Evaluating the Impacts of the IRIS EPO Presence at the NSTA 2022 National Convention

For
Michael Hubenthal – IRIS Education and Public Outreach
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Executive Summary
Annually, the IRIS Education and Public Outreach (EPO) program participates in the national conference of the National Science Teachers Association. Through participation in the conference, IRIS seeks to increase the science education community's awareness of the IRIS Consortium and the products and programs that it offers, while also encouraging and enabling post-conference use of IRIS's educational resources. IRIS has three primary approaches to achieve these goals. First, staff work directly with teachers in hour-long in-person professional development workshops. Second, staff promote products and programs as part of share-a-thon sessions. Finally, staff engage in one-on-one interactions with teachers at the IRIS booth on the convention floor. Due to the global pandemic, the 2020 and 2021 NSTA conferences were canceled.

Prior to the 2022 conference, IRIS staff set the following Impact Objective for session attendees (based on 2019 objectives).

	Metric	**2022 Findings**
Impact Objective	90% of attendees of hour-long sessions will indicate the intention to use the featured IRIS resources in their classroom	95% of post-session survey respondents indicated that it was likely (21%) or highly likely (74%) that they would use IRIS resources presented in the session in their classroom. ***Thus, IRIS met or exceeded this impact objective and made progress towards increasing both the quantity and quality of seismology education while at NSTA.***

Based on the evaluation of IRIS performance at the 2022 NSTA meeting and a comparison of these results to results from NSTAs in 2013-2019, three key recommendations have been identified to continue to improve implementation in 2023.

Recommendation #1 – Follow-up with session attendees at 6 months to one year post experience
- Session attendees consistently state their intent to use what they have learned in the session in their classroom or educational setting. A follow-up survey will give additional information about actual implementation and insights into changes from intention.

Recommendation #2 – Tailor titles and descriptions to align with participants' selection practices
> This practice, stated in 2021/22 yielded positive attendance rates and should continue in the future.

Recommendation #3 – Review common items to insure they are providing evidence towards goals
- A review of the current survey items should be conducted to insure alignment with current and future goals.

Background
Annually, the IRIS Education and Public Outreach (EPO) program participates in the national conference of the National Science Teachers Association (NSTA). Through participation in the conference IRIS seeks to increase the science education community's awareness of the IRIS Consortium and the products and programs that it offers, while also encouraging and enabling post-conference use of IRIS's educational resources. IRIS has three primary approaches to achieve these goals.

- Direct work with teachers in hour-long in person professional development sessions
- Promotion of products and programs as part of share-a-thon sessions
- One-on-one interactions with teachers at the IRIS booth on the convention floor

Participation in the NSTA National Convention is also an opportunity for IRIS EPO to receive feedback, directly from teachers about the products and programs it offers, and to gain an understanding of teachers' instructional needs and concerns. While much of this feedback is collected informally through conversations with teachers at the booth, IRIS also uses the meeting to conduct formal evaluations of EPO products and programs with this national teacher audience. This combination of formal and informal feedback informs the development and updating of IRIS products and services.

In 2022, the NSTA conference was held in Houston, TX from March 31 – April 2. IRIS EPO had four sessions selected for presentation. These hour-long sessions provide an opportunity for IRIS EPO to contribute to the content knowledge and pedagogical content knowledge of participants. Sessions are designed such that participants can learn new content while gaining direct experience using the featured IRIS resources. This allows, teachers to confidently implement the activity when they return to their classrooms. In the session, participants not only receive relevant handouts for the lesson, but they also receive the IRIS Earthquake Resource handout (Appendix B). This handout provides an overview of the spectrum of resources IRIS offers beyond what is covered specifically in the workshop.

Friday, April 1 - 8:00 AM - 9:00 AM
Earthquakes as a Phenomenon to Drive Student Inquiry

George R. Brown Convention Center - 332B
Help students explore earthquakes and Earth science in context after major earthquakes using a suite of FREE web-apps, data, animations, and visualizations from IRIS.
Takeaways: Explore: 1. the current seismicity of the planet; 2. resources to help students examine a recent earthquake in Earth science context; and 3. resources to enable students to work with authentic earthquake data.

Seismic Monitor - http://ds.iris.edu/seismon/index.phtml
IEB – www.iris.edu/ieb
Station Monitor - https://www.iris.edu/app/station_monitor/
EQ Locate - https://www.iris.edu/hq/inclass/software-web-app/eqlocate_app
Layered Earth
https://www.iris.edu/hq/inclass/lesson/determining_and_measuring_earths_layered_interior

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Friday, April 1 - 9:30 AM - 10:30 AM

Discover and Measure Earth's Layered Interior Using Seismic Data and Simple Models: A 3-D Learning Activity from IRIS

George R. Brown Convention Center - 322A

By using math, building models, analyzing earthquake data, and participating in scientific discourse, your students can discover and measure Earth's outer core!

Takeaways: 1. Demonstrate that Earth cannot be a homogeneous mass and must have a layered interior; 2. Explain how seismic waves provide evidence for Earth's internal structure and composition; and 3. Explain the usefulness of models in the process of science, as tools to generate predictions that can be compared to observations of the Earth system.

Hands-on activity
https://www.iris.edu/hq/inclass/lesson/determining_and_measuring_earths_layered_interior
Online lab version
https://www.iris.edu/hq/inclass/software-web-app/layered-earth
Brief History of Earth's Interior
https://www.iris.edu/hq/inclass/animation/layers_of_the_earth

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Friday, April 1 - 12:30 PM - 1:30 PM

Hands-On Demonstrations and Models for Your Plate Tectonics, Nature Hazards, Earthquake Units

George R. Brown Convention Center - 360 E/F

Explore inexpensive hands-on demonstrations and interactive models to build conceptual understanding of Earth's elasticity, structure, plate motions, and more.

Takeaways: Participants will be able to: 1. describe a suite of hands-on models, evaluating their merits and limitations; 2. differentiate between mental models and expressed models, linking multiple types of models to phenomena (to express the unviewable); and 3. support explanations by analyzing and interpreting data generated by physical models.

Saturday, April 2- 12:30 PM - 1:30 PM

Historic Observations, Physical Models, and GPS Data Reveal the Long and Short Behavior of Earthquakes in NGSS-Focused Resources!

George R. Brown Convention Center - 351E

FREE IRIS and UNAVCO resources explore how the earthquake system behaves across long and short time scales using observations; evidence; and simple, interactive physical models.

Takeaways: Teachers will be able to: 1. use evidence and reasoning to construct an explanation for earthquake occurrence at varying timescales; 2. model energy inputs and outputs to the earthquake cycle using a simple mechanical model; and 3. describe how the moment magnitude is calculated for an earthquake and how this relates to basic physical science principles.

Evaluation Methods

The evaluation of hour-long sessions sought to answer two key questions; How large was the reach of the workshop (e.g. how many people attended)? How did the workshop impact participants (e.g. how did their Behaviors, Attitudes, Skills, Interest, and/or Knowledge change as a result of participating)?

The reach of the session was measured by conducting head counts shortly after each session began. Since there is some ebb and flow in participation (some teachers arrive late while others

leave early), a second head count was taken later in the workshop. When possible, staff attempted to document headcounts with photographic evidence (Appendix C). Attendance is also tracked by the difference in the number of handouts brought to the session compared and the number remaining at the end of the session. Since each approach has its own shortcomings (e.g. coming and goings of participants, and people potentially taking extra handouts or not taking any at all) the evidence is triangulated to arrive at a reasonable estimate that the program can have confidence in.

To answer the question of impact, a post-session evaluation was employed. The survey was distributed, in hardcopy, to session participants 5 minutes before the conclusion of the session, so participants had time to complete the evaluation before leaving for their next session. Data was then entered online and shared with the external evaluator for analysis and summary.

Evaluation Results & Discussion
The combined session reach for the 2022 NSTA was estimated at 153 teachers. Each hour-long session, facilitated or co-facilitated by IRIS, was attended by at least 8 or more participants. The attendance of one sessions was above the long-term session average of 36 people. The session with the largest attendance in 2022 was Hands on demonstrations and Models for Your Plate Tectonics, Nature Hazards, Earthquake Units which had an estimated attendance of 75 teachers.

IRIS's sessions were well received by attendees. For example, across all sessions, 91% of respondents agreed (28%) or strongly agreed (63%) that the session was a valuable use of their time. Sessions also appeared to meet participant expectations related to session selection. Here, 95% of participants across all sessions indicated that it was likely (21%) or highly likely (74%) that they would use IRIS resources presented in the session in their classroom. This is above the impact objective, "90% of attendees of hour-long sessions will indicate the intention to use the featured IRIS resources in their classroom", set for hourlong workshops prior to NSTA. Teachers also indicated that their interest in, and their knowledge of the topics of the sessions increased (see individual summaries). And, in a related measure, these increases were applicable to their classrooms as 91% of participants agreed (28%) or strongly agreed (62%) that they would be able to include some of what they learned in the session in their own work. Indicative of participants' perceptions of the quality of the instruction and resources they received across all IRIS sessions, respondents reported an average of 8.9/10 when asked "How likely are you to recommend IRIS resources to a friend or colleague? Complete details for each session's evaluation can be found following the executive summary.

Evaluation Findings by Session

Session 1: Historic Observations, Physical Models, and GPS Data Reveal the Long and Short Behavior of Earthquakes in NGSS-Focused Resources (N=4)

How satisfied are you with your learning from today's session?

	N	%
Extremely satisfied	2	50%
Somewhat satisfied	2	50%
No satisfied	0	0

How likely are you to use elements from today's session in your classroom?

	N	%
Extremely likely	2	50%
Somewhat likely	2	50%
No likely	0	0

How likely are you to recommend IRIS resources to a friend or colleague?
Mean = 8.8

Is there anything about today's session you would like to share with us?
- *It is helpful to have the slides ahead of time to take notes as we go through the session*
- *I enjoyed the level of detail and rigor.*

What level do you primarily teach?

	N	%
High school	3	75%
Middle school	1	25%
Elementary school	0	0

Which of the following best describes your primary teaching responsibilities over your career?

	N	%
Earth science	2	50%
Physics	1	25%
Other	1	25%

How many years have you been teaching?
Mean = 14
Range 5-25

Session 2: Discover and Measure Earth's Layered Interior Using Seismic Data and Simple Models: A 3-D Learning Activity from IRIS (N=14)

Please indicate the extent to which you agree or disagree with the following statements.

	SD	D	N	A	SA

I will be able to include some of what I learned in this session in my own teaching				7%	43%	50%
This session provided me with new science content in a way that was not overwhelming			7%	36%	50%
As a result of today's session, I feel better prepared this sessions topic to students			7%	57%	36%
I know how to access IRIS's educational resources		7%	7%	36%	50%
Overall, the session was a valuable use of my time				36%	69%
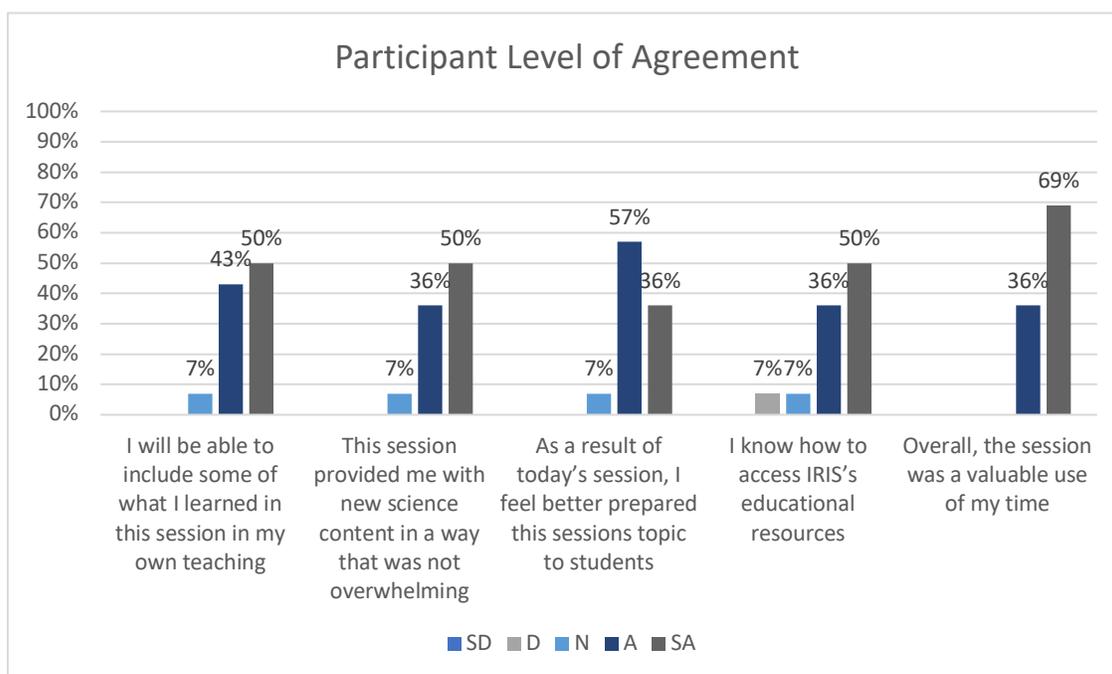
How likely are you to use the activity from today's session in your classroom? (N=10)

	N	%
Extremely likely	8	80%
Very likely	0	0
Somewhat likely	2	20%
No likely	0	0

What classroom challenges do you think the activity we presented today could help you address?
- *I teach middle school. I worry about students losing their progress.*
- *Computer issues*
- *The content might be a little too difficult for them.*
- *Layers of the earth. Instead of building a mod I will do this first.*
- *Practicing with the SEP's*
- *Students who still don't believe in the layers of earth.*
- *Lots of topics in a single lab... concepts and skills*

- *Ability to analyze data and connect to content*

How likely are you to recommend IRIS Resources to a friend or colleague? (N=13)
    Mean response = 9.1/10

In your recommendation to a friend of colleague, what would you say to them?
- *This is an awesome resource.*
- *This is well thought out from start to finish*
- *I'm going to walk you through this online resource to teach the layers of the earth using p waves. It's super interactive and easy for students to see connection through data. You do not lose class time to students not being able to calculate as it does this for you.*
- *Very well-designed; Good Pedagogy; easy to use; substantial content.*
- *Good activity to use - especially the independent aspect for students*

Please rate your level of agreement with each statement BEFORE and AFTER the workshop.

	BEFORE	AFTER
I can demonstrate that Earth cannot be a homogeneous mass and must have a layered interior.	3 – SA 8 – A 1 – SD	8 – SA 2 – A
I can explain how seismic waves provide evidence for Earth's internal structure and composition.	5 – SA 7 – A N – 1	8 – SA 4 – A
I can explain the usefulness of models in the process of science, as tools to generate predictions that can be compared to observations of the Earth system.	5 – SA 7 – A	9 – SA 2 – A
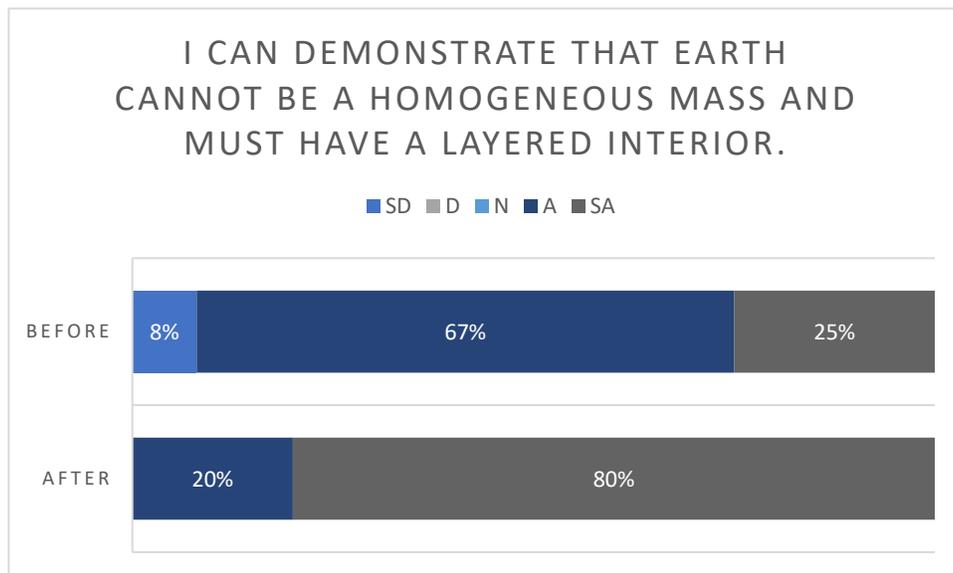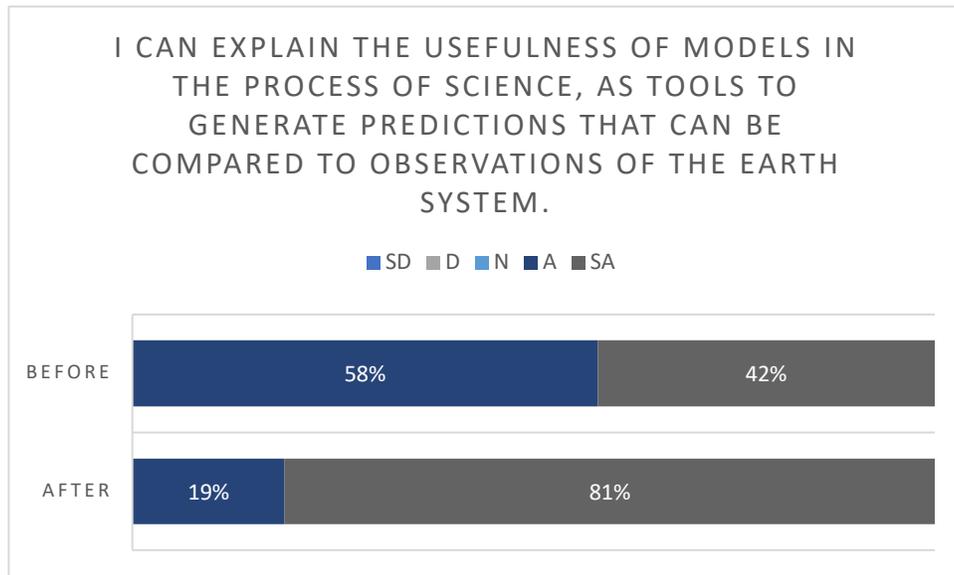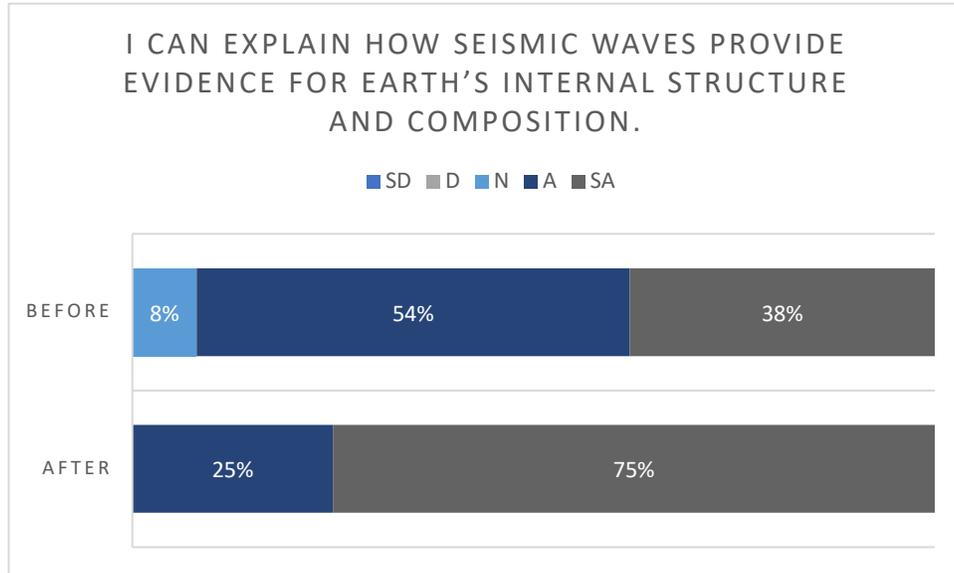
I CAN DEMONSTRATE THAT EARTH CANNOT BE A HOMOGENEOUS MASS AND MUST HAVE A LAYERED INTERIOR.

SD D N A SA

BEFORE: 8% | 67% | 25%
AFTER: 20% | 80%

I CAN EXPLAIN HOW SEISMIC WAVES PROVIDE EVIDENCE FOR EARTH'S INTERNAL STRUCTURE AND COMPOSITION.

Legend: ■SD ■D ■N ■A ■SA

BEFORE	8%	54%	38%
AFTER	25%	75%	

I CAN EXPLAIN THE USEFULNESS OF MODELS IN THE PROCESS OF SCIENCE, AS TOOLS TO GENERATE PREDICTIONS THAT CAN BE COMPARED TO OBSERVATIONS OF THE EARTH SYSTEM.

Legend: ■SD ■D ■N ■A ■SA

BEFORE	58%	42%
AFTER	19%	81%

Please rate your level of agreement with each statement BEFORE and AFTER the workshop.

	BEFORE	AFTER
My level of interest in today's topic	VH – 5 H – 3 Mod – 2	4 – VH 4 – H 1 – Mod
My level of knowledge of today's topic	1 – VH 8 – H 3 – Mod	3 – VH 6 – H 1 – L

MY LEVEL OF INTEREST IN TODAY'S TOPIC

VL ▪ L ▪ M ▪ H ▪ VH

BEFORE	20%	30%	50%
AFTER	12%	44%	44%

MY LEVEL OF KNOWLEDGE OF TODAY'S TOPIC

VL ▪ L ▪ M ▪ H ▪ VH

BEFORE	25%	67%	8%
AFTER	10%	60%	30%
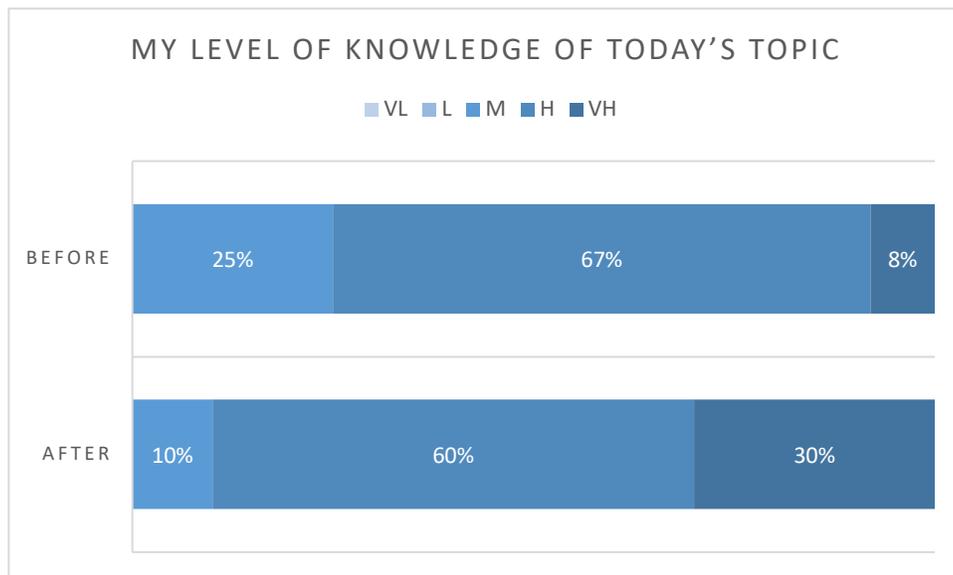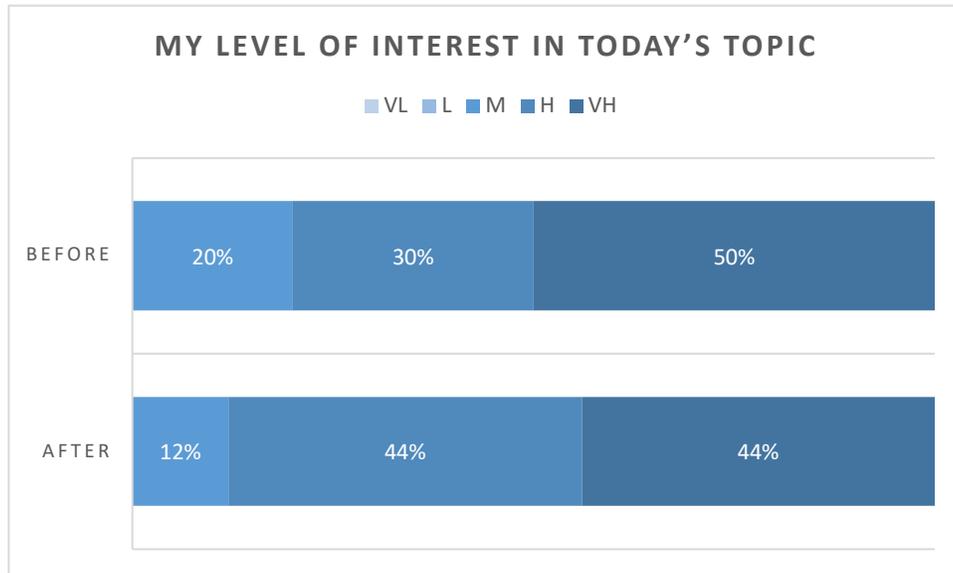
Is there anything else about today's session you would like to share with us?

- *No*
- *Lower level students (6-7th graders) might find the number of steps overwhelming.*
- *Love it! Great tool! I can see a lot of potential use in my classroom!*
- *Would like more demo of access to all IRIS resources... maybe last 5 minutes for those who wanted to stay after.*

What level do you primarily teach? (N=13)

	N	%
High school	6	46%
Middle school	7	54%
Elementary school	0	0

Which of the following best describes your primary teaching responsibilities over your career? (N=13)

|	N	%
Earth science	6	46%
Physics	2	15%
Integrated/General Science	2	15%
Biology	1	8%
Chemistry	1	8%
Other	1	8%

How many years have you been teaching? (N=13)
> Mean = 19
> Range - 2-30

Session 3: 2022 Hands-On Demonstrations and Models for Your Plate Tectonics, Nature Hazards, Earthquake Units (N=14)

Please indicate the extent to which you agree or disagree with the following statements.

	SD	D	N	A	SA
I will be able to include some of what I learned in this session in my own teaching	7%			36%	57%
This session provided me with new science content in a way that was not overwhelming	7%		14%	43%	36%
As a result of today's session, I feel better prepared this sessions topic to students	7%		14%	36%	43%
I know how to access IRIS's educational resources	7%		7%	36%	50%
Overall, the session was a valuable use of my time			14%	50%	36%
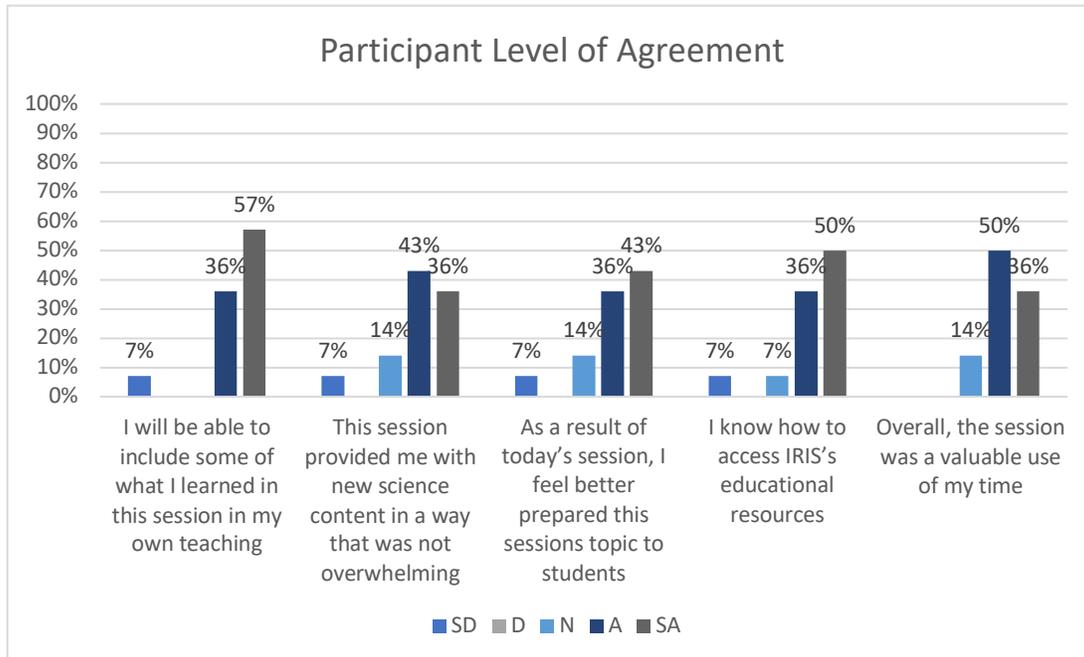
Participant Level of Agreement

How likely are you to use elements from today's session in your classroom? (N=10)

	N	%
Extremely likely	6	60%
Somewhat likely	4	40%
No likely	0	0

How likely are you to recommend IRIS Resources to a friend or colleague?
Mean response = 8.0/10

Please rate your level of agreement with each statement BEFORE and AFTER the workshop.

	BEFORE	AFTER
I can describe what a scientific model is.	3 – SA 6 – A 1 – N 1 – D	5 – SA 7 – A
I can differentiate between mental and expressed models.	2 – SA 7 – A 1 – N 2 – D	3 – SA 8 – A 1 – N
I know how to access IRIS and UNAVCO activities online.	1 – SA 7 – A 3 – N 2 – D	5 – SA 6 – A 1 – N
I can compare/contrast intraplate vs plate margin models for the earthquake cycle.	6 – A 3 – N 2 – D 1 – SD	5 – SA 6 – A 1 – N
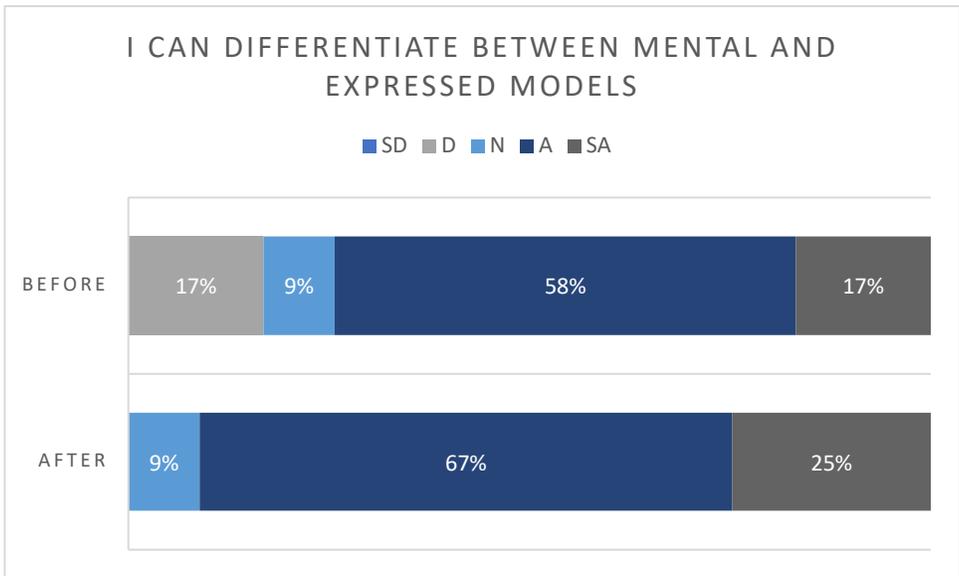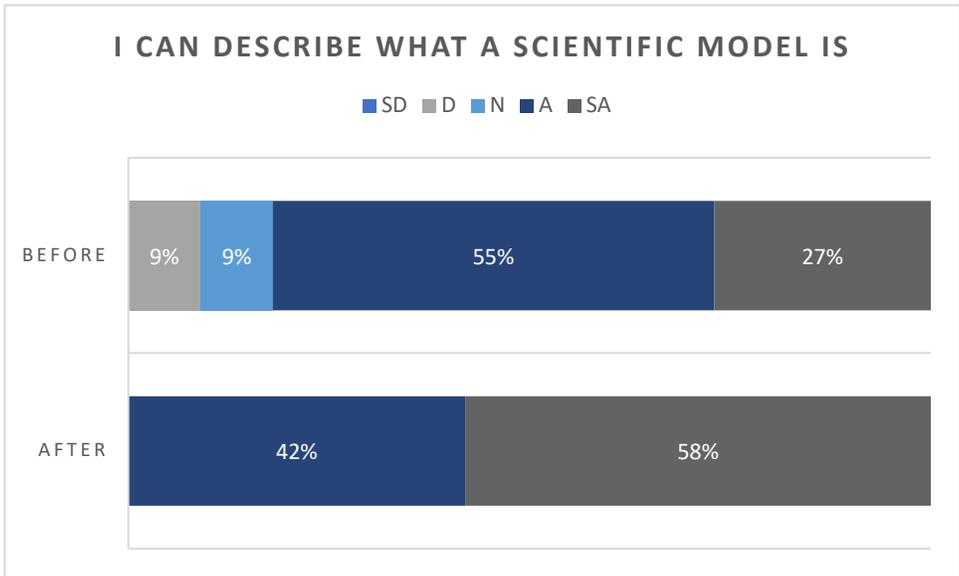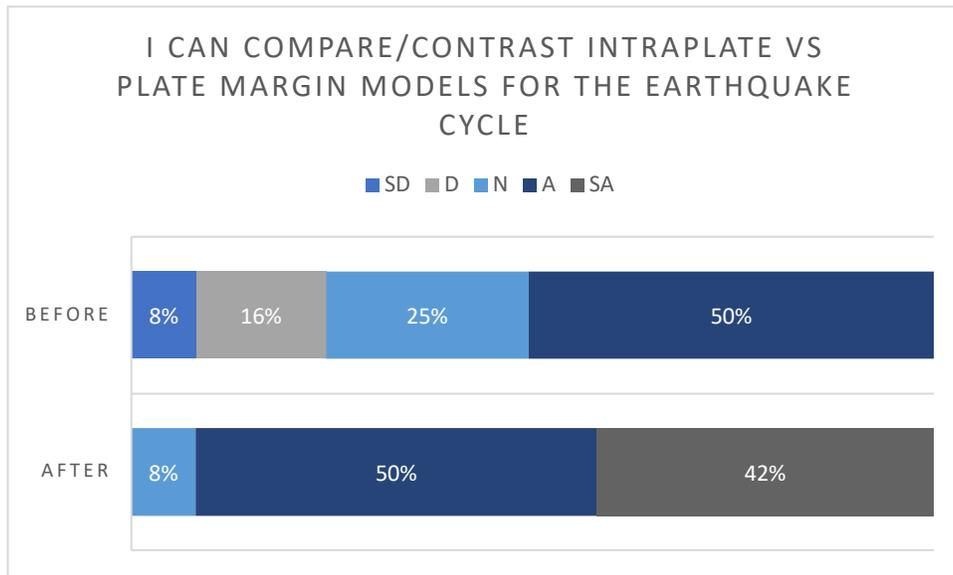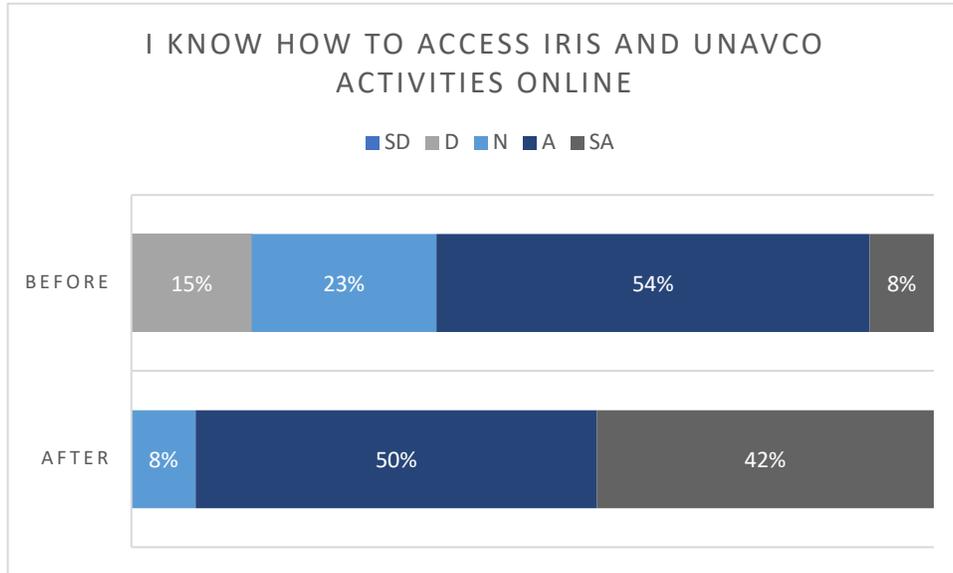
I CAN DESCRIBE WHAT A SCIENTIFIC MODEL IS

SD ■ D ■ N ■ A ■ SA

BEFORE | 9% | 9% | 55% | 27%

AFTER | 42% | 58%

I CAN DIFFERENTIATE BETWEEN MENTAL AND EXPRESSED MODELS

SD ■ D ■ N ■ A ■ SA

BEFORE | 17% | 9% | 58% | 17%

AFTER | 9% | 67% | 25%

I KNOW HOW TO ACCESS IRIS AND UNAVCO ACTIVITIES ONLINE

Legend: ■ SD ■ D ■ N ■ A ■ SA

BEFORE	D 15% — N 23% — A 54% — SA 8%	
AFTER	N 8% — A 50% — SA 42%	

I CAN COMPARE/CONTRAST INTRAPLATE VS PLATE MARGIN MODELS FOR THE EARTHQUAKE CYCLE

Legend: ■ SD ■ D ■ N ■ A ■ SA

BEFORE	SD 8% — D 16% — N 25% — A 50%
AFTER	N 8% — A 50% — SA 42%

Please rate your level of agreement with each statement BEFORE and AFTER the workshop.

	BEFORE	AFTER
My level of interest in today's topic	VH – 4 H – 5 Mod – 3	4 – VH 4 – H 2 – Mod
My level of knowledge of today's topic	3 – H 6 – Mod 2 – L	1 – VH 7 – H 3 – M

MY LEVEL OF INTEREST IN TODAY'S TOPIC

Legend: VL L M H VH

BEFORE	25%	42%	33%
AFTER	20%	40%	40%

MY LEVEL OF KNOWLEDGE OF TODAY'S TOPIC

Legend: VL L M H VH

BEFORE	18%	54%	33%
AFTER	27%	64%	9%
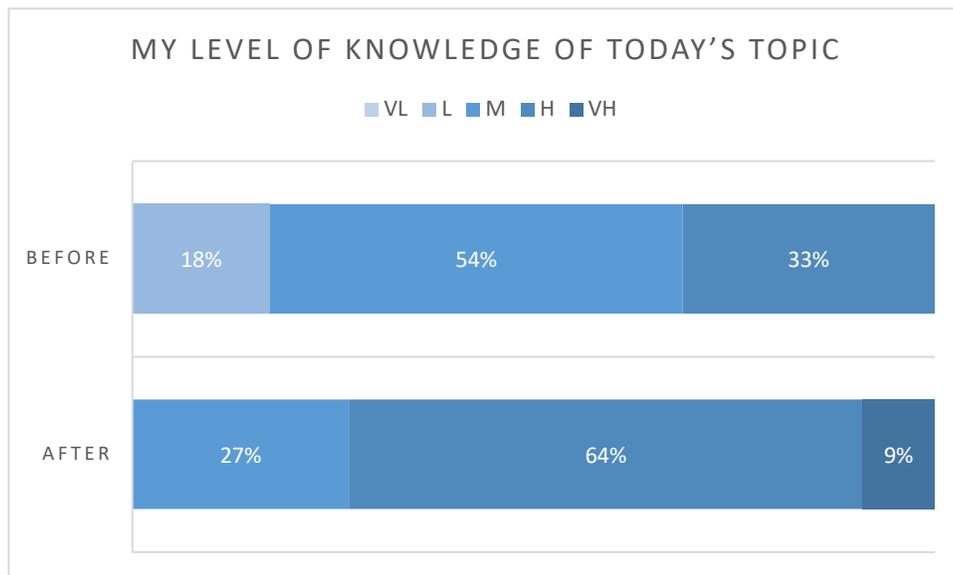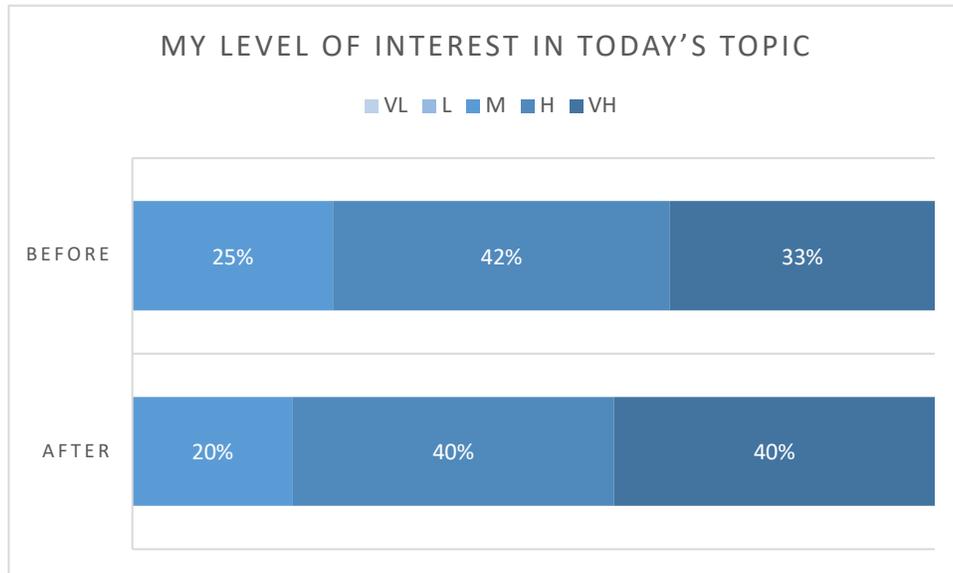
Is there anything else about today's session you would like to share with us?

- *Great presentation by a very enthusiastic presenter. Information is able to be immediately incorporated into my classroom*
- *Need actually hands on for participants.*
- *Thank you for showing all the resources.*

What level do you primarily teach? (N=12)

	N	%
High school	2	17%
Middle school	8	75%
Elementary school	1	8%
Not a teacher or instructor	1	8%

Which of the following best describes your primary teaching responsibilities over your career? (N=12)

|	N	%
Earth science	6	50%
Physics	1	8%
Integrated/General Science	4	33%
Elementary	1	8%

How many years have you been teaching? (N=19)

Mean = 14

Range = 5-27

Session 4: Earthquakes as a Phenomenon to Drive Student Inquiry (N=25)

Please indicate the extent to which you agree or disagree with the following statements.

	SD	D	N	A	SA
I will be able to include some of what I learned in this session in my own teaching	12%			16%	72%
This session provided me with new science content in a way that was not overwhelming	8%		8%	32%	52%
As a result of today's session, I feel better prepared this sessions topic to students	8%		4%	36%	52%
I know how to access IRIS's educational resources	12%		8%	28%	52%
Overall, the session was a valuable use of my time	12%			16%	72%
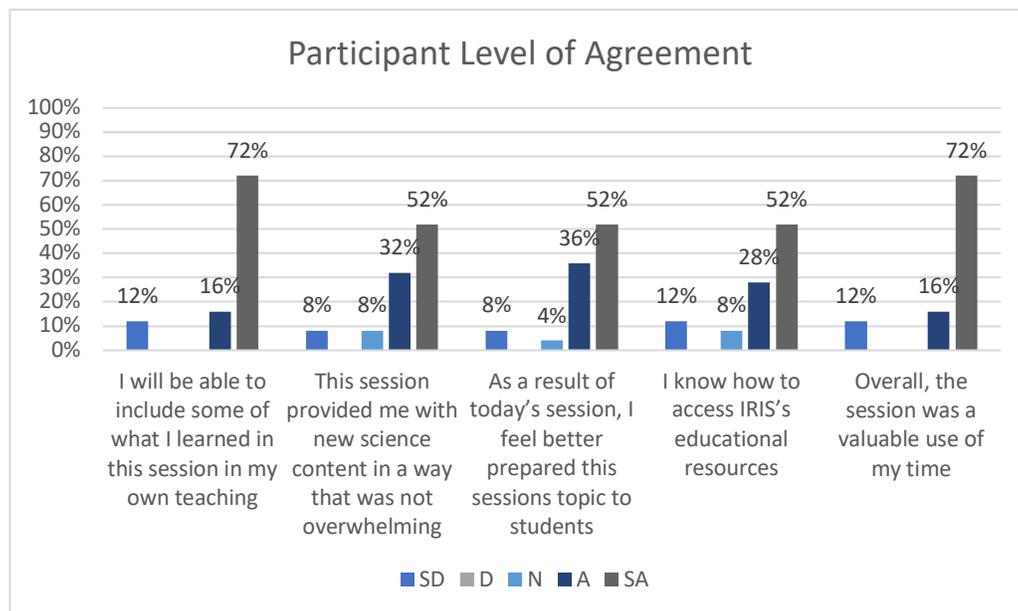
How likely are you to use elements from today's session in your classroom? (N=18)

|	N	%
Extremely likely	15	83%
Somewhat likely	3	17%
Not likely	0	0

How likely are you to recommend IRIS Resources to a friend or colleague? (N=24)
    Mean response = 9.3/10

Please rate your level of agreement with each statement BEFORE and AFTER the workshop.

|	BEFORE	AFTER
I have strategies to explore the current seismicity of the planet using one or more of the tools from IRIS.	9 – SA 6 – A 2 – N 2 – D	11 – SA 11 – A 1 – SD
I can use IRIS resources to enable students to explore authentic earthquake data to answer questions about recent newsworthy events.	12 – SA 6 – A 1 – N 2 – D 1 – SD	13 – SA 8 – A 0 – N 0 – D 1 – SD
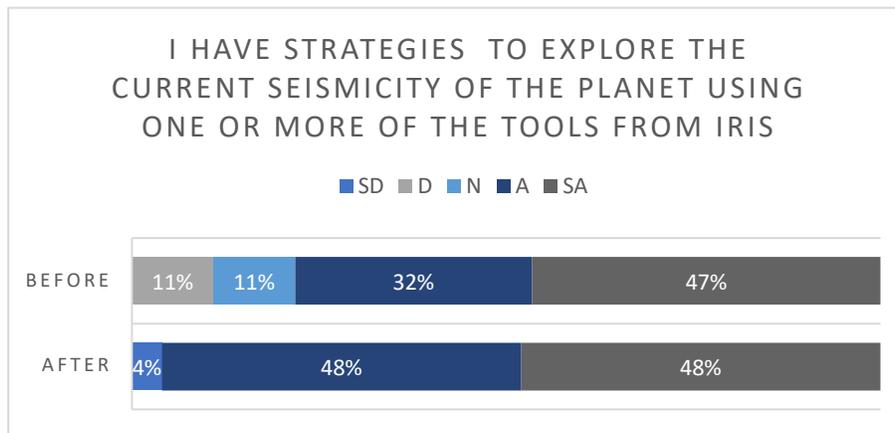
I HAVE STRATEGIES TO EXPLORE THE CURRENT SEISMICITY OF THE PLANET USING ONE OR MORE OF THE TOOLS FROM IRIS

SD D N A SA

BEFORE	11%	11%	32%	47%
AFTER	4%		48%	48%

I CAN USE IRIS RESOURCES TO ENABLE STUDENTS TO EXPLORE AUTHENTIC EARTHQUAKE DATA TO ANSWER QUESTIONS ABOUT RECENT NEWSWORTHY EVENTS

Legend: SD, D, N, A, SA

BEFORE	5%	36%	59%
AFTER	4%	48%	48%
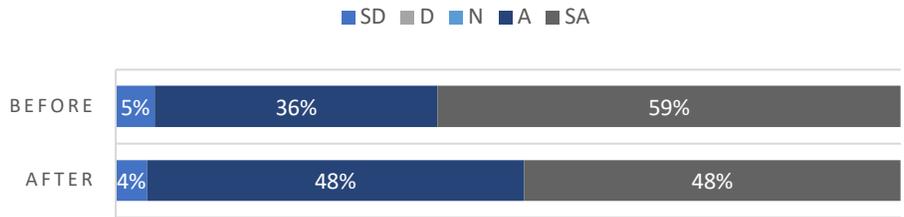
Please rate your level of agreement with each statement BEFORE and AFTER the workshop.

	BEFORE	AFTER
My level of interest in today's topic	VH – 13 H – 2 Mod – 4 L – 2	8 – VH 4 – H 3 – M 1 – L
My level of knowledge of today's topic	2 – VH 8 – H 9 – Mod 3 – L	3 – VH 5 – H 5 – M 3 – L

MY LEVEL OF INTEREST IN TODAY'S TOPIC

Legend: VL, L, M, H, VH

BEFORE	10%	19%	10%	62%
AFTER	6%	19%	25%	50%

MY LEVEL OF KNOWLEDGE OF TODAY'S TOPIC

VL L M H VH

BEFORE	14%	41%	36%	9%
AFTER	19%	31%	31%	19%
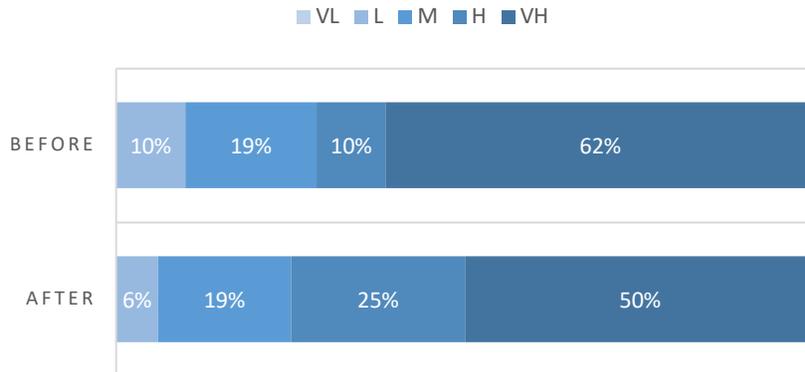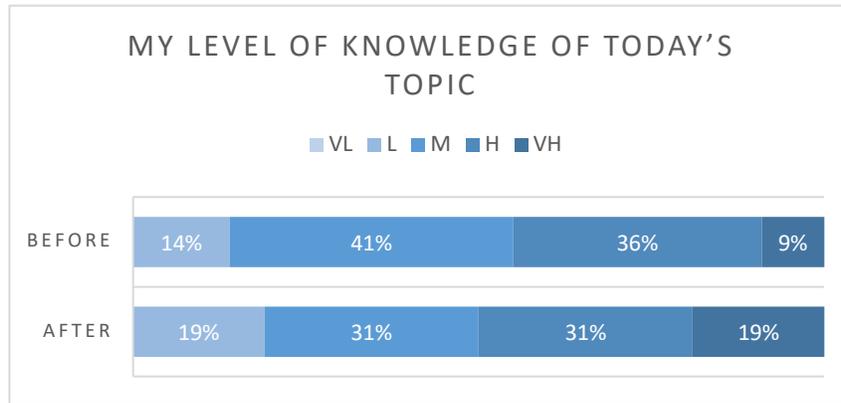
Is there anything else about today's session you would like to share with us?

- *Thank you! Awesome!*
- *Thank you! Very informative!*
- *Great tools*
  Showed us one specific session that was key to helping me understand how to apply it.
  You may want to include 3D software that help with modeling!
  Presenter could include time to have teachers play with the simulations just 2 or 3 so we may follow along with how to use these great resources.
- *Thank you so much for sharing this!! You made our teaching moments easy.*
- *Great session.*
- *This session saved my NSTA Houston 2022*

What level do you primarily teach? (N=23)

	N	%
College	1	4%
High school	3	13%
Middle school	18	78%
Elementary school	1	4%

Which of the following best describes your primary teaching responsibilities over your career? (N=23)

	N	%
Earth science	7	30%
Physical science	2	9%
Integrated/General Science	8	35%
Elementary	1	4%
Biology	3	13%
Chemistry	1	4%
Other	1	4%

How many years have you been teaching? (N=21)

    Mean = 17
    Range = 1-30

Appendix A: Workshop Attendance Photos

Photo of attendance at IRIS's session "Historic Observations, Physical Models, and GPS Data Reveal the Long and Short Behavior of Earthquakes in NGSS-Focused Resources" from the back of the room, at the beginning of the session.

Photo of attendance at the IRIS/UNAVCO session "Are Earth's Plates Really Moving" from the side of the room, near the end of the session.