

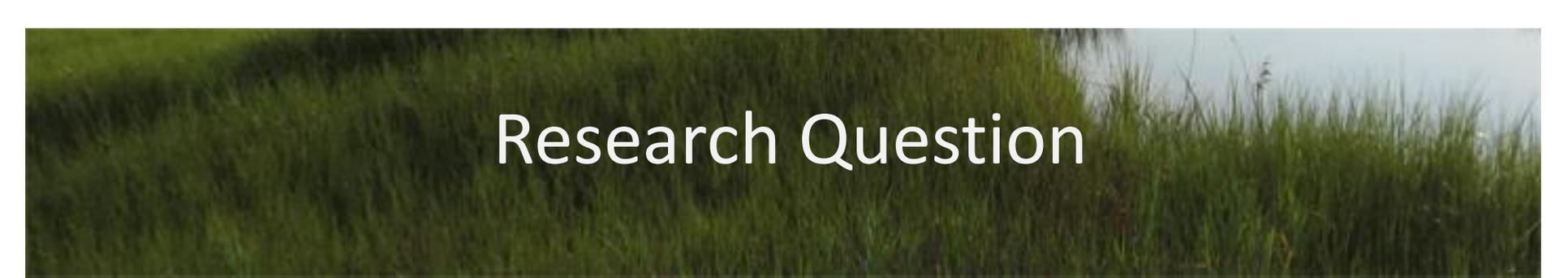
# Talking About Science Educators: Investigating Role and Responsibility for Climate Change Education

A presentation in the Center for Science and Technology in Education  
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A Talk Presented by:  
Professor J. Randy McGinnis  
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Photo by Emily Hestness;  
PPT embellishment, also!



# Research Question

What do science educators from differing groups (*outside of higher education* – formal (K-12) and informal; *inside of higher education* – content and pedagogy experts) believe are the roles and responsibilities of: 1) their group of educators, and 2) other groups of educators, related to climate change education?

# Background of the Investigation

**Context:** 5-day residential summer professional development Climate Science Academy; funded NSF project (MADE CLEAR) ([www.madeclear.org](http://www.madeclear.org); [www.ClimateEdResearch.org](http://www.ClimateEdResearch.org))

**Participants:** Diverse community of educators (N=33) from two Mid-Atlantic states

## Participants from outside of higher education

Formal (K-12) educators (n=22)



Informal science educators (n=4)



## Participants from within higher education

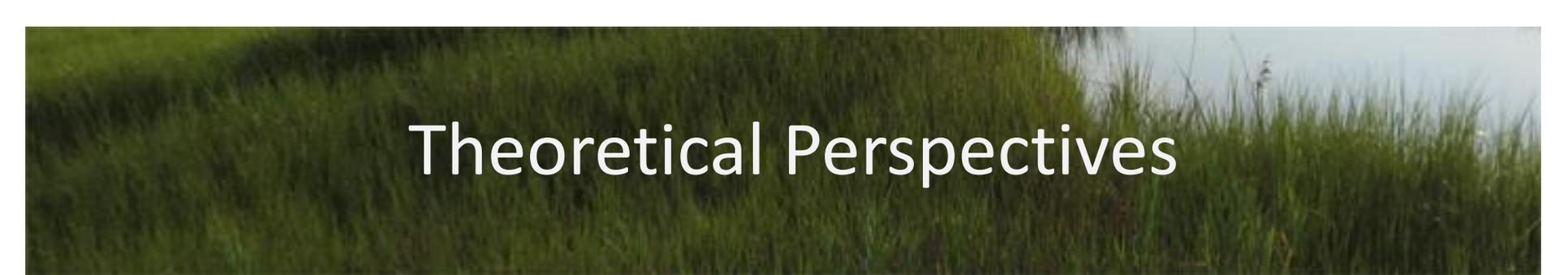
Science content experts (n=4)



Science pedagogy experts (n=3)



*Participants engage in an activity on sea level rise [photo release granted]*



# Theoretical Perspectives

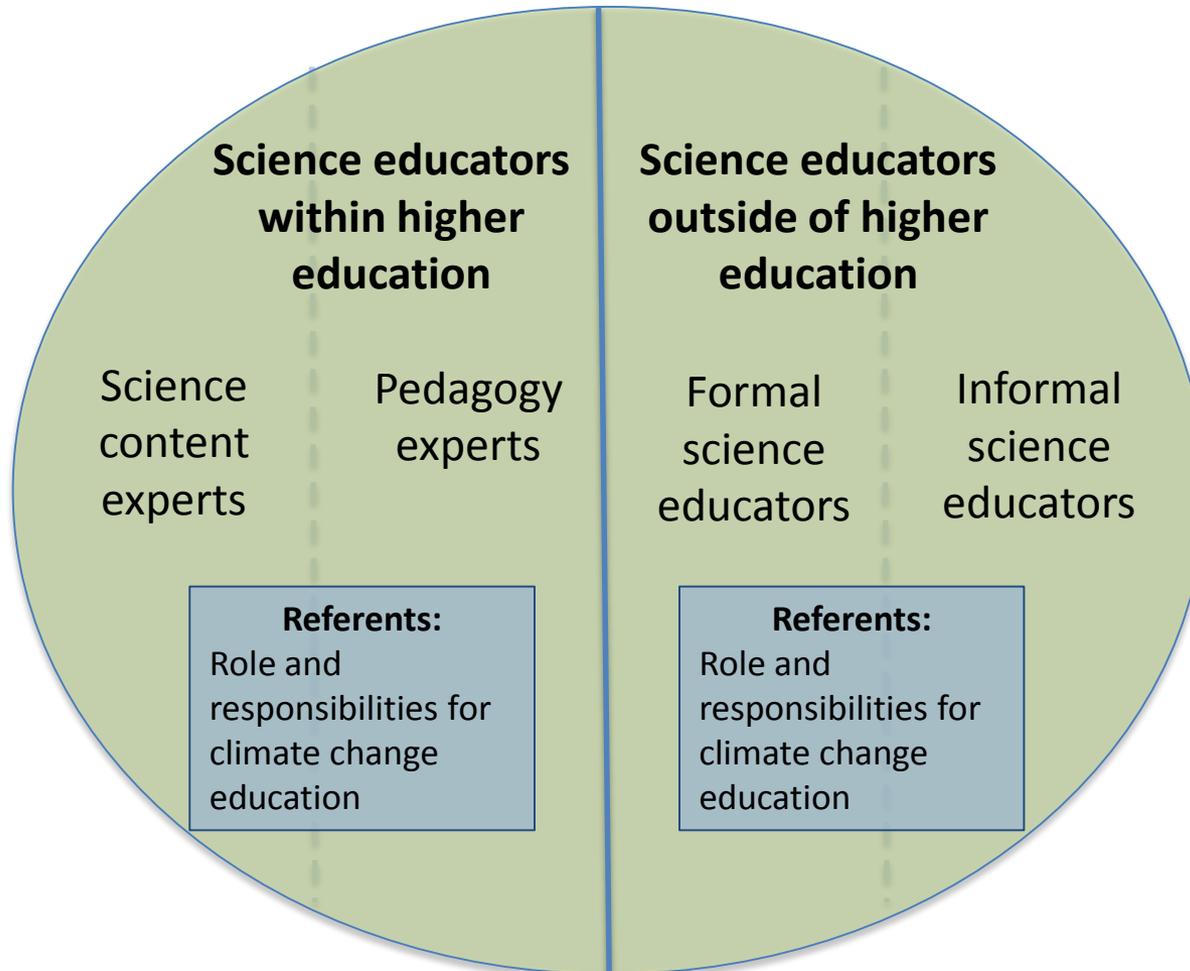
## **Interactionism** (Cobb & Baursfeld, 1995) - *primary*

- Individuals communicate meanings of experiences by inventing symbols within a cultural context
  - Invented symbols include units of communication (such as written artifacts) that may be interpreted for meaning within a community (McGinnis, 2003)

## **Social constructivism** (Bruffee, 1986)-*secondary*

- Construction of understandings of experiences is a socially mediated act

# Delimited Discourse Community



# Research Design

- Qualitative methodology (Stake, 2010)
- Delimited discourse community analysis (McGinnis, 2003)



*A university-based science content expert and a first-year high school science teacher participating in the Climate Science Academy [photo release granted by participants]*

# Data Sources: Researcher-Crafted Questionnaires (pre- and post-Academy)

## **For Science Educators within Higher Education:**

1. What are the roles and responsibilities of science educators *within higher education* (i.e. your roles and responsibilities) for promoting understanding of climate change?
2. What are the roles and responsibilities of science educators *outside of higher education* for promoting understanding of climate change?

## **For Science Educators Outside of Higher Education:**

1. What are the roles and responsibilities of science educators *outside of higher education* (i.e. your roles and responsibilities) for promoting understanding of climate change?
2. What are scientists' unique responsibilities for promoting understanding of climate change?

# Findings: Higher Education (Content Experts)

**Group:** Science Educators within Higher Ed  
**Subgroup:** Science Content Experts

## *Roles and responsibilities (exemplar quotes):*

*[For self, others in higher ed]:* “My job is to **translate the [scientific] work we do related to climate change to the broader public** including government officials (federal, state, local), business leaders, educators... It is important to **be a role model** for best practices (wind turbine, electric vehicles) and **provide information that will inform decision makers.**” (Scientist 1)

“...To **help train the next generation of citizens** to be critical thinkers and to **interpret information and understand the consequences** of their decisions.”  
(Scientist 1)

# Findings: Higher Education (Content Experts)

**Group:** Science Educators within Higher Ed  
**Subgroup:** Science Content Experts

## ***Roles and responsibilities (exemplar quotes):***

*[For science educators outside of higher ed]:* “K-12 science educators **provide foundational understanding** of the processes involved in climate change and **provide relevant examples to help students understand and connect** to the information.” (Scientist 1)

# Findings: Higher Education (Pedagogy Experts)

**Group:** Science Educators within Higher Ed  
**Subgroup:** Science Pedagogy Experts

***Role and responsibility (exemplar quote):***

*[For self, and others in higher ed] “[My role is to] **prepare future teachers in how to teach science effectively to all learners.**” (Science Education Professor 1)*

# Findings: Higher Education (Pedagogy Experts)

**Group:** Science Educators within Higher Ed  
**Subgroup:** Science Pedagogy Experts

## ***Roles and responsibilities (exemplar quote):***

*[For other science educators outside of higher ed]:* “**Formal classroom teachers are guided by standards and accountability structures... Informal educators typically have more freedom to pursue learning for relevance and understanding with learners of all ages, and not be bounded by the structures formal science educators face.**

Their unique expertise includes... making the climate change topic **relevant to learners’ everyday lives**, so that they will be **motivated to learn** climate science and **take appropriate action** on the issue. They also have the opportunity to **collaborate with learning sciences researchers** to investigate climate change education and **test out ways to teach climate education** to maximize learning.” (Science Education Professor 1)

# Analysis: Higher Education

## Comparing the speech communities (Content vs. Pedagogy Experts)

- Discrepancies in views of own roles and responsibilities:
  - *Trends for content experts:* **Deliver evidenced-based scientific information** in a way that others could model when teaching the topic
  - *Trends for pedagogy experts:* Teach both **accurate science content knowledge** (as delimited by the science standards) **AND effective pedagogy** (theory and methods) for the topic
- More similarities in views of others' (outside of higher education) roles and responsibilities:
  - Emphasized importance of teaching the topic for an informed citizenry
  - Emphasized need to teach in an effective manner (e.g., the purpose of scientific information is to be prepared to **make informed decisions**; learners should **see relevance to own lives**)

# Findings: Outside of Higher Ed (Formal K-12)

## *Roles and responsibilities (exemplar quote):*

*[For self, other K-12 science educators]:* “It is my responsibility to **deliver the content** in an **engaging, meaningful** way that addresses the **NGSS**. It is also my responsibility to help **educate my community about climate change** [and] its implications.” (Middle School Teacher 1)

**Group:** Science Educators outside of Higher Ed  
**Subgroup:** Formal K-12

# Findings: Outside of Higher Ed (Formal K-12)

## *Roles and responsibilities (exemplar quote):*

*[For scientists]:* “Scientists are responsible for **measuring** the variables in **honest, transparent, [and] reproducible** ways. They must also **promote true understandings** of how climate change will/may impact our global community in ways that can be **understood by nonscientists.**” (Middle School Teacher 1)

**Group:** Science Educators outside of Higher Ed  
**Subgroup:** Formal K-12

# Findings: Outside of Higher Ed (Informal)

## *Roles and responsibilities (exemplar quote):*

*[For self, other informal educators]:* “[To be an educator who] **understands the issue** and the **resources available.**” (Informal Science Educator 1)

“[T]o help students [and the] public **understand big concepts** of climate change, and **why it matters**, and then to help them be able **to find reliable resources** as more information and impacts become known.” (Informal Science Educator 1)

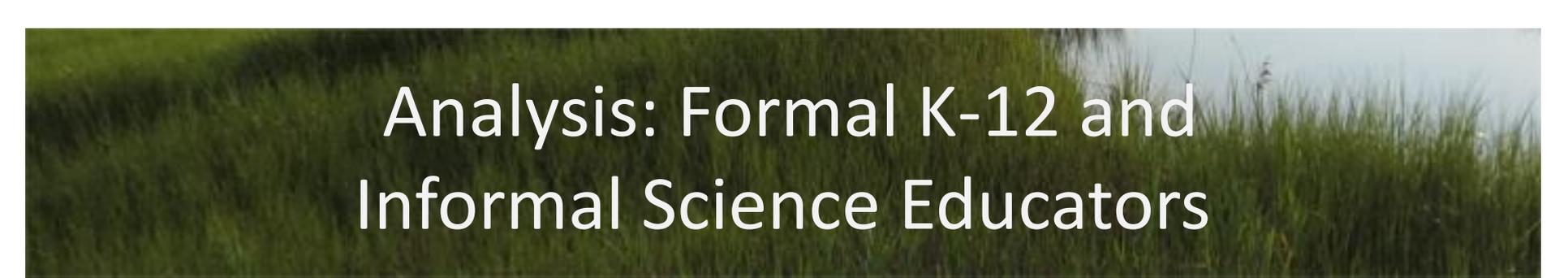
**Group:** Science Educators outside of Higher Ed  
**Subgroup:** Informal

# Findings: Outside of Higher Ed (Informal)

## *Roles and responsibilities (exemplar quote):*

*[For scientists]:* “To make climate change language and results **understandable**. To work with education [and] others who work with the public to **create language, lessons, curriculum, and messages** that help people **understand what is going on and what needs to happen.**”

**Group:** Science Educators outside of Higher Ed  
**Subgroup:** Informal



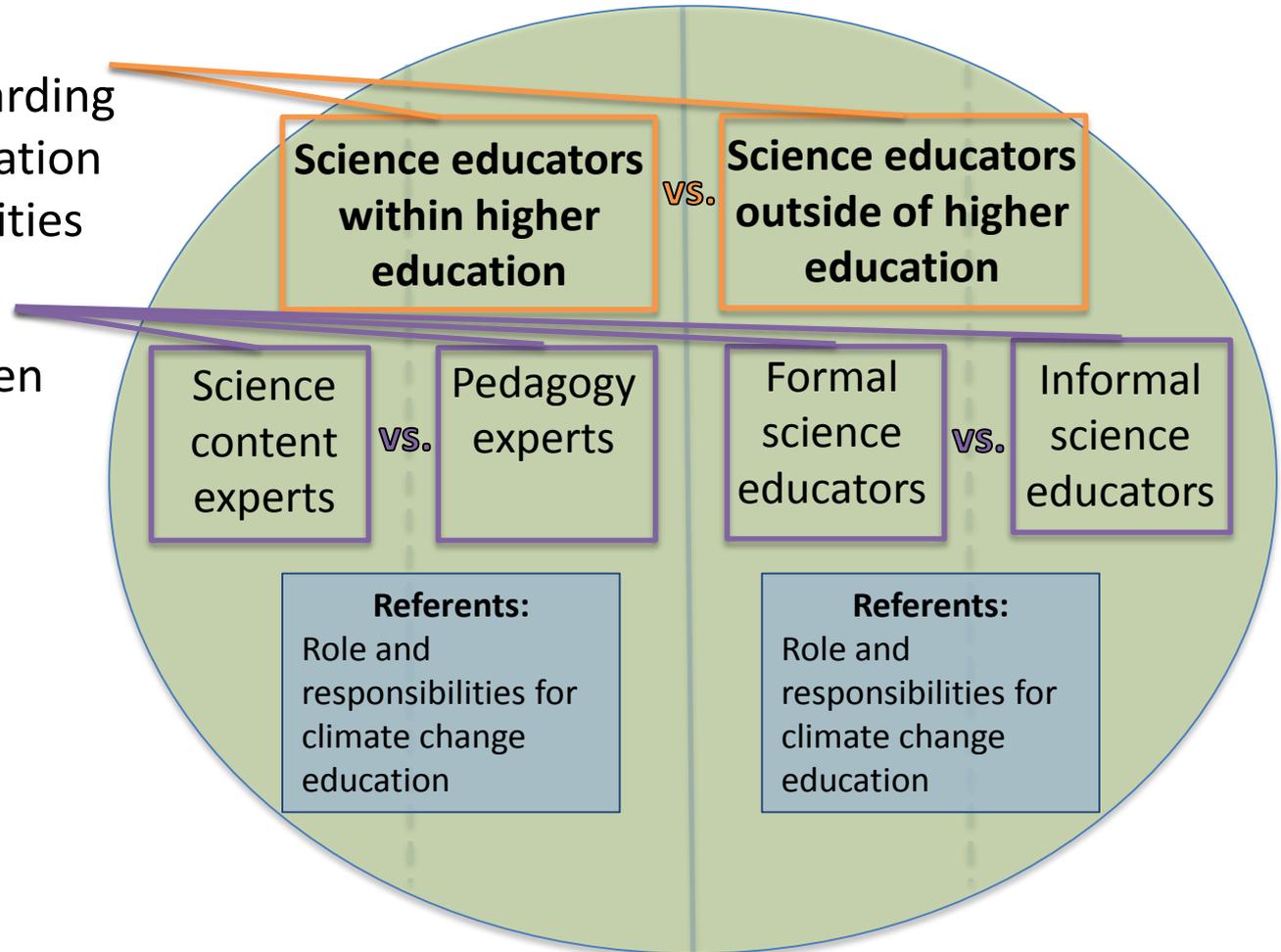
# Analysis: Formal K-12 and Informal Science Educators

## Comparing the speech communities: K-12 vs. Informal

- Trends for formal (K-12) science educators:
  - View that teacher should present data (from scientists), then teach students how to analyze and interpret data objectively, so they could make up their own minds
  - Projected the belief that the scientist is the source, the student is the consumer, and the teacher is in the middle
- Trends for informal science educators:
  - Valued current, evidence-based information from scientific community
  - High concern for science communication; communicating information that is understandable to the general public by avoiding technical language, helping people see relevance of science to their everyday lives

# Conclusions

- Larger discrepancies between groups regarding climate change education roles and responsibilities
- Some minor discrepancies between subgroups



# Conclusions

## Primary Climate Change Education Focus:

- Process of collecting relevant evidence-based data

Science educators within higher education

Science content experts

Pedagogy experts

**Referents:**  
Role and responsibilities for climate change education

Science educators outside of higher education

Formal science educators

Informal science educators

**Referents:**  
Role and responsibilities for climate change education

## Primary Climate Change Education Focus:

- Role in presenting data accurately to learners
- Greater focus on relevancy to learners' lives for informal educators

# Implications

## For professional development:

- Design
- Implementation

### *Possibilities may include:*

- Adding information on effective science communication with learners and the general public;
- Opportunities for differing groups to share views of their roles and responsibilities;
- Discussion of actions that individuals could take (personal and societal) in response to their understanding of climate change



*Participants engage in an activity on sea level rise  
[photo release granted]*

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