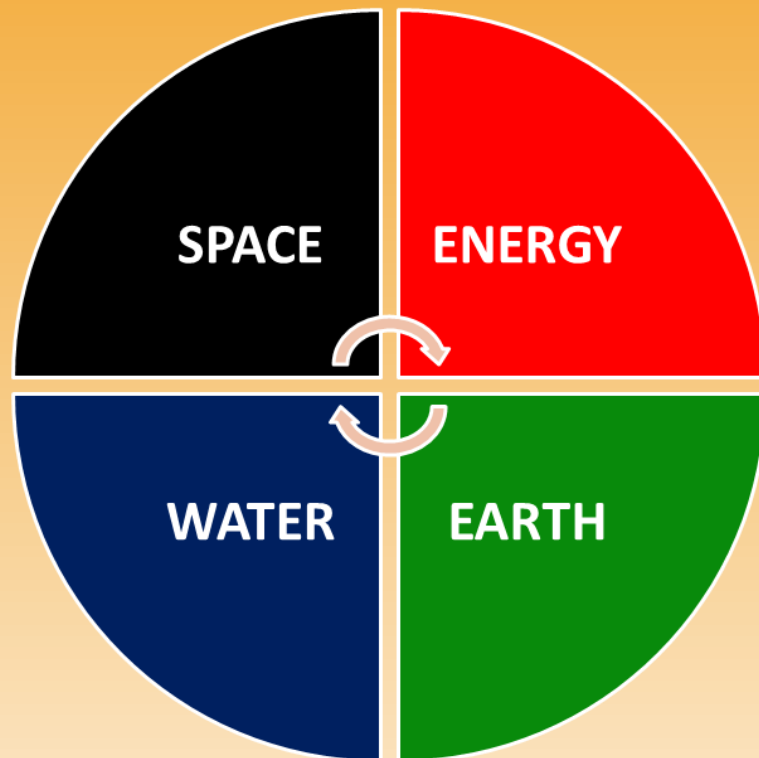




Transfer of Knowledge Project - (2019)

Ty Show, Jamie Cornish, Tony Hartshorn



A Partnership with:

Browning Middle School

Funded by: Northwest Earth & Space Science Pipeline (NESSP)

How can we increase Blackfeet youth's engagement and fascination with science?



Research Question & Hypothesis

1.) Research Question:

- Will using a mix of Western science and Native ways of knowing improve Blackfeet youth's engagement and fascination with science?

2.) Research Hypothesis

- Schools often lack the resources to integrate Native science into their curriculum. Using lesson plans that highlight indigenous knowledge and the traditional systematic structure of societies will increase students' engagement and fascination with science.

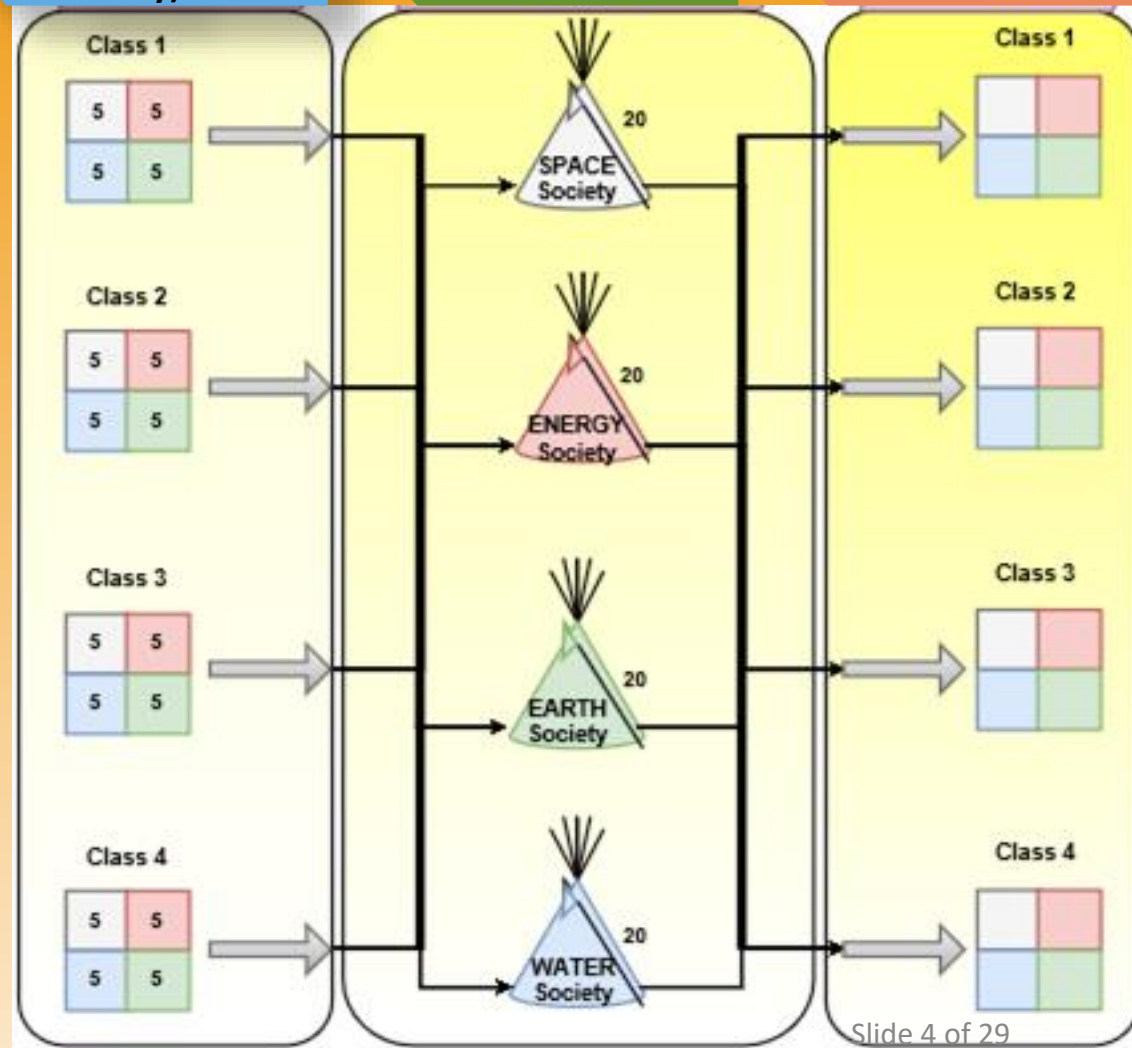
Phases of the Project

Phase 1
(Societal
Breakdown & Pre
Survey)

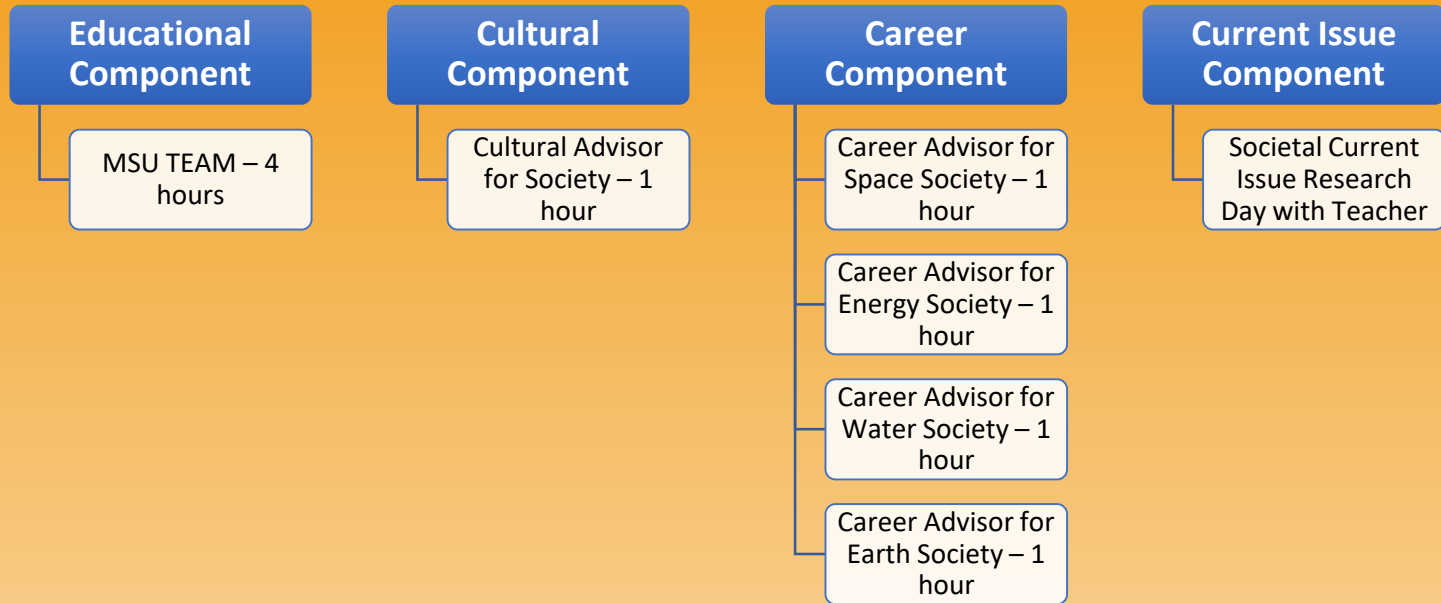
Phase 2
(Intervention
group Only)

Phase 3
(Transfer of
Knowledge)

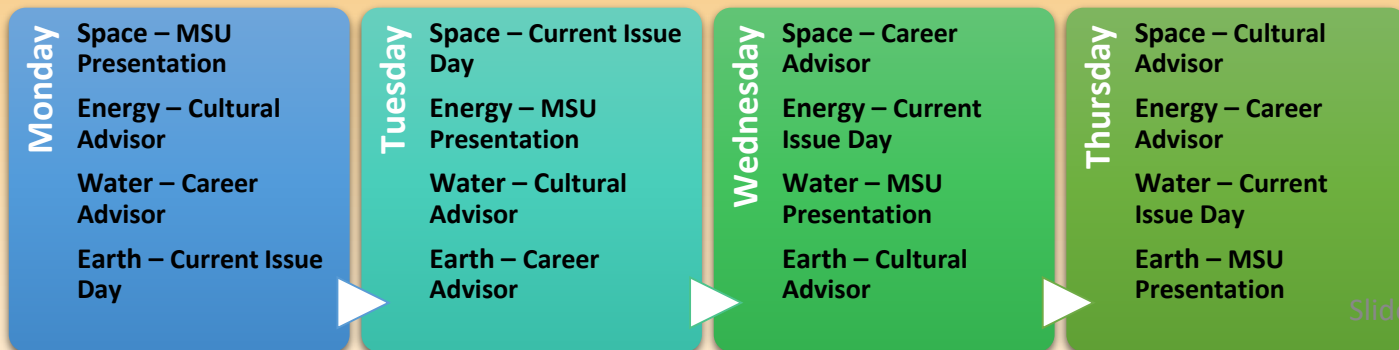
- 56 Browning Middle School students in the intervention
- 8 Browning Middle School students in the control
- Intervention students had @ 7 hours of participation in the program
- 4 classes in intervention
 - (2 science/2 social studies)
 - Grades 7 & 8
- Project intervention occurred May 2019



Rotation of societies among 4 Components



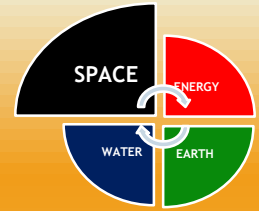
Week of Events Daily Rotation Schedule for Each Society



Educational Component



Space Society



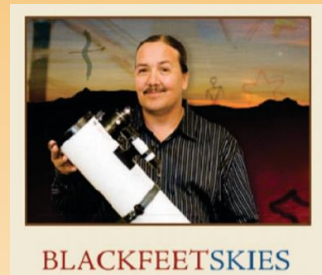
• Lesson 1 - Indigenous Science - Moon Face



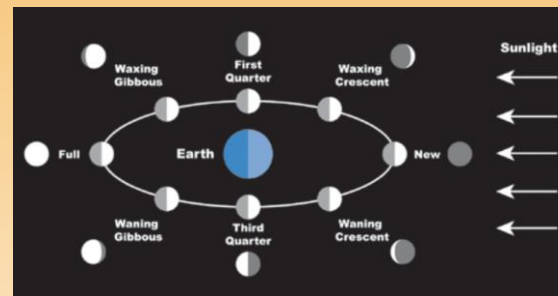
Learning Objective:

- Students will explore indigenous observations of the Moon and stars. They will learn that patterns of the apparent motion of the Sun, the Moon, and stars in the sky can be observed, described, predicted, and explained with models. They will also try making their own Moon craters.

• Lesson 2 - Western Science - Phases of the Moon



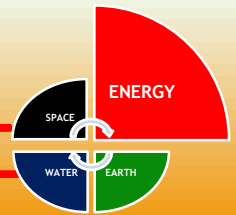
The space society lesson plans were heavily based on *Blackfeet Skies*.



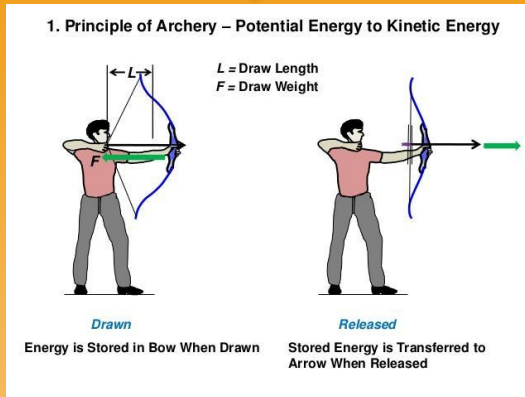
Learning Objective:

Students will develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.

Energy Society



• Lesson 1 - Indigenous Science - [Energy of the Bow & Arrow System]



<https://worldbuilding.stackexchange.com/questions/127970/would-bio-kinetic-metabolism-allow-the-user-to-also-absorb-kinetic-energy-too>

Learning Objective:

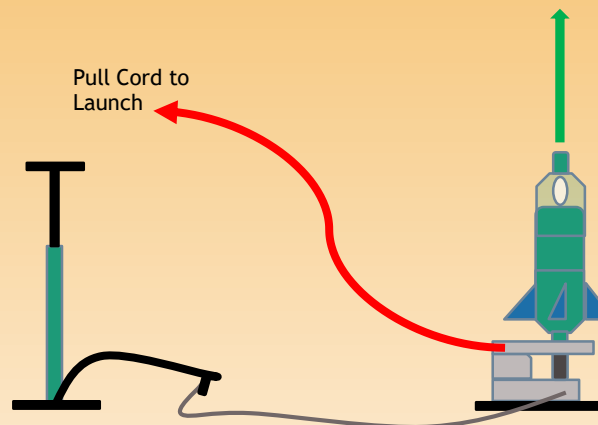
- Students will learn to identify the difference between **potential and kinetic energy** through the application of Traditional Ecological Knowledge (TEK) and Indigenous science of the Blackfeet bow & arrow.



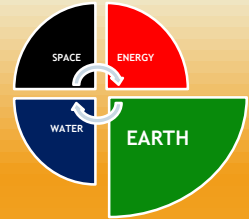
• Lesson 2 - Western Science - [Energy of a Water Rocket System]

Learning Objective:

- Students will learn to identify the difference between **potential and kinetic energy** through the application of engineering concepts utilizing the Western science of a rocket.



Earth Society



- Lesson 1 - Indigenous Science - [Ninaistako]

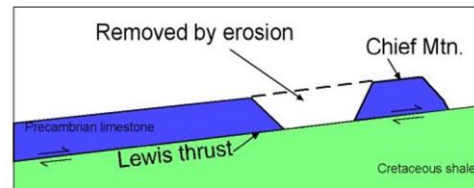


Learning Objective:

- Students will learn that mountains like Ninaistako (Chief Mountain) are part of the “Below World” and understand connections between this world and the “Water World” and the “Sky World.”

- Lesson 2 - Western Science - [Mountain-building]

Explanation of Lewis Overthrust



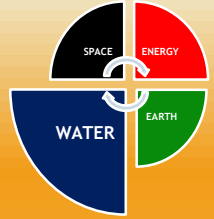
- Chief Mountain was moved about forty kilometers and isolated by erosion
- Chief Mountain is much older (Precambrian) than the rock upon which it rests (Cretaceous)

Source: [http://www.geosciences.fau.edu/Resources/CourseWebPages/Summer2013/GLY2010_E13/\(L13\)Folding,_Faulting,_and_Mountains_E13.ppt](http://www.geosciences.fau.edu/Resources/CourseWebPages/Summer2013/GLY2010_E13/(L13)Folding,_Faulting,_and_Mountains_E13.ppt)

Learning Objective:

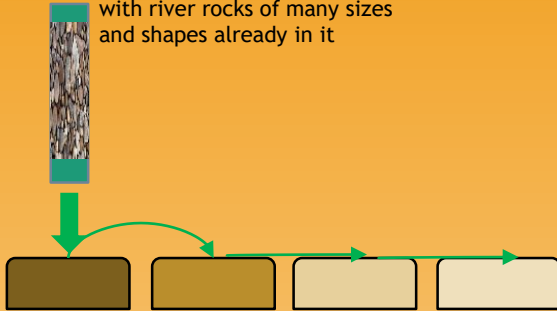
- Students will learn that mountains like Chief Mountain reflect the balance between mountain-building and mountain-eroding forces. Normally, deeper material is older than shallower material.

Water Society



- **Lesson 1 - Indigenous Science** - [Life & Natural River Water Filtration]

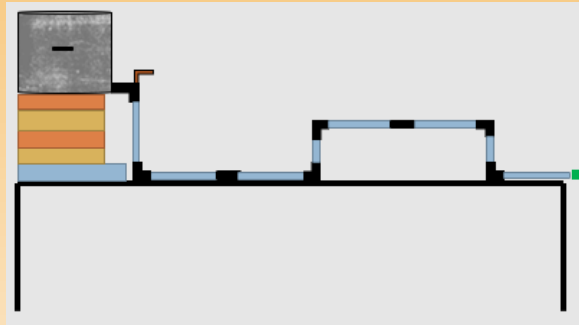
Put dirty water into wide pipe with river rocks of many sizes and shapes already in it



Learning Objective:

- Students will learn to identify how water is essential for life, the water cycle, and gain an understanding of the Traditional Ecological Knowledge (TEK) used to sustain a healthy and sustainable water source used for drinking water of the tribe.

- **Lesson 2 - Western Science** - [Life & Modern Water Filtration]



Learning Objective:

- Students will learn to identify how water is essential for life, the water cycle, and gain an understanding of the application of engineering concepts utilizing the Western Science of modern water filtration for drinking water.

Cultural Component

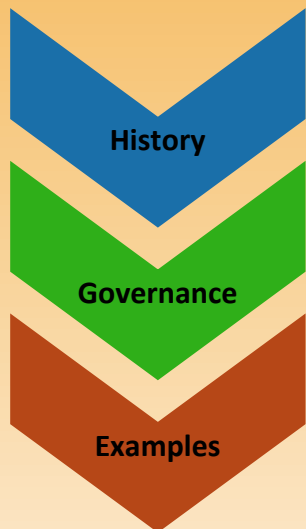
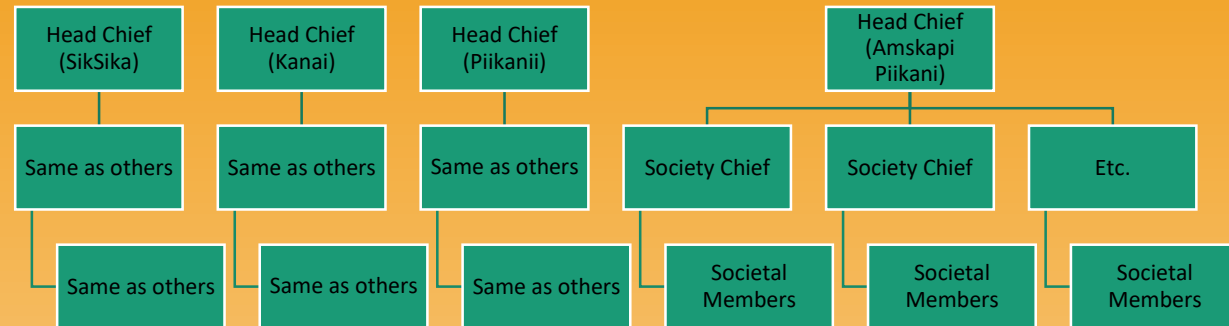


Cultural & Language Component

Blackfoot Confederacy

(Siksika, Kanai, Piikani, and Amskapi Piikani)

Robert Hall –
*Director,
Browning Public
Schools Native
American Studies*



- Societal History, Language & Different Blackfoot Societies

- Societal Structure used to govern Tribe

- Example of Blackfoot Society duties and responsibilities

During the summer many of the bands would gather together for a joint encampment which might last as long as two weeks. During this time there would usually be a Sun Dance and the chiefs might gather in council. At this time, the most influential band chief would be recognized as the head chief of the tribe. However, the only time when this rank had any significance was during the summer encampment. At this time, the role of tribal chief was really as chairman of the council of chiefs rather than as a ruler.

Career Component



Career Component

Career Advisors:

- **Earth Society - Monday**
 - 1 Career adviser with expertise relating to Earth
 - **Thedra Birdrattler – Blackfoot Tribe ARMP & Food Sovereignty**
 - Presentation on healthy food choices, and traditional foods
- **Energy Society - Tuesday**
 - 1 Career adviser with expertise relating to Energy
 - **Ron Crossguns Blackfoot Tribe Oil & Gas Director**
 - Presentation on Blackfoot Natural Resources
- **Space Society - Wednesday**
 - 1 Career adviser with expertise relating to Space
 - **Noel Stewart – Past NASA intern & Blackfoot Community College Science Teacher**
 - Presentation on SPACE
- **Water Society - Thursday**
 - 1 Career adviser with expertise relating to Water
 - **Ardis DayRider Ksik Stakii Project**
 - Presentation on water projects within the Blackfoot Reservation

Current Issues Component



Current Issues Component

The students in each society explore current issues using the Internet by doing the following.

1. Research a topic relating to society
2. Document any interesting finds
3. Share this information with other society members

Current Issues Information Sheet

• Event Name Found researching on the internet

• Summary of Current Issue

• How current issue relates to your society

- 1.) _____
- 2.) _____
- 3.) _____
- 4.) _____

• Future work someone like you could do to better the community:
(try to relate what you know about the subject to your culture or a known project in your area).

- 1.) _____

- 2.) _____

Transfer of Knowledge Project

Pre/Post Results for Intervention & Control

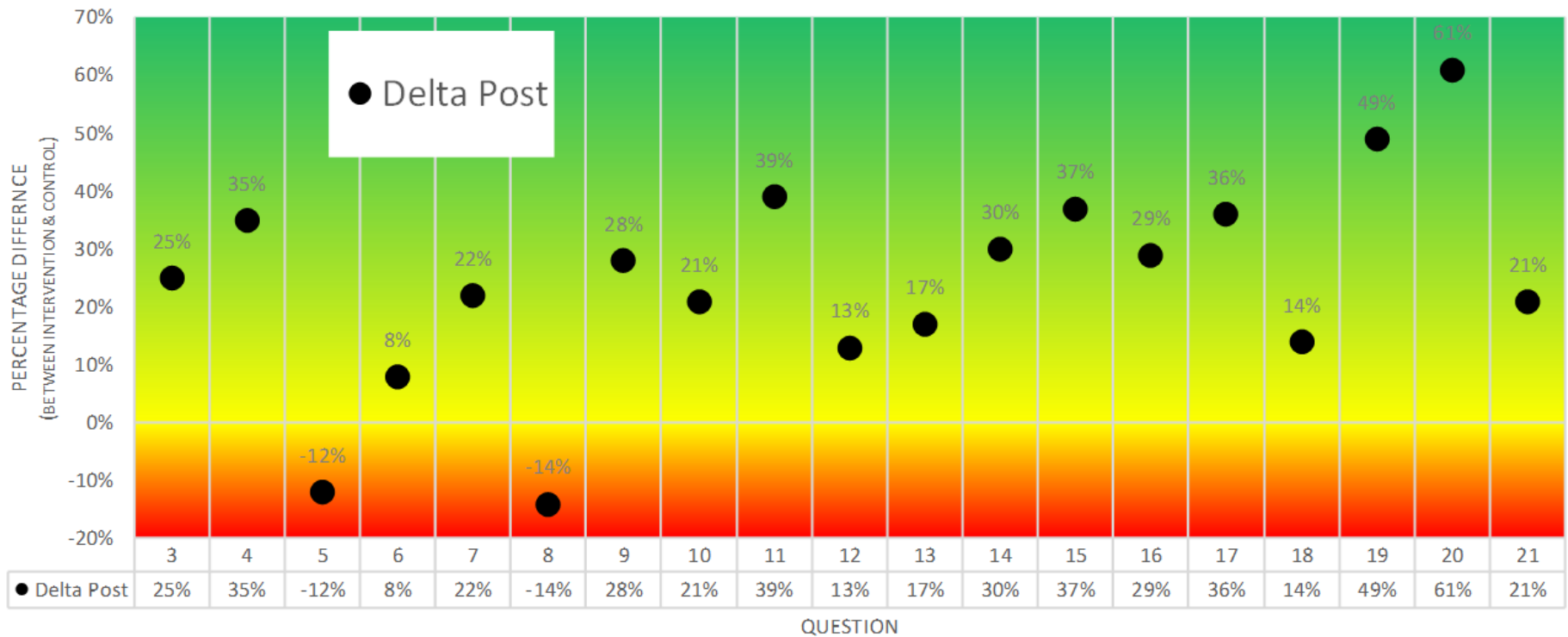
Survey Instrument

- Science Learning Activation Lab (activationlab.org) *Valuing Science* and *Fascination in Science* instruments
- written for 10-14 year olds
- piloted with over 2,500 youth nationally

Item ID Number	Prompt	Response Options and Coding
V01	Knowing science is important for:	4=all jobs 3=most jobs 2=a few jobs 1=no jobs
V02	Knowing science helps me understand how the world works:	4=all the time 3=most of the time 2=sometimes 1=never
V03	Thinking like a scientist will help me do well in:	4=all my classes 3=most of my classes 2=a few classes 1=none of my classes
V04	I think scientists are the most important people in the world.	4=YES! 3=yes 2=no 1=NO!
V05	I think science is more important than anything else.	4=YES! 3=yes 2=no 1=NO!
V06	Science makes the world a better place to live.	4=YES! 3=yes 2=no 1=NO!
V07	Knowing science is important for being a good citizen.	4=YES! 3=yes 2=no 1=NO!
V08	I think science ideas are valuable.	4=YES! 3=yes 2=no 1=NO!

Did we move the needle? This is "Post" only...

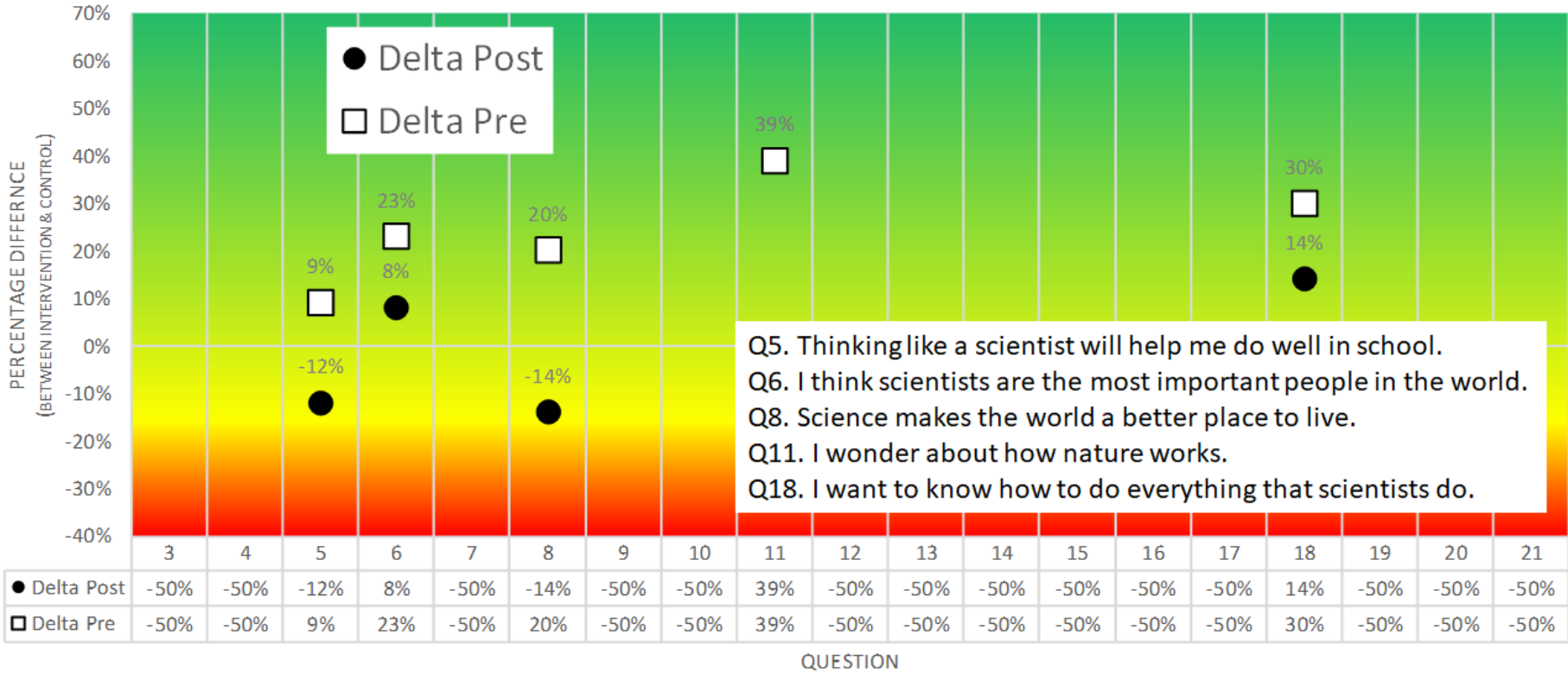
POSITIVE RESPONSE (YES) ANALYSIS DIFFERENCE (INTERVENTION - CONTROL)



Did we move the needle?

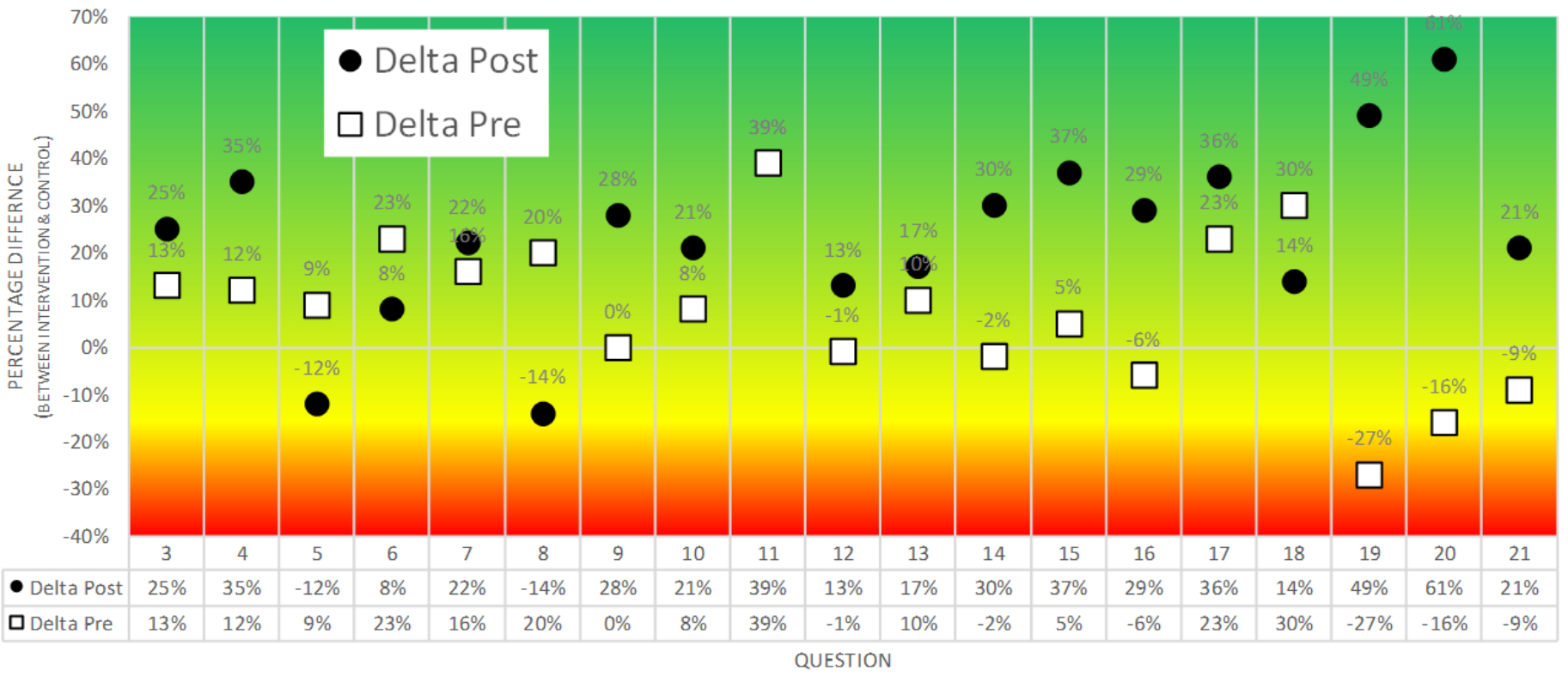
Yes, but... in 5 cases, upside down!

POSITIVE RESPONSE (YES) ANALYSIS DIFFERENCES WHERE CONTROL > INTERVENTION



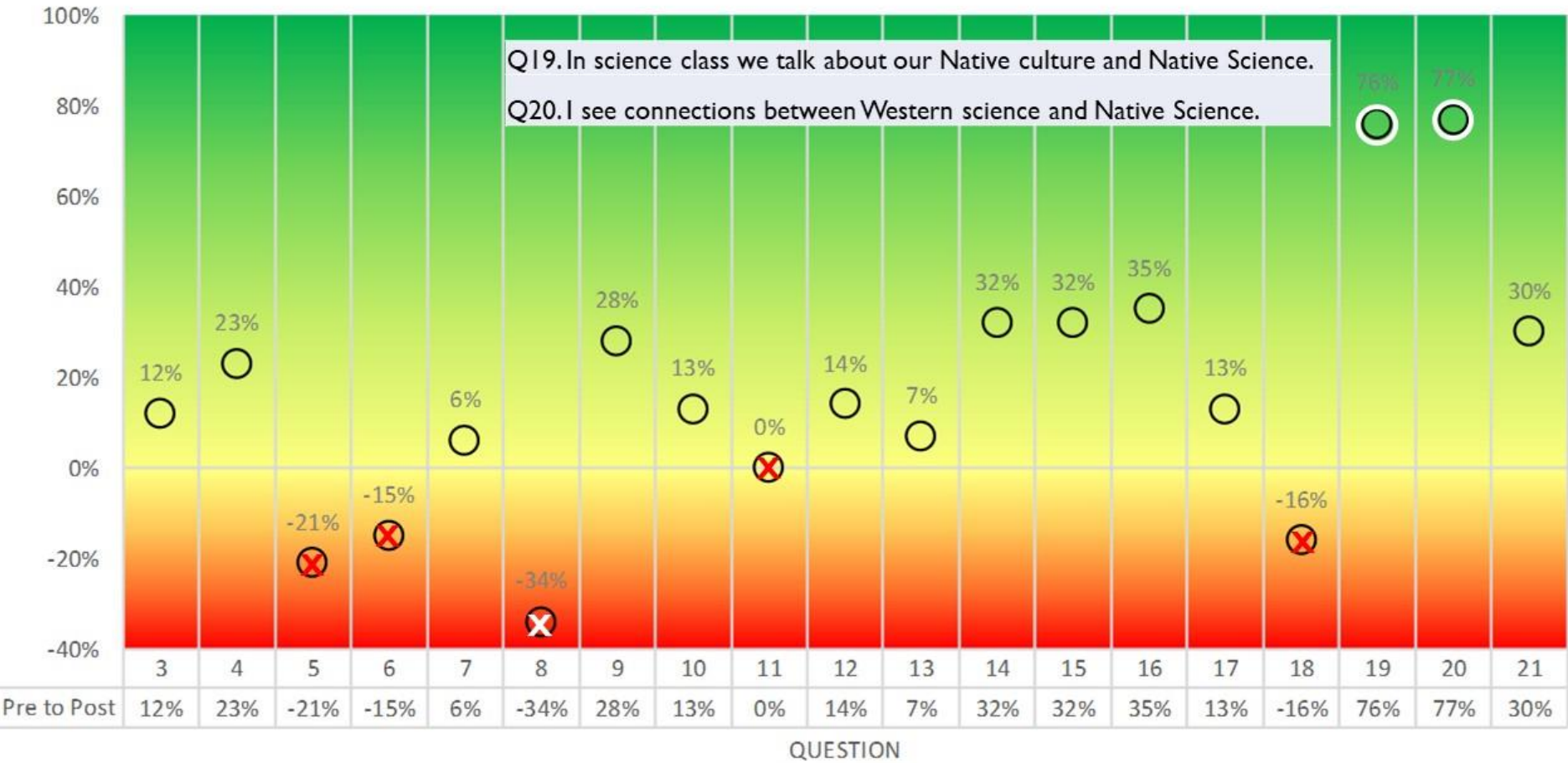
Did we move the needle?

POSITIVE RESPONSE (YES) ANALYSIS DIFFERENCE (INTERVENTION - CONTROL)



Did we move the needle?

POSITIVE RESPONSE (YES) ANALYSIS
 PERCENT DIFFERENCE IN PRE & POST
 BASED ON DIFFERENCE BETWEEN CONTROL & INTERVENTION



Highest Movement Questions

77% I see connections between Western Science and Native Science
76% In science class we talk about our Native Culture

35% I want to read everything I can find about science

32% After a really interesting science activity is over, I look for more information about it

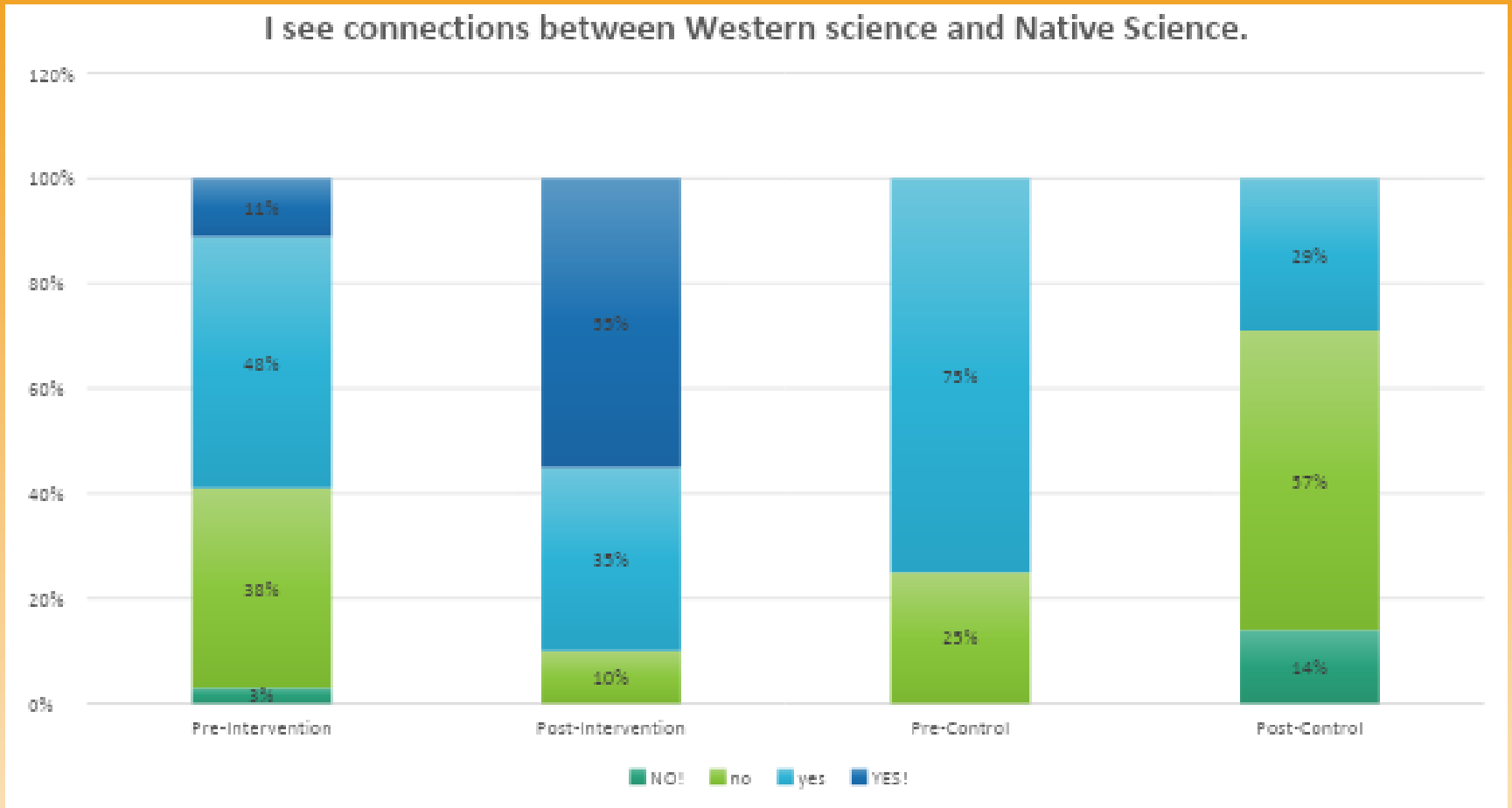
32% I need to know how objects work

30% Studying Piikani traditional knowledge in science class makes me like science more

28% Knowing science is important for being a good citizen

23% Knowing science helps me understand how the world works

Question #20 - I see connections between Western science and Native science.

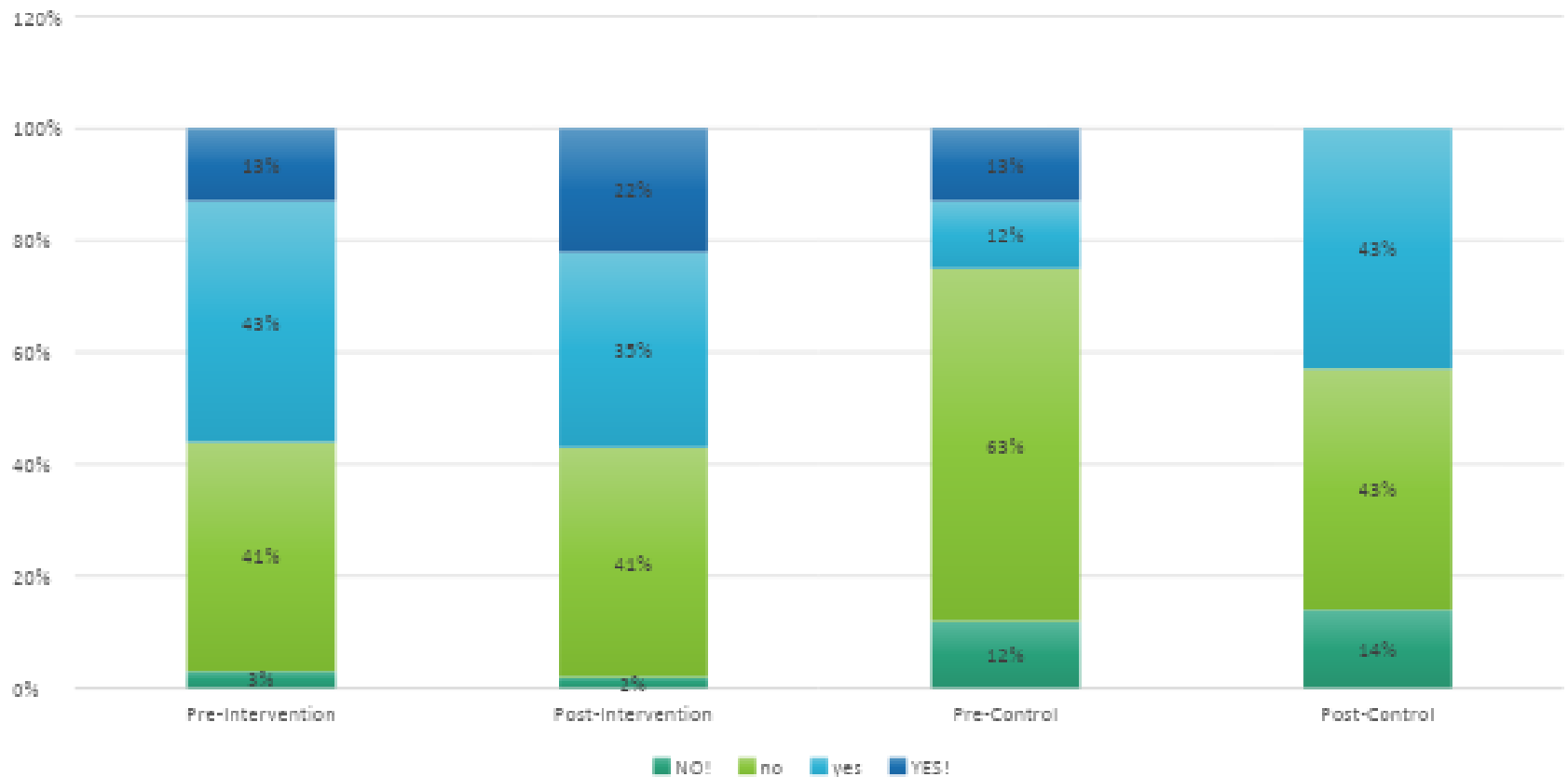


Low Movement Questions

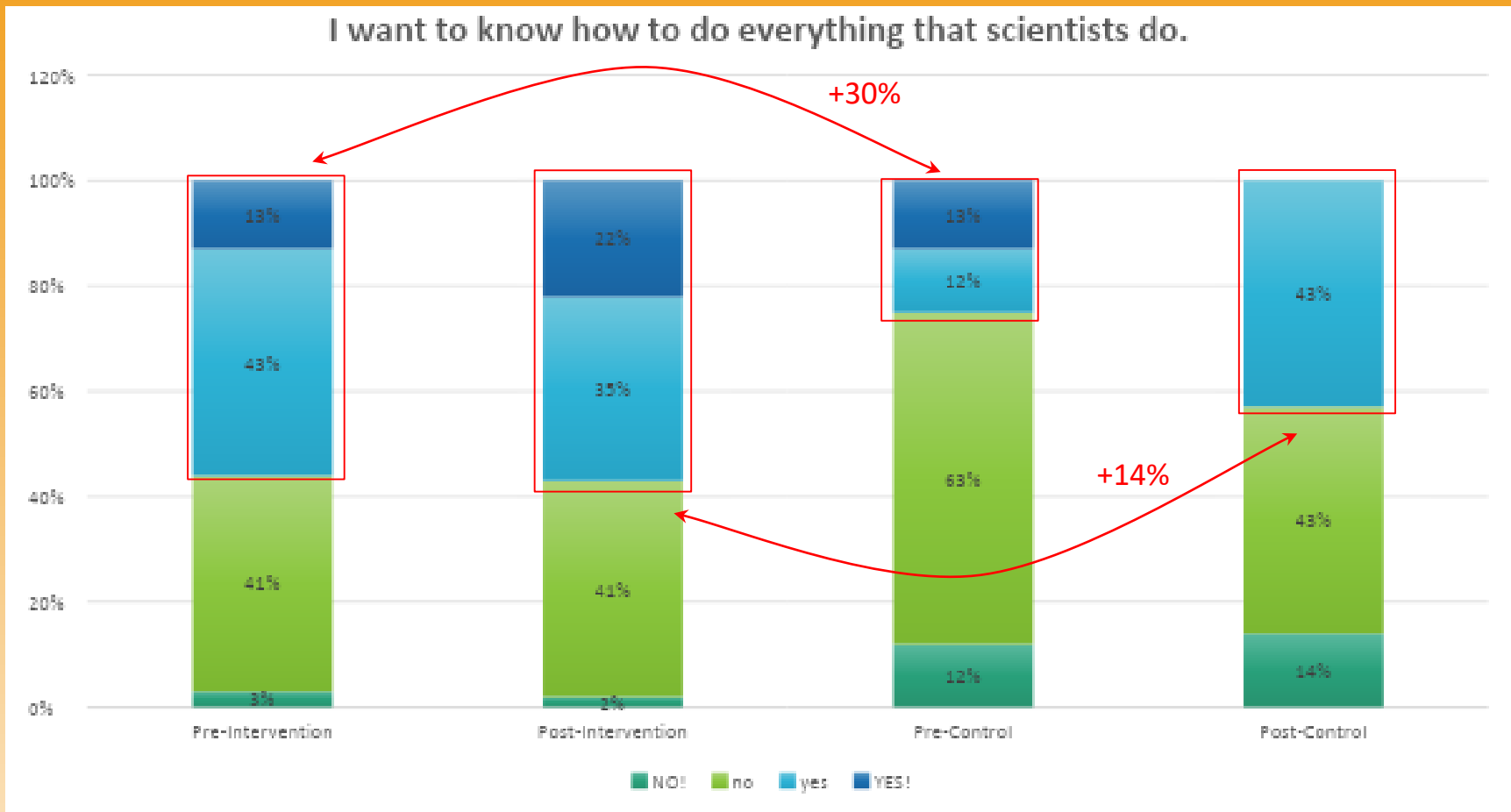
- 0% I wonder about how nature works
- 15% I think scientists are the most important people in the world
- 16% I want to know how to do everything scientists do
- 21% Thinking like a scientist will help me do well in (all my classes/ most of my classes/ a few classes/none of my classes)
- 34% Science makes the world a better place to live

Question #18 - I want to know how to do everything that scientists do.

I want to know how to do everything that scientists do.



Question #18 - I want to know how to do everything that scientists do. (Post delta [+14%] - pre delta [30%]= -16%)



Future Work

- further statistical analysis into the results
- create and deliver website of lesson plans and resources for the school district
- repeat the intervention with a larger control group and a capstone project
- publish findings in journal articles
- identify and pursue more external funding

QUESTIONS?

