salmon and would no longer talk about this slide).

[3]Note that numbers in parentheses are the student's scale responses to the posttest slide.

- (4) They are catching the fish and soon there might not be any more fish.
- (3) Taking fish out of water, feel sorta sad, if I was in there (one of the fishermen) I would like to eat them, right? PROBE: *How do you feel about eating salmon?* Eating salmon makes me feel sorta happy. It would be nice to let some of them free. I had salmon the day before yesterday.
- (4) Sad, because they are catching all the fish, they look well, they have a long time to live, and I don't know why they do this, to eat? PROBE: *Is it OK to eat salmon?* It's OK, but I just think, just when about to turn red, (he doesn't think the fish are full grown) eat when they don't look that healthy. PROBE: *What is wrong with eating healthy fish?* I just think they should let them live longer. I don't think you'd like to be killed when you're seventeen. Because they are both living (fish and teenager), they both have a life.

4.3.2 Results from Slide # 2

Slide two shows a large school of sexually mature red sockeye in the river. This slide was selected to represent salmon successfully returning to spawn and to represent good environmental conditions.

Table 4.5: F-Table for Slide # 2

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	.000	1	.000	.000	.988
Occasion	7.749	1	7.459	4.184	.041
Interaction Effects					
Group X Occasion	11.615	1	11.615	6.612	.010
Residual	802.834	457	1.757		
Total	821.809	460	1.787		

Table 4.6: Group Means for Slide # 2

Group	Pretest	N	Posttest	N
Treatment Pretested	2.35	116	2.54	114
Treatment Not Pretested			1.98	125
Total Treatment	2.35	116	2.24	239
Control Pretested	2.10	109	2.22	116
Control Not Pretested			2.29	106
Total Control	2.10	109	2.25	222

As shown in Table 4.5 there were no significant treatment effects for this slide. It was expected that students in *SICP* would have been shown media resources which should have acquainted them with this aspect of the salmon life cycle. This may or may not have been done and the students may not have fully understood or appreciated the significance of the slide. The interviews indicated that the students have varying beliefs about what was happening and this may have determined their affective response. Those that correctly saw the salmon returning to spawn indicated a positive affect. A few students were also happy because they thought the salmon were playing. Some students mistakenly believed, with negative indicated affect, that the red fish were injured or too crowded. Some students did not understand the slide.

Comments from Slide # 2 included:

- (1) Makes me happy, they are swimming up the stream and they are going to lay some eggs.
- (5) Feel sad, bunching together, they might die, because most can't swim on top of each other.
- (5) Sad, because they are dead and the eggs are still in the body, so there will be less fish, unless they take them. PROBE: *What makes you think they are dead?* Well, cause they are red, and I think they will die when red.

4.3.3 Results from Slide # 3

Slide three demonstrates how SEP volunteers net brood stock for a hatchery. One salmon is clearly displayed as it is held by one of the men. The slide was selected because it represents acceptable artificial enhancement techniques. Again it was expected that students in *SICP* would have been shown media resources which should have acquainted them with these types of procedures.

Table 4.7: F-Table for Slide #3

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	18.692	1	18.692	10.370	.001
Occasion	4.090	1	4.090	2.269	.133
Interaction Effects					
Group X Occasion	.140	1	.140	.078	.781
Residual	823.717	457	1.802		
Total	847.484	460	1.842		

Table 4.8: Group Means for Slide # 3

Group	Pretest	N	Posttest	N
Treatment Pretested	2.82	116	3.42	114
Treatment Not Pretested			3.58	125
Total Treatment	2.82	116	3.50	239
Control Pretested	2.57	109	2.98	116
Control Not Pretested			3.21	106
Total Control	2.57	109	3.09	222

The data from Table 4.8 shows the treatment classes had a pretest mean of 2.82 and a posttest mean of 3.42. The total treatment posttest mean was 3.50 and the total control posttest mean was 3.09. These results indicated that the treatment students became more negative to this slide depicting salmon being caught and handled than

students not exposed to *SICP*. Either they did not understand the enhancement procedures being used, or they did not trust the actions of the volunteers to be beneficial to the salmon. The interviews suggested that students have a variety of beliefs about what is happening in this slide. Generally the students saw salmon being caught for food and responded to that concern with its themes of death and insufficient escapement. One child expressed the sad concern that the fish held by the man would be separated from its mate. In opposition to this stance, yet with a similar negative response, one child interviewed thought that the men did not catch enough fish. Once the treatment students understood the artificial enhancement purpose of the activity behind the slide, they were more positive.

Comments from Slide # 3 included:

- (2) It's spawned already (happy) and they are catching it for food (both happy and sad). PROBE: (He thinks the people will use the fish for some purpose, e.g., eating).
- (2) Sorta happy, they are going to help it. The water is too shallow. There might be more gravel over there to spawn.
- (1) Cause I think they are going to look at the salmon and let it go. PROBE: *Why do you think they will let it go?* Cause it looks like he is returning it.

4.3.4 Results from Slide # 4

Slide four portrays two salmonids spawning in gravel. The picture clearly shows a close-up of the two fish with gaping-toothed jaws. The slide is, to the unknowledgeable person, quite scary. Students who are familiar with the spawning behaviors of salmon should have seen the slide as normal and a "good thing" for the salmon.

Table 4.9: F-Table for Slide #4

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	46.547	1	46.547	23.396	.000
Occasion	10.788	1	10.788	5.422	.020
Interaction Effects					
Group X Occasion	4.573	1	4.573	2.299	.130
Residual	909.206	457	1.990		
Total	969.189	460	2.107		

Table 4.10: Group Means for Slide # 4

Group	Pretest	N	Posttest	N
Treatment Pretested	2.72	116	3.48	114
Treatment Not Pretested			2.98	125
Total Treatment	2.72	116	3.22	239
Control Pretested	2.77	109	2.65	116
Control Not Pretested			2.54	106
Total Control	2.77	109	2.60	222

The posttest only cell means from Table 4.10 for treatment and control groups were 2.98 and 2.54 respectively. The difference, although small, is significant. Once again, the treatment groups were more negative to this slide than the control groups. Since the fish are not being handled or are in any apparent danger, some children were probably interpreting the fish's behavior as abnormal or as stress, rather than as a natural activity. Preliminary discussions with students support this explanation. One child, from the pilot study, thought the fish were "too hot" in the bright light and the open mouths indicated heavy breathing as a result of the heat. Posttest interviews indicated that some children responded negatively to the slide because they believed the salmon were dead or dying or even threatening small fry as if they were predators. Children who understood the slide and the life cycle of salmonids responded most

positively.

Comments from Slide # 4 included:

- (3) They are trying to get away the predators, so they can spawn and die. Trying to scare other fish off that won't let them spawn. PROBE: (Chasing predators and spawning made this student happy, that the fish was going to die made this student sad).
- . (1) Happy because they are going to lay eggs, then hatch, then become salmon, then lay eggs all over again, like in a circle.
- (4) Well, don't know what it is really about. PROBE: *Why are you a little bit sad?* Cause it looks like they are dying, but I'm not sure. PROBE: *Why do you think they are dying?* Because it looks like water is polluted, and fish acting, sort of like they want to get out to find fresh water.
- (4) Makes me feel a little mad because they might be going to eat another little salmon.

4.3.5 Results from Slide # 5

Slide five is of a dead spawned out sockeye lying in a shallow quiet pool. The slide was selected because it represents successful spawning and good environmental conditions. It was expected that treatment students would be more accepting of all aspects of the life cycle, including the salmon's natural death, than students not exposed to *SICP*.

The cell means from Table 4.12 for posttest only groups were 3.79 for treatment classes and 3.26 for control classes. The treatment groups reacted more negatively to the dead fish (or about to be dead) even though these casualties are natural to the life cycle and represent successful spawning. During the posttest some children asked if

Table 4.11: F-Table for Slide # 5

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	13.672	1	13.672	6.844	.009
Occasion	8.948	1	8.948	6.479	.035
Interaction Effects					
Group X Occasion	4.236	1	4.236	6.120	.146
Residual	912.948	457	1.998		
Total	938.842	460	2.041		

Table 4.12: Group Means for Slide # 5

Group	Pretest	N	Posttest	N
Treatment Pretested	4.06	116	3.89	114
Treatment Not Pretested			3.79	125
Total Treatment	4.06	116	3.84	239
Control Pretested	3.59	109	3.73	116
Control Not Pretested			3.26	106
Total Control	3.59	109	3.50	222

the sockeye was really dead. Many students were not sure how the fish died. Some of the treatment students were concerned that it had died before spawning and therefore responded more negatively. One video viewed by treatment students showed returning salmon being bounced off rocks in a river so it may have appeared to some students that this fish died prematurely. Students who appeared to understand the life cycle of the salmon and the significance of this dead salmon appeared to be most favorable.

Comments from Slide # 5 included:

- (5) Looks sad, the fish is dying, sorta of happy because it laid eggs already, so there's going to be more fish. Don't like seeing fish dying and all that, and let other fish eat them. There's hardly any fish cause one fish eats most of them. .

- (5) Because fish is dying. I would like it to spawn, but it died already, it hasn't spawned.
- (2) Happy cause this one spawned and already died. Happy, already laid eggs.
- (4) (Feels bad because the salmon is on the rocks and the fish might have got hurt. The teacher said the class saw a film, Jacques Cousteau, about salmon swimming up a swift stream, jumping and getting banged into rocks).

4.3.6 Results from Slide # 6

Slide six depicts a cannery worker sorting iced salmon. The fresh dead salmon are piled on a stainless steel table and the worker is sorting and weighing the fish. The slide was selected to represent an acceptable use of the salmonid resource. It was expected that the students studying *SICP* would become more accepting of this type of human use of the resource.

Table 4.13: F-Table for Slide # 6

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	31.221	1	31.221	16.166	.000
Occasion	2.108	1	2.108	1.092	.297
Interaction Effects					
Group X Occasion	4.826	1	4.826	2.499	.115
Residual	882.576	457	1.931		
Total	921.540	460	2.003		

As displayed in Table 4.14, the comparison of cell means from the treatment group (3.58) with the control group (3.05) demonstrates that the treatment students studying *SICP* reacted more negatively to the dead salmon than the control students, even

Table 4.14: Group Means for Slide # 6

Group	Pretest	N	Posttest	N
Treatment Pretested	3.25	116	3.61	114
Treatment Not Pretested			3.55	125
Total Treatment	3.25	116	3.58	239
Control Pretested	2.91	109	2.89	116
Control Not Pretested			3.23	106
Total Control	2.91	109	3.05	222

though they were being sorted for human consumption. Treatment students who completed both pretests and posttests produced means of 3.25 for the pretest and 3.61 for the posttest, indicating that this more negative reaction toward this slide developed during the course of *SICP*. This change may again indicate that treatment students were developing more empathy toward salmon at the expense of positive attitude formation regarding human use of the resource. Interviews indicated that some treatment students were concerned not only because of the premature death of the salmon, but also because the salmon were to be eaten before they could spawn and this would reduce the number of future salmon.

Comments from Slide # 6 included:

- (1) Happy because they are weighing fish for people to buy it, there's good things in salmon for people to eat, I like eating the inside and outside of salmon.
- (4) Sad because they are putting it in a box and in some ice so people can eat them, they're putting them away and making them die again. PROBE: *Explain die again.* They will kill some more fish. PROBE: *What makes you happy?* People need food. PROBE: *And sad?* They are dead.
- (3) Well all they are doing is weighing them, and I really don't know what's going on in this picture.

- (4) Sad because they are killing the salmon for food. PROBE: *Why sad about killing salmon?* Because they haven't spawned yet.

4.3.7 Results from Slide # 7

Slide seven portrays a close-up of a sexually mature pink salmon being held by hand for the pose. The picture focuses on the fish and not on the handling. This picture was selected because it represents a healthy, sexually mature salmon that is ready to spawn. It is not an aesthetically pleasing picture or a picture of a "handsome" fish. It was expected that students becoming familiar with the life cycles of various salmonid species would become more accepting of the morphological changes that occur during the normal life cycle of salmon and therefore increase their "happiness" toward this slide as a result of participating in *SICP*.

Table 4.15: F-Table for Slide # 7

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	6.359	1	6.359	3.642	.057
Occasion	.094	1	.094	.054	.817
Interaction Effects					
Group X Occasion	.336	1	.336	.192	.661
Residual	797.971	457	1.746		
Total	804.703	460	1.749		

However, as the data from Table 4.15 demonstrates, there were no significant treatment effects for this slide. If *SICP* students were reacting more negatively to potential harm to salmon in the previous slides, they did not do so for slide seven. Probably they were either not aware of the hands supporting the salmon or they did not believe that the fish was in danger. Interviews with students indicated a usual sadness that

Table 4.16: Group Means for Slide # 7

Group	Pretest	N	Posttest	N
Treatment Pretested	3.29	116	3.28	114
Treatment Not Pretested			3.20	125
Total Treatment	3.29	116	3.24	239
Control Pretested	3.11	109	2.99	116
Control Not Pretested			3.02	106
Total Control	3.11	109	3.00	222

the fish is out of the water but also the belief that the fish is merely being displayed for the purpose of taking the picture and will be allowed to spawn. As such, the previously noted concerns that students express for harm to a fish are not stimulated by this picture.

Comments from Slide # 7 included:

- (5) Sad because taking salmon out of water. I want it to turn into a spawner and lay some eggs to hatch. PROBE: *Why do you think they will not put it back?* Looks like hands that they are carrying it to a place. (He thinks there is a weigh scale that it will be put on).

- (3) Don't really know what they are doing to it, so I don't have any feelings. PROBE: *What makes you happy and what makes you sad?* Sorta happy because they might let it go and are just showing them and sad because they are taking it out of the water and he might die.

- (3) I think it was good to show people what they look like up close, so they can learn more about salmon. PROBE: *Why mark in between happy and sad?* (At first didn't know, but later decided that it was good. Would have changed the 3 to a 2).

- (3) They are just looking at it, they will let it spawn, they will let it go. PROBE: *Is it OK to look at it?* Yes if they leave them wet. PROBE: *Why look at them?* Make sure they are healthy, no disease.

4.3.8 Results from Slide # 8

Slide eight displays a pile of dead pink salmon females which had been stripped of their eggs. A fisheries technician is measuring the length of each fish in a hatchery setting. This slide was selected to represent acceptable enhancement techniques that students in *SICP* should become familiar with through media resources.

Table 4.17: F-Table for Slide # 8

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	15.554	1	15.554	8.247	.004
Occasion	.287	1	.287	.152	.697
Interaction Effects					
Group X Occasion	3.105	1	3.105	1.646	.200
Residual	861.875	457	1.886		
Total	881.046	460	1.915		

Table 4.18: Group Means for Slide # 8

Group	Pretest	N	Posttest	N
Treatment Pretested	3.66	116	3.87	114
Treatment Not Pretested			3.76	125
Total Treatment	3.66	116	3.81	239
Control Pretested	3.32	109	3.34	116
Control Not Pretested			3.56	106
Total Control	3.32	109	3.44	222

The difference between cell means, as shown in Table 4.18, for the treatment groups (3.81) and the control groups (3.44) is large enough to be significant. The students

who studied *SICP* reacted more negatively to the dead pink salmon or their developed empathy toward salmon overpowered their acceptance of acceptable SEP procedures when they saw dead fish. Interviews indicated that treatment students were generally not pleased with the dead fish unless they also had the belief that the dead salmon would be used to produce more salmon. In this case they expressed a positive affect toward the picture. Some students did not focus on the intended attitude object but were taken in by the activity of measuring; some liked the measuring and responded positively while others did not like the salmon being "poked" and responded negatively.

Comments from Slide # 8 included:

- (1) Happy, just measuring salmon. PROBE: *What makes you happy about the measuring?* So know how big, because I like big salmon but I don't want too many (to eat).

- (1) Happy because they are killing the fish and taking the eggs out. Happy for the eggs and let them (eggs) live. PROBE: *And if they are killed for food?* Sorta happy and sorta sad, if kill for nothing that's worse, that's no good, better if food, best if for more eggs.

- (4) Because salmon are dead, they haven't spawned yet either. (Student doesn't know why fish are dead.)

- (5) This one I'm sad cause they're just leaving the salmon on the ground. PROBE: *What is happening?* That sharp thing may have poked them. (She thinks the technician may be harming the fish).

- (4) Makes me feel a little bit sad, they are measuring salmon, so they might give it to the fish store because there might not be any salmon left.

4.3.9 Results from Slide # 9

Slide nine shows eggs being stripped from a female chum salmon while the milt from a male chum is mixed with the eggs in a plastic container. This slide was selected because it represents acceptable artificial enhancement techniques which the students would certainly become familiar with since each class had observed the developing eggs in the classroom incubator.

Table 4.19: F-Table for Slide # 9

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	11.229	1	11.229	4.036	.045
Occasion	4.792	1	4.792	1.723	.190
Interaction Effects					
Group X Occasion	7.723	1	7.723	2.776	.096
Residual	1271.429	457	2.782		
Total	1294.538	460	2.814		

Table 4.20: Group Means for Slide # 9

Group	Pretest	N	Posttest	N
Treatment Pretested	3.46	116	2.84	114
Treatment Not Pretested			3.30	125
Total Treatment	3.46	116	3.08	239
Control Pretested	3.53	109	3.41	116
Control Not Pretested			3.35	106
Total Control	3.53	109	3.38	222

Taking the cell means from Table 4.20 and comparing treatment groups (3.08) to control groups (3.38) shows that the treatment students are "happier" than the control students about this slide. The mean for the pretested treatment groups was 3.46 on the pretest and 2.84 on the posttest. These results demonstrate that students studying

SICP became more positive to the slide over the course of *SICP*. In this case, they became more accepting of harm to the fish if it was evident that eggs are the result of that harm. Treatment students became *happier* about this slide despite the fact that the scene depicted was not aesthetically pleasing for some students. Interview results for this slide indicate that even students who are strongly empathic toward salmon can justify harm to salmon if it is obvious that such harm can produce more salmon. In some cases the students were oblivious to the harm being done to the salmon when they saw the eggs. It appears that students may become more favorable to artificial enhancement techniques if they understand the process and see the end result.

Comments from Slide # 9 included:

- (1) Happy, kill the fish and going to take eggs, dump in the bucket, and eggs will grow into big salmon, they can live, the father (male) is alive. PROBE: *Why do you want so many fish?* Because people eat them and more for laying eggs.

- (1) Because I don't want fish to die, but when take eggs out there will be more salmon, because there will be lots of salmon when they hatch. PROBE: *Why should there be more salmon?* (A circuitous "so there will be more", answer was repeated.) PROBE: *Why more and more?* So more to swim , more to eat. PROBE: *Why more to swim?* Because I like salmon. PROBE: *Why do you like salmon?* Eat, taste, mom's a good cook. I like they swim and they mate.

- (1) Makes me feel good because they are taking apart the salmon and they are taking the eggs out of it, and when the other salmon, when they cut and squeeze out milt. PROBE: *How do you feel about the eggs?* Good. PROBE *Why?* Because more salmon will grow. PROBE: *And why should there be more salmon?* Because not much left. PROBE: *What's happened to them?* Most have been catched by fish boats and bears. PROBE *Is that good that fish boats and bears*

catch them? No, because there might not be enough salmon left to go back to spawn. PROBE: *How do you feel about cutting open the fish?* Good, so they can get the eggs out. PROBE: *What will they do with the eggs?* Fertilize them with milt and grow them.

- (1) This one I'm happy cause they are having babies. PROBE: *Is this the normal way to have young?* No. PROBE: *Is it OK to cut open salmon?* No, but they are getting eggs out. PROBE: *Is that good?* Yes. PROBE: *When you marked happy, were you thinking of eggs or cutting open salmon?* Eggs.

4.3.10 Results from Slide # 10

Slide ten presents a filtered close-up of salmon eggs with visible developing embryos. This slide was representative of the eggs that students nurtured in their classroom incubator, hatched and raised to fry stage for release.

Table 4.21: F-Table for Slide # 10

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects					
Group	19.634	1	19.634	15.742	.000
Occasion	1.190	1	1.190	.954	.329
Interaction Effects					
Group X Occasion	.124	1	.124	.100	.752
Residual	569.999	457	1.247		
Total	591.432	460	1.286		

Table 4.22 displays the cell means and the significant difference between treatment groups (1.58) and control groups (2.00). This difference demonstrates that *SICP* students were more positive to the eggs. The fact that this change occurred during the course of *SICP* is evidenced by the difference between the pretest mean (2.09) and the

Table 4.22: Group Means for Slide # 10

Group	Pretest	N	Posttest	N
Treatment Pretested	2.09	116	1.61	114
Treatment Not Pretested			1.54	125
Total Treatment	2.09	116	1.58	239
Control Pretested	1.92	109	2.06	116
Control Not Pretested			1.93	106
Total Control	1.92	109	2.00	222

posttest mean (1.61) for the pretested treatment classes. Obviously, their exposure to the developing classroom salmonid eggs was enjoyable and the students became more fond of eggs which they saw develop into salmon. The interviews confirmed this conjecture as most of the students realized that the developing salmon were in the eggs and would soon hatch.

Coments from Slide # 10 included:

- (2) Kinda sad and happy, don't really know, but they are probably going to live, not sure all live, so not completely happy.
- (1) Happy, eggs, more salmon.
- (1) Well, I'm interested what eggs look like close up, and glad eggs in the world, study and see them, and its really interesting, so I'm happy.
- (1) Happy cause they might hatch.
- (1) This picture makes me feel good because the eggs are growing.

A final summarizing statement volunteered by a grade one boy while reviewing pictures of the slides in preparation for an interview: "I like eating salmon, but I don't want to see them die".

4.3.11 Results from Supplementary Student Interviews

The following excerpts were taken from two interviews which took place with a grade 2 boy and a grade 5 girl who were studying salmonids in another school district. It might give some insight into what sense children are making about *SICP* and the reasons they are raising salmonids in their classrooms.

I: Why are the salmon in the classroom?

B: We want to study about salmon and we need to know some things what they do, what they eat and what they look like and things.

I: Why do your think you need to know these things?

B: If we don't, we come into, say grade 7, and then we study hard things about salmon we wouldn't know very much because we didn't get teached in like grade 1 or 2.

I: Why would you be taught salmon in grade 7?

B: Well, there might be an incubator like ours in the classroom.

I: Why not study frogs instead of salmon?

B: Salmon are more interesting than frogs.

I: Why is your class putting salmon in X creek, isn't there enough fish already in the creek?

B: I can't answer that. I don't know why they put so much fish in the creek, that's one question I can't answer.

I: Where would you find that answer?

B: Maybe one of the teachers knows. I certainly don't know. They haven't told anything about that.

This boy is interested in studying salmon, but not from the point of view that what he learns could be helpful for the salmon's survival. He has already learned and

has faith that what is taught in school is cultural capital that must be important for himself, otherwise the schools would not present such knowledge to him. Obviously, *SICP* has not made this boy aware of the goals of the *SEP*, but it has probably made him more aware of the goals of the school.

I: Do you think the salmon belong in the classroom?

G: It's nice to have them because it teaches the children about how to feed them and keep an eye on them. ...People should be learning about them.

I: Why should they be learning about them?

G: Some people are really interested in fish and they have fish and they want to take a salmon and put it in a fish tank, they don't know what they could be doing to them, like if it's good for them, or if it isn't.

I: So why is it important to know what's good for them and what's not good for them?

G: If you do something that's not good for them, then they might die, and I don't think you'd be really happy with that. ...One day you'll like to go to university and study about them and if you have an incubator of your own and if you don't know the right temperature then you might put it up too high or too low.

This girl continues with the same theme of what is taught in the classroom will become important later on for the student. Also the same reoccurring theme of *interesting* is stated as why the salmon are studied. Of the group of five students interviewed, none were aware of the *SEP* and its basic goal to increase the numbers of salmon. They were all interested in caring for the fish and protecting them, but these students had not yet developed a global reason for why salmon should be enhanced. The care of the salmon in the classroom appears to be the primary concern.

Chapter 5

Conclusions and Recommendations

5.1 Introduction

This concluding chapter of the study commences by restating each of the four problems that were researched. Each statement is followed by the corresponding conclusions of the study. This section is followed by a section pointing out the limitations of this study. Suggestions for further research are then made and the concluding remarks offer suggestions to both the developers of the program and teachers who may attempt to implement the program.

5.1.1 Research Problems and Corresponding Conclusions

From Interest Group to Student: The Attempt to Transfer Values

1. How does one special interest group construct an educational program designed to effect students' attitudes and behaviors that are supportive of the interest group's goals and objectives?

SICP is a product of the *Salmonid Enhancement Program*, a multi-million dollar investment in the Pacific salmon resource. The stated goals of *SEP* are to return salmon runs to their historical levels and thus improve the regional and national economies and preserve local cultures, resources and environment. The Federal Government, having a vested interest in its programs, started an information campaign to obtain public acceptance for its goals. The basic contradiction is that the Federal and Provincial

Governments have, in the past and are still permitting over-fishing and destruction of habitat which prevents salmon runs from returning to their historic numbers, and yet is collecting and spending millions each year to artificially enhance the stocks. This contradiction has arisen because the government's position is based on an economic and technical perspective, which lacks balance with the social and environmental perspectives. The results are policies that allow tradeoffs of valuable salmon habitats that are replaced by artificial enhancement techniques and expensive information campaigns. The information programs lack the substance of the issues of enhancement, but emphasize the explanation of the technical aspects of the program.

The primary *SIC* package reflects the values of this public information campaign of which it is a part. The issues of salmonid enhancement are absent for both teachers and students, yet there is a vastness to the technical inclusions. One basic contradiction occurred when teachers assisted in the development of *SIC*. They were supplied with an abundance of technical information from fisheries. Instead of questioning this narrow technical perpective and broadening the value base for the curriculum, their contributions mostly teacherized the activities for the classroom. The results were lessons that were easy to implement, educationally suitable, and enjoyable for students, but were irrelevant to the basic issues of why the government is now spending over $42 million a year on salmonid enhancement.

The Federal Government, through many teachers, has gained access to classrooms in B.C. and has provided valuable materials, resources, and expertise. Anderson [6] reported that interest groups are able to gain access to social education through the resource materials used in classrooms. These groups suspect that they can influence instruction, and the values promoted by these groups through their school programs are rarely questioned. Beatty [9] & Cameron [17] have pointed out in their papers addressed to the biases in Ontario Hydro's school program, the names of educators and

organizations appearing in the curriculum materials may give the false impression of endorsement to the program. This may not only inhibit the discussion of ideas on issues but lull unwitting users to accept the program as-is while the program is promoted. The *SEP* interest group has gained a powerful position for potential persuasion to enhance its image and the economic program it administers when it was invited into the classrooms.

Although *SEP* is based upon economic goals and its political managers have stressed these goals, the curriculum, *Salmonids in the Classroom: Primary Package*, has not reflected this dominant theme, even though *SIC*'s own rationale includes statements of the economics and value of the resource. There are obvious contradictions between stated economic goals and the product of the developers. However, in Apple's [7] view, this may be consistent with his "social reproductive beliefs" about class structures in society and how what happens in the classroom is reflective of society itself. Could the Mr. Siddons of the *DFO* want the majority of young people to become the *guardians of the resource* in the next generation, but not necessarily the beneficiaries and decision makers? Could they become the guardians like the dutiful officers and technicians who carry out both the good and the bad laws of the politician without question?

Young people could become knowledgeable of the economics of the fisheries, have an appreciation for all the benefits that the salmon and the natural environment provide, and have an ability to participate as an informed citizen. However, this curriculum material has not provided these opportunities. The educational values pertaining to economics and environment are not well developed in the classrooms while the value of technology (e.g., being able to raise salmonids in a classroom hatchery) is strong. Lacking a sense of the worth of the salmonid resource, future citizens may unknowingly allow future governments to continue to trade away valuable watersheds to hydro electric power or other competing industries. When the young have not had an opportunity

to understand and decide upon the solutions for the economic and environmental value of salmonids and have gained an appreciation of salmon only when they are animated as cartoon heroes and raised in tanks, wild rivers that have become mostly devoid of wild salmon might well be dammed.

2. **What effect does the study of the *Salmonids in the Classroom Program* have on attitudes of students toward the salmonid resource?**

The results of this analysis suggest that students participating in the *Salmonids in the Classroom* program become fond of salmon. They generally do not approve of harming salmon or having salmon die. They do approve of acquisition of eggs (artificial reproduction) which will lead to the birth of new salmon, although they probably do not have a reason why there should be more salmon other than the fact they like them and they are interesting. The *SICP* students might be described as "pro-lifers" for salmon, even to the extent of rejecting the use of salmon as a resource. They seem to know that humans cause harm to the salmon and they react negatively to this aspect of human behavior. These students have been developing positive attitudes that would encourage future preservation (as opposed to conservation) of the resource. Preservation is one very important aspect of environmental education, but preservation techniques and progams are often implemented to the detriment of other aspects of the environment. Students also appeared to be expressing concerns about human activities related to the resource and about human utilization of the resource.

3. **What goals and objectives of the *Salmonid Enhancement Program* are being supported or rejected by students after they have studied *Salmonids in the Classroom Program*?**

The protectionist response seems to indicate that students exposed to *SICP* do not exhibit as strongly the previously reported tendencies of younger children to consistently place the needs of people over that of wild animals [52], at least when it pertains

to salmon. If younger children have the potential for being more destructive to wildlife than older children, then *SICP* is instilling attitudes that may correct these tendencies. However, these primary students do not appear to be learning about the economic and environmental importance of salmon, and thus they tend not to be favorable to salmon being used as a resource. In addition, they do not display an understanding of, or a sense of the importance of the environment that is tied to the salmon's survival. If this importance is recognized, it is overcome by their increasing empathy toward salmon and their unhappiness regarding the death of fish.

Students and teachers benefit from *SICP* as they learn about the salmon, a creature from the wild that momentarily shares a part of its life cycle in the classroom. Education becomes more meaningful with salmonids in the classroom. The experience has brought joy to teachers and students and has enhanced a reverence for life concept. Vancouver's urban children certainly benefit by having a touch of nature in the class.

4. **What factors from the *Salmonids in the Classroom Program* influence the resulting attitudes of students who have studied the salmonid program?**

Teachers are ultimately responsible for what is taught in the classroom. They are the final gatekeepers to *SICP* curriculum and the interpretation of the content. Based on the student results, it appears that *SICP* primary teachers have not stressed the importance of salmon as an important component of the total environment and as a valuable economic resource, probably because *SIC* omits this information. Certain content was selected for *SIC*, and the developers no doubt had good reasons to chose the content they did. The content is suitable and interesting. Students exposed to *SICP* have developed positive attitudes toward the salmon (and hopefully toward wildlife in general), and have learned about the life cycle of salmonids. However, it is limited in that it does not present salmonids as a resource and omits information regarding the importance of salmonids to the economy and the environment. In addition, the basic

issues of why the resource is at risk and possible solutions to the problems are ignored.

The necessary environmental conditions for the salmon's survival are documented in *SIC*, however, importance of the salmon to the environment is neglected. The importance of salmon to humans as well as to other organisms is not emphasized. When the focus is on a certain organism, such as the salmon being reared and nurtured in the classroom incubator, it often becomes the center of attention to the exclusion of other organisms. Natural predators become *enemies*, as prompted in the activity sheet from the *SIC* resource manual, when in reality these predators are important to the salmon's overall survival as a species. Students and teachers have not had the opportunity to adequately explore these important aspects of the salmon and the environment.

In addition, *SICP* does not stress the economic importance of salmon as a resource. The economic aspects of salmon cannot be ignored in our society, especially since economic users compete not only against each other, but also against other resource users over the same habitat. Students do not appear to have been able to integrate this understanding with their developing attitudes toward salmon as a species and as a component of the total environment. The value of the salmonid resource is not an apparent focus in *SICP* implementation.

The primary package of *SIC* only provides teachers with the background and technical information on the incubation and life cycle aspects of *SICP*. Primary teachers are generally neither experienced biologists nor trained environmental educators. Although it is the teacher's duty and responsibility to understand and balance the curriculum, this does not always happen since the process is very time consuming. Since teachers have not been provided with unbiased or multi-perspective background information and technical data regarding the economical and environmental importance of salmonids, they may have been unable to develop a rational scope and sequence for a balanced

program which would include the above concerns. Without a balanced curriculum and a balanced perspective, primary teachers will probably continue to promote a limited curriculum with a narrow viewpoint regarding the resource. The resulting attitudes developed by students toward the salmonid resource will reflect the narrow viewpoint of the curriculum.

5.1.2 Limitations of the Quantitative Instrument

Obviously, students responded differently to each slide and the treatment and maturation changed those responses. One factor that may have had an effect was a growing controversy regarding the management of the salmonid resource in British Columbia which gained rapid momentum between the time of piloting and the time of the pretest administration. The controversy continued to grow, up to and including the time of posttesting. This time period was accompanied by extensive coverage both in print and on television, sometimes displayed by front page photographs in newspapers. This publicity may have had effects on all students involved in the study, both experimental and control, and thus altered the way students were reacting to the individual slides.

A second factor that may have contributed to the low reliabilities of the instrument was that it was piloted in a suburb with few cultural groups while it was intended for an urban setting that had more cultural diversity. These groups may operate from different value bases. Likert [55] explains this inherent weakness in the scale:

> It is certainly reasonable to suppose that just as an intelligence test which has been standardized upon one cultural group will hardly be applicable in its existing form to other cultural groups (p.95).

A third factor was that the salmonid resource is a very general category for an attitude object, so the expected responses to the scale should be general in nature.

This generalization was further promoted by having slides representative of more than one aspect of the salmon resource. For example, one slide was of incubating salmon eggs while another depicted the catching of fish. This diversity of aspects may also have contributed to the low reliabilities.

A fourth factor is that the maturation process resulted in a reduction to the reliability of the scale. As students learned more about salmon, they possibly viewed the slides from different perspectives and thus found a variety of ways to evaluate their feelings.

A fifth factor that may have had an effect upon the low reliability was an inherent weakness within the scale. The scale had to be produced and piloted within a very short time span. Larger and wider samples for pilot testing could not be undertaken due to time constraints placed on the study by the as Vancouver *SICP* program.

5.1.3 Limitations of the Study

- The classes were not randomly selected. However, all the volunteer teachers' classes were included except for two. Volunteers were, however, considered typical of provincial teachers instructing the *SICP*.

- This researcher did not personally conduct the pretests and three of the posttests. Continuity was lacking because of the inability to control the testing by using one individual. However, written instructions were provided to the examinees, and were reportedly adhered to.

- The pretests for the control groups lagged by up to three weeks after the pretests of treatment classes. The media was quiet about salmon during this overlap. However, students matured and news of salmonids in some schools may have reached some of the control students.

- Case studies using interviews and observations with a limited number of students before the pretest, during treatment and after the posttest would have added greatly to this study. The posttest interviews from this study were contaminated as the researcher had shared with the students and teachers the significance of the slides after the posttest. The mid-treatment interviews were conducted in a third district which is a suburb of Vancouver.

- The experiment was confined to one large diverse district but limited to only ten treatment classes. A more complete study would have included a greater number of classes and districts that have implemented the *SICP*.

- Urban school data may not be generalized to other localities in the province.

- These first year *SICP* teachers were generally enthusiastic. The program was new, so that they may have been more enthusiastic and careful than the experienced *SICP* teacher. This extra care and enthusiasm may have been modeled to the students thus creating stronger attitudes than might otherwise be the case.

- The teachers knew that their students were going to be tested and may have prepared their students a little extra for the test. For example, more *SIC* content may have been covered than with the average provincial teacher. One teacher included the testing as part of the prominently displayed salmonid diary that remarked on events that occurred around the incubator.

- There was a lack of control to determine the content selected for lessons. Teachers are generally free to adapt to the salmonid program.

- There was no documentation of the treatment classes to determine the content covered and the attitudes fostered. Obviously, some classes did more than others

and had different emphasis in their activities.

- This study was unable to investigate what components of the program had the greatest effect in developing attitudes. It was thought that the incubator generated the most excitement, interest, and emotional bonding to the salmon.

- It was discovered after the posttest that two of the treatment classes had to share the classroom incubator with other classes in the school. This seemed to make a difference in the qualitative data in one of the classes and in the decision by the teacher of that class to not run the salmonid program again the next year. This was the only teacher not enthusiastic about the program. The decisions to share the incubators were made at the school level and in both cases, the incubator could not physically be installed within the specified class.

The limitations of this study do not restrict the findings that treatment students tend to be more pro-life for salmon; more pro-preservation, pro-artificial reproduction and pro-natural enhancement; but more anti-utilization of the resource than students who have not been exposed to the *Salmonids in the Classroom Program.*

5.1.4 Recommendations for Further Study

In general, the value of program goals and objectives are unquestioned by teachers implementing a program. This is an especially serious concern when the program is sponsored by a special interest group outside of the normal educational community.

Educators therefore need to continually evaluate programs sponsored by special interest groups and the resultant learning outcomes at all levels in the affective and behavioral domains since this is where the special interest group intends to make the greatest impact. Analyses should be aimed at all levels and components of the the

school program. Follow-up studies on adults who have also taken the program as children could be undertaken to determine the attitudes, values and behaviors of that group that have sustained over time.

In addition, future studies should include larger samples, perhaps province wide, and include a variety of instruments, both quantitative and qualitative. Interviews and other ethnography studies can triangulate and enrich any quantitative study. Future research might also consider which particular components of the program have the greatest positive and negative impacts upon attitudes and behavior.

Finally, comparative studies of the *SICP* program with other environmental education programs across Canada should be undertaken to establish national norms for basic environmental literacy and concern.

5.1.5 Recommendations for *SICP*

Teachers and students enjoy their salmonid studies. During visits to the treatment classrooms to administer the tests, a high satisfaction level from both the teacher and the students was evident to this researcher. *SICP* is novel. The live salmon in the classroom and the related multi-disciplinary activities (especially art activities which are highly visible) are very rewarding, and a high level of student enthusiasm is immediately obvious. Visitors to the *SICP* classrooms express amazement at the classroom incubator and provide teachers and students with positive comments which creates an immediate, overt reward structure. However, this type of immediate reward may not persist as the teacher repeats *SICP* year after year. *SICP* must deal with the underlying issues of why *SICP* was developed for use in the classroom. These issues are expressed in the goals of *SEP* and in the submissions from the public forums, but are not explicitly stated in the materials given to teachers. Teachers must have an understanding of the different perspectives in order that they may structure appropriate

programs and lessons. If a more complete picture is presented, more long-term benefits may be attained by the *SICP*.

Teachers who are untrained in environmental issues cannot be expected to implement a meaningful environmental education program. They will continue to implement the salmonid theme into the things that they presently know how to do well in the classroom: reading, spelling, writing, arithmetic, art, etc. The materials they are given will be integrated as content into their regular curriculum. Teachers need to be made more environmentally literate. They need to be provided with additional education through programs of both inservice and pre-service environmental awareness. *SEP* should consider adding a section on environmental literacy to the *SIC* materials and to their workshops which they present to teachers considering implementing *SICP*. Since any presentation by *SEP* would come from their own perspective and therefore be necessarily biased, this should constitute only one part of a teacher's development in environmental awareness. In any case, until *SICP* addresses, in a balanced environmental fashion, the overall aspects surrounding the salmonid resource, *SEP* cannot expect students to achieve an understanding and appreciation of the goals of each of the many interest groups this government agency is supposed to represent.

Gaps in *Salmonids in the Classroom Program: Primary Package* need to be filled. The developers cannot assume that primary students will pick up the missing pieces in their future educational endeavors. They also should not assume that young students are incapable of appreciating and understanding the political, environmental and economic aspects of the salmonid resource.

> Childhood political learning is critically important because it presents valuable, never-to-be repeated opportunities on which to build a guided and systematic political education. During this period in children's intellectual,

> emotional and social development their political selves are still being formed [5, p.8].

The salmonid resource is at risk, and the issues surrounding the salmonid resource problem should be dealt with at the early stages of a child's life. Children do have a sense of justice. However, if we refuse to deal with the issues, such as, "Why is pollution that will kill salmon fry permitted when the government spends so much tax money to produce those same fry?"; then we cannot expect children to develop the knowledge, concerns, and skills necessary for informed decision making when facing these contentious issues. We cannot expect students to meaningfully deal with environmental and economic issues surrounding the salmonid resource when they are older if we refuse to deal with the fundamental issues when their attitudes are being formed. Students need more of a reason to value salmon than just because they are a likable animal and are interesting to study.

In reality, there can only be a practical balance between the complexity and simplicity of *SICP* so as not to discourage teachers from implementing the program. As Werner [106] points out, if too many of the issues and controversies are included into a program, as these recommendations may seem to suggest, then the teachers, who are the final gatekeepers of the innovation, may reject it on the basis of perceived costs and risks. It appears that a school program from an outside interest group cannot have it both ways; dealing with the complexity and controversy issues and still have successful implementation. For the present, until educators learn to question their values and the content from the curriculum, the only compromise may be a watered down program that might be better than no program at all.

The Department of Fisheries and Oceans should be encouraged to continue to expand the salmonid and marine studies programs that are not present to any extent in

the B.C. elementary science and social studies curricula. Users of *SICP* should take advantage of the many resources, including *SEP* materials, that are offered by the Federal Government. Wees [100] states that the highest good is happiness and he questions the immorality of students not finding happiness in schools. Children experiencing the salmonid program will probably learn something about wild animals in the classroom. *SICP* allows many students to find such happiness. They learn about the life cycle of the salmon and the salmon's requirements for survival. Many students enjoy caring for this interesting animal and it is one of their most rewarding, enjoyable, and happy educational experiences in school. Obviously, there is much to value in *SICP* and thus the program should continue.

5.1.6 Suggestions for the Application of Findings to Practice

Generally the findings of this study provide evidence to educators that the intended goals of a program may not be achieved because of the developmental nature of the program itself. In the case of *SIC*, there were two different groups of developers, each working from their own context. The fisheries technicians supplied what information they believed to be interesting and important, and the teacher-developers modified that information into activities appropriate for the resource package used in the primary classroom.

This study should remind educators that a review of the goals, objectives, and content of educational packages produced by outside interest groups is necessary and these goals, objectives, and content should never be accepted as a given. In addition, along with analyses of the technical congruence of these components, consideration should be given to the worthiness of the program.

This study can assist educators to understand that developers of a program operate in light of their own biased context and not necessarily from the goals and objectives

of the sponsors of the program. Hidden goals and objectives of the program may be created naturally by the developers.

Students and teachers have a variety of past experiences which help to determine values, attitudes, and ultimately behavior as they study the salmonids. Teachers should learn to understand their students' beliefs, attitudes, and values so as to guide their learning outcomes.

Attitudes are learned early and may persist over time. What is learned about salmonids may last a lifetime. Educators can determine what activities will enhance student attitudes to ensure the protection of the salmon's habitat and therefore take advantage of using those activities.

Children can learn to care for wildlife. However, their strong concern for salmon may be at the expense of concern for other animals. *SIC* and teacher users need to revise the curriculum to emphasize the importance of predators to the total environment.

SIC is deficient in environmental and economic content and avoids the basic issues that lead to the creation of the *SEP* program. Students therefore tend to empathize with salmon at the expense of concern for and understanding of the fishermen's activities and other wild animals in the environment. Teachers aware of this imbalance can restructure the curriculum accordingly.

There is a need for the developers and users of *SIC* to reevaluate the goals and objectives of *SEP* and *SICP* for their worthiness and transferability from *SEP* through *SICP* and to the student.

There is a need to provide preservice and inservice programs to teachers implementing the *SICP*. The focus should be on the economic, environmental, and social aspects of the program and not just the mechanics of the incubator or the technical applications of the *SIC* activities. These educators should also learn how to implement those variables (action skills, knowledge of action strategies, knowledge of issues) described

by Sia, Hungerford, and Tomera [85] that are most strongly associated with responsible environmental behavior.

In order to accommodate the development of environmental awareness in teachers, universities that train teachers should have strong environmental education programs and should give attention to examples of environmental education programs sponsored by outside interest groups.

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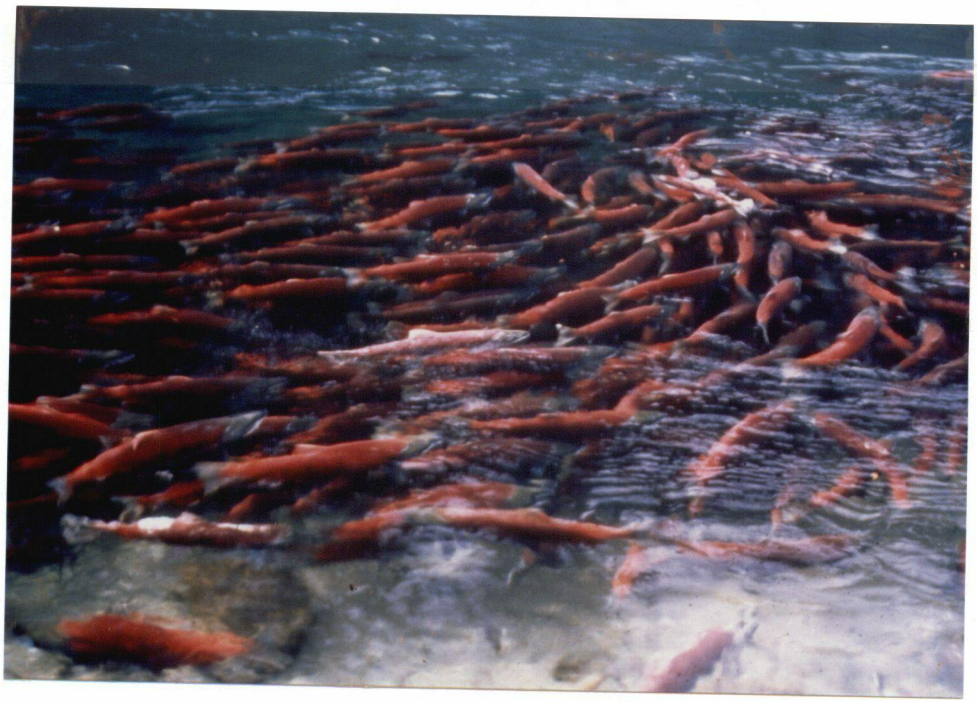
Appendix A

Slides Used in the Affective Instrument

Slide # 1

Slide # 2



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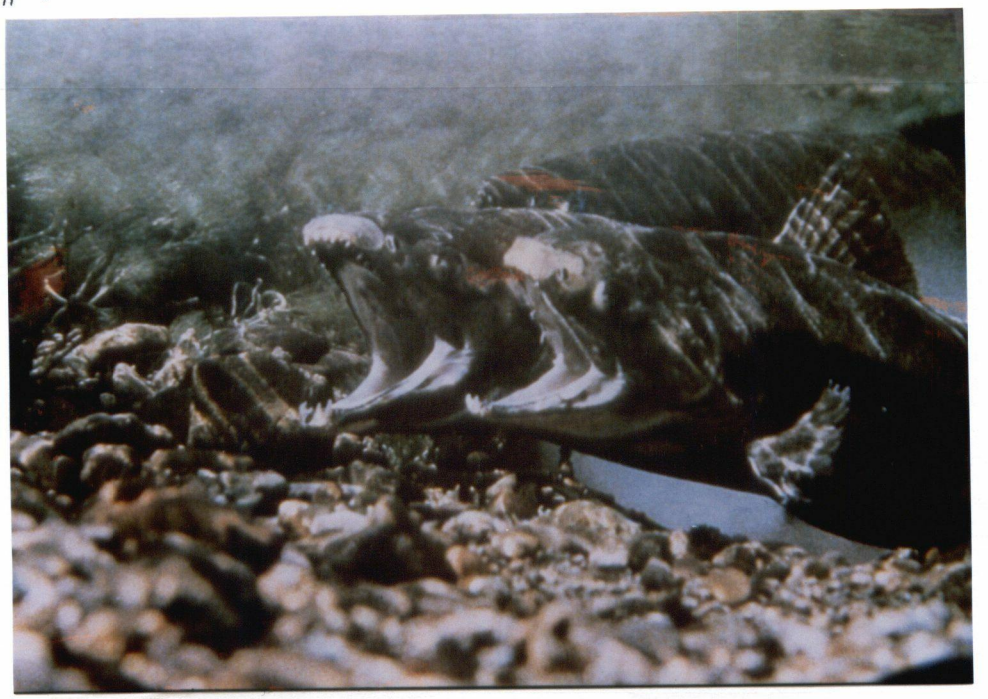
Slide # 4



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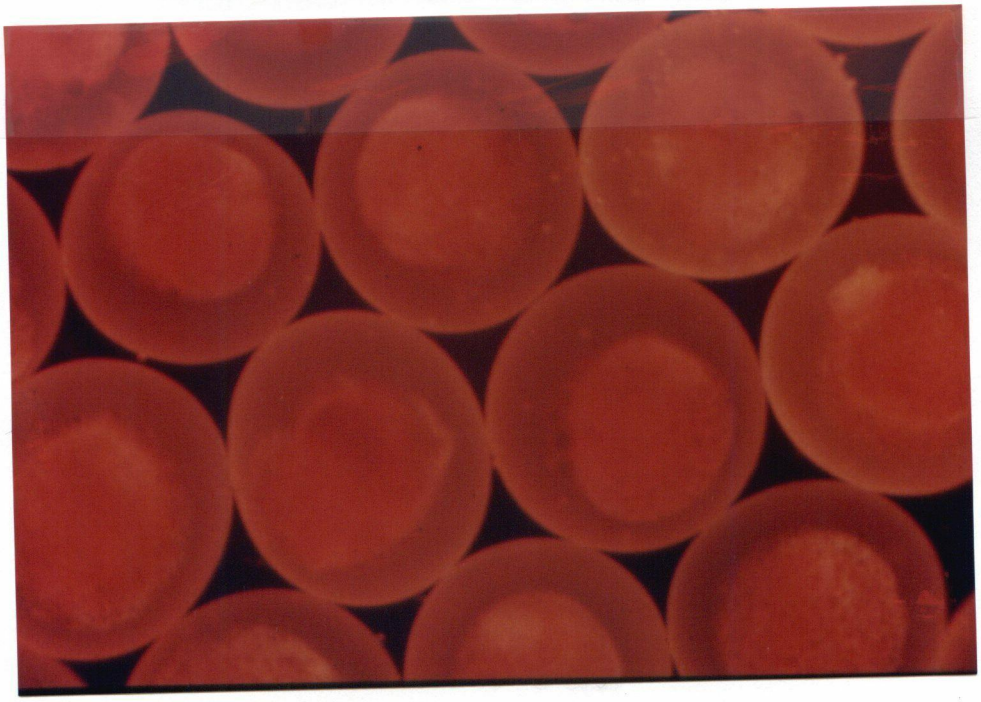

Slide # 10

Appendix B

Student Response Sheet

CLASS_____ Student #_____ B G

1. 
2. 
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4. 
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7. 
8. 
9. 
10. 

Appendix C

Student Interview Questions

C.1 Questions for Primary Students:

1. Do you like salmon?
2. What do you like (not like) about salmon?
3. What do you like best about the salmon (eggs) in the classroom?
4. What will happen to the salmon in your classroom when summer holiday comes?
    - Where will you let them go?
    - Will all of them be released?
    - Is that OK?
    - Do you want to let them go?
    - Why or why not?
5. What will happen to them after you let them go?

C.2 Questions for Intermediate Students:

1. Have you seen salmon before? Where?
2. Where do salmon come from?
3. Where do salmon belong?
4. What do salmon need to survive (live)?
5. What is the reason salmon have so many eggs?
6. What can harm salmon? How?
7. Who uses salmon How do they use them?
8. Should there be more salmon? (If "yes" then ask "Why should there be fewer (or the same)?" and STOP.)
9. Why do you think there should be more salmon?
10. How can salmon best increase in numbers?