

EVALUATING THE EFFECTIVENESS OF THE STEELHEAD IN THE CLASSROOM
PROGRAM IN 5TH GRADE CLASSROOMS

by

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ABSTRACT

In this investigation of the Lewiston, Idaho Steelhead in the Classroom program, data results were used to determine the overall level of effectiveness of the 12 week Steelhead in the Classroom Program. Student knowledge of aquatic concepts and fish ecology were assessed while satisfying Idaho 5th grade science standards. Student pre and post examinations, teacher surveys, student interviews and student minute papers were analyzed to assess the value of mentor visits, and content taught in the classroom. Particular students whom would not normally perform well in science, proved to excel throughout the duration of the program as they were motivated by participating in a program that fit their interests.

INTRODUCTION AND BACKGROUND

Project Background

Teaching Experience & Classroom Environment

For the past six years, I have been working for Idaho Fish and Game in the Clearwater Region of Idaho (Appendix A). Starting in November 2012, I changed positions to work as the Regional Conservation Educator. The change in job classification allowed me to have a direct role in our regional aquatic education programs as my duties involve educational and media outreach. Idaho Fish and Game (IDFG) operates primarily on hunting and fishing license dollars therefore one of the main educational goals of my position is to offer programs that promote the sport of fishing (and hunting). Steelhead in the Classroom is an example of a school-based outreach programs sponsored by IDFG that has the intent of a long-term investment of promoting the sport of fishing for future generations.

Our department has three main fishing recruitment programs under the state aquatic education umbrella. Programs include; 1) “Take Me Fishing” trailer; 2) Rod Loaner Program and 3) Steelhead in the Classroom Program. These three programs are administered in each region of Idaho to varying degrees.

The “Take Me Fishing” Trailer is scheduled at various lakes & reservoirs in the region starting in March with the majority of the season wrapped up by June or July (Appendix B). The main focus of the trailer program is to give first time anglers the opportunity to try fishing without having to first purchase a license or their own gear. The trailer is stocked with all the needed equipment such as various types of tackle, rods, reels and practice casting/knot tying gear. Two temporary trailer technicians operate the trailer during 10:00am-1:00pm on Saturdays and Sundays during the spring fishing season at the scheduled locations. Trailer events are also

scheduled by appointment or for special events. Fishing related educational activities are offered at these events. One example of an activity is named “water address” (Appendix C). Water address activity is one used to demonstrate to students how anadromous fish such as steelhead and salmon find their way back to their natal stream to spawn. The activity allows students to use their sense of smell to find their way.

The rod loaner program is an extension of the “Take Me Fishing” trailer program. Each region in Idaho has multiple racks of rods that are available to be checked out to various user groups such as; afterschool programs, scout groups, 4-H and other camps or educational programs. The duration of time that rods are loaned varies depending on demand and availability.

Steelhead in the Classroom Program is the third aquatic education program and will be explained in greater detail during the remainder of this investigation. This program is a school-based outreach program sponsored by IDFG having the intent of a long-term investment of promoting the sport of fishing for future generations. For the duration of my research, I spent time with Lewiston, Idaho 5th grade students to measure the effectiveness of our Steelhead in the Classroom Program in local area schools. Steelhead in the Classroom was especially useful to teach science to students with different learning styles.

Fishing is very much a part of the typical Idahoan lifestyle. Even so, the common lifestyle in Idaho seems to be changing every year to less outdoor activities such as spending time fishing (and hunting). As the conservation educator, I am interested in identifying the effectiveness of our current Idaho Steelhead in the Classroom curriculum and utilizing it as a tool to make the connections between aquatic ecology concepts and science standards taught in the 5th grade classroom. My hope is that through IDFG, students can be re-connected to the outdoors

and a greater interest in aquatic conservationism may occur. Through this program, associations are made with different students' with multiple intelligences' as real world applications are connected to science concepts and taught at an individual classroom level. This form of place-based education is very meaningful to the local students as they learn about the aquatic resources surrounding them.

Wildlife (including fish) of Idaho belongs to all citizens of Idaho. It is important for all citizens (especially young students) to know how to make responsible decisions to benefit Idaho's wildlife and the habitat in which it lives. The mission of Idaho Fish and Game is to protect, perpetuate & manage all wildlife of Idaho. This can only be done with the help of our citizens. By educating our future generations (young students of today), we can help prepare for better natural resources management into the future.

Educating youth for the purpose of developing and understanding their role and commitment to natural resources management will be essential to the continued legitimacy of fishing (Connelly and Decker, 1990). This statement establishes one of the main motivations that led to the idea that the Steelhead in the Classroom program has merit in a state agency with declining revenue due to an annual decrease in fishing (and hunting) license sales.

As the main sponsor of the Steelhead in the Classroom program, IDFG is concerned about sustaining our fishing legacy into the future. Finding innovative ways to connect youth to the outdoors is one of the main goals of IDFG. As the agency discovers new ways to provide additional opportunities to learn about aquatic conservation concepts, the ability to sustain interest and preserve the sport of fishing for future generations has the potential to become a realistic outcome.

Steelhead in the Classroom is one tool that is being used in Idaho to foster the relationship between youth and outdoor education. This program is a conservation-oriented environmental education program targeted for 5th grade level students. The Steelhead in the Classroom Program has six main goals:

1. Raise steelhead from eggs to fry
2. Monitor tank water quality
3. Engage in stream habitat study
4. Learn to appreciate water resources
5. Begin to foster a conservation ethic
6. Grow to understand ecosystems

During the spring semester, each participating teacher tailors the program to fit his or her curricular needs. Therefore, each program is unique. Steelhead in the Classroom has interdisciplinary applications in science, social studies, mathematics, language arts, fine arts, and physical education. This act of raising, monitoring, and caring for young steelhead cultivate a conservation ethic within participating students and promotes an understanding of their shared water resources. While the immediate goal of Steelhead in the Classroom is to increase student knowledge of water quality and aquatic ecosystem conservation, its long-term goal is to reconnect an increasingly urbanized population of youth to the system of streams, rivers, and watersheds that sustain them.

Concern about the future of fishing and student engagement and retention in science (based on low Idaho Science Achievement Test (ISAT) scores) led me to my primary focus question: What is the effectiveness of the Steelhead in the Classroom Program? Therefore, I measured the degree of content learned throughout program, assessed student attitudes, and examined impacts to teachers participating in the Steelhead in the Classroom Program.

As this project evolved, I realized the success of the project would depend on close collaboration of many active participants. Several colleagues, parents, friends, teachers,

principals, administrative staff and students were critical to accomplishing this project, however I chose three main critical friends in the natural resource education field to specifically thank and mention.

Brenda Beckley is IDFG's state aquatic education coordinator. Her insight has been helpful as she is the statewide aquatic education coordinator and can provide big picture oversight and advice. Six other regions in Idaho have active Trout in the Classroom Programs; however the Clearwater Region is the only region that raises Steelhead in our local classrooms. Brenda recognizes and encourages our regional specialized programs and provides us with financial and educational resources as needed. Bill Seybold is the well educated, supportive regional hunter education/volunteer coordinator. His ideas are much appreciated as they are innovative, constructive not to mention he is an Excel wizard. Bill's background in fish and wildlife research has helped me understand types of data collection techniques and statistical analysis. Finally, Matt Bruns is not only my life partner, but is also a well-respected high school science teacher in Troy, Idaho. As a past Steelhead in the Classroom participant, he was willing to share lesson plans with new participating teachers and provide equipment troubleshooting advice as needed. Matt also is well educated in the natural resources field as he received a degree in wildlife management and now works in the fisheries field during the summers while off from teaching. All critical friends have played a major role in formulating and shaping my action research project.

CONCEPTUAL FRAMEWORK

To measure the effectiveness of the program, we must first understand the potential effectiveness of teaching considering students' different learning styles. Gardner's eight levels of

intelligences are outline in table one. By primarily using a naturalistic learning approach, the program was able to connect with students that may not normally perform well in science, but have interest in aquatic ecology.

The purpose of schooling should be to develop a variety of intelligences and to help people reach vocational and avocational goals that are appropriate to their particular spectrum of intelligences (Gardner, 2000). Steelhead in the Classroom allowed for this opportunity to fit students' intelligence spectrum. People, who are helped to understand their learning styles, feel more engaged and competent and therefore more inclined to serve society in a constructive way. Gardner's theory argues that students will be better served by a broader vision of education, wherein teachers use different methodologies, exercises and activities to reach all students, not just those who excel at linguistic and logical intelligence. It challenges educators to find ways that will work for the students' learning these topics (Gardner, 2000 p. 10).

Gardner's theory of motivation was practiced in our local schools while implementing the Steelhead in the Classroom Program. Teachers were challenged to implement this program in ways that worked best for their classroom. All of Gardner's eight intelligences can be reached during Steelhead in the Classroom program implementation.

Table 1

Gardner's Eight Levels of Intelligences (adapted from Gardner, 2000)

Intelligence Strength:	Students may enjoy:
Verbal-Linguistic	Writing, speaking, publishing, vocabulary, word puzzles, puns, tongue-twisters
Logical-Mathematical	Math games, logic puzzles, experiments, codes, analogies, numbers, mysteries
Visual-Spatial	Maps, charts, diagrams, drawing, sculpture, graphic organizers, models, puppets, photographs
Bodily-kinesthetic	Movement, dance, manipulative, drama, building, role-playing, sports
Musical	Musical instruments, listening, recording, rhythmic language, poetry, songs, clapping
Interpersonal	Board games, cooperative groups, collective problem solving, interviewing, peer tutoring, think-pair-share, discussions
Intrapersonal	Journaling, scrapbooks, reflection, goal-setting, self-directed projects, debates, memoir
Naturalistic	Outdoor experiences, plants pets, bugs, classifying natural objects, environmental topics

According to Gardner's eight intelligences', the intelligence with the most direct connection to the Steelhead in the Classroom Program is the naturalistic intelligence. Naturalistic intelligence relates to outdoor experiences, plants, pets, insects, classifying natural objects, environmental topics. Many students participating in the program connected to this level of intelligence.

Although naturalistic intelligence can be one of the most difficult intelligences to reach in a classroom setting, teachers' acknowledged the ability for students in this intelligence group to engage in this program. One teacher stated that, "school is very difficult for Dalton. However, this program allowed him to be included and share lots of his knowledge." Another teacher stated, "Matt struggles with staying motivated. He was always ready to participate and learn when it came to the steelhead." These examples demonstrate the benefit of adopting this program

into the 5th grade classroom allowing these students a chance to excel while focusing on their level of intelligence.

An additional benefit of the program is the local or place-based relevance it has to our area. Steelhead and salmon are very significant parts of our history, culture, and economy in Idaho. Place-based education is the main premise behind the uniqueness of the Steelhead in the Classroom. Every anadromous (ocean-going) fish that comes into the state of Idaho has to come through Lewiston to make their journey either to or from the ocean. This knowledge is what makes this program so important to this area and so close to home for the students to appreciate and understand. When researching other similar programs within the United States, I only found one other active Steelhead in the Classroom Program in California.

Place-based education is a relatively new term, appearing only recently in the education literature. However, progressive educators have promoted the concept for more than 100 years. For example, in "The School and Society," John Dewey advocated an experiential approach to student learning in the local environment: "Experience [outside the school] has its geographical aspect, its artistic and its literary, its scientific and its historical sides. All studies arise from aspects of the one earth and the one life lived upon it" (Montessori, 1915, p. 91). Place-based programs allow students to connect with their particular corners of the world. Proponents of place-based education often envision a role for it in achieving local ecological and cultural sustainability.

Steelhead in the Classroom brings outdoor education inside of the 5th grade science classroom. It is a broader term than "environmental education," which can be described as instruction directed toward developing a citizenry prepared to live well in a place without destroying it (Orr, 1994). This form of education is critical to the future of our surrounding

natural resources as it teaches the concept of sustainable living and conserving our natural environment in which we live.

The practice of ecological education requires viewing human beings as one part of the natural world and human cultures as an outgrowth of interactions between species and particular places (Smith and Williams, 1999). *Steelhead in the Classroom* provides practical experiences outdoors through the application of an ethic of care as well as grounding learning in a sense of place through investigation of surrounding natural and human communities.

Some critics of place-based education believe that the primary goal of schooling should be to prepare students to work and function in a highly technological and consumer-oriented society. In contrast, place-based educators believe that education should prepare people to live and work to sustain the cultural and ecological integrity of the places they inhabit. To do this, people must have knowledge of ecological patterns, systems of causation, and the long-term effects of human actions on those patterns (Orr, 1994). One of the most compelling reasons to adopt place-based education is to provide students with the knowledge and experiences needed to actively participate in the democratic process.

Outdoor nature programs provide a positive, fun environment for children to learn about the world as well as teaching them responsibility (Kaiser, 1976, Konoshima, 1995; Montessori, 1912), improving their attitudes towards school and reducing dropout rates (Baum A., J. D. Fisher, and J. E. Singer, 1985). Studies have shown that it is important to instill positive attitudes toward science in children at an early age. Many educators believe in the strong correlation between children attitudes toward school and academic achievement (Catsambis, 1995; Farenga and Joyce, 1998; Simpson and Oliver, 1990; Yager and Yager, 1985).

Positive attitudes in the elementary school years tend to encourage exploration of science and science related careers in the future. (Tanner, 1980). Out-of-school science activities and hands-on learning experiences are viable mechanisms to promote science to students (Farenga and Joyce, 1998), yet many traditional science programs do not take advantage of these opportunities (Yager and McCormack, 1989). Steelhead in the Classroom provides this perfect opportunity for science exploration through hands-on learning.

METHODOLOGY

The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained (Appendix D).

During the months of February through May, 2013, over 400 students within a total of five communities and 11 schools were active participants in the Steelhead in the Classroom program in the Clearwater Region of Idaho. A random number generator was used to select a smaller portion of students to a sample of 73 students to allow for more of a controlled, manageable data set. Collected data came from two randomly selected schools in the local community of Lewiston.

I consider the data collected to be both reliable and valid in that I used a random number generator to select two schools to sample (Camelot & Orchards elementary). I then collected data using the pre & post test from each student at both schools, thus I collected a reliable representation of information from each randomly selected school. In addition, I believe the data were valid because the data sets from each school were non-biased and not influenced by other participants, instructors or mentors. All instruments were valid and reliable because surveyed teachers were all given the same questions and allowed to answer the surveys with their answers

kept anonymous if they wished. Most of the questions on the survey were open-ended and allowed for teachers the opportunity to provide adequate feedback. Pre and post exams information from students was also kept anonymous. Student exams were numbered as individuals to track the same student with the pre and post exam responses. The pre and post exams had similar questions and students were not notified ahead of time that they would be tested on the material. Therefore students did not have the anxiety that they might have had if they were notified in advance. Students were allowed to take the exams facilitated by their teachers during their own time when IDFG staff was not present. The exams were then collected, scored and given an individual student identification number to keep the results anonymous.

Each participating classroom in the Clearwater Region received approximately 100 steelhead eggs in late February that were raised to the fry stage of their lifecycle when they are released at the end of May into approved cold water rivers such as the main stem of the Clearwater River. Our region had a total of eleven schools involved in the program during spring 2013 from February-May.

Orchards and Camelot elementary schools in Lewiston, Idaho were the two randomly selected schools for the study. I randomly selected two schools with approximately 73 total students to sample from the 400 total students participating in the program. General descriptions of the demographics from these two schools are listed in table two below.

Demographics

This demographic table shows the basic demographics from both schools that were selected for the pre & post test results.

Table 2

Illustrates the total number of students, gender, ethnicity, student to teacher ratio & number of students eligible for free & reduced lunch of Camelot and Orchards elementary in Lewiston, Idaho

School Name	Total Enrollment	Student Profiles	Ethnicity	Student to Teacher ratio	% of Students Eligible for Free & Reduced Lunch
Camelot	Total students- 497 Total 5 th grade- 78	5 th Grade Male- 53.8% 5 th Grade Female- 46%	White- 92% Black- 0.78% Hispanic- 2.16% Nat. Amer.- 3.56% Asian/Pac.- 1.5%	19.49:1	27%
Orchards	Total students- 318 Total 5 th grade- 51	5 th Grade Male- 56.8% 5 th Grade Female- 43.2%	White- 83.6% Black- 0.6% Hispanic- 6.6% Nat. Amer.- 6.3% Asian/Pac.-2.8%	15:1	48%

Orchards Elementary School Scores
(2011 - Grade 5)

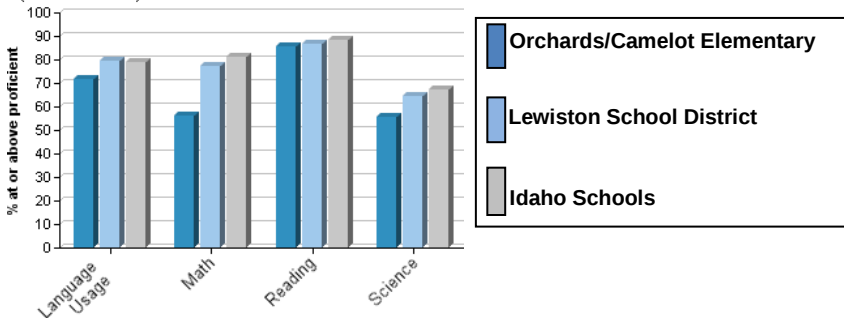


Figure 1a. Percent 5th grade students at Orchard elementary scoring at or above proficient on 2011 Idaho Standardized Achievement Test (ISAT) in language, math, reading and science.

Camelot Elementary School Scores
(2011 - Grade 5)

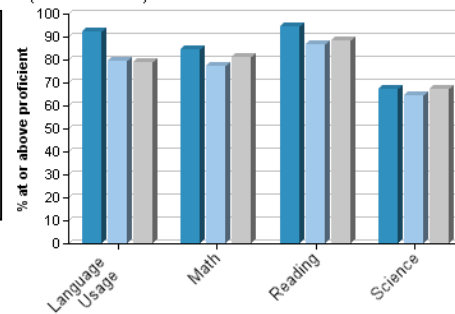


Figure 1b. Percent 5th grade students at Camelot Elementary scoring at or above proficient on Idaho Standardized Achievement Test (ISAT) in language, math, reading and science.

Camelot and Orchards Elementary school are both in the area closest in proximity to the IDFG office in the “orchard” area of Lewiston. Table one shows the size difference in the 5th grade Camelot versus Orchards Elementary. Camelot has 78 students in the 5th grade and Orchards has 51 for a difference of 27 more students at Camelot. Orchards elementary have 21% more students that are eligible for free and reduced lunch and that 6.6% of students are of Hispanic ethnicity. After additional research, I found that one of the main reasons for this difference may be because of the Hispanic migrant population of workers. Most of the children of the workers attend Orchards Elementary as it is in the school zone where most of the kids from the local outlying migrant farming communities attend. The Lewiston area hires many migrants to work seasonally in the local fruit orchards, farms and ranches.

Figure one a and b show the lower science test scores at both schools. On average in 2011, both schools’ 5th grade students scored 20% lower on science ISAT exams compared to the remainder of the subjects. This showed me the need for an all inclusive science program such as Steelhead in the Classroom. Camelot scored 10% higher in science compared to Orchards Elementary. One reason could be because of some of the students having the difficulty of a language barrier at Orchards Elementary due to Orchards having a diverse ethnicity/language group of students. Test scores showed that Orchards students also scored approximately 10% lower on other subjects (math, reading, language). Also, Orchards free and reduced lunch rate is almost twice as much compared to Camelot indicating lower incomes.

Treatment

The treatments that I used were implemented throughout the duration of the program starting in February and ending May, 2013. We began the program with a teacher and mentor orientation meeting in January at the Clearwater regional office. This meeting gave new teachers an

opportunity to learn about the goals of our program. We also provided resources to the teachers by giving them a brief tutorial concerning tank set-up, maintenance, and troubleshooting their equipment. Teachers were paired with a department mentor at the meeting. Mentors are IDFG biologists, technicians or volunteers. Anyone with an interest in fisheries education can apply to become a mentor for the 12 week program. Mentor training is provided as needed before, and throughout the program. The teacher/mentor pairs were assigned to work together throughout the program. Each mentor was expected to make arrangements with the teacher to come into the classroom for a minimum of 3 classroom visits. One visit took place when the eggs arrived as it was the mentors' responsibility to deliver the eggs to the appropriate 55-gallon classroom tanks. At this time, mentors explained to the class the process of caring for their fish including; taking water quality measurements, feeding their fish, and cleaning the tank. Mentors also did an activity named 'Predict a Hatch Date' (Appendix E) and they gave a brief intro on the Steelhead lifecycle (Appendix F). Visit two included information on how much food to give to their fish in relation to their body size. Mentors once again talked to their students about caring for their tank. Visit three often was scheduled to do a fish anatomy lesson by using adult steelhead carcasses to conduct a detailed fish dissection with each class.

A mentor's final visit was to capture the fish in the tank the morning of the release day. The release day was scheduled for the Thursday and Friday before Memorial Day (May 23rd & 24th, 2013) at Spaulding Park-Nez Perce Historical Site near Lapwai, Idaho (Appendix G). The final release day for the students was the concluding event designed to have them learn more in the field to summarize their learning about fisheries and aquatic habitats. Students rotated through the following eight stations;

1. Macroinvertebrates- sponsored by Nez Perce Tribal fisheries

2. Water Quality- sponsored by Nez Perce Tribal watershed
3. Stream Flow- hosted by Army Corp. of Engineers
4. Watershed Address- hosted by Dworshak National Fish Hatchery
5. Release Station- hosted by Clearwater Idaho Fish and Game state Hatchery
6. Fishing Trailer- hosted by Idaho Fish and Game
7. Hooks & Ladders (Steelhead migration obstacles) - hosted by Idaho Fish and Game
8. Cultural- hosted by Nez Perce Tribe (Elmer Crow-Nez Perce tribe member story teller)

All of these organizations worked together to host this large field day for the 400 participating students. Students were given a workbook and each page focused on a particular station of the event. Students were expected to follow along in the workbook at each station, ask questions and fill out certain parts of the workbook.

Prior to the release day, instruments were used throughout the course of the program to evaluate the effectiveness and usefulness of the 12 week program to the Lewiston classrooms.

Research Design

Instrument 1: Pre & Post Tests

The first instrument given was a ten question steelhead anatomy pre tests (Appendix H). Mentors were responsible for giving the exams to the teachers so the exams could be given at their convenience prior to the scheduled dissection time. Pre-tests were administered by the teachers approximately one week prior to dissection time. As part of the pre-test, students were asked to label ten common structures by viewing a drawing of a cross sectioned fish, using a word bank and listing each response on a worksheet. The first seven questions were primarily external anatomy and the last three questions were internal anatomy. Fish dissections were facilitated by the classroom mentor within a week following the post-test exams. Within a week

following the fish dissection, a post-test was administered to each student to measure the effectiveness of using the fish dissection to teach fish anatomy in the classroom. Students were again asked to label the same ten fish structures on a worksheet using a word bank along with listing the function next to each structure. Post-test were collected from each class and graded to assess changes in pre & post test scores.

Instrument 2: Teacher surveys

Teacher surveys were given to teachers toward the end of the program in April (Appendix I). Teachers were asked to provide input on five main questions. They had the opportunity to list what they liked about the program and what if any suggestions they had for the future. Teachers were also asked if their students seemed to have more, less or about the same motivation to learn science when using the Steelhead in the Classroom Program as part of their curriculum. Teachers had the option to list the names of individual students that were especially motivated by the program. They were then asked to state if these students normally performed well in science.

Finally, at the end of the survey, teachers were asked if the program had been useful to teach 5th grade science concepts. If so, teachers were asked to list a few specific science standard goals and objectives that were fulfilled by using this program in their class.

Instrument 3: Student minute papers

Students were asked to write for one minute about their experience with the fish dissection. They were given probing statements and asked to write about what they liked, did not like and what they learned from the dissection. Twenty five randomly selected students completed their minute papers. Figure five shows student comments summarized into main emerging terms and topics.

Data Collection Techniques

Exams, surveys, and student minute papers were the data techniques I used to gather information from Steelhead in the Classroom teacher and student participants (Table 2). This allowed me to acquire high quality, diverse, valid and reliable data from multiple sources to help answer my four action research questions. All data was triangulated from multiple instruments. Colleagues and support team members looked over the instruments to ensure quality data.

Table 3
Triangulation Matrix

Research Question	Student pre & post exams	Teacher surveys	Student minute papers
<i>Main focus question:</i> What is the effectiveness of the Steelhead in the Classroom Program?	X	X	
<i>Sub question 1:</i> What is the degree of content learned (specifically Steelhead Anatomy) throughout the 12 week program?	X	X	X
<i>Sub question 2:</i> What is the attitude of students participation involved with the Steelhead in the Classroom Program?		X	
<i>Sub question 3:</i> What is the impact to teachers that participate in the Steelhead in the Classroom Program?		X	

These four instruments allowed me to collect the necessary data to help answer each of the questions. The instruments were used throughout the duration of the program from February-May at different time intervals depending on school scheduling and mentor availability.

DATA ANALYSIS

I gained measurable feedback using the exams, survey and minute papers to measure ways to effectively include Steelhead in the Classroom information in the classroom setting, and identify strategies useful to fish and game to better support Idaho science standards in our programs and events. A long-term goal is to take the information given in the surveys and

interviews and put together an action plan that would encourage more participation in the sport of fishing.

Data for Research Questions

Sub question 1: What is the degree of content (specifically related to Steelhead anatomy) learned throughout the 12 week program?

To answer this research question, I used the 10 question pre and post Steelhead Anatomy exams (Appendix H). Figures' two and three display the percent of students answering each question correctly on the pre and post test. As seen by the figures, students' scores significantly improved between the pre and post exams.

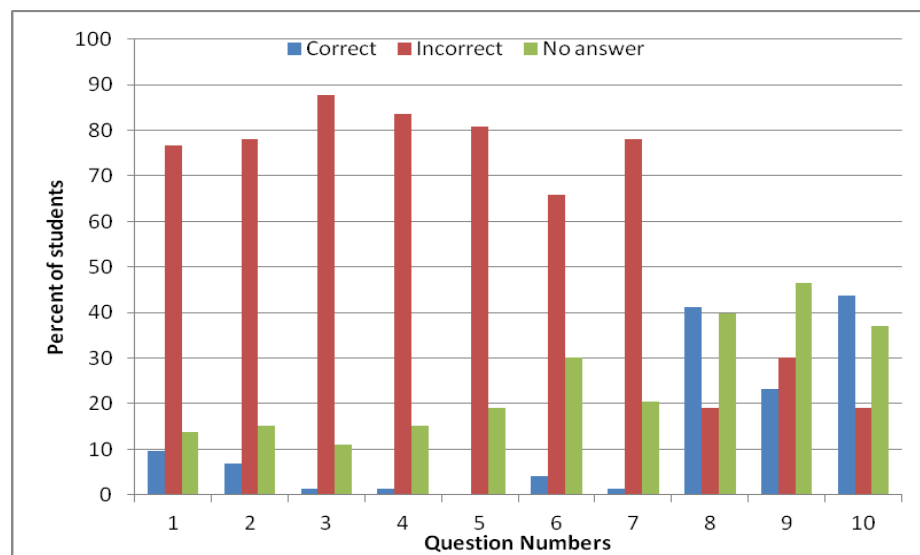


Figure 2. Percent students answering correct, incorrect and no answer on anatomy pre-test given to Lewiston area schools during the Steelhead in the Classroom Program (Feb.-May), $N=73$.

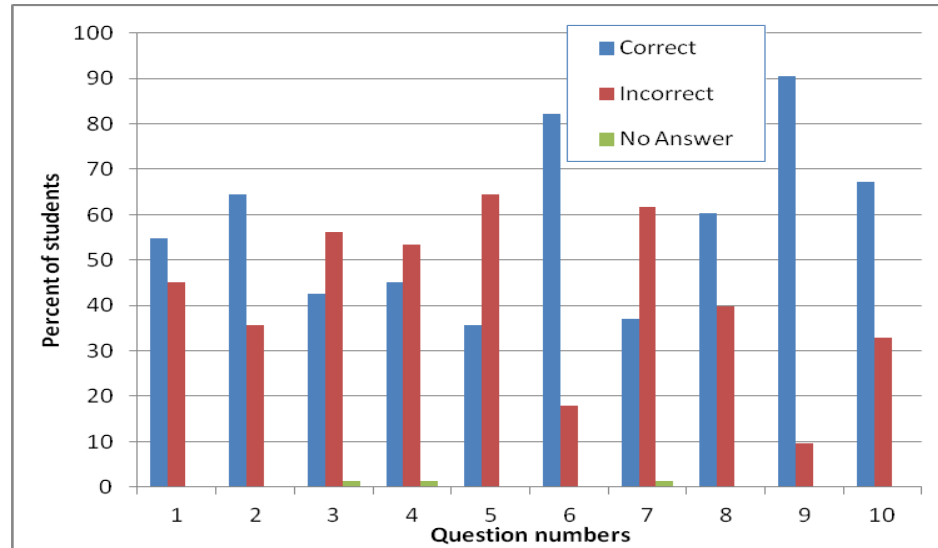


Figure 3. Percent students answering correct, incorrect and no answer on anatomy post-test given to Lewiston area schools during the Steelhead in the Classroom Program (Feb.-May), $N=73$.

As I analyzed the data for each question on the pre-test, I realized there was a large difference in student exam scores from questions 1-7 and 8-10. Students scored substantially higher on questions 8-10 compared to questions 1-7 on the pre-test. I began to speculate what the reasons might be for this difference. As I researched this further, I noticed that questions 1-7 primarily pertained to external anatomy and labeling names of specific fins (Appendix H). For example, question 1 was Operculum (gill cover), and questions 2-7 were all names of specific fins. Questions 8-10 pertained to internal anatomy including gills, heart and lungs. Pre-test results showed that students were noticeably not as familiar with certain fins of a fish and the function of each fin questions 1-7.

Most students are familiar with these three main internal organs and have studied these organs at younger ages in lower grade levels. Even though human anatomy course curriculum may not be taught within biology class until junior high, Idaho state science standards list goals and objectives of teaching about form (shape) and function (use) as early as 2nd grade. (Retrieved

from http://www.sde.idaho.gov/site/content_standards/science_standards.htm on June 27th, 2013).

Learning the appropriate function of certain fins and other anatomy structures has considerable importance as it helps students begin to understand certain adaptations of animals, and allows students the opportunity to closely study and observe the movement of the fish. Plus, many of these fin names and features are used in identification keys that students will use in the future. Learning the structures and functions of these fish also introduces a great vocabulary building activity.

Form and function goals and objectives are listed under the 5th grade science standard Number 1: Nature of Science. Goal 1.5 and Objective 1 is to understand concepts of form and function and to explain how the shape or form of an object or system is frequently related to its use or function. This specific goal and objective was my focus when conducting steelhead anatomy structure and function pre and post testing. My intent was to appeal to teacher's interest by creating this direct connection to Idaho 5th grade science standards, and to measure student improvement with learning this standard as they studied and observed their young steelhead.

Figure two displays the results of the pre test by showing the percent of students answering correct, incorrect and no answer responses for individual questions 1-10. Figure three displays the post-test results for individual questions 1-10. By comparing the two bar graphs, you can noticeably see the increase of student correct responses on each question from the pre-test to the post-test. For example, less than 10% of students answered question one correctly on the pre-test while over 50% of students answered question one correctly on the post-test. Many of the other questions have similar results in the increase of correctly answered questions on the pre-test compared to the post-test.

Another noticeable difference between questions 1-7 and questions 8-10 on the pre-test was that a much larger percentage of student answered questions 8-10 correctly compared to questions 1-7, however there was a higher percentage of students that did not answer questions 8-10 compared to the no answers of questions 1-7. There was not as much of a difference in correct responses and no answers for those same questions 1-7 and 8-10 on the post test.

There could be many reasons for the increase in no answers for questions 8-10. Perhaps students were not allowed enough time to finish the pre-test exam and therefore did not respond to the final three questions. Those same students could have been given more time on the post-test to take the exam and answered correctly on the final questions. Students could also have had test anxiety and were confused on the internal organs and did not want to mix up their responses and guess on the last three questions, so they left the answer blank.

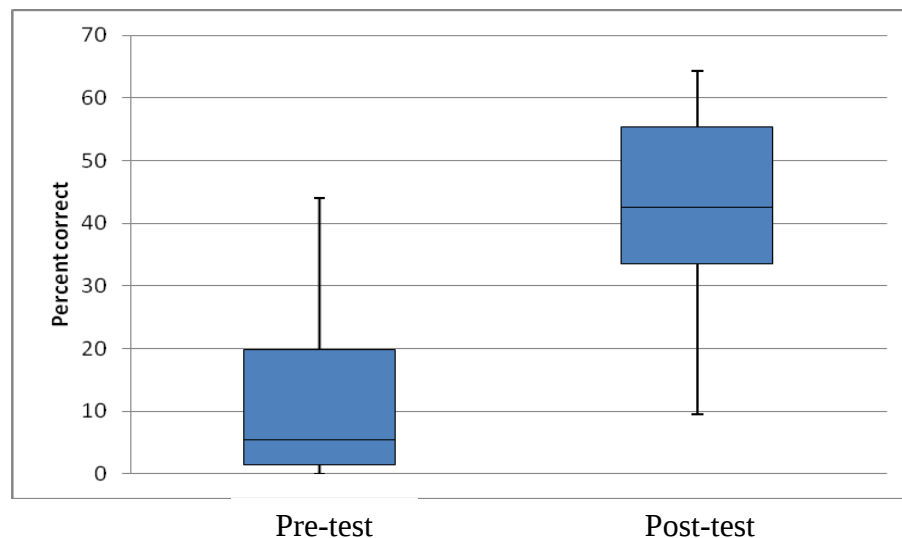


Figure 4. Percent correct responses on pre and post test (questions 1-10) given to Lewiston area schools during the Steelhead in the Classroom Program from Feb.-May, 2013, $N=73$.

The box and whisker plot shown above illustrates the overall percent questions correct for the pre-test compared to the post-test. The whiskers show the range of the highest and lowest

test scores. One of the students received a 0% because they left most of the questions blank and guessed incorrectly a few responses. The boxes of the graph represent the average of the lowest and highest scores. The bottom of the box shows the average lowest percent correct and the top of the box shows the highest average test score. There was an average increase of 35% higher scores on the post-test compared to the pre-test.

The black lines in the middle of the box represent the overall average test scores from the pre-test compared to the post-test. On average, students scored an average of 40% better on the post-test compared to the pre-test. Overall, students had a much better understanding of the terms, after the treatment of the fish dissection even though the exam was given a week following. With student scores improving, the students not only learned fish anatomy terminology, but also had a better understanding of the function of each structure. I would be curious to give students the same test again one year from now to track long-term retention

level

s.

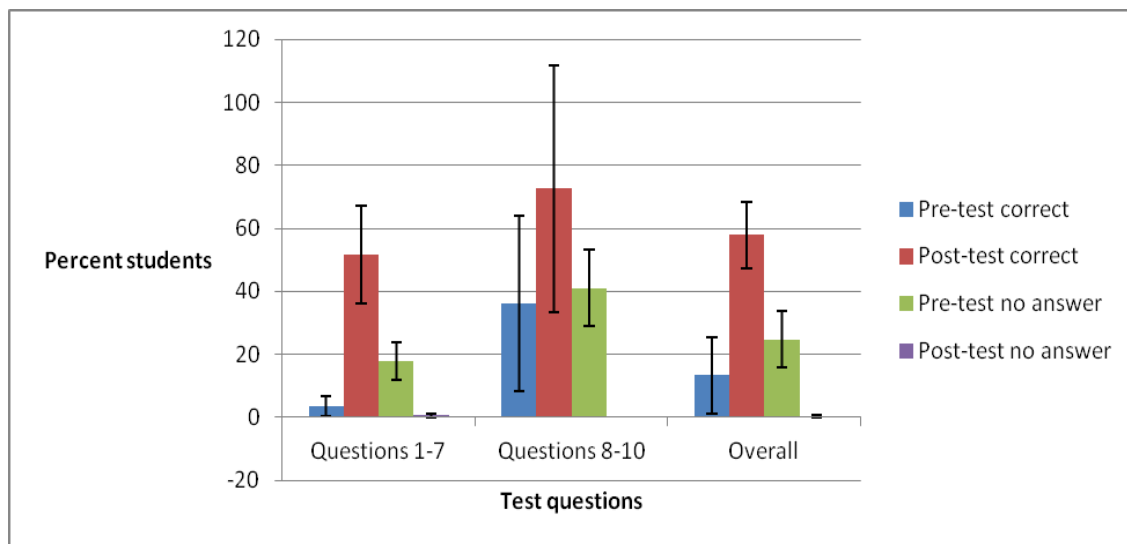


Figure 5. Mean percentage students scores on questions 1-7, questions 8-10, and overall (1-10) on the anatomy pre and post test given to Lewiston area schools during the Steelhead in the Classroom Program from Feb.-May, 2013, N=73.

Figure five shows the mean percent of summary student scores on the break-down of the questions 1-7, 8-10 and overall scores on the pre and post test as well as showing pre-test no answer responses. As mentioned in the information above, students scores improved an average of 35% from the external anatomy questions 1-7 compared to the internal anatomy questions 8-10 during the pre-test. According to the error bars for the 95% confidence interval, there was a significant difference between pre-test questions 1-7 and 8-10 and no answers compared to a no significant difference in those same questions on the post-test and the overall scores. I believe it was because students already knew the answers to questions 8-10 when they took the post-test, so we did not see a significant change in results. Also, the overall data did have a larger difference because there were a large proportion of the questions from 1-7 that effected the results.

Student minute papers were also used to help answer the sub question relating to the degree of content learned throughout the duration of the Steelhead in the Classroom Program. Minute papers were a great tool to use to demonstrate how students related to the fish dissection exercise. Minute papers (Classroom Assessment Technique 6) provide a quick and simple way to collect written feedback on student learning (Angelo, 1993).

Twenty five randomly selected students completed their minute papers. Results were compiled by placing student comments into emerging terms/topics. Student results were summarized into categories as listed below in figure six.

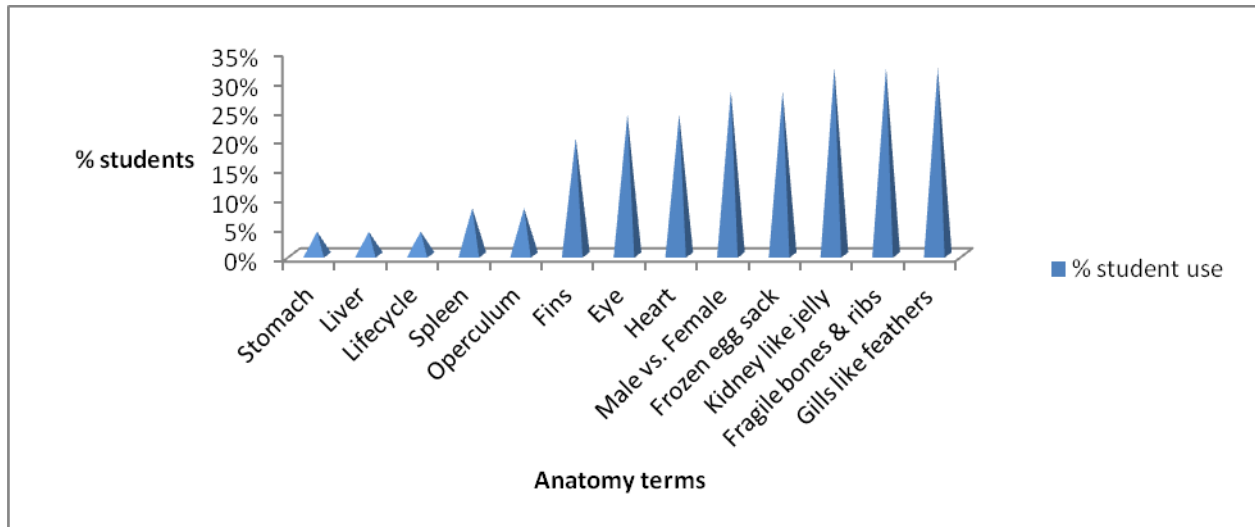


Figure 6. Student use of Steelhead anatomy terms on student minute papers, $N=25$.

The stomach and liver were both mentioned at the lowest frequency of once (4% of students). Gills compared to feathers and kidneys like jelly were mentioned with the highest frequency of eight times (32% of students). I speculate that students mentioned the gills, kidneys and eggs because these structures were so unique to these fish and cannot be seen to the same degree on other animals. Also, many students have not had the opportunity to study these structures up close on a large steelhead.

It is important for students to make observations, comparisons, and practice their writing skills by journaling their experience throughout the program. In this minute paper exercise students were expected to observe the dissection with specific detail to form analogies, study detail and make inferences about how these fish function using certain parts of their anatomy. Teachers often can help students understand lessons by sometimes having them describe an object based on feel, observations or comparisons, so describing the anatomy structures in detail demonstrated their comprehension of the fish dissection exercise.

When analyzing the minute paper data, five main topics emerged from the data. Students tended to make analogies or descriptive observations based on their own experiences such as, “I

got to feel the kidney, it felt like jelly.” Another student compared the gills as shaped like feathers. By having the hands-on dissection opportunity students were able to study steelhead anatomy with great detail and make realizations such as, “I saw that the ribs and bones were fragile and the eye had juice in it.”

Within their minute papers, students were also able to make predictions based on their previous fish observations. One student predicted the fish to be 3 1/2 inches long when they released them into the river. These students were able to make those predictions and test them when they had the opportunity.

The third topic students wrote about in their minute papers was the life history of a steelhead. One student stated, “I liked to learn about the steelhead lifecycle. I liked to learn how to tell the difference between a male and a female and how they spawn.” Another student wrote, “It was exciting watching our fish hatch and grow to become fry and smolts. It was cool to see frozen eggs during the dissection.”

The final topics that were mentioned in the minute papers were the things that students did and did not like. Only one student stated, “I did not like touching the parts, but it was interesting.” Another student mentioned their favorite part of the dissection by saying, “I liked cutting off the fin, operculum and the gills...I also liked when I held its eye and its heart. Thank you for letting us do that.” Yet another student mentioned their fact stating, “I liked learning how they (the fish) migrate like how they change color when they get to salt water.” I found these statements to be powerful messages and justification for conducting the fish dissection in the classroom. Many students started the dissection with a feeling of nausea, however ended the hour dissection with fish slime up to their elbows. The students’ were so excited to have the hands-on experience of touching the fish and learning where all the organs were located. Parents and

teachers stated that the dissection would be the one thing that students remembered from 5th grade. Teaching these same concepts can be challenging in a traditional classroom approach, but when aided with real-life examples, can be successful.

I was able to assess their level of understanding using student minute papers as the minute papers were written approximately one week following the fish dissection. I would be interested in testing the same student next spring to again assess the retention of the material.

Sub question 2: What is the impact to teachers involved with the Steelhead in the Classroom Program?

To answer this question, I used teacher surveys (Appendix I). The survey allowed teachers to identify particular students that especially benefitted from using this hands-on program in their classroom. Teachers then were able to explain if these students normally performed well in science or if by using this program, students were able to excel as it may have related to students personal interests compared to other content areas. I also wanted to capture feedback from the teachers about their attitudes of the program, what worked well and what could be improved for next year. I also wanted to get an idea of how effective the program was to teachers and how successful they were in implementing the program in their class.

Teachers were asked five main questions during the survey to identify the current strengths and future improvements that need to be made to the program. Teachers were also encouraged to list the main Idaho science standards that they were able to accomplish by implementing the Steelhead in the Classroom curriculum in their classroom.

All teachers expressed their interest in participating in the program for another year during spring 2014 (6 out of 6- 100%). The majority of the teachers involved in the program stated that their students were “more motivated” to learn science due to using the Steelhead in

the Classroom Program (5 out of 6- 83%). Approximately half of the teachers stated that the best part of the program was having mentors come into the classroom (3 out of 6- 50%). Most teachers stated that they enjoyed having mentors come into the classroom. One teacher stated, “it is important to me that our kids see adults who have turned their passion into a career.” Half of the teachers stated specific names of students that do not normally perform well in science and are not as motivated in class, yet these students became more eager to learn and participate when given the chance to become involved in this program by participating as a student scientist.

All teachers agreed that the program was useful to help teach 5th grade science concepts such as; 1) Using prior knowledge to set up hypothesis, make predictions & test, 2) Observation skills, 3) Environments, life cycles, food chains & food webs 4) Data collection skills (100% of teachers found the program to be useful to successfully cover science material by not only incorporating science content, but also the subjects of language usage, reading, math, history, art and even physical education with movement activities). The results of the teacher survey help to answer the question of the student and teacher attitudes and the impacts to the teachers utilizing this program. After analyzing the teacher survey responses, I also noticed four main themes emerging from the data. The first noticeable theme was that the program allowed students the ability to use prior knowledge to make predictions. One teacher stated, “Data collection, documenting observations, it helps kids ‘live the life of a scientist’ by having the fish here and needing their care each day. I have enjoyed setting up a hypothesis and following through with the steps of successfully raising the fish.”

Classroom mentors included Idaho Fish and Game staff biologists, technicians and volunteers. Mentors made periodic visits to each classroom to talk about the life of a biologist

and to help students learn to collect data like a scientist. Students were expected to use their prior knowledge to think about what outcomes might occur as the fish developed in the tank.

Observing and comparing changes in the fish overtime was a second emerging theme. Teachers stated, “Science note-booking work exceptionally well with the program.” Students were required to journal and keep track of changes with the tank and/or with the health of their fish. Students observed the fish daily and had to make detailed sketches or descriptions in their note-book to document changes and developments.

A third recognized theme was the opportunity for students to collect and record data by checking chemical levels in the tank. “Students are interested and excited to observe the aquariums. Students have taken on the responsibility for feeding, checking chemical levels, and cleaning, says a local teacher. Students collected data and documented the information in their student science note-book. Students were responsible for taking measurements and recording chemical levels, daily temperatures, and document them in the notebook or data sheet as they occur. They had to monitor how much food to feed the fish and when to feed them. Students also were held accountable for changing the water and cleaning the tank as needed.

The final recognized theme from survey information was teachers’ appreciation to have a program that helped teach concepts such as life cycle, environments, and food chains. All of these mentioned concepts are included as part of the requirements for 5th grade science standards (Appendix J). The standard number and content area is listed as well as the goals and objectives of each standard. Teachers stated that they were able to cover the above highlighted areas (Content Area 1- Nature of Science & Content Area 5-Personal and Social Perspectives, Technology) by using this program.

In fact, teachers specifically listed grade 5 standard 1.1, 1.2.1, 1.3.2, 1.5, 1.6, and 5.1 as objectives they were able to fulfill while incorporating this program into their science curriculum. Many teachers expressed their satisfaction with the program as they were able to utilize the curriculum in a multidisciplinary fashion within their classroom. Teachers already have so much of their day filled with other required subject matter that it is often difficult to prepare and implement hands-on science lessons. Steelhead in the Classroom offers a well-rounded approach to covering the necessary standards while also inspiring students to learn science through real-life observations. Elementary science standards can be challenging to cover with regular teacher lessons. One teacher stated, “It (the program) is the best of all worlds, students are engaged, focused and willing to learn more. It is also place-based so students find a real-connection to the material. We have enjoyed every minute of it!”

Elementary level teachers may not have the science training therefore are not confident to teach all of the required science material. Teachers may also find it difficult to find lessons that incorporate so many of the standard goals and objectives that Steelhead in the Classroom provides. Steelhead in the Classroom is a great fit to be utilized in many diverse ways to teach science concepts at a 5th grade level.

INTERPRETATION AND CONCLUSION

The study provides evidence of the overall effectiveness of the Steelhead in the Classroom Program. This was tested by using surveys, pre and post testing and student minute papers. By using the pre and post test, I was able to measure the degree of content learned throughout the program. I found the results to be encouraging as student test scores improved on average by 40%. I would expect this number to be even higher if students were tested on the

actual fish carcass instead of tested using a drawing on paper. I chose to test using the sketch in order to keep the data consistent from the pre and post test, however if I were to test again in the future, I would structure the test as a lab practical and number parts on the fish carcass so students could easier to see the actual features. Students would then be able to closely study the three dimensional parts of the fish when taking the exam compared to only viewing a two dimensional labeled photo.

Teacher surveys also helped answer the question of degree of content learned. Teachers replied that students whom do not normally perform well in science, proved to excel during this program and it better related to their level of intelligence compared to other disciplines of study. Two of the six teachers even mentioned specific names of students affected positively by this program.

Student attitudes were also measured using the teacher surveys to help answer sub question two. Suzanne Marks from Camelot stated, "All 24 of my students are highly motivated by this. It has caused an interest in writing." Debbie Bell from Orchards stated, "All my students have been motivated in some way with this project. They recognized the uniqueness of having something alive in the classroom." Five out of the six teachers said there students were more motivated to learn science while participating in the program.

The degree of content learned was also measured using student minute papers. Students expressed their interest in the overall program, especially the steelhead dissection. Their responses were summarized into five main topics that demonstrated the content learned. Students listed and described what they learned from the dissection including; 1) Analogies/descriptive observations, 2) students gave predictions, 3) students mentioned learning about life history, 4) students mentioned their least and most favorite parts of the program pertaining to overall

content learned such as learning about the life cycle, migration of a steelhead, and the structures and functions of the steelhead anatomy.

Subquestion three was assessing the impact to teachers involved with participating in the program. This question was also answered by using teacher surveys. All six teachers agreed that while implementing the program, teachers were able to fulfill several 5th grade science standards. All participating teachers enjoyed the program, especially by having mentors come into the classroom to help teach the science concepts and to help train the students to be classroom scientists by collecting data as well as making observations and predictions.

Teachers do want to improve the program next year by having additional training to be able to troubleshoot the equipment (tank, chiller and accessories) used in their classrooms when needed. We did have some equipment difficulties this spring with chiller thermostats and fish needing to be rescued from being vacuumed up in the filter. We intend to figure out practical long-term solutions to avoid these problems next year. Teachers would also like to have more communication with their mentor and additional classroom visits.

It is reasonable to conclude that both teachers and students are positively influenced by this program. If I had to conduct this research project over again, I would sample multiple schools in other outlying areas of Idaho. I would be interested in the backgrounds and influences of students and how that might affect student attitudes toward the program and what results we might find on the exam scores. I would also like to measure long-term retention of these students over 1-2 years to see if they can still retain basic anatomy terms and components of the steelhead lifecycle. It would also be interesting to see transformative impacts of this program. Going back 5 years later and surveying what students are doing, memory of the program, and

impacts would be important to measure long-term success. Similar to any research, this project opens up additional questions that could be researched further.

It would also be interesting to compare and contrast other outlying schools in the area to compare their test results. I would be interested in researching student demographics in outlying areas such as Troy, Idaho and comparing with the results that I obtained within this project. I would also like to do testing on other components of the program such as lifecycle terminology, etc. Another topic of interest would be to track these students to see if they would be potential fishing license buyers in the future.

The uniqueness of this program is admired and recognized by many agencies across the state. Many regions in the state of Idaho have Trout in the Classroom Programs, however the Clearwater Region of Idaho is the only region in the state where classes have the ability to raise anadromous fish (ocean going) like Steelhead. Local Idaho area students have the exceptional opportunity to learn about wild Steelhead as a 'threatened' species to Idaho. Students gain an increase awareness of their 'sense of place' as a result of this specialized program.

The future of the program is yet to be determined. Our goal is to be able to purchase at least one to two more tank chiller systems to accommodate two additional schools in Lewiston. Whitman Elementary and All Saints Catholic School are the only two schools that are not currently participating in this program in Lewiston. We hope to have all schools in Lewiston as participants by next spring 2014. The information in this investigation will be used when promoting the program to these two additional schools and will be used to further support and justify the importance of the program into the future.

VALUES

The Steelhead in the Classroom Program has been extremely valuable to incorporate into the classrooms at various grade levels, with a main focus in the 5th grade classrooms in Lewiston. I have heard nothing other than positive feedback from parents, chaperones, teachers, other students, principals, and various other community members. Our local news station, KLEW came down to the release day event. The media coverage has been very important to the continued success of the program. The following is a link to the short news clip that showcased our program. Retrieved May 25th, 2013 <http://www.klewtv.com/news/local/Lapwai-creek-208823781.html?tab=video&c=>.

In August, we will have a salmon camp designed as an extension of the Steelhead in the Classroom Program. Last year was our first year offering this program and we can only take 15 students due to limited availability with transportation and lodging. Students are nominated by their teachers to attend the camp. Students whom have taken initiative and expressed great interest during the Steelhead in the Classroom will be chosen for this 3-day camp.

As we continue to expand this program, I feel that these teachers' statements can be used as great testimonies for the overall effectiveness of the program and the positive impact that the program has on our local schools and community. With individual permission, we can use these quotes when soliciting donations for the program and gaining support for program expansion.

We hope to grow the program's release day by adding another day or two in May. Instead of naming it Steelhead Release Days, we are planning to call it "Steelhead Festival" week. We hope to find other sponsors that would be willing to sponsor other activities at the release festival such as other games, contests, show cases, etc. Steelhead festival week would be an opportunity

for business owners and community members to participate by sponsoring a booth to provide information, hand-outs and to help with the education component.

Data from this research study can be used to support the benefit of adding the additional schools in the near future. The positive response given within teacher attitude surveys, the improvement of test scores and student minute paper responses all conclude that the program is achieving high standards. The research results from this paper will be shared with teachers, parents, facility and staff at the new schools to illustrate the effectiveness of adding this program in hopes to convince them to add this to their existing 5th grade science curriculum.

All of our aquatic education funding comes through federal grant dollars and has to be documented as volunteer match. All teacher, mentor, and release day volunteer time can be used as a match within future grants. The main purpose of the grant dollars will be to continue to expand the program to new schools by funding the additional tanks and chiller systems.

We also plan to hopefully fund a part-time position that would coordinate all Steelhead in the Classroom activities from equipment troubleshooting, to mentor visits to the release day planning. Next year, we also plan to involve the teachers in the release day planning by incorporating their feedback into monthly release planning meetings. We hope to increase long-term program investment.

This program impacted students in a positive way. Many students wrote thank-you letters to IDFG with statements of gratitude. One student expressed his appreciation by saying, "Thank you for answering all of our questions about the fish. Another student wrote, "Thanks for coming into my class and bringing the tank and fish for us to study. Everyone enjoyed you. " Yet another said, "I really enjoyed what you taught us. Thanks for bringing the eggs. It was awesome! It really made my day."

I personally learned a substantial amount from teachers and mentors as to how to better implement the program by improving communication between mentors, incorporating more classroom visits/lessons and final release day coordination. As the release day continues to grow in student numbers, it will be even more important to include teachers, community members, parents and mentors in the planning process. Collaboration, clear, constant communication and organization on many levels will be key to creating a long lasting sustainable program.

The entire program has great value, rewards and even more future potential for growth. I feel fortunate to be a part of this program in our region. We, as an agency are very thankful to have so many local community and agency members that support our regional efforts of educating the youth of today to be leaders of tomorrow.

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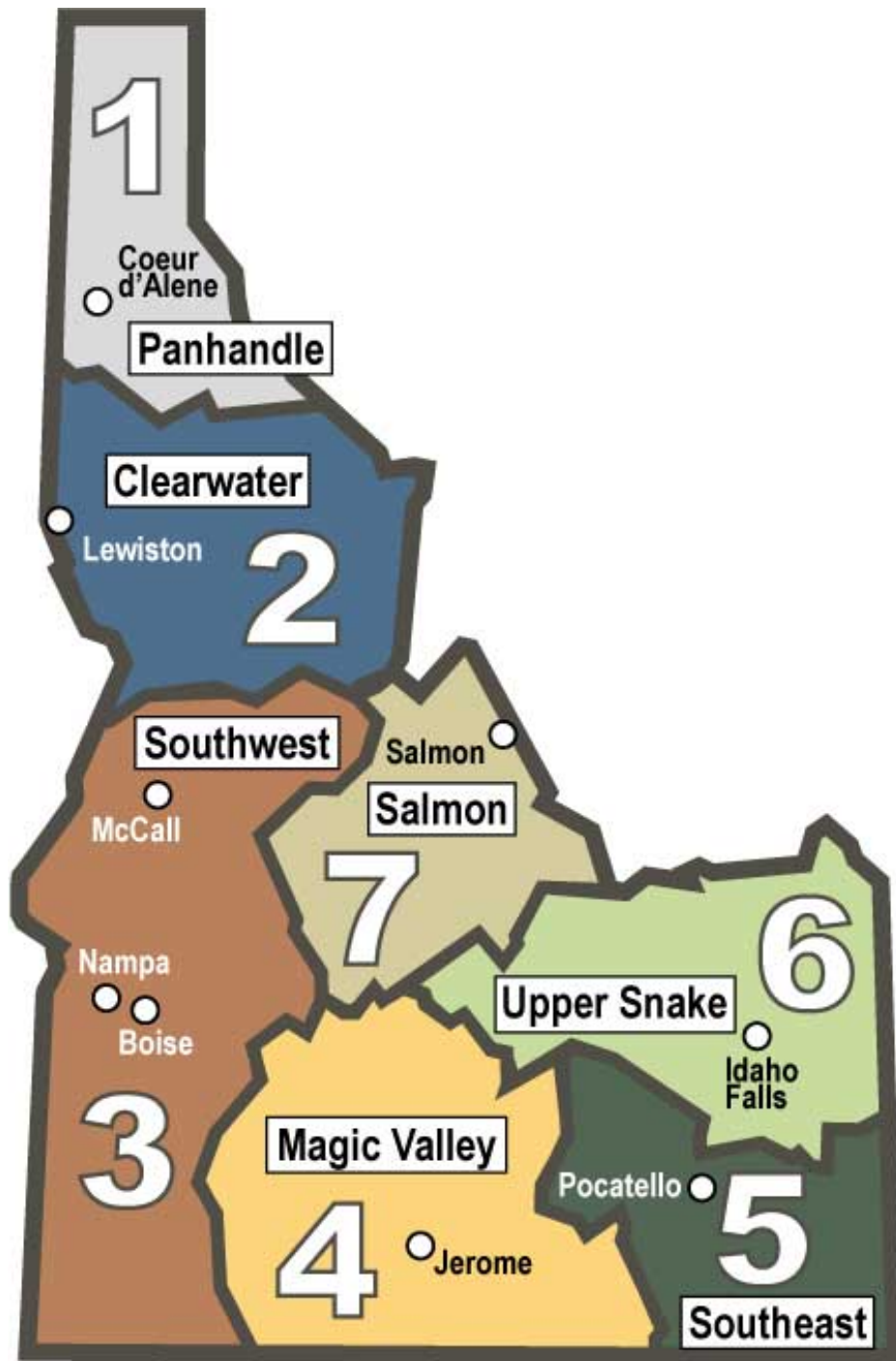
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APPENDICES

APPENDIX A

MAP OF IDAHO FISH AND GAME 7 REGIONS



APPENDIX B

TAKE ME FISHING TRAILER SCHEDULE

2013 Clearwater Region Fishing Trailer Schedule



Date	Location	Time
March 30	Mann Lake, Lewiston	10 am - 1 pm
April 6	Kiwanis Park, Lewiston	10am- 1pm
April 7	Mann Lake, Lewiston	10am- 1pm
April 13	Robinson, Kamiah	10am- 1pm
April 14	Kiwanis Park, Lewiston	10am- 1pm
April 20	Lewiston Wildlife Habitat Area Earth Day Event	10am- 1pm
April 21	Spring Valley Reservoir, Troy	10am- 1pm
April 27	Hordemann Pond, Moscow Kid's Fishing Day	10am- 1pm
April 28	Kiwanis Park, Lewiston	10am- 1pm
May 4	Mann Lake, Lewiston	10am- 1pm
May 5	Kiwanis Park, Lewiston	10am- 1pm
May 11	Robinson, Kamiah	10am- 1pm
May 12	Moose Creek Reservoir, Bovill	10am- 1pm
May 18	Tunnel Pond, Orofino Dworshak Kid's Fishing Day	8am- 1pm
May 19	Spring Valley Reservoir, Troy	10am- 1pm
May 25	Hordemann Pond, Moscow	10am- 1pm
May 26	Mann Lake, Lewiston	10am- 1pm
June 1	Kiwanis Park, Lewiston	10am- 1pm
June 2	Robinson, Kamiah	10am- 1pm
June 8	Spring Valley Reservoir, Troy Free Fishing Day	9am- noon
June 15	Dworshak State Park- Freeman Creek	9am- 3pm
June 16	Dworshak State Park- Freeman Creek	9am- noon
June 22	Moose Creek Reservoir, Bovill	10am- 1pm
June 23	Kiwanis Park, Lewiston	10am- 1pm
June 29	Deyo Reservoir, Weippe	10am- 1pm
June 30	Winchester Lake, Winchester	10am- 1pm

APPENDIX C

WATER ADDRESS ACTIVITY

This lesson plan can be adapted for students in grades K-12. In groups of four, students participate in map and simulation exercises to explore the migration of steelhead through their sense of smell.

Background

In this two-part activity, students explore the migration of steelhead through their sense of smell. Steelhead begin life as eggs in the gravel of a stream or (in the case of some Sockeye) lakeshore. They migrate down rivers to the ocean and spend several years in that vast salty environment. Then somehow at a certain time, they swim back to their "home" rivers and migrate upstream all the way to the exact place where they were born. How do they do it? Scientists think these traveling fish may receive cues from their orientation to the earth's magnetic field, plus clues from the sun's position in the sky. They also think scent plays a major part in the ability of a steelhead to find home. Your students might give some thought to how well they'd find their own homes if they had to rely only on smell!

Materials

- map of the Columbia River Drainage System
- blue ribbon, chalk or colored rope (a lot of it)
- four sample scents such as garlic, mint, chocolate, anise

Objectives

The student will be able to:

1. Trace and label the migratory route that steelhead take from the Pacific Ocean to tributaries in Idaho. (Include rivers, dams, lakes, reservoirs, and states.)
2. Describe one theory about how salmon & steelhead can find its birth stream.
3. Lead other students or classes in discussion and the migration.

Preparation

Note: The following steps are for the minimum setup; we recommend you conduct the activity this way the first time. With experience, you can increase the number of scents, choices, and routes. Each increase of scent or route increases the difficulty of the activity.

- a. Prepare the scent samples. Choose four scents such as garlic, mint, chocolate, anise. Place each scent into a container (film canisters work well).
- b. Lay out a river system using chalk, ribbon or rope. Establish "spawning routes" by placing scents in the correct order at each fork in the migration path. (One route follows the odd-numbered order of scents; one route follows the even-numbered order of scents.) Be sure to note the two correct routes. Mix up the scents for the remaining routes.

Procedure

1. Ask students to close their eyes and picture a favorite place such as the forest, a fishing spot, someone's home. Ask them to recall distinct odors or fragrances from that place.

Extensions

- To increase the challenge and learning opportunity of this activity, you may wish to have the students choose their method of learning about the life cycle of Sockeye. For example, one group could decide to interview a fisheries biologist or to look for information on the Internet. Allow a specific time for this phase and then set aside a period for the groups to share their information with each other. Have the entire class contribute to a large drawing that shows the life cycle.
- Ask students to create either visual images or a piece of creative writing that describes the life of the salmon or steelhead.
- Ask each group to choose another species of salmon and investigate its life cycle and migration.
- Ask each group to choose another animal that migrates (bald eagle, Monarch butterfly, elk) and develop a class presentation (verbal or visual) describing that migration.

Derived from: <http://idahoptv.org/dialogue4kids/season11/salmon/teachers03.cfm> on Sunday, June 9th, 2013

APPENDIX D

MONTANA STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD APPLICATION

INSTITUTIONAL REVIEW BOARD

For the Protection of Human Subjects

FWA 00000165

960 Technology Blvd. Room 127
c/o Immunology & Infectious Diseases
Montana State University
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Telephone: 406-994-6783
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MEMORANDUM

TO: Jen Bruns and Walt Woolbaugh

FROM: Mark Quinn, Chair *Mark Quinn CJ*

DATE: January 31, 2013

RE: "Identifying Ways to Incorporate Hunter Education Curriculum Components into the Classroom while Fulfilling Idaho Science Standards" [JB013113-EX]

The above research, described in your submission of January 17, 2013, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- X (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- X (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- _____ (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- _____ (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- _____ (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- _____ (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.

APPENDIX E

PREDICT A HATCH DATE ACTIVITY

So, when will our eggs hatch?



	Eyed Egg	Hatch	1 st Feed
Temp. Units:	325	520-550	875

Daily Temperature Unit = Water temp-32 F

Cumulative Temperature Unit = Daily TU + Previous Day TU

1. Need to figure out how many TU's they have today:

Hatchery TU _____

Total days at hatchery _____

Hatchery water temperature _____

Daily Hatchery TU- (Hatchery water temperature) _____ - 32 = _____

Hatchery TU = (Total days at hatchery) _____ x (Daily Hatchery TU) _____ = _____

2. How many TU will they accumulate each day in our aquarium? **Daily Aquarium TU** _____

Our aquarium's average water temperature = _____

Daily aquarium TU= Aquarium water temperature _____ - 32 = _____

3. The eggs need ~ 535 TU to hatch, so....

TU's still needed = _____

535- (Hatchery TU) _____ = _____

4. How many days?

Days needed to hatch = _____

Daily aquarium TU x days = days _____

TU still needed / Daily aquarium TU _____ = days _____

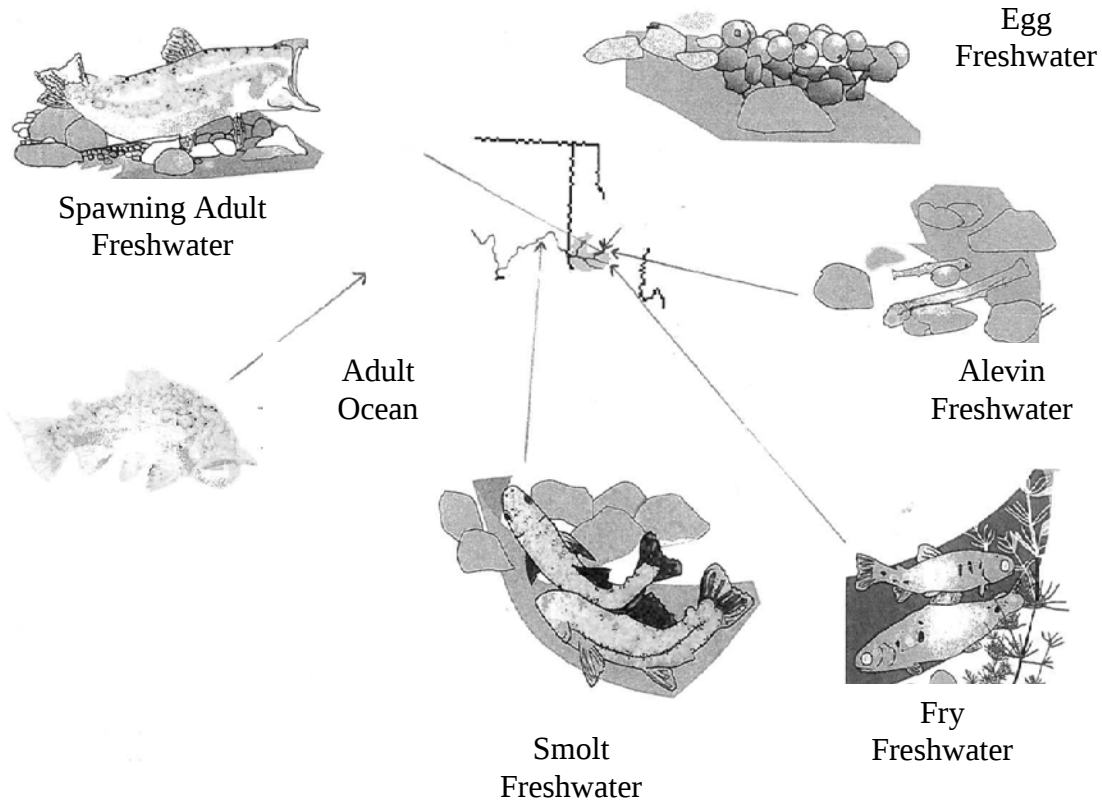
_____ / _____ = days _____

Our eggs will hatch on: Today's Date + _____ days to Hatch = **Hatch Date** _____ !!!

APPENDIX F

STEELHEAD LIFECYCLE WORKSHEET

Steelhead Lifecycle



Lifecycle Word bank

Smolt
Alevin
Adult
Fry
Spawning Adult
Egg

Water type Word bank (words can be used more than once)

Freshwater
Ocean

Next to each photo of the lifecycle, choose one of the words from the word bank in the left box to write the name of the stage of that lifecycle. In the next blank, write the appropriate water type for that stage of each lifecycle.

APPENDIX G

2013 STEELHEAD RELEASE DAY SCHEDULE

Steelhead Release: May 23, 2013

8:30 Mentor will arrive at each school to load fish
 9:15 **Student Leave School**
 9:45 Arrive at Spaulding Park, Introductions, Organize for Rotations
 10:00 Begin Stations – try your best to arrive promptly to each station
 2:30 – 2:45 Students Depart for Schools

Time	10:00-10:30	10:30-11:00	11:00-11:30	11:30-12:00	12:00-12:30	12:30-1:00	1:00 –1:30	1:30 –2:00	2:00-2:30
Station #1 Culture	Group #1	Group #8	Group #7	★	Group #6	Group #5	Group #4	Group #3	Group #2
Station #2 Water Address	Group #2	Group #1	Group #8	Group #7	★	Group #6	Group #5	Group #4	Group #3
Station #3 Stream Flow	Group #3	Group #2	Group #1	Group #8	★	Group #7	Group #6	Group #5	Group #4
Station #4 Lunch				Group #4,5,6	Group #1,3,7	Group #2,8			
Station #5 Macros	Group #4	Group #3	Group #2	Group #1*	Group #8	★	Group #7	Group #6	Group #5
Station #6 Water Quality	Group #5	Group #4	Group #3	Group #2	★	Group #1	Group #8	Group #7	Group #6
Station #7 Release	Group #6	Group #5	Group #4	Group #3	Group #2	★	Group #1	Group #8	Group #7
Station #8 Fish Trailer	Group #7	Group #6	Group #5	★	Group #4	Group #3	Group #2	Group #1	Group #8
Station #9 Hook/Ladder	Group #8	Group #7	Group #6	★	Group #5	Group #4	Group #3	Group #2	Group #1

Sponsors/Volunteers:

Idaho Department of Fish and Game
 Nez Perce Tribe: Watershed and Fisheries
 Dworshak National Fish Hatchery
 Spaulding: Nez Perce National Historical Park
 U.S. Army Corp of Engineers

Student Groups:

Group #1: Moscow Charter
 Group #2: Centennial (Kinzer)
 Group #3: Centennial (Feucht)
 Group #4: Centennial (Valdivia)
 Group #5: Lapwai
 Group #6: Camelot (Marks)
 Group #7: Camelot (Dietz)
 Group #8: Camelot (Gomez)

Educational Station Leaders:

Station #1 Nez Perce Culture

- Jaden Hudson – Nez Perce National Historical Park
- Elmer Crow

Station #2 Salmonid Water Address (Sense of Smell)

- Jeremy Sommers – Idaho Fish and Game
- Angela Feldmann – Dworshak National Fish Hatchery

Station #3 Stream Flow

- Mark Graves – U.S. Army Corps of Engineers
- Damon Keen – Idaho Fish and Game

Station #5 Macroinvertebrates

- Tim Cochnauer – Idaho Fish and Game, Retired
- Justin Peterson – Nez Perce Tribe Watershed Division

Station #6 Water Quality

- Bobby Hills – Nez Perce Tribe Watershed Division

Station #7 Steelhead Release

- Dan Dillon– Idaho Fish and Game, Clearwater Hatchery
- Ryan Banks- Idaho Fish and Game Hatchery

Station #8 Take Me Fishing Trailer

- Scott Cron – Idaho Fish and Game
- Erin Tennesen – Idaho Fish and Game

Station #9 Hook and Ladder Simulation

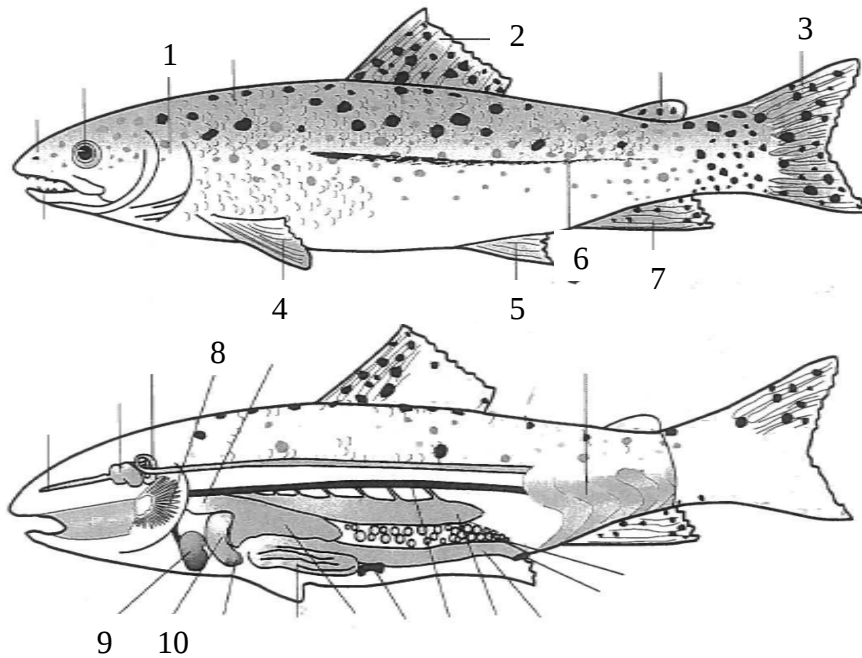
- Bill Seybold- Idaho Fish and Game

APPENDIX H

PRE & POST STEELHEAD IN THE CLASSROOM ANATOMY EXAMS

Fish External & Internal Anatomy Pre & Post-test

Name: _____ School: _____



Structure	Function
1. Operculum	To protect the gills
2. Dorsal Fin	To keep from rolling on side- keep upright
3. Caudal Fin	To power through water and act as rudder
4. Pectoral Fin	To brake; to help steer
5. Pelvic Fin	To steer; to help hover
6. Lateral Line	To sense water movement and chemicals in water
7. Anal Fin	To keep from rolling on side- keep upright/stable
8. Gills	To breathe; extracts oxygen from the water
9. Heart	To pump blood through body
10. Liver	To manufacture bile (needed to break down fat)

APPENDIX I

TEACHER SURVEY

1. What did you like about the Steelhead in the Classroom Program?

2. What are some suggestions for improvement of the Program?

3. Are you interested in participating in the program next year?

4. Do you feel the program changed student motivation to learn science?
If so, were students (please circle/highlight one choice)

more motivated

less motivated

About the same motivation

Can you list the names of any students in your that were especially motivated by this program?

Do these students normally perform well in science?

5. Do you feel that the program has been useful to teach science concepts?

What science standard connections were you able to make through this program?

In other words, please list some of the 5th grade science standards that you were able to fulfill by using this program in your class.

APPENDIX J

IDAHO 5TH GRADE SCIENCE STANDARDS

Standard 1: Nature of Science

Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 1.1: Understand Systems, Order, and Organization	5.S.1.1.1 Compare and contrast different systems.						
Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations	5.S.1.2.1 Use observations and data as evidence on which to base scientific explanations and predictions.	5.S.1.2.2 Explain the difference between observation and inference.	5.S.1.2.3 Use models to explain or demonstrate a concept.				
Goal 1.3: Understand Constancy, Change, and Measurement	5.S.1.3.1 Analyze changes that occur in and among systems.	5.S.1.3.2 Measure in both U.S. Customary and International System of Measurement (metric system) units with an emphasis on the metric system.					
Goal 1.5: Understand Concepts of Form and Function	5.S.1.5.1 Explain how the shape or form of an object or system is frequently related to its use or function.						
Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	5.S.1.6.1 Write and analyze questions that can be answered by conducting scientific experiments.	5.S.1.6.2 Conduct scientific investigations using a control and a variable.	5.S.1.6.3 Select and use appropriate tools and techniques to gather and display data.	5.S.1.6.4 Use evidence to analyze descriptions, explanations, predictions, and models.	5.S.1.6.5 State a hypothesis based on observations.	5.S.1.6.6 Compare alternative explanations and predictions.	5.S.1.6.7 Communicate scientific procedures and explanations.

Standard 5: Personal and Social Perspectives; Technology

Goals:	Objective 1	Objective 2
Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced	5.S.5.1.1 Identify issues for environmental studies. CL: E Content Limit: Content should be limited to events in the local school or community environment. For example: Food waste from the hot lunch program, storm runoff entering a local stream, and the impact of wild fires.	