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NCELA

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English Language Acquisition and
Language Instruction Educational Programs

presents

Honoring the Bitterroot: Traditional Knowledge, Science Education, and Intrinsic Motivation

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Honoring the Bitterroot: Traditional Knowledge, Science Education, and Intrinsic Motivation



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Introduction

- My name is Rose E. Honey.
- Grew up in Darby, Montana and currently live in Missoula, Montana.
- B.Sc. In Physics from University of Oregon, Ed.M. in Mind, Brain and Education from Harvard Graduate School of Education.
- Doctoral candidate at Harvard Graduate School of Education.
- Doing my dissertation with students on the Flathead Indian Reservation.
- Started this study in the spring of 2011 and plan to graduate in May 2013.



Webinar Overview

- I. How does traditional knowledge relate to science education?
- II. The Literature – What does the current research tell us?
- III. Research Study
 - a. Introduction
 - b. Intrinsic Motivation
 - c. Participants
 - d. Community Input and Approvals
 - e. Quantitative Findings
 - f. Qualitative Findings
- IV. Conclusion



Honoring the Bitterroot: Traditional Knowledge, Science Education, and Intrinsic Motivation

- Bitterroot (*Lewisia rediviva*) was once a staple food for Native American peoples.
- Salish/Pend d'Oreille people on the Flathead Indian Reservation tell a story about how the bitterroot plant came to their people, during a time of starvation (Arlee, 2008).
- Annual ceremony to welcome the “first visitor” and give thanks for its return to the people.
- Medicinal qualities:
 - increasing milk production while nursing infants
 - purifying blood
 - clearing skin conditions
 - helping with diabetes symptoms
 - settling an upset stomach



(Cederberg, 2011)

Honoring the Bitterroot: **Traditional Knowledge,** Science Education, and Intrinsic Motivation

Traditional Knowledge, Traditional Ecological Knowledge, Indigenous Science, Native Science, Traditional Ways of Knowing....

... that body of traditional environmental and cultural knowledge that is unique to a group of people and that has served to sustain those people through generations of living within a distinct bio-region (Cajete, 2000).

Honoring the Bitterroot: **Traditional Knowledge,** Science Education, and Intrinsic Motivation

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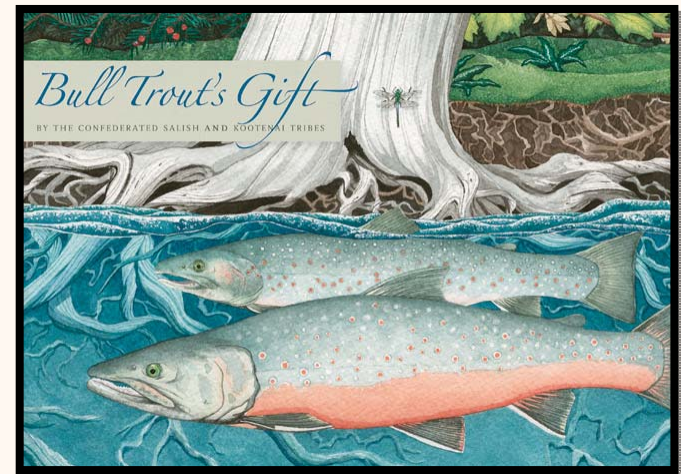


Honoring the Bitterroot: **Traditional Knowledge, Science Education, and Intrinsic Motivation**

- How is traditional knowledge related to science education?
- Culturally relevant education is important for equal opportunity (Hunt & Harrington, 2008).
- ...content in science education being taught and learned is fundamentally cultural (Bang, Medin & Cajete, 2009).
- Western science contains its own suppositions about the nature of science (Sutherland, 2005).
- ...in order for science education to become truly culturally relevant, it needs to be more culturally inclusive (Patchen and Cox-Peterson 2008).

How is cultural relevance being implemented in the science classroom?

- Montana Indian Education For All – a multicultural education initiative to foster understanding and respect for Montana Indian people, their histories, and their culture.
- This is called Indian Education for All, and in 2005, Montana's Office of Public Instruction created the Division for Indian Education, which develops educational materials and offers professional development for teachers.
- In addition, Native communities are producing local materials, such as this book, Bull Trout's Gift.
- Big Sky Science Partnership (BSSP):
 - Specific to science education



(Confederated Salish and Kootenai Tribes, 2011)

BIG SKY SCIENCE PARTNERSHIP

A horizontal banner with a dark green background. At the top, the text "BIG SKY SCIENCE PARTNERSHIP" is written in a white, bold, sans-serif font. Below the text, there is a stylized illustration of a mountain range with several peaks. The mountains are white with grey shading to indicate depth. The background of the banner is dark green with small white stars scattered across it.

- Mission: The Big Sky Science Partnership (BSSP) is a 5-year NSF project whose mission is to create a strong, long-term, sustainable partnership of Tribal representatives, scientists, and professional educators who will work together to improve the science achievement of American Indian students in grades 3-8 by strengthening science instruction in our schools.
- Flathead, Northern Cheyenne, Crow Reservation, Missoula area schools, Salish Kootenai College, the Univ. of Montana and Montana State Univ.
- Summer institutes, tribal culture camps, workshops and online courses focus on content within local tribal context.
 - Science topics change each year.
 - A focus on social construction of the content is emphasized.
 - And real-life applications of science ideas.

<http://www2.umt.edu/bssp/index.html>

Some Findings from the Literature

- **Context Matters:**
 - ✓ Menominee students agreed that an Elder would say that rocks and water are alive, but that a science teacher would not (Bang, Medin & Atran, 2007).
- **Language is Important:**
 - ✓ Teachers can be more effective when first language is allowed (Lewthwaite & McMillan, 2010)
- **Student/Teacher Relationships:**
 - ✓ Ethnicity can change relationships (Diakidoy, Vosniadou & Hawks, 1997; Sutherland & Dennick, 2002)
 - ✓ Teachers from same tribe and/or community are recommended (Friedel, 2011).

Some Findings from the Literature

- **Local Focus:**
 - ✓ Traditional knowledge for one local culture may not parallel local cultural knowledge in another (Matthews & Smith, 1994).
- **Be Careful About Assumptions:**
 - ✓ Being Indigenous does not automatically make a person interested in or knowledgeable of traditional knowledge (Solano-Flores & Nelson-Barber, 2001).
 - ✓ Educators should be wary of some of the terminology they use (Gardea, Rios, Gardea-Torresdey & Narayan, 2011).
- **Space and Time to Talk:**
 - ✓ Students should be given the opportunity to discuss conflicting cultural beliefs and values in the classroom (Snively, 1990).

Honoring the Bitterroot: Traditional Knowledge, Science Education, and **Intrinsic Motivation**

- Interest can have a strong influence on performance (Hidi, 2000).
- Cree First Nation: Students with more intrinsic motivation were better at integrating traditional and scientific knowledge (Sutherland, 2005).
- Psychometric research is sometimes looked upon unfavorably and disregarded among Indigenous people (McInerney & Swisher, 1995).
- Larger study brings quantitative and qualitative data together to answer the research question:

Is culturally relevant science education engendering motivation to learn, and is this related to how students think about and value traditional knowledge in their science classrooms?



Questions



Participants

- Flathead Indian Reservation
 1. Bitterroot Salish [say-lish]
 2. Pend d'Oreille [pon-duh-rey]
- Ages 10-14 years old (n=106)
 - 51 American Indian participants
 - 55 non-American Indian participants
- Public schools: (n=101)
 - 45 Participants taught by teachers trained in the Big Sky Science Partnership (BSSP)
 - 56 Participants not taught by BSSP teachers
- Nk'^wusm Salish Language Institute: (n=5)





Approvals & Community Input

- **Tribal Level: Salish - Pend d'Oreille Culture Committee**
 - Initial study approved by committee of Elders
 - Survey topics & questions discussed and changed
 - Final survey questions approved
- **School Level: Indian Education Committee**
 - Questions removed based on parent/teacher suggestions
- **Family Level: Parent/Guardian Consent Forms**
- **Student Level**
 - Students chose whether to participate and whether or not to answer the questions in the survey.



My Study

Research Question

Do students who learn in science classes that include local traditional knowledge, values, and language have motivation to learn about science and culture in different ways than students who do not learn this type of science?

Quantitative: Survey

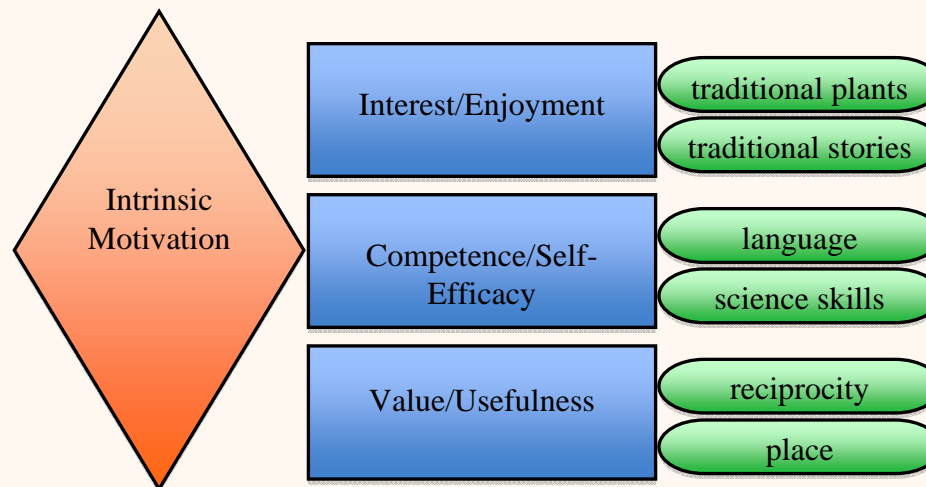
How does motivation and interest to learn cultural information about the environment differ between students?

Qualitative: Interview

How does student ability to integrate traditional knowledge into science education (as self-assessed and self-reported) differ?

Quantitative: Survey

- **Constructs:** Based on the Intrinsic Motivation Inventory (Self-Determination Theory, 1996).
- **Subtopics:** Explore the following questions:
 - Are students interested in learning about cultural knowledge as it relates to the environment?
 - Do students think they are competent in Native language and/or science skills?
 - Do students value learning traditional knowledge about the environment?



Survey Subtopics

traditional plants

How interested are students in learning about the locations and uses of Native plants that are culturally important to the local tribe?

traditional stories

Do students enjoy hearing and learning about the local traditional Native stories?

language

Do students think they are competent in learning the local Native language?

science skills

Do they think they are competent in learning science skills?

reciprocity

Do students value the idea of balance in nature? Taking from mother earth and giving back?

place

Is it useful to learn about the cultural meanings of local places, and the attachments to those places held by the local Native people?

Example Questions

traditional plants

How much do you enjoy/not enjoy learning to dig and gather bitterroot plants?

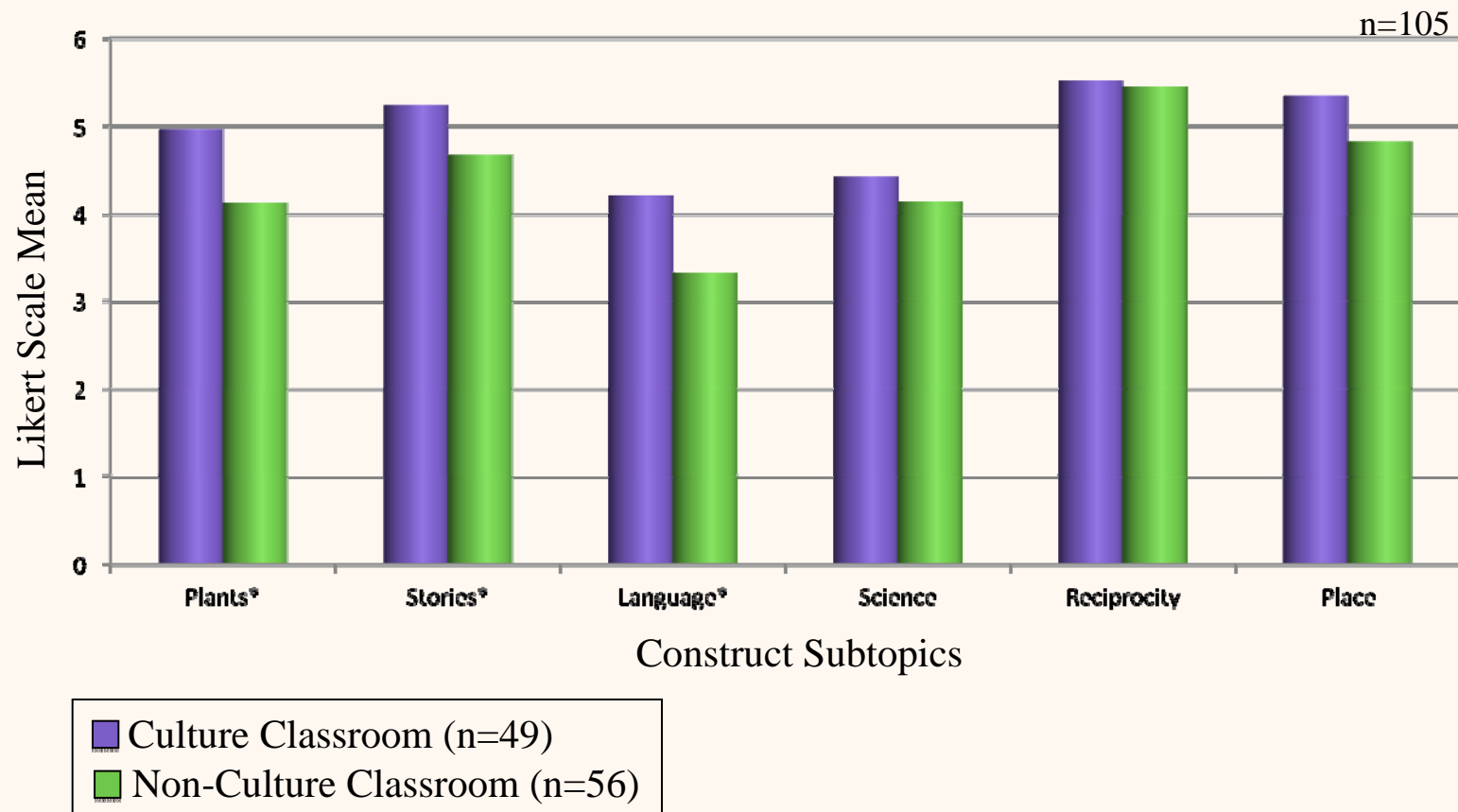
| | | | | | | | |
|----------------------------|--------------------------|-----------------------|---------------------------|-----------------------|-------------------------|-------------------------|---------------------------|
| I don't enjoy it at all | I enjoy it a tiny bit | I kind of enjoy it | I somewhat enjoy it | I mostly enjoy it | I enjoy it very much | I extremely enjoy it | I have never done this |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

reciprocity

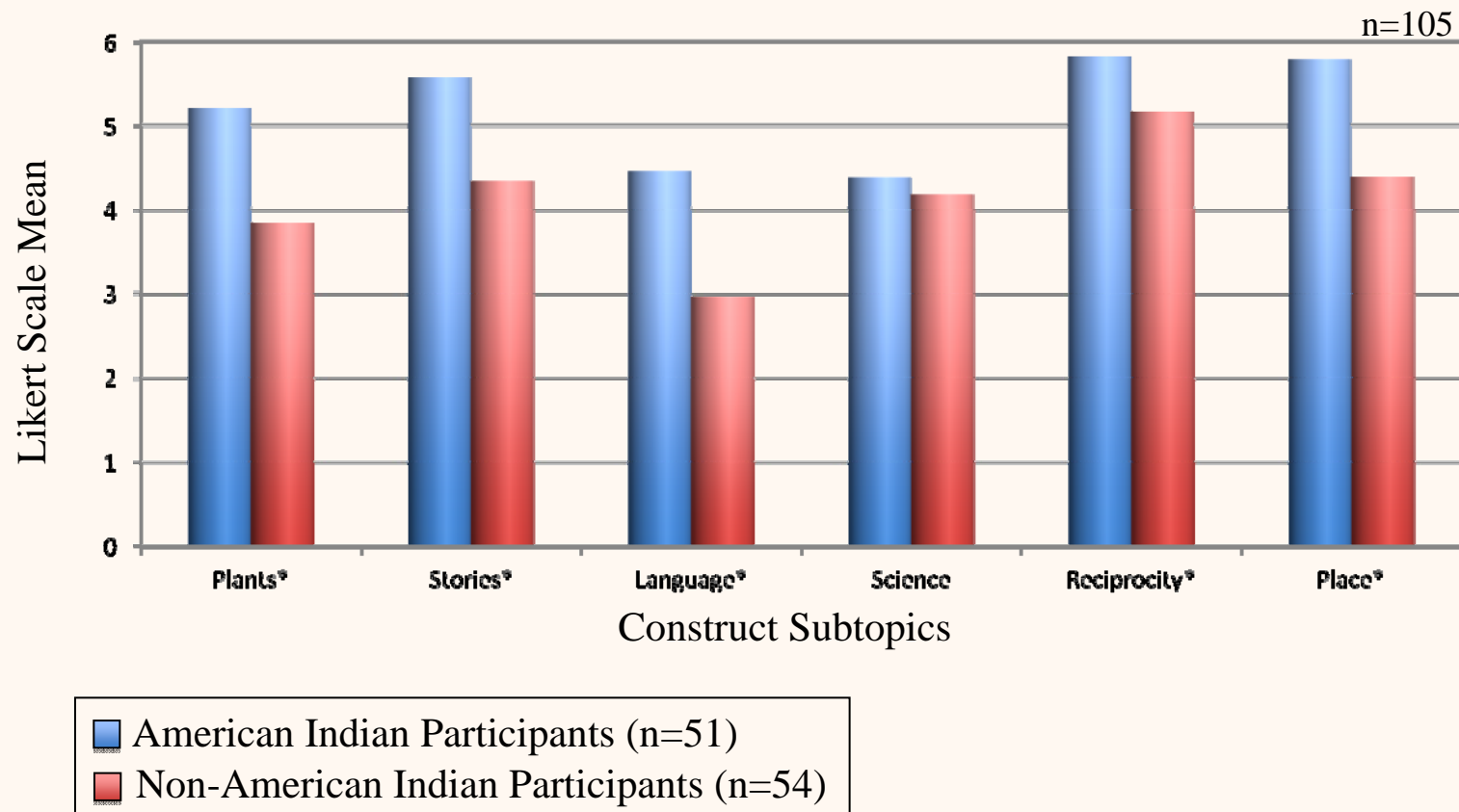
How valuable or not valuable is it for you to learn about responsible hunting and gathering?

| | | | | | | | |
|------------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------------|
| not valuable at all | a tiny bit valuable | kind of valuable | somewhat valuable | mostly valuable | very valuable | extremely valuable | I have never done this |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Culture Classrooms vs. Non-Culture Classrooms



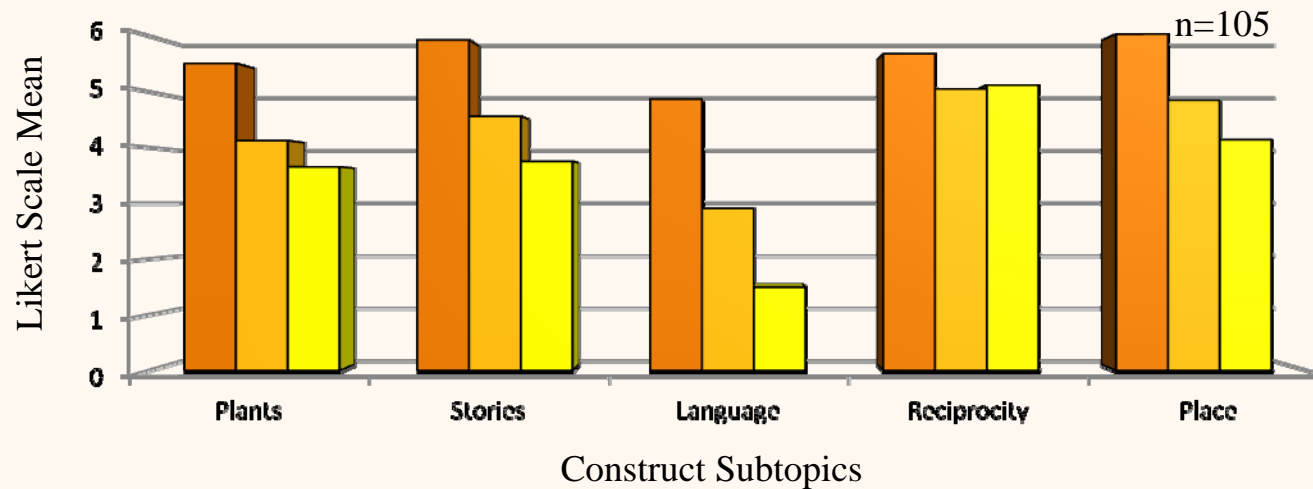
American Indian Participants vs. Non-American Indian Participants



Enculturation

- Enculturation refers to the extent to which ethnic/cultural minorities have retained their Indigenous or traditional cultural norms (Kim & Omizo, 2005).

| | Home | Personal |
|---------|------|----------|
| Level A | Yes | Yes |
| Level B | No | Yes |
| Level C | No | No |



Qualitative: Interview

Research Questions:

- How do students incorporate traditional cultural knowledge into formal mainstream science education?
- Do students value traditional cultural knowledge, or think that their science teachers value it?

Critical Incidents:

- Stories that incorporate both scientific and traditional knowledge, and are used to inquire about students' perceptions of the nature of science.
- The critical incidents in this study focused on:
 - Bitterroot plant
 - The formation of and traditional names for local geological location

Participant Responses

Participants were told a traditional story and cultural practices related to the bitterroot plant in addition to information about the bitterroot plant from a school textbook.

They were then asked: **Should the information from the text books AND the information learned from Elders be included in a report about the bitterroot plant for school?**

Culture Classroom/Level A Enculturation

1. The books wouldn't tell you what they really used it for. They just tell you information that really isn't important. The book wouldn't have where you can find it, or information you might need or might be useful.

2. Books can get things wrong a lot. When he talked to his grandfather, his grandfather will probably know because he has probably been to the ceremony a bunch of times.

Non-Culture Classroom/Level B & C Enculturation

3. The traditional stuff is not science. I would call the story an Indian belief. Beliefs are different than science unless they can be proved.

4. The traditional story about how and why it grew probably wouldn't be accepted as science. Traditional is just beliefs, I think mostly.

Participant Responses

When students were asked: **Are both kinds of information science?**

Culture Classroom/Level A Enculturation

1. *Well, the same kind of information, but what they were saying is different. I would say it is Earth science. But I don't know about the feast. The ceremony is not science. It is a confusing question.*

2. *I don't know which one to believe, because I guess they are both kind of true in some ways... cause that could have happened, It could have happened either way.*

Non-Culture Classroom/Level B & C Enculturation

3. *Probably the stuff out of the book is science because geologists could have wrote them and it's testable maybe, or you know that it is a fact and if you really wanted to, you could look and make sure that it is a fact.*

4. *The parts that I would call science would be the petals, the roots, the pollen and because those are the 4 parts that it mainly needs.*



Conclusions

- Statistically significant differences between groups are emerging from the survey data.
 - Students in culture-classrooms vs. non-culture classrooms
 - Students with different levels of enculturation
 - Students who self-identify as American Indian vs. students who do not
- Patterns are emerging from the interview data.
- Students in classrooms that integrate culture into science education seem to be more intrinsically motivated to learn about traditional plants, traditional stories, and traditional language (as compared to participants who are not taught culturally integrated curriculum).
- Additionally, participants in culture-classrooms appear to be thinking about traditional and scientific knowledge in more integrated ways.

Thank You!

Comments & Questions

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Questions



Thank you for participating in today's webinar on "**Honoring the Bitterroot: Traditional Knowledge, Science Education, and Intrinsic Motivation**" presented by Rose E. Honey, and hosted by National Clearinghouse for English Language Acquisition, NCELA, located at the Graduate School of Education and Human Development at The George Washington University.

- For more information or if you have additional questions contact:
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