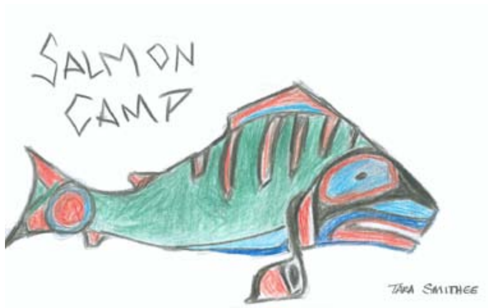
FINAL REPORT

SALMON CAMP RESEARCH TEAM



National Science Foundation Information Technology Experiences for Students and Teachers Grant

Oregon Museum of Science and Industry

January 2007

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Portland, Oregon 97204

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ANNUAL REPORT

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National Science Foundation Information Technology Experiences for Students and Teachers Grant

Oregon Museum of Science and Industry

October 1, 2005—December 31, 2006

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EXECUTIVE SUMMARY

A synergy swirls among components of an experience known as *Salmon Camp Research Team* (simply referred to as *Salmon Camp* by participants and constituents). The experience—far from a typical summer camp—fuses together components of indigenous knowledge, cutting edge western science, field experience, learning in culturally and ecologically significant places, mentors, and friends, in a program for Native American youth in the northwest region of the United States of America. Salmon hold a special significance to native and non-native northwesterners. Salmon habitats focus study and provide a narrative for Salmon Camp to expose urban and suburban youth with tribal affiliations to cultural and scientific knowledge. The result holds promise as a model for engaging Native American students in meaningful studies and contributions to communities.

The Salmon Camp Research Team (SCRT) project is sponsored by the Oregon Museum of Science and Industry (OMSI). It evolved in conjunction with tribal leaders, and OMSI Native and non-native staff members over the course of over 10 years before receiving funding under the National Science Foundation (NSF) program, Information Technology Experiences for Students and Teachers (ITEST). The long-term aim of Salmon Camp under NSF funding was to increase representation of Native Americans in science and information technology-related career fields, evidence of which is beyond the scope of this evaluation. A deeper long-standing goal of Salmon Camp is to recognize and advance the gifts that individual students bring to the Native American community and advance their ability to contribute meaningfully to that community.

Salmon Camp strives to provide middle and high school students with engaging and personally relevant experiences that build skills and knowledge through summer camps, enrichment programs on weekends through the school year, and weeklong spring break sessions. Participating students have Native American community affiliations and are interested in advancing their learning to pursue technologically rich careers or areas of study. Students come from a wide variety of indigenous backgrounds. Many, have limited cultural experience with their Native American communities. During the final year of NSF funding, students identified 44 different tribes with which they were affiliated.

The NSF-ITEST summer high school Salmon Camp Research Teams were immersed in field research for three and a half weeks. The three sessions, each composed of about 10 students, study three different ecological regions, in Oregon; California; and Washington/British Columbia. The research teams spent their days exploring local ecosystems, learning traditional Native American knowledge, or working with researchers on real-life problems. When working with researchers, students gained hands-on experience, participating directly with university, tribal, and agency scientists or natural resource managers. They joined ongoing studies, and were often collecting authentic data which will be used by researchers. Students were exposed to advanced technologies currently used in salmon recovery and habitat restoration such as Global Positioning System (GPS) units and Geographic Information Systems (GIS), telemetry equipment, and water quality assessment instruments. The students and counselors either tent camped or stayed at research stations as they traveled to various study sites. High school students also selected a related topic of interest to study and reported on their topics through an oral presentation with a supporting PowerPoint slideshow. During the final salmon bake prepared by local tribal members, students presented their research topics to an audience of fellow campers, elders, parents, and interested researchers.

The middle school experience was less intensive than the high school program, spanning one week at a residential camp with an overnight camping trip. Approximately, 25 students participated in the middle school summer sessions each year.

Evaluation findings drew from a wide range of strategies and instruments used for formative and summative feedback. The project was found to be highly successful in achieving objectives. Students attributed gains in cultural identity as well as increased technology skills and science knowledge to involvement in Salmon Camp. The analyses of matched pre- post-involvement student surveys, showed participants reported educationally significant gains in their science, technology, engineering, and mathematics (STEM) career preparation, and workplace skills. In self-reported ratings of science self-efficacy, increased numbers of students reported on their final surveys that they would choose to take an elective science class and could handle more difficult science. Field journal entries captured the content students learned during camps as well as ways in which they were integrating new knowledge by describing how activities helped build understanding of the "big picture" of salmon restoration/ecology.

Student interviews revealed that most students considered working in a science career in the future and appreciated aspects of Salmon Camp that helped them explore their career interests. Nearly all high school interviewees said that Salmon Camp helped them build skills used in a job. Participants specifically cited technology and computer skills, communication and people skills, and career exploration as areas in which they grew through involvement in SCRT. Most students and parents interviewed identified ways in which Salmon Camp helped them succeed in school and developed the knowledge and skills necessary to take advanced mathematics or science classes. Across topics and sessions, students attributed gains to the hands-on nature of the Salmon Camp experience. In addition, the approach of collaboration with researchers in the field on real world inquiries was viewed as highly successful to building skills and understanding.

Acknowledgements

My thanks to the many folks who contributed data for this report. My appreciation goes out to OMSI staff members Marcie Benne, Ivy Feibelman, and Cate Rhodes who were valuable colleagues and collaborators. Thanks also go to the SCRT leaders, Travis Southworth-Neumeyer and Dan Calvert as well as counselors who assisted with data collection and provided candid insight into project implementation. And of course, a note of thanks to my colleagues at NWREL who have helped with data entry, crunching, and editing. Finally, I greatly appreciate the patience in completing surveys, and honest reflections students and parents provided. You make it all worthwhile.

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PROJECT OVERVIEW

The Oregon Museum of Science and Industry (OMSI) is striving to provide middle and high school students with engaging and personally relevant experiences that build skills and knowledge through the Salmon Camp Research Team (SCRT) project. Participating students have Native American community affiliations and are interested in advancing their learning to pursue technologically rich careers or areas of study. The long-term goal of Salmon Camp is to increase representation of Native Americans in IT-related career fields.

During the 2005-2006 project cycle, activities included curriculum development for summer 2006 camps, enrichment sessions during the 2005-2006 school year (and fall 2006), three spring break camps, and the implementation of three summer sessions for high school aged students as well as one session for middle school students. High school spring break sessions took students to two different areas. The first session engaged students with First Nations members and university researchers on Vancouver Island in British Columbia. The second session brought students to the San Juan Islands and Olympic Peninsula area. The middle school spring break camp was conducted out of OMSI's Hancock Field Station. In the summer camps, high school sessions explored three different ecological regions, in Oregon; California; and Washington/British Columbia. Twenty-eight students participated in the summer high school research team sessions. The middle school program operated out of Cascade Science School, in central Oregon. The summer middle school group totaled 32 students.

The fall enrichments sessions were typically conducted over a weekend and provided an opportunity for students to sustain interest and involvement in Salmon Camp activities during the school year. Continuing a frustrating trend over the previous two years, 2005-2006 Enrichment Sessions which were designed, arranged, and had verbal commitments from students to attend, did not all occur, as students failed to show up for two sessions. Reportedly, conflicts with transportation, high school sports, and personal commitments precluded students from attending the other sessions. However, students followed-through on attending four out of the six sessions offered. The fall 2006 no-cost extension of the grant provided additional enrichment opportunities for students, resulting in a total of one enrichment session in the fall 2005, one in winter 2006, and two in fall 2006. Across the four sessions that occurred, 28 students participated. Taken together, 2005-2006 enrollments for Salmon Camp Research Team Enrichments, Spring Break, and Summer sessions totaled to 126 students (which is a duplicate count of individuals since most students attend more than one session).

Each of the summer high school research teams participated in an intensive experience over the two and a half-week camp period. The groups spent their days exploring local ecosystems, learning traditional Native American knowledge, or working with researchers. The students and counselors either tent camped or stayed at research stations as they traveled to various study sites. The weeklong summer middle school team used OMSI's Cascade Science School as a residential camp with trips launched from there. The students in both middle and high school groups worked directly with university, tribal, and agency scientists, researchers, and natural resource managers. Students were exposed to advanced technologies currently used in salmon recovery and habitat restoration such as Global Positioning System (GPS) units and Geographic Information Systems (GIS), as well as task-specific technologies for habitat monitoring.

Summer camp high school students also selected a related topic of interest to study and report on through an oral presentation with a supporting PowerPoint slideshow. Students presented their research topics during the culminating Salmon Bake at the end of the high school summer sessions. Students presented to an audience of fellow campers, and invited elders, parents, and researchers.

EVALUATION ACTIVITIES

The goal of the Salmon Camp project was to create a continuum of culturally relevant, information technology (IT)-focused, science experiences for middle school through high school students with Native American community affiliations to address their educational career needs.

To reach this goal, the objectives of the project were to:

1a. Develop and disseminate a model science IT program that addresses national and state education standards and is relevant to the cultural experience of Native American students.

1b. Immerse students in a culturally relevant, IT intensive, scientific research experience that will allow them to apply information technology to the resolution of real world natural resource problems.

2. Enable students to gain experiences and skills necessary to obtain science and IT-related internships and jobs.
3. Enable students to work together with educational and professional mentors through cooperative hands-on, inquiry-based research activities.
4. Provide students with opportunities to interact in a positive and supportive learning and work environment.

To evaluate the project's achievement in meeting its goal and objectives, a multiple measures approach was used to gather input from participants and assess impact. The evaluation included quantitative and qualitative methods that facilitated triangulation of findings. Annual student surveys, End-of-session feedback forms, in-camp interviews, a sample of collaborating researcher phone interviews, and field journals were used to measure progress. Copies of the instruments may be found in Appendix A.

At the beginning of each high school camp session, students completed a survey using laptops in the field. The SCRT Student Survey was developed by NWREL in collaboration with the OMSI evaluator and Salmon Camp coordinator in 2004 and slightly modified each year. (See Appendix A-1 for a copy of the 2006 SCRT Student Survey form.) The survey was used each year before the summer camp sessions as a repeated-measures design to show changes over time. Content of the survey includes items on attitudes toward science, technology skills, experience with science, as well as workplace and basic academic skills derived from Secretary's Commission on Achieving Necessary Skills (SCANS). The middle school student survey was modified in 2005 to be more age appropriate. It was completed by students on laptops at the conclusion of their 2006 session.

During the high school camp sessions, an in-camp interview was conducted with each student by the coordinator. The in-camp interview guides were created to learn more about the participants' interests in science careers, computers and technology, job skills, and the relationship of SCRT to success in school. The interviews contained a series of questions that were common across interviews (see sample in Appendix A-2).

An evaluator attended the culminating Salmon Bake for the middle school session. This provided an informal opportunity to discuss Salmon Camp with counselors, Native American adults who have been involved in the program, or were preparing the Salmon Bake. The culminating Salmon Bake also provided an opportunity to conduct informal interviews with students.

To gather information on students' perception of the value of participation in Salmon Camp, students were asked to write letters to future Salmon Campers. The content of the letters focused on outcomes by asking participants to describe why other students should attend Salmon Camp and what they might gain from the experience. The letters were written as recommendations to future campers, highlighting ways in which others would benefit by involvement in Salmon Camp.

The conclusion of each of the camps included an End-of-session feedback form which contains closed-response Likert-style ratings on camp implementation and impact as well as qualitative items to provide insight into the most successful or effective aspects of the camp session. (See Appendix A-3.)

Ongoing communications between NWREL and project leaders/OMSI staff members provided feedback on implementation for SCRT planners and evaluators. The variety of evaluation activities provided documentation of activities and data to measure project impact.

Taken together, these activities provide data to answer broad evaluation questions. Overarching evaluation questions focus on continuous improvement, the degree to which the Salmon Camp project achieves its objectives with regards to students' skills and attitudes, as well as implementation and outcome questions. Evaluation activities are designed to probe five major areas:

1. **Student Knowledge and Skills.** To what extent do students gain experience with digital tools, field research, and workplace skills?
2. **Student Attitudes.** How are students' attitudes and self-efficacy as science students changing with involvement in Salmon Camp? How are career interests changing or deepening? Are there differences in these dispositions based on level of participation in activities?
3. **Implementation.** What is the fidelity of project implementation? Is the project being implemented as envisioned? What factors influence implementation? What is the level of participation? Are cultural as well as technical aspects of the project being addressed?
4. **Outcomes.** What impact is the project having? Are there unanticipated or ancillary impacts to the community of learners involved in Salmon Camp? How are former Salmon Campers, counselors, mentors, researchers, parents, and family members influenced by the project?
5. **Continuous Improvement.** How can the project improve? What is working? How can evaluation findings be most useful to the project as it unfolds?

ACHIEVING OBJECTIVES

Participation

Over the course of the project 177 different students participated in at least one Salmon Camp session. Most students attended more than one session during a given year and a core of 23 students attended sessions for more than one year. In the 2005-2006 year, 61 different students participated in sessions. The group was 55 percent male. Fifty-four percent attended at least one middle school session (46% high school).

Activities

Project activities were designed to achieve multiple objectives with strategies complementing each other and building on previous or ongoing activities. Although a linear model does not capture the dynamic well it does show key connections between objectives and activities. Table 1 shows objectives associated with primary strategies used to achieve the objective. Highlighted areas were not implemented as originally envisioned.

Table 1
SCRT Objectives and Implementation

Objectives	Strategies/Activities
(1a) Develop and disseminate a model science and IT program that addresses national and state education standards and is relevant to the cultural experience of Native American students.	HS: 3-week summer program MS: 1-week summer program Annual Science Enrichment Activities HS&MS: 1-week spring break program (2 HS sessions held in 2006) HS&MS: 12-14 weekend residential programs (4 Enrichment sessions held in 2006)
(1b) Immerse students in a culturally relevant, IT intensive, scientific research experience that will allow them to apply information technology to the resolution of real world natural resource problems.	Side-by-side collaboration with: • Researchers in the field • Native Americans with traditional ecological knowledge
(2) Students will gain experiences and skills necessary to obtain science and IT-related internships and jobs.	Exposure to: • Advanced information technology used by scientists and resource managers • Career opportunities
(3) Students will work together with educational and professional mentors through cooperative hands-on, inquiry-based research activities.	Personal connection to local: • Academic mentors • Professional mentors
(4) Provide students with opportunities to interact in a positive and supportive learning and work environment.	Participation in: • Authentic data collection • Engaging field experiences

Leadership

The stability of retaining the Salmon Camp coordinator from the end of the summer 2004 sessions for the duration of the project promoted fidelity in implementation, continuous improvement of project, built ongoing relationships with collaborating field researchers, and sustained personal relationships with students over time. The retention of staff members also enabled leaders to know students and use exemplary and interested students as junior counselors. This “grow your own” approach to staffing proved an effective strategy for building capacity among experienced Salmon Campers as well as role models for other students. Planning and organizational work occurred throughout the year in preparation for ongoing Enrichment Sessions as well as the spring break and summer camp sessions. Planning was greatly facilitated by contacts from previous years and an understanding of beneficial activities based on experience. Through project activities, the heaviest attention was given to exposing students to the nature of field work, habitat restoration/preservation, and Native American knowledge. Students also received increased exposure to advanced information technology tools each year. The following sections synthesize findings from the full course of evaluation strategies to draw conclusions on the extent to which the project accomplished each objective.

Objective One, Part A

Develop and disseminate a model science and IT program that addresses national and state education standards and is relevant to the cultural experience of Native American students.

The Salmon Camp Research Team project has been a demonstration project for the efficacy of the approach as a model program. The “model” emerged from about 14 years of the previous OMSI camps director working with partners from fisheries, tribal leaders, Oregon State University, Bonneville Power Administration, U.W. Fish and Wildlife, Lucent Technologies and the National Science Foundation to develop an educational and culturally relevant program for Native American youth. As the structure and approach of the program solidified, OMSI staff members saw the potential for the program to be exemplar. Under NSF funding, SCRT leaders used past experience, contacts, and seasoned staff members to hold the program to more rigorous standards and integrate more content into the curriculum. In 2004, the staff members and students adjusted to increased emphasis on technology tools which gained increased attention under the ITEST funding. This emphasis was increasingly important in successive years.

From campers’ and parents’ perspective, Salmon Camp was a highly effective model for learning science content and technology skills. All returning high school campers reported that they would recommend SCRT to others and that the experience made them more curious about science.

In 2005, parents unanimously reported that the experience was “great” for their children and saw concrete ways in which the experience supported their children’s learning in school. Staff members have worked to align the curriculum with academic standards which enabled some students to accrue science credit for participation in Salmon Camp. See Appendix B for a copy of the standards alignment document used to show how Salmon Camp content addresses national science standards. Parents and students reported ways in which Salmon Camp content enriched students' understanding of topics covered in school science and in other nonformal settings.

Through compelling letters to future campers written by experienced SCRT students, they passionately described ways in which Salmon Camp participation fostered interest and success in school science. The letters capture in students' own words, the personal significance of project involvement and its relevancy to their lives as Native American youth. Their rich descriptions of impact warrant reading individually and may be found in Appendix C.

Striking a balance between science, field research, IT experiences and cultural knowledge is a delicate task. The balancing act is highly dependent on staff members with a range of skills and the ability to weave activities into a coherent experience. The stability of having the project director successfully complete two and a half years' worth of activities, enabled the project to build on procedural knowledge accrued from previous years. The importance of dynamic staff members with a range of expertise is a critical variable as the project develops with potential for wider dissemination.

The importance of cultural identity to academic success for Native American youth has been documented by numerous researchers (Deyhle, 1995; Huffman, 1993) and is a premise of the Salmon Camp Research Teams. For any science immersion program to be most effective for Native American students developing cultural appreciation, awareness, and identity are crucial program components. During the 2005-2006 reporting year, an open-ended question was added to the End-of-session surveys specifically asking students about how Salmon Camp impacted their awareness of Native American culture. Nearly all respondents were able to identify Native American cultural impacts from participation in Salmon Camp sessions. As shown in table 1, responses clustered around three broad ways in which Salmon Camp impacted students' awareness of Native American culture, although many students also noted that they generally were impacted "a lot." Areas of major impact were:

- "Increased understanding of Native ways of knowing, common cultural dispositions, concerns/issues in tribal communities," exemplified by comments such as:
    - *I got to learn more about salmon and what it means to us natives.*
    - *Every Native American is connected to each other in some way!*
    - *It taught me about the natives of the past and how to help my people in the future.*
- "Increased understanding of other tribal cultures, differences and similarities among tribal cultures," an area of impact revealed through comments such as:
    - *Salmon Camp has made me more aware of how different and how similar many of the tribes are!*
    - *It has shown me that customs are the same with almost every native culture*
    - *It shows you different ways Native Americans use salmon and how they get it!*

- "Learned more about 'who I am' as a Native American, increased appreciation of own culture, increased pride as Native American, increased interest in learning more," evident in responses such as:
    - *I've learned so much with talking and sharing experiences with elders and native teens. These meetings may help with things in our future.*
    - *When I'm home, we don't really have traditions, or culture taught at all. My families not really into the Native American things. When I come with Salmon Camp, it's like a new and different family and we learn science and N.A. culture together which to me is a life changing event at every trip!*

A content analysis of responses was used to identify common themes and clusters of responses, shown in the table below. See Appendix D for verbatim responses.

Table 2
Ways in Which Salmon Camp Impacted Students' Awareness of Native American Culture

Response Clusters	High School Summer n=26	Middle School Summer n=25	High School Spring Break n=16	Middle School Spring Break n=20	Fall 2006 Enrichments n=12
Increased understanding of Native ways of knowing, common cultural dispositions, concerns/issues in tribal communities	27% (7)	24% (6)	31% (5)	50% (10)	41% (5)
Increased understanding of other tribal cultures, differences and similarities among tribal cultures	31% (8)	20% (5)	56% (9)	25% (5)	41% (5)
Learned more about "who I am" as a Native American, increased appreciation of own culture, increased pride as Native American, increased interest in learning more	31% (8)	8% (2)	25% (4)	35% (7)	17% (2)
Generally increased awareness	12% (3)	28% (7)	13% (2)	10% (2)	—
Developed friendships with other Native American students	—		13% (2)	—	8% (1)
Don't know/no response	4% (1)	16% (4)	6% (1)	—	—
It did not/not that much	—	8% (2)	6% (1)	—	17% (2)

Dissemination of the model was facilitated by presentations at national conferences. For the third sequential year, the current Salmon Camp coordinator was part of a panel presentation for the annual conference of the Association of Science-Technology Centers meeting. He gave an overview of the project with a PowerPoint presentation on the summer's programs. The presentation provided an orientation to the kinds of work taking place under ITEST projects with "intensive, student-centered, hands-on information technology experiences that are embedded in scientific content." The Salmon Camp coordinator, Science Camps director, and NWREL evaluator also attended the annual ITEST conference in 2006 and have been active participants in the online discussions organized by the Learning Resource Center.

Objective One Part B

Immerse students in a culturally relevant, IT intensive, scientific research experience that will allow them to apply information technology to the resolution of real world natural resource problems.

The SCRT approach of learning to use technology through task-embedded experiences helped build students' IT skills through authentic research. Feedback from students documented ways in which summer camps provided participants with exposure to science researchers in the field as well as a culturally relevant experience for Native American students. Each year, some students commented on the End-of-session forms that learning about traditional Native American practices, particularly salmon fishing and traditional salmon baking were interesting aspects of camp. The culminating Salmon Bake put on by tribal members at the end of each summer session and Native American staff members involved in programming provided significant cultural context for students. The Salmon Bake used traditional Native American recipes and traditions to prepare and share the meal. During each session, local tribal members shared expertise with students on topics such as fish hatcheries, indigenous knowledge, cultural traditions, and indigenous uses of native plants.

The End-of-session feedback forms used a four-point scale ranging from "No way" to "Yes!" (A sample form may be found in Appendix A-3, with results in Appendix D.) For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest. On the End-of-session feedback forms, most students agreed that they learned about resource management, gained skills in using technology in science research, and increased their science knowledge.

The 2006 high school spring break camps posted the highest levels of agreement on both resource management and science knowledge. During these sessions, students were immersed in collecting authentic data that researchers would be using for their studies. While on the British Columbia trip, collaboration with University of Victoria doctoral students enabled Salmon Campers to use GPS/GIS tools to mark invasive plant species in a local nature preserve, then apply the data to maps using ArcView software. During the Washington trip, the team worked with University of Washington researchers on archaeological surveys of shell midden deposits on Canoe Island. Salmon Campers mapped the sites using Trimble GPS units and learned protocols for conducting archaeological surveys. The rich infusion of technology skills and science knowledge proved highly successful and exemplify work on this objective. Table 3 shows means for middle and high school summer and spring break sessions on relevant questions.

Table 3
SCRT Survey Responses on Resource Management, Technology in Science Research, and Science Knowledge Summer Sessions 2004-2006 Spring Break Session 2005-2006

Survey Item	Year and Session	High School Mean (s.d.)	Middle School Mean (s.d.)	N
		1-4 Scale, 4= Highest Rating		
Did you learn about resource management?	2004 Summer Camp	3.7 (.6)		19
			3.2 (.8)	23
	2005 Summer Camp	3.2 (.6)		24
			3.0 (.7)	24
	2006 Summer Camp	3.5 (.5)		28
			3.3 (.6)	32
	2005 Spring Break	3.4 (.5)		10
			3.1 (.7)	22
	2006 Spring Break	3.5 (.7)		17
			3.4 (.7)	21
Did you gain skills in using technology in science research?	2004 Summer Camp	3.7 (.7)		19
			3.4 (.7)	23
	2005 Summer Camp	3.2 (.8)		24
			3.1 (.7)	24
	2006 Summer Camp	3.6 (.6)		28
			3.3 (.8)	32
	2005 Spring Break	3.4 (.7)		10
			2.9 (.6)	22
	2006 Spring Break	3.8 (.4)		17
			3.1 (.8)	21
Did you increase your science knowledge?*	2004 Summer Camp	NA		0
			NA	0
	2005 Summer Camp	3.4 (.8)		24
			3.5 (.7)	24
	2006 Summer Camp	3.7 (.5)		28
			3.4 (.8)	32
	2005 Spring Break	NA		0
			NA	0
	2006 Spring Break	3.8 (.6)		17
			3.7 (.5)	21

* This item was added summer 2005.

End-of-session data were also collected for four Enrichment Sessions held between fall 2005 and fall 2006. Three of the Enrichment Sessions were held over a weekend, the fall 2006 session was a full week. Feedback from the Enrichment sessions was comparable to that of the longer summer sessions. Table 4 shows these data.

Table 4
SCRT Survey Responses on Resource Management, Technology in Science Research, and Science Knowledge Combined High School and Middle School Enrichments

Survey Item	Year and Session	Mean (s.d.)	N
Did you learn about resource management?	2004-2005	3.3 (.6)	15
	2005-2006	3.8 (.7)	28
Did you gain skills in using technology in science research?	2004-2005	3.4 (.6)	15
	2005-2006	3.8 (.6)	28
Did you increase your science knowledge?	2004-2005	NA	0
	2005-2006	3.8 (.4)	28

Overall, feedback from all of the 2005-2006 Salmon Camp Research Team sessions was very positive and documented that students learned to use GPS units and were exposed to other technological tools as well as learning science and resource management content through work on real world natural resource problems.

Objective Two

Students will gain experiences and skills necessary to obtain science and IT-related internships and jobs.

A primary metric to gauge student gains in experience and skills was the SCRT Student Survey. The survey was developed in collaboration with OMSI staff members as a repeated measures tool. Content of the survey includes items on attitudes toward science, technology skills, experience with science, as well as workplace and basic academic skills. The instrument draws from the Fennema-Sherman Attitude Scales (Fennema and Sherman, 1976), Efficacy Indices developed by NWREL for measuring self-efficacy with regards to technology, ProfilerPro (Profiler, 2004), and the Secretary's Commission on Achieving Necessary Skills (SCANS, 1991).

In 2004, the survey was administered for baseline data collection on the first day of each SCRT session and was completed by students in the field using a bank of 10 portable laptops. In 2005 the survey was also administered as one of the first camp activities, and in 2006, as a final assessment. As an integrated activity for each session, the survey aligned with the Information Technology-rich camp experience and acted as a performance assessment as staff members observed student completion of the instrument. Most high school students readily used the dropdown boxes and easily saved their surveys to both the desktop and removable disk. A few students were slowed by a lack of typing proficiency, most showed adequate keyboarding skills. Middle school students struggled with the survey completion during the Spring Break camp in 2005. Students were primarily challenged by the terminology used in items which resulted in a lack of understanding on some items. The misunderstandings resulted in high levels of inaccurate self-reporting. These reactions prompted the evaluation team to revise the middle school survey and use a simplified paper copy during the middle school camps in 2005 and an electronic version of the simplified survey in 2006.

SCRT High School Student Survey Findings

A matched set of surveys was used for a more rigorous final analysis of the student survey data from baseline to their final surveys. Twenty-three SCRT students completed two surveys either in 2004 and 2005, 2004 and 2006, or 2005 and 2006. They served as the pre- post-implementation study group. This matched group was composed of 10 males and 13 females. Students ranged in grade from eighth to twelfth grade, all were Native American. Most students participated in all types of sessions available to them (spring break, summer, and enrichments). Survey results documented students' self-reported attitudes and skills before their participation in the first NSF-ITEST Salmon Camp and at the final NSF-funded camp (one or two years later).

The baseline to final data showed that students overall reported greatest gains in science, technology, engineering, math (STEM) career preparation. The survey rating scales used a "1" to "5" coding with "5" as the highest rating. Negatively worded items were reversed to generate means that consistently report higher ratings as more positive. The full data tables may be found in Appendix E. The following table shows means and standard deviations for indices composed of several items each from the student survey.

Table 5
SCRT Student Survey Responses on Survey Subscales

Survey Index	Mean (Standard Deviation)	
	Pre	Post
Confidence and Self-Efficacy with Science	3.8 (.6)	3.8 (.5)
School computer use	3.7 (.8)	3.6 (.7)
IT Applications	3.4 (.7)	3.2 (1.1)
Internet proficiency	4.2 (.5)	4.3 (.6)
Advanced Technology Proficiency	3.8 (.9)	4.0 (.7)
STEM Career preparation	3.4 (.8)	3.7 (.7)
SCANS skills	3.6 (.7)	3.5 (.7)
Basic skills	3.5 (1.0)	3.5 (.4)

Pre- post-involvement changes on index means were not found to be statistically significant on any of the subscales. However, gains on the STEM career preparations would be considered educationally significant (using a guideline of gains of half of the item's standard deviation).

Since the index means do not provide insight into specific areas of growth, the following sections highlight gains on items within each index.

Science Self-efficacy

Although no significant change was reported in means for the index on science self-efficacy, three of the items on the subscale emerged in the pre-post analysis as attitudinal questions that pointed toward areas where students reported greater gains than in other areas. These areas speak positively to students' confidence in themselves as science learners. In addition, *fewer* students agreed with an item suggesting a *lack* of self-confidence in science as shown in the following table.

Table 6
Gains in Science Self-efficacy
N=23

Survey Item	Percentage Agreement	
	Pre-	Post-
I would choose to take an elective science class.	60	68
I think I could handle more difficult science.	48	57
Most subjects I can handle OK, but I just can't do a good job in science.	13	9

School Computer Use

The next section of the survey asked students to report on the kinds of things they do "a lot" using a computer at school. Throughout the project period, students reported high rates of:

- Looking up information on the World Wide Web
- Word processing activities
- Creating presentations (PowerPoint, KidPix, etc.)

Although word processing activities were already commonly reported at baseline, students reported increased rates of "strongly agreeing" that they often word processed in school (from 26% to 39% strongly agreeing, pre- post-implementation). These findings suggest that over time students continued or expanded their use of standard IT tools.

IT Applications

In the baseline to final data, students reported gains in their abilities to use advanced features of a word processor and use formulas in spreadsheets. On “Use advanced features of a word processor (tables, headers and footers, macros, table of contents, columns, etc.)” a striking number of students shifted to the “strongly agree” rating on their final surveys, from 22 percent to 52 percent (evident in the data tables in Appendix E). Internet related skills in which students reported high proficiency at baseline received comparable or higher ratings on final surveys. Students posted gains in their skills with e-mail attachments and maintaining Web sites. The following table shows gains in student agreement levels on IT Applications and Internet proficiency.

Table 7
SCRT Student Survey Responses on IT Applications and Internet Proficiency
N=23

Survey Item	Percentage Agreement	
	Pre-	Post-
Use formulas and/or functions in a spreadsheet (Excel, SPSS, SAS, etc.)	43	62
Send, receive, and open e-mail attachments	87	96
Maintain/edit a Web site	56	72

Advanced IT Skills

Students reported strong gains in their abilities to scan a document and work with graphics, as shown in the following table.

Table 8
SCRT Student Survey Responses on Advanced IT Skills
N=23

Survey Item	Percentage Agreement	
	Pre-	Post-
Scan a document	52	73
Reduce, enlarge, or crop a graphic	65	77
Convert graphics from one file format to another	39	68

Increased use of digital cameras in the last four years as well as students’ experience in developing PowerPoint presentations during SCRT for presentation at the final Salmon Bakes, may have contributed to gains in manipulating digital images.

STEM Career Preparation

The pre-post matched Salmon Campers reported strong gains on many items in this subscale and overall greater change was reported than on other indices. Perhaps most significant are increases posted in students' knowledge of steps to take to prepare for a career in science/resource management, from 55 percent agreement at baseline to 86 percent agreement on the final surveys. While change in this area may be associated with student maturation, SCRT exposure to university researchers and college programs may also have facilitated gains. Items of notable change are highlighted in the following table.

Table 9
SCRT Student Survey Responses on STEM Career Preparation
N=23

Survey Item	Percentage Agreement	
	Pre-	Post-
I can explain how computer applications are used in science.	26	37
I have been involved in activities that help me think about science/resource management career options.	70	78
I know which classes I should take to help me succeed in a science career.	74	82
I know of steps I can take to prepare for a career in science/resource management.	55	86

SCANS Skills

Strong growth was registered over the years on the survey rating scales on workplace skills. Students reported gains on nearly all SCANS skill items, with most students noting that they were at least "OK" on all workplace skills.

Table 10
SCRT Student Survey Responses on SCANS Skills
N=23

Survey Item	Percentage Agreement	
	Pre-	Post-
I plan my time, money, materials, and space to get things done.	62	74
I think creatively to imagine new ideas.	91	96
I use logical reasoning to make decisions.	77	83
I take careful steps when I am trying to solve problems.	50	72
I can draw conclusions from reliable evidence.	82	95

Basic Skills

In most basic skill areas, students rated themselves slightly higher from baseline to final, as would be expected with maturation and advancement in school. In speaking, final ratings were slightly lower than baseline. Mathematics was the area where most students rated themselves as good or great in previous years, however in 2006, this was the weakest area and one in which students grew less confident in their abilities, perhaps as they faced more challenging mathematics courses. The following table shows percentages of agreement that students were at least "OK" in their skill level.

Table 11
SCRT Student Survey Responses on
Basic Skills
N=23

Survey Item	Percentage Agreement	
	Pre-	Post-
Reading	74	82
Writing	70	78
Mathematics	91	83
Speaking	57	55
Listening	90	95

Survey Summary

Overall, the comparison study of matched students from baseline to final on the high school survey revealed that students gained in their interest in taking science classes and believed they could handle more difficult science content through the course of their involvement with Salmon Camp. They felt they had strong skills in Internet proficiency and advanced technology skills. Most students gained in their basic skills, however lowered estimations of their skills in mathematics is an area of concern since advanced mathematics courses are gateway classes to advanced science coursework. Most significantly, students reported the strongest gains in their STEM career preparation and SCANS skills, fundamental aims of the ITEST program. Although statistically significant gains were not found on subscales, areas of strongest growth were aligned with focal areas of Salmon Camp.

SCRT Middle School Student Survey Findings

Eighteen middle school students completed the survey during the summer session. Since only four of the students had completed a survey the previous year, a matched comparison with baseline data was not reasonable. However, as a rough comparison, the 2005 data are shown in the following tables. The first part of the survey measured students' attitudes toward science and technology, and self-efficacy as science learners. Both years, most students agreed that science would be important to them as community members and in their careers. In 2006, students also reported strong agreement that their teachers believe they are good at understanding science, and interest in technology use in science. The following table shows results for these items.

Table 12
SCRT Middle School Survey Responses on Attitudinal and Self-efficacy Items
2005, N=23; 2006, N=18

Survey Item	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Mean (5=highest rating)
	n	%	n	%	n	%	n	%	n	%	
Understanding science will help me be a better community member. (2005)	—	—	—	—	7	30%	15	65%	1	4%	
2006	—	—	—	—	2	11%	12	67%	4	22%	4.1
Science is hard for me. (2005)	4	17%	8	35%	5	22%	5	22%	1	4%	
2006	3	17%	9	50%	3	17%	1	6%	2	11%	2.4
I think I could handle more difficult science. (2005)	4	17%	4	17%	4	17%	9	39%	2	9%	
2006	1	6%	1	6%	5	28%	8	44%	3	17%	3.6
My teachers believe I am good at understanding science. ('05)	1	4%	3	13%	7	30%	9	39%	3	13%	
2006	—	—	—	—	3	17%	9	50%	6	33%	4.2
I'll need a good understanding of science for my future work. (2005)	1	4%	—	—	7	30%	7	30%	8	35%	
2006	—	—	1	%6	5	29%	8	47%	3	18%	3.8
I can explain how computers are used in science. (2005)	4	17%	4	17%	7	30%	7	30%	1	4%	
2006	—	—	4	22%	5	28%	7	39%	2	11%	3.4
I want to learn more about using technology in science. (2005)	—	—	3	13%	9	39%	4	17%	7	30%	
2006	—	—	—	—	4	22%	7	39%	7	39%	4.2

Students showed confidence in their workplace and collaborative skills in their responses to the items drawn from the SCANS skills. Both years, most students rated themselves at least “OK” on the items. In 2006, students reported high levels of confidence in their creative thinking skills and ability to take careful steps when solving problems. The weakest area in 2005 was in taking careful steps to solve problems. The following table reports results for these items.

Table 13
SCRT Middle School Survey Responses on
SCANS Skills Items
2005, N=23; 2006, N=18

Survey Item	Bad News		Not Bad…		OK		Quite good		I'm Great		Mean (5=highest rating)
	n	%	n	%	n	%	n	%	n	%	
I plan my time, money, materials, and work space, to get things done. (2005)	—	—	6	26%	11	48%	3	13%	3	13%	
2006	1	6%	4	24%	7	41%	2	12%	3	18%	3.1
I work well on teams, teach others, lead, negotiate, and work well with people from culturally diverse backgrounds. (2005)	—	—	2	9%	8	35%	8	35%	5	22%	
2006	—	—	1	6%	3	18%	11	65%	2	12%	3.8
I think creatively to imagine new ideas. (2005)	—	—	1	4%	9	39%	7	30%	6	26%	
2006	—	—	—	—	4	24%	6	35%	7	41%	4.2
I use logical reasoning to make decisions. (not used 2005)	—	—	—	—	—	—	—	—	—	—	
2006			3	17%	7	39%	5	28%	3	17%	3.4
I take careful steps when I am trying to solve problems. (2005)	1	4%	3	13%	10	44%	7	30%	2	9%	
2006			3	17%	2	11%	7	39%	6	33%	3.9

The middle school students also reported confidence in their basic academic skills. Most students saw themselves as at least “OK” in core academic areas as well as speaking and listening. Paralleling the high school students, the middle schoolers felt less confident in their speaking skills than in other areas. Nearly all students in 2006 considered themselves as at least “OK” readers. The following table shows students’ ratings.

Table 14
SCRT Middle School Survey Responses on
Basic Academic Skills Items
2005, N=23; 2006, N=18

Survey Item	Bad News		Not bad…		OK		Quite good		I'm Great		Mean
	n	%	n	%	n	%	n	%	n	%	(5=highest rating)
Reading skills (2005)	—	—	3	13%	8	35%	6	26%	6	26%	
2006	1	6%			3	17%	7	39%	7	39%	4.1
Writing skills (2005)	—	—	6	26%	8	35%	5	22%	4	17%	
2006	1	6%	1	6%	4	22%	7	39%	5	28%	3.8
Mathematics skills (2005)	4	17%	4	17%	5	22%	4	17%	6	26%	
2006	2	11%	2	11%	3	17%	4	22%	7	39%	3.7
Speaking skills (2005)	1	4%	5	22%	8	35%	5	22%	4	17%	
2006	—	—	2	11%	9	50%	5	28%	2	11%	3.4
Listening skills (2005)	2	9%	3	13%	6	26%	8	35%	4	17%	
2006	1	6%	2	11%	4	22%	6	33%	5	28%	3.7

In-camp Interview Findings

The in-camp interviews were conducted with all 27 high school SCRT participants toward the end of each camp session. The interviews drew from expressed interests and goals gathered during previous assessments (either the pre-camp phone interview or the SCRT Student Survey). A full report on the In-camp Interviews may be found in Appendix F. Overall, the interviews substantiated survey and parent interview results. Findings indicated that Salmon Camp gave students more specific knowledge of careers, technology tools, and job skills as well as supporting interest in science in school. The numbers and the percentages in the following section are out of the total population of 27 students.

The results of the 2006 SCRT summer camp interviews are very similar to the results from the previous two interviews conducted during the 2004 SCRT summer camps and the 2005 spring break and summer programs. The following section summarizes the interviews.

Science career interests

- The majority of participants can see themselves working in a science career some day, and marine biology/fisheries continues to be the science career interest mentioned most by participants (41%).
- Participants think Salmon Camp is helping them explore their career interests. When asked how, participants responded that Salmon Camp has given them hands-on experience in the field, expanded their thinking about career options, and provided them with the opportunity to meet and work with real scientists.
- When asked how Salmon Camp could help participants explore their interests further, most responses simply related to having more exposure overall: more career options, more learning opportunities, more and different kinds of activities, and more technology. Participants were generally satisfied with how Salmon Camp was helping them explore their interests and simply wanted more exploration.
- When asked about the integration of traditional Native American knowledge and modern science, 22 percent of participants' responses suggested that the two were in opposition while 15 percent suggested they were integrated. These data, along with those from the previous two camps where this question was asked (spring break 2006 and summer 2005), suggest the challenges faced by staff members and students in Native American programs to address Western and Native ways of knowing into science learning.

Computers and technology

- Salmon Camp is making participants more aware of how computers and technology are used in science/resource management. Almost all participants (89%) were able to name a specific example of a technology they had used during the camp. GPS technology was the most frequently mentioned example, as it has been during previous programs. Participants also mentioned specific types of wildlife or water monitoring technology, GIS, and software such as Excel and mapping programs.
- When asked how Salmon Camp could help them gain more experience with computers and technology, participants were interested in having more time and opportunities for hands-on use of computers and different technology. One participant suggested learning more "about [the] history and future of technology and Native ways."

Work experience and skills

- The vast majority of participants (96%, or 26 out of 27) said that Salmon Camp had helped them build skills used in a job. Participants specifically cited technology and computer skills, communication and people skills, and career exploration and exposure as the primary skills they gained.
- When participants were asked how Salmon Camp could further help them with work experience and skills, most of the suggestions were for the camp to provide more of the types of the experiences already provided (e.g. more science and math activities, more

hands-on experience, and more interactions with professionals). One participant requested SCRT staff members help with resume development. It should be noted that this was a request during the summer 2005 camps as well.

Connections to school

- About 60 percent of participants said that Salmon Camp is helping/will help them in school, and that it will help them develop the knowledge and skills to take advanced math or science classes. Participants primarily stated that this was thanks to the hands-on experience they had received.
- Only about 30 percent of participants are receiving or think they can receive school credit for attending Salmon Camp. About 67 percent of participants did not know if they could receive credit or they did not know how to find out if they could. SCRT staff members may want to consider further supporting participants in getting school credit for their attendance.
- When asked if they would be interested in having internships and mentors, a high percentage of participants (about 74%) would like an internship, while just under half (41%) are interested in having a mentor. About 30 percent of participants already have at least one mentor, and additional participants have people who fulfill that role. On the contrary, only seven percent of participants currently hold internships, despite their greater popularity amongst campers. Internships may appeal to participants more than mentorships because internships can provide hands-on experiences that let participants explore different options, provide job training, and invaluable experience that can be listed on a resume to help with future job searches and college applications. Salmon Camp staff members could consider ways to help participants find relevant internships. Perhaps weekend enrichment programs could be used to teach participants how to pursue an internship, practice interview skills, and help them develop resumes.

Future plans

- Almost all of the participants (93%) plan on attending future SCRT camps because they found the camps to be both fun and educational.
- When asked about their plans after high school graduation, most participants said they wanted to go on to college and/or a professional school (89%). Some participants said they hoped to obtain a Master's or Ph.D., and others mentioned specific career paths they hoped to pursue. Only three participants did not know or were not sure what they planned to do.

Objective Three

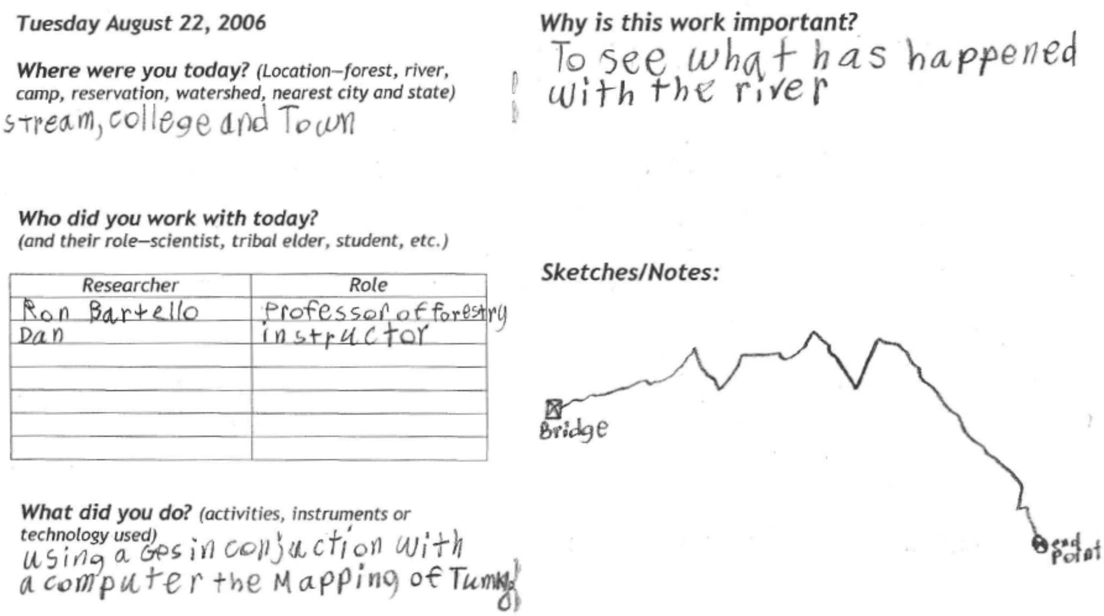
Students will work together with educational and professional mentors through cooperative hands-on, inquiry-based research activities.

In order to better understand the impact of working with professionals through authentic research activities during their summer camp sessions, field journals were developed for the 2006 sessions. The journaling approach was pilot tested during the spring break sessions and used in the summer 2006 sessions. Results of the pilot test demonstrated the value of the methodology and warranted full use during the summer sessions. Appendix G-1 contains transcribed responses from the spring break pilot.

The summer high school journals used prompts each day for students to reflect on their location, activities, researchers with whom they worked, technology used, interesting information they learned and how the activity helped them understand the "big picture" of salmon restoration and/or ecology. The middle school journals used a simplified set of questions, prompting students to reflect on where they were, who they worked with, what they did, and why the work was important. Both the high school and middle school journals also provided room for sketches or notes with each day's entry. See Appendix G-2 for sample journals.

Journal entries were transcribed and analyzed. The contents were analyzed using ethnographic techniques of abstraction from item responses to patterns among responses to emergent themes.

Middle School Journals


Tuesday August 22, 2006

Where were you today? *(Location—forest, river, camp, reservation, watershed, nearest city and state)*
stream, college and Town

Who did you work with today? *(and their role—scientist, tribal elder, student, etc.)*

Researcher	Role
Ron Bartello	Professor of forestry
Dan	instructor

What did you do? *(activities, instruments or technology used)*
using a Gps in conjuction with a computer the Mapping of Tum[illegible]

Why is this work important?
To see what has happened with the river

Sketches/Notes:
Bridge
End Point

Figure 1. Sample Middle School Journal, August 2006

The first two days of the middle school summer session were focused more on content and use of field protocols. Responses to "What did you do? (activities, instruments or technology used)" for Day 1 were effectively captured by all but one of the 22 students. Nine of the 22 students (41%) provided rich descriptions that communicated an understanding of the activity. Exemplary responses included:

- *We worked with GPS to map the river, rocks, and logs so we knew if the river has moved since the fire 20 years ago.*

- *We took plots of land and identified plants within that plot.*
- *[Wrote] depths and length measurements of the stream using a yard stick and a measuring tape numbering amount of different plants near the stream.*
- *We used a GIS system and using the system used coordinates to map the log build ups on the creek. Then went to a community college to map the log build ups, rock build ups, and the creek onto a map.*

The remaining students provided some version of these descriptions including more simplified descriptions such as:

- *Pebble count and invertebrates*
- *Recorded rocks*
- *Pebble count, bug identifying*
- *GPS, mapping*
- *GPS, computers*

The question following the item on activities and technology used asked students, "Why is this work important?" Responses clustered into themes of increased science knowledge, habitat restoration/preservation, measuring stream health, and seeing change in the river over time or location.

Table 15
Importance of Middle School Day 1 Activities
N=22

Responses* Percentage (Number)	Theme
50% (11)	General increased science knowledge or understanding e.g.: • *Because we learn about bugs and rocks!* • *To learn about the creek.* • *Because it will make us better in science.* • *Because we have to research.*
32% (7)	Habitat restoration/preservation e.g.: • *So it can help the environment.* • *To save the river and all the animals around it.* • *To build up the river so more fish will be there, animals, and save the forest.*
18% (4)	Stream health, e.g.: • *It tells us how healthy the streams are.*
14% (3)	Measure change in the river, e.g.: • *To see changes of the Tumalo Creek throughout the coming years.*

* Response rates do not add up to 100% as some responses were categorized in more than one thematic area.

Responses to "What did you do? (activities, instruments or technology used)" for Day 2 were captured by 21 students. Responses showed a high degree of variation as students selected activities that were personally meaningful to them. Six students mentioned the use of GPS in their responses. Eleven of the 21 students (52%) provided descriptions that clearly communicated an understanding of the activity as part of a scientific investigation. Exemplary responses included:

- *Today we used GPS units and computers and looked for fish.*
- *Tried to find the deepest part of a cross-point with a meter stick and measuring tape.*
- *We captured insects in the water. For every step we took in the water, we picked up the rock and measured how long it was in every transcript [transect].*
- *We went to the nearest city to use the data collected on GPS to make maps.*

Remaining students' responses were short answers such as:

- *Snorkeling surveys*
- *Go under water and see fish*
- *Measure currents*
- *Research for fish*

The question following the item on activities and technology used asked students, "Why is this work important?" Responses clustered into themes of increased science knowledge, information about creek dwelling animals, personal relevance of the skills/knowledge, and seeing change in the river over time or location. Table 16 highlights responses.

Table 16
Importance of Middle School Day 2 Activities
N=21

Responses* Percentage (Number)	Theme
52% (11)	General increased science knowledge or understanding e.g.: • *To see the different ways that obstacles effect the depths of the creek* • *To find the deepest part of the creek will tell you the coldest point of the creek, which, is where the fish will most likely be, in the coldest and deepest spot.*
33% (7)	Learn about creek inhabitants e.g.: • *See the fish environment.* • *To provide a healthy habitat for critters that live in the river.* • *To know the bugs and how fast the river is.*
33% (7)	Practical/personal relevance of activity, e.g.: • *Because if we get lost, a GPS will help us find our way back.* • *It taught us to work together and develop people skills, also it taught me how to use a GPS which is great because I could use it in snowboarding.*
10% (2)	Measure change in the river, e.g.: • *To see how the water changed.*

* Response rates do not add up to 100% as some responses were categorized in more than one thematic area.

One student particularly enjoyed the hike and discussion of edible plants. This student mentioned the Native American connection, writing that it was interesting “to learn how the natives used these plants.”

Middle School Journal Summary

Taken together the entries from the two content-heavy days of the weeklong session show most students understood the meaning of activities they were engaged in and how they fit into a larger picture of stream monitoring. Students clearly learned field protocols for measuring the health of streams over time and gained skills with GPS. The middle school journals provide additional evidence that collaboration with professionals in the field on experiential inquiries generated increased content knowledge and technical skills. Verbatim transcripts of the entries may be found in Appendix G-3.

High School Journals

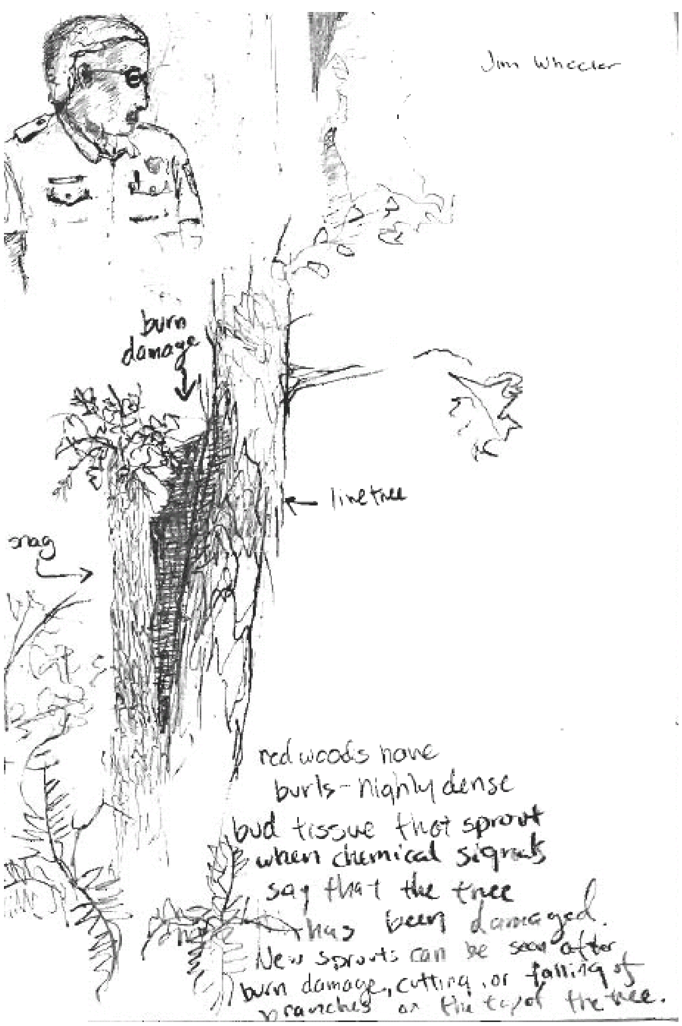


Figure 2. Sample Page From Field Journal, California 2006

An enormous degree of variation was found among the high school journal responses. Variation was apparent across different students for whom the method was effective to different degrees, and across days, depending on how well the prompts matched the day’s activities. For a few students, each session the journal exercise was more of a straightforward statement of events. However, for most students, the written reflections seemed to be an excellent way to capture their thinking and experience. Students in the Oregon and California sessions used their journals more regularly and wrote longer responses than the Washington/B.C. group. This raises the importance of the dynamic that develops within a research team. If a few students enjoy writing and value that reflective time, then others will be more likely to model the journaling behavior as well. At their best, the journals are rich with personal meaning drawn from each day’s activity often accompanied by sketches and artwork. They are a window into students’ thinking about salmon, ecological systems, and Native American culture, as well as their humor and thoughts about the future.

As an assessment tool, the journals were most useful for understanding the nature of day-to-day life on the road and in the field with the research teams. A holistic content analysis (examining responses across all three sessions) was used to draw out emergent themes. (See Appendix G-4 for a transcription of high school students' responses.)

Instruments. Most students accurately identified technological tools/instruments used for the day's activities. The comprehensive list across sessions includes: GPS, computers, Electro Shocker, PDA, Excel, PowerPoint, Pygmy meter, banding equipment, telemetry equipment, and meter guns.

Specific facts or interesting information learned. The variety of interesting facts which students identified demonstrates how individual students draw meaning from various activities in unique ways. As an example, entries from July 12th during the California session show a range of interesting facts recorded by students:

- *I learned that cedars are in fact the tallest trees in the world. There have been many Douglas Firs documented at over 400 feet, but they have been logged.*
- *Measuring trees.*
- *The way fish [illegible] water.*
- *When birds lay eggs it triggers ovulation.*
- *Learning about how the habitat and how to measure.*
- *How to get diameter of trees.*
- *Second growth trees have a hard time gaining diameter when growing because they were planted so close together.*
- *Area x velocity = cubic feet*
- *The way fish live in sewage water.*

How the activity helped students understand the "big picture" of salmon restoration/ecology. Integrating the field journals was prompted by interest in capturing what students were "really learning" in Salmon Camp. The core question that drew out students thinking was on how the day's activity helped them understand the "big picture" of salmon habitat restoration and preservation. Across sessions, responses fell into six broad themes highlighted in the following section with sample student responses.

Salmon Research Prompts Reflection on Habitat Practices

- *It made me think about how salmon and their environment are really making people think. Like before people thought it would be a good idea to take all the logs out and now they took a second to think and are now spending millions of dollars on putting logs back into the stream.*
- *Logging almost destroyed the river. At this point in time, the water is too warm to have any fish live in it because of the logging.*

- *That restoring forests helps prevent sediment from going into creeks and rivers.*
- *They wanted to see what the environment is before they blow the dams! Elwah and Granite Dam.*

Salmon "Habitat" Includes Watersheds as Well as Rivers

- *It made me think that you must take care of everything around the salmon stream in order for them to survive.*
- *Trees and forests are especially important to salmon because erosion causes damages to salmon runs…*
- *Taking care of forests helps water stay clean.*
- *I learned that erosion from stream banks and surrounding hills is a large killer of salmon eggs (and fish). The vegetation is important for holding banks up.*
- *Dams have made it harder on salmon.*

Technology is Used to Monitor Populations

- *How to graph things like a creek or different kinds of points [using a GPS trimble unit].*
- *It helped show some of the methods that are being utilized to monitor salmon populations and helped us meet people well rooted in the Redwood Creek restoration effort.*
- *It showed how radio tags can be used to track species and estimate populations as well as monitor dispersion.*

Cultural Connections

- *It made me think how the Native Americans had it down in the fact that they never took more than they needed and in turn they insured the future of the salmon.*
- *… I learned about my past and the culture of my people. I think that is more important when you are in a program specifically for young Native Americans that are in a time when they may not know of their tribe or history or where we came from.*
- *This was one of the best activities I have been on [seeing the Yurok Brush Dance]. This opens doors to seeing other tribes' culture first hand rather than just hearing it.*

Career Paths

- *By visiting Humboldt, we saw what classes and a potential venue to learn about hatcheries, forestry, and other sciences.*
- *Umm…consider THINKING of going to HSU and working there.*

Although comments in this area of career paths were limited to one day in which the group visited Humboldt State University, they are included here to demonstrate how visits to college campuses prompted students' thinking about college and career trajectories. Although not a theme running throughout the journals, similar activities have been important in other sessions.

High School Journal Summary

Responses from the high school journals depict the many ways in which scientists, researchers, graduate students and tribal members served as mentors and role models. Students' field work built understanding of ecological principles and how technology is used in authentic research projects. Students documented developing skills with GPS as well as digital tools specific to particular research such as telemetry units and measuring devices. As the middle school journals did, the high school entries provide additional evidence that collaboration with professionals in the field on experiential inquiries generated increased content knowledge and technical skills.

Objective Four

Provide students with opportunities to interact in a positive and supportive learning and work environment.

The summer camps provided daily opportunities for students to interact in learning environments. Daily camp schedules and debriefing sessions with counselors provided insight into opportunities to learn and work with others. Although students in the summer sessions often saw scientists and resource managers at work in their field sites rather than their offices, they were exposed to field sites as authentic outdoor work environments. High school students in each session met with numerous specialists during their camp experience. The specialists spoke with students or engaged them in activities during their presentations or field work. Students interacted with presenters or researchers on topics ranging from indigenous knowledge to highly sophisticated information technology tools and field protocols. (See Appendix H for a sample camp schedule.)

Motives for Attending Salmon Camp

The high school summer 2006 annual survey asked student to rank the importance of eight different motivators for attending Salmon Camp by indicating if the factor was "very important," "important," "somewhat important," or "not important." All factors of interest were at least "somewhat important" to participants. Interestingly, working with scientist was rated as "important" or "very important" by the most participants, closely followed by being with friends/making new friends, and the Native American connections developed through the program. The number one, "very important" factors to participation emerged as Native American connections and using science in the real world. The following figure displays results of this question.

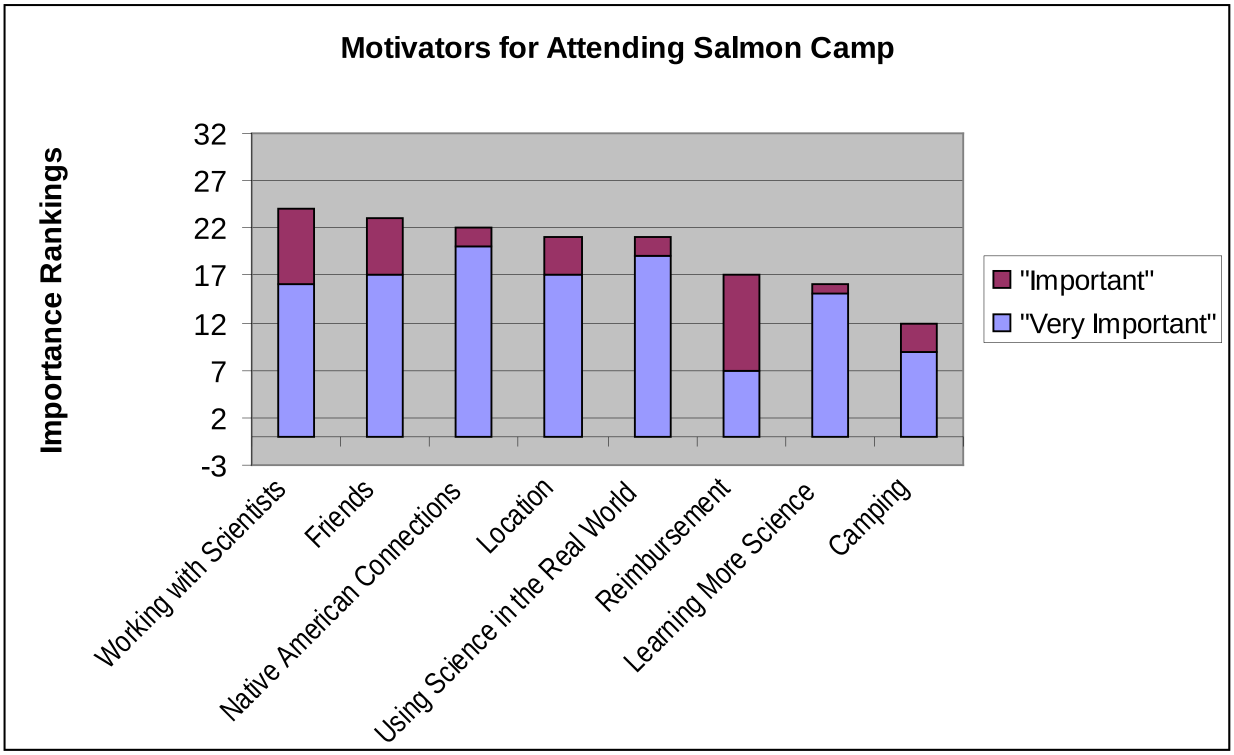


Figure 3: Most Important Factors for Attending Salmon Camp

Affective Feedback on End-of-session Forms

As another indicator of the extent to which these interactions were positive and supportive, the End-of-session feedback forms asked several related questions. On the feedback forms, nearly all the high school students and most middle school students agreed that Salmon Camp met their expectations, made them more curious about science, and was fun. One question asked if students would recommend the program to others. As mentioned earlier, the survey used a four-point scale ranging from "No way" to "Yes!" For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest. (See Appendix C for data tables by session.) Table 17 shows means for middle and high school spring break, and summer sessions on related questions. Ratings on all items for all groups were quite high. As with the other End-of-session survey responses, the high school students were slightly more positive than the middle school students.

Table 17
SCRT End-of Session Survey Responses on Affective Questions

Summer Sessions 2004, 2005, 2006; Spring Break Session 2005, 2006

Survey Item	Year and Session	High School Mean (s.d.)	Middle School Mean (s.d.)	N
		1-4 Scale, 4= Highest Rating		
Did Salmon Camp meet your expectations?	2004 Summer Camp	3.7 (.5)		19
			3.2 (.9)	23
	2005 Summer Camp	3.8 (.5)		24
			3.4 (.6)	24
	2006 Summer Camp	3.8 (.5)		28
			3.4 (.8)	32
	2005 Spring Break	3.8 (.4)		10
			2.9 (.6)	22
	2006 Spring Break	3.9 (.3)		17
			3.4 (.6)	21
Has this program made you more curious about science?	2004 Summer Camp	3.6 (.5)		19
			3.1 (.7)	23
	2005 Summer Camp	3.4 (.7)		24
			3.3 (.6)	24
	2006 Summer Camp	3.4 (.7)		28
			3.1 (.8)	32
	2005 Spring Break	3.9 (.3)		10
			2.9 (.8)	22
	2006 Spring Break	3.7 (.5)		17
			3.2 (.7)	21
Did you have fun?	2004 Summer Camp	3.9 (.2)		19
			3.3 (1.1)	23
	2005 Summer Camp	4.0 (.2)		24
			3.8 (.4)	24
	2006 Summer Camp	3.9 (.6)		28
			3.9 (.3)	32
	2005 Spring Break	4.0 (.0)		10
			3.6 (.8)	22
	2006 Spring Break	4.0 (.0)		17
			3.7 (.6)	21
Would you recommend this program to others?	2004 Summer Camp	4.0 (.2)		19
			3.6 (.9)	23
	2005 Summer Camp	3.4 (.8)		24
			3.8 (.4)	24
	2006 Summer Camp	3.8 (.7)		28
			3.8 (.4)	32
	2005 Spring Break	4.0 (.2)		10
			3.6 (.7)	22
	2006 Spring Break	3.9 (.3)		17
			4.0 (.2)	21

Enrichment sessions were also very well received. Means were notably higher on expectations and increased curiosity about science in the 2005-2006 Enrichments. Means are reported in Table 18. Note the extremely high rates of "fun" and recommendations to others.

Table 18
SCRT End-of Session Survey Responses on Affective Questions
Combined High School and Middle School Enrichments
2004-2005, N=15; 2005-2006, N=28

Survey Item	Year	Mean (s.d.)
Did Salmon Camp meet your expectations?	2004-2005	3.4 (.5)
	2005-2006	3.8 (.6)
Has this program made you more curious about science?	2004-2005	2.9 (.8)
	2005-2006	3.7 (.5)
Did you have fun?	2004-2005	3.9 (.3)
	2005-2006	3.9 (.4)
Would you recommend this program to others?	2004-2005	4.0 (.0)
	2005-2006	4.0 (.0)

Summary of Affective Items

Responses on End-of-session feedback forms displayed in this section add to previous qualitative data from annual surveys, interviews, and field journals. Together, they provide strong evidence for the positive and supportive learning environment created during Salmon Camp. Sitting in on college science courses, discussing fisheries practices with researchers, and collecting data in the field for genuine science studies, have created a "work environment" that clearly met students expectations, increased curiosity about science and was fun. The ultimate test of the programs' success—high rates of recommendations to others—further confirms that SCRT involvement was a positive experience for the vast majority of students.

Interestingly, students felt supported regardless of age group, gender, or tribal affiliations. Students reported 44 different tribal affiliations. (See Appendix I for a list of tribes.) Across demographics, participants almost unanimously came together at Salmon Camp and increased their curiosity, had fun, and would recommend the program to others.

SUMMARY

Triangulated data from various sources on each objective confirmed that the project accomplished the goal of creating a continuum of culturally relevant, information technology-focused, science experiences for middle school through high school students with Native American community affiliations to address their educational career needs. Key accomplishments in achieving grant objectives are summarized in the following section under each objective. Overall, evaluation findings from OMSI's *Salmon Camp Research Team* document high achievement on all objectives.

1a. Develop and disseminate a model science IT program that addresses national and state education standards and is relevant to the cultural experience of Native American students.

NSF funding enabled OMSI to refine and embed SCRT as a cornerstone experience among many Native American families and students interested in science and technology. Development of the Salmon Camp "model" was facilitated by consistency in staffing and sustained relationships with field researchers and tribal members. Blending hands-on field experiences and cultural activities was a well-conceived design feature. The out-of-school experiences which students were engaged in at Salmon Camp reportedly transferred to essential knowledge and skills which students applied in their school coursework. The social bonding and exposure to other Native American students was also seen as a feature which made the experience relevant to participants. Salmon Campers reported increased understanding of Native ways of knowing science, other tribal cultures/traditions, and greater cultural identity.

1b. Immerse students in a culturally relevant, IT intensive, scientific research experience that will allow them to apply information technology to the resolution of real world natural resource problems.

Working side-by-side with researchers and scientists in the field made Salmon Camp research authentic and elevated the importance of data collection for participants. The task-embedded approach of learning technology skills enabled students to learn to use IT tools in the process of studying real world natural resource problems. Students reported gaining particular skills in using GPS and GIS technologies as well as job-specific tools for environmental monitoring. Participants learned about resource management and increased their science knowledge.

2. Enable students to gain experiences and skills necessary to obtain science and IT-related internships and jobs.

High school students posted educationally significant gains on their pre- post-involvement surveys in STEM career preparation and SCANS skills. On the final survey, an increased number of students reported that they would take an elective science class and believed they could handle more difficult science. Although not directly related to Salmon Camp experiences, on the post-assessment, high school participants reported improved technology skills in: formulas/functions in a spreadsheet such as Excel, e-mail attachments, Web site maintenance, scanning documents, and manipulating digital graphics.

Gains in these areas suggest that students maintained interest and were building technology skills outside of Salmon Camp as well as through SCRT experiences. Another change not directly related to Salmon Camp involvement but noteworthy is that students posted lower ratings on their proficiency in mathematics over time. This finding has implications for success in advanced science courses which typically have mathematics prerequisites or at least include the integration of mathematics in coursework.

The in-camp interviews with high school participants revealed an increased knowledge of careers, technology, and job skills attributable to Salmon Camp. Students also reported that SCRT experiences supported science learning in students' respective schools.

Middle school participants viewed themselves as creative problem solvers who worked well in teams and who felt confident in their academic skills. They reported high self-efficacy as science learners and valued science as important to their future. Nearly all agreed on the post-involvement surveys that:

- Understanding science would help them be better community members
- Understanding science would be needed in their future work
- Teachers believed they were good at understanding science
- They wanted to learn more about using technology in science

3. Enable students to work together with educational and professional mentors through cooperative hands-on, inquiry-based research activities.

Analyses of the field journals revealed that learning in the field was idiosyncratic for participants. While many students identified common ideas and concepts from activities, they also reported a wide range of responses in interesting facts or information they learned. Middle school students generally described ways in which SCRT increased their science knowledge. High school participants described gaining new or deeper understanding of habitat restoration/preservation practices, factors that constitute healthy salmon habitat, technologies used to monitor populations, and increased awareness of career paths. They also expanded their knowledge of cultural traditions and made connections with their tribes as well as other tribes.

4. Provide students with opportunities to interact in a positive and supportive learning and work environment.

Across the many methods and instruments used to evaluate the Salmon Camp Research Teams, students reported and demonstrated ways in which the experience was positive and SCRT learning supported learning in school. As a result of participation in Salmon Camp, students nearly universally reported increased curiosity about science and that they had fun. Participation in Salmon Camp was widely recommended by participants.

CONCLUSIONS

Student Knowledge and Skills

Involvement in Salmon Camp appears to have built skills with digital tools used in the context of field research and improved students' understanding and interest in science. Students gained an understanding of research protocols and how technology is used to monitor environmental conditions. They reported gains in understanding what is required of them to pursue coursework and careers in science, technology, engineering, and mathematics. Most students reported gains in their workplace skills.

Student Attitudes

Students' attitudes and self-efficacy as science learners improved in several significant areas due to involvement in Salmon Camp. Perhaps most importantly, they reported increased confidence in their ability to take difficult science classes. In interviews, students reported an increased awareness of career options in the field of science and resource management attributed to Salmon Camp.

Implementation

The *Salmon Camp Research Team* project was implemented with high fidelity. Implementation was true to the design proposed and demonstrated the efficacy of the approach in context. The mentorship component is the one exception. The envisioned role of OMSI staff members linking students to mentors in their schools was undesired by some students who already had school mentors and unwanted by others who valued the mentor relationship developed with the Salmon Camp coordinator and counselors. The selection and retention of high quality staff members proved critical to implementation as envisioned. Spring and summer sessions were fully enrolled and engaged students in a high level of active participation. Obtaining commitment and follow-through from students to participate in enrichment sessions was challenging but leaders learned to plan around sports schedules and be flexible with time and numbers. The cultural aspects of the project were addressed through collaboration with local tribes, tribal fisheries, and Native American staff members. The cultural connections were highly valued by students and parents.

Outcomes

Compelling letters from SCRT participants conveyed the impact of the project and perceived value to other Native American students. An unanticipated outcome of participation in Salmon Camp was the friendships that developed across personalities, social strata, and local communities. The strong social bonds established during the high school sessions enabled the

Native American students to support each other outside of camp. Interestingly, digital tools such as cell phones and e-mail greatly facilitated students in sustaining friendships. Experienced Salmon Campers and their parents have grown to view participation in Salmon Camp almost as a rite of passage for students interested in science and technology. Members of many immediate and extended families attended Salmon Camp sessions, with sibling supporting each other in their involvement. Counselors, the coordinator, and researchers unanimously felt enriched by their experience and further committed to the value of projects such as Salmon Camp.

Continuous Improvement

Salmon Camp staff members and leaders were responsive to feedback and continuously strived to improve activities as well as the program as a whole. The grueling summer schedule of essentially all summer in the field is one area that was not resolvable under the current design but needs to be addressed if Salmon Camp is to be sustainable. Formative evaluation strategies were helpful in continuous improvement. The in-camp interviews, field journals, and letters to future campers in particular fostered understanding among staff members as to how students were integrating experiences and internalizing new found knowledge and skills.

Apparent keys to success include the consistent staff members, the immersion experience that balanced Native American perspectives with cutting edge research through hands-on activities, and learning to use technology tools in context. A promising approach to sustainability and inclusion of knowledgeable staff members may be a strategy which the project has taken up of “growing our own” counselors. Several Salmon Camp enthusiasts were enlisted as counselors during the last two grant years. The potential for these students to serve as role models and eventually as leaders opens the door to an exciting second generation of Salmon Camp.

Overall

The many collaborators and participants in the *Salmon Camp Research Teams* are to be commended on the numerous accomplishments and impacts of the project. Through soggy campfires, exhausting days in the field, emergency evacuations due to forest fires, and balancing budgets, project leaders conducted three years of exceptional Salmon Camp programming. The experiences appear to have launched a good proportion of Native American students on a career trajectory that includes increased interest and confidence in science, technology, and resource management.

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Appendices