

Introduction to Geoscience Education Research Methods

**Hosted by the NAGT Geoscience Education
Research Division**

**Presenter: Julie Sexton, Ph.D., University of
Northern Colorado**

Host and Logistics

Host

- Anne Gold



Logistics

- Audio on mute
- How to participate in polls
- How to provide input and ask questions in the chat box
- Troubleshooting
- Record webinar

About the Presenter

Julie Sexton

Assistant Director of Assessment
Research Associate
University of Northern Colorado



Geology Training

B.A. Geology
M.S. Geology

Geology Career

Petroleum
Industry

Community
College

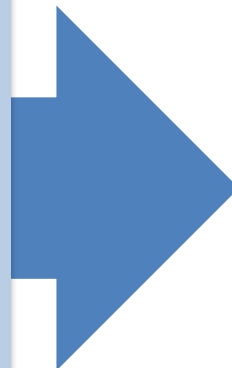
Geol. Soc. Amer.

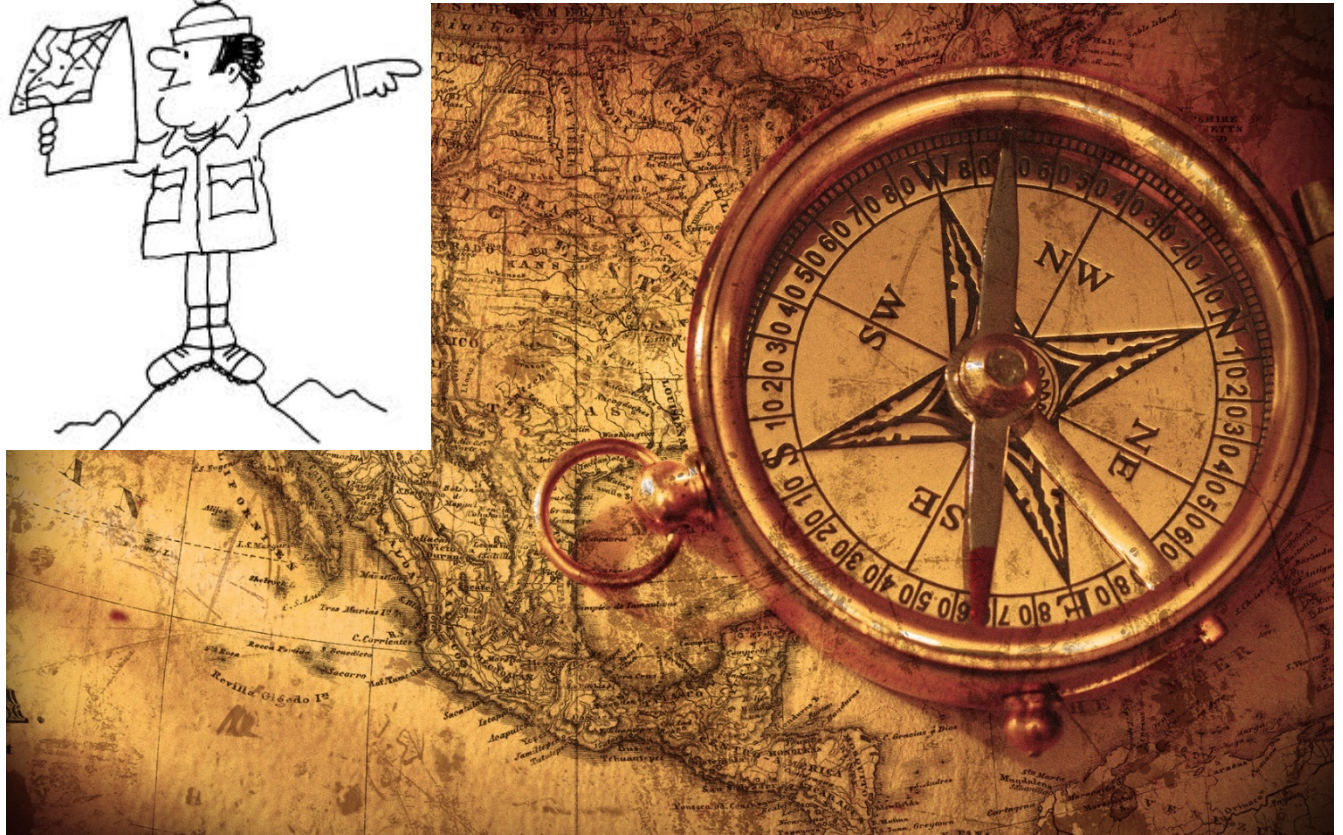
Geo Education Training & Career

Ph.D. Geo Ed

Geo Ed
Researcher

Education
Administrator





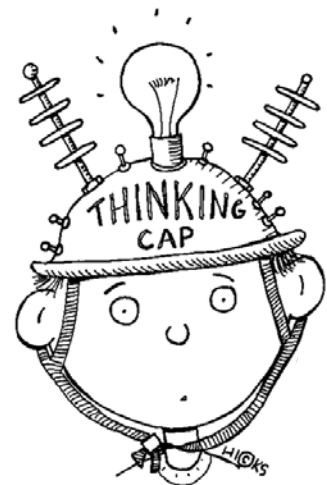
Agenda

1. What are topics people research?
2. What are the types of education research?
3. What are the purposes and characteristics of quantitative and qualitative research?
4. What are research study steps and components of a research plan?
5. Wrap-Up



Learning Outcomes

1. Describe differences between quantitative and qualitative education research
2. Describe the steps of the research cycle
3. Describe the components of a research plan



Activities

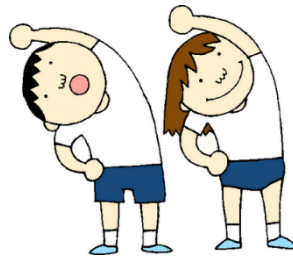
1. Polls



2. Input

In the chat box

3. Stretch & Ask Questions



Ice Breaker Poll

Which option best describes your current position?

- a. Student: undergraduate or graduate
- b. Faculty: 2 or 4-year college/university
- c. K-12 teacher
- d. Researcher
- e. Other



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What are topics people research?

1. How do two teaching strategies affect student learning?
2. What are student attitudes about various teaching methods?
3. What is the relationship between students' spatial abilities and their science knowledge?
4. What are the success factors for completion of a science degree?
5. What are the experiences of underrepresented students in science?
6. What are the characteristics of effective teacher professional development?

Current Research

What attracts students to a geology major?



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What are the types of education research?

Type	Data	Analysis Method
Qualitative	Qualitative	Qualitative (text analysis)
Quantitative	Quantitative and/or Qualitative	Quantitative (statistical analysis)
Mixed	Qualitative & Quantitative	Qualitative & Quantitative

Poll

Question: Which of the research types have you conducted?

- a. Qualitative only
- b. Quantitative only
- c. Mixed methods (in one study)
- d. Both qualitative research and quantitative research (but not in the same study)
- e. None yet



Poll

Research topic: What attracts students to a geology major?

Question: Which research type is most appropriate for the topic above?

- a. Qualitative
- b. Quantitative



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What are the Purposes and Characteristics of Quantitative Research?

Purpose

1. Describe trends or explain the relationship among variables
2. Investigate or examine causality
3. Generalize findings to other groups
4. Need numerical results



What are the Purposes and Characteristics of Quantitative Research?

Purpose

1. Describe trends or explain the relationship among variables
2. Investigate or examine causality
3. Generalize findings to other groups
4. Need numerical results

Characteristics

1. Ask specific, narrow questions
2. Collect data that can be quantified
3. Large number of participants
4. More controls on design
5. Conduct statistical analysis and report numerical results



Input: Quantitative Research Question

Two versions

- Version 1: Is flipped teaching effective?
- Version 2: What is the effect of flipped teaching and traditional lecture on college students' conceptual understanding as measured by the final exam?

Input

In the chat box,
list one way that
the versions
differ.

Quantitative Research Question Elements

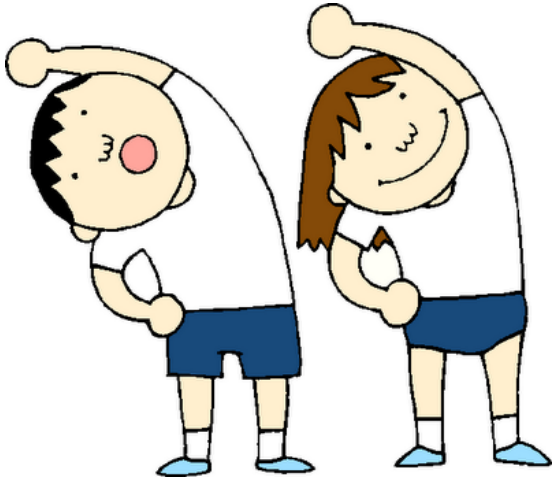
Two versions

- Version 1: Is flipped teaching effective?
- Version 2: What is the effect of flipped teaching and traditional lecture on college students' conceptual understanding as measured by the final exam?

Elements to include

1. Clarify exactly what is to be investigated
2. Identify variables (independent and dependent)
3. Identify participants

Stretch and Ask Me a Question



What are the Purposes and Characteristics of Qualitative Research?

Purpose

1. Investigate in-depth understanding of topic
2. Seek perspective of participant
3. Identify variables
4. Develop hypotheses and theories



What are the Purposes and Characteristics of Qualitative Research?

Purpose

1. Investigate in-depth understanding of topic
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Characteristics

1. Ask broad, general questions
2. Collect descriptive data (e.g., words and pictures)
3. Small number of participants
4. Fewer/no controls on study
5. Conduct non-numerical analysis and report categorical results

Input: Qualitative Research Question

Two versions

- Version 1: To what extent do students use the tutoring center to help them be successful in an intro geology class?
- Version 2: What are the resources and strategies students use to be successful in an intro geology class?

Input

In the chat box,
list one way that
the versions
differ.

Qualitative Research Question Elements

Two versions

- Version 1: To what extent do students use the tutoring center to help them be successful in an intro geology class?
- Version 2: What are the resources and strategies students use to be successful in an intro geology class?

Elements to include

1. Clarify exactly what is to be investigated
2. Identify participants
3. Exploratory, broad language
4. Avoid language leading to quantification

Deciding between Qualitative and Quantitative Research

Quantitative

1. Investigates causality and numerical relationships
2. Numerical data
3. More controls on design
4. Large sample size

Qualitative

1. Investigates what and how, in-depth participant perceptions
2. Non-numerical data
3. Fewer controls on design
4. Small sample size

Deciding between Qualitative and Quantitative Research

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4. Large sample size

Qualitative

1. Investigates what and how, in-depth
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**Researcher
Preference/Skill**

Poll

Research topic: What attracts students to a geology major?

Question: Which research type is most appropriate for the topic above?

- a. Qualitative
- b. Quantitative



Case Study

Research topic: What attracts students to a geology major?

Type	Research Question	Data Collection	Analysis
Quant	To what extent do interest, self-efficacy, and having role models predict students' intent to major in geoscience?	Likert-scale questions on a survey	Multiple step regression
Qual	What are the reasons students select a geoscience major? How did those reasons influence their decision to major in geology?	Interviews	Constant comparative analysis

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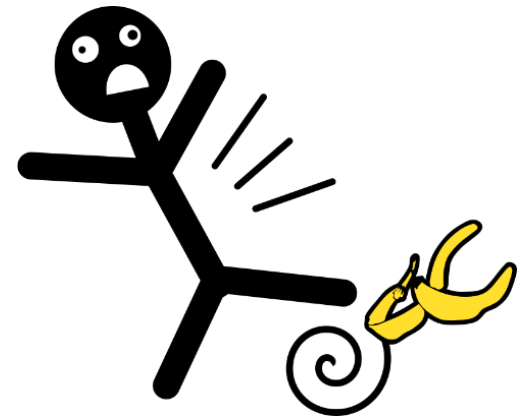


What are research study steps?

1. Identify a problem or topic to investigate
2. Review literature
3. Create a research plan
4. Get institutional review board approval
5. Conduct study
6. Report results

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What are components of a research plan?

1. Identify a problem or topic to investigate
2. Review literature
3. Create a research plan
4. Get institutional review board approval
5. Conduct study
6. Report results

Research Plan

1. Research purpose and questions
2. Theoretical framework
3. Variables, factors, constructs
4. Research design
5. Participants and recruiting
6. Data and collection
7. Data analysis
8. Ensuring quality
9. Study Management

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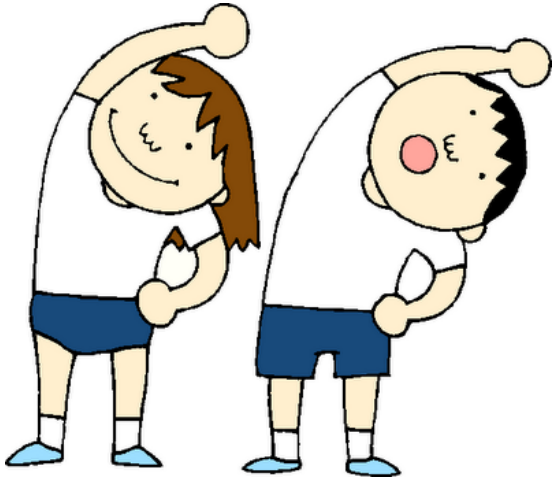


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Stretch and Ask Me a Question



NAGT GER Division Events at GSA

1. **Topical Sessions**

- T100: Barriers, Misconceptions, and Progress in Improving Climate Literacy and Strategies for Communicating about Climate Change
- T113: Geoscience Education Research: Implications for Undergraduate Geoscience Teaching and Learning
- T120: Making Thinking Visible: Actions and Expressions of Problem Solving and Decision Making in the Geosciences

2. **NAGT GER Division Meeting** - Sunday, Oct. 22, 6:10-6:55pm, Sheraton Seattle Hotel - Willow A

3. **GSA Town Hall on Geoscience Education Research Grand Challenges and Strategies** - Monday, October 23, 5:30-6:30pm, Washington State Convention Center - Room 2A



Thank you!

Thank you for attending and participating!

Please provide feedback on the webinar at

<https://tinyurl.com/GERWebIntroEval>

We will also send you the link.