

Scholarship of Teaching and Learning: Next Steps

**Earth Educators'
Rendezvous 2022**

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Objectives

- By the end of this workshop, participants will:
 - Explore challenges and opportunities in scholarship of teaching and learning (SoTL) research
 - Identify where you are in your SoTL journey and determine the next steps
 - Develop strategies to systematically collect data
 - Identify places and strategies to disseminate SoTL research
 - Apply the strength of evidence pyramid to their research plans

What is Scholarship of Teaching and Learning (SOTL?)

What is exciting about SOTL?

What are challenges associated with SOTL?

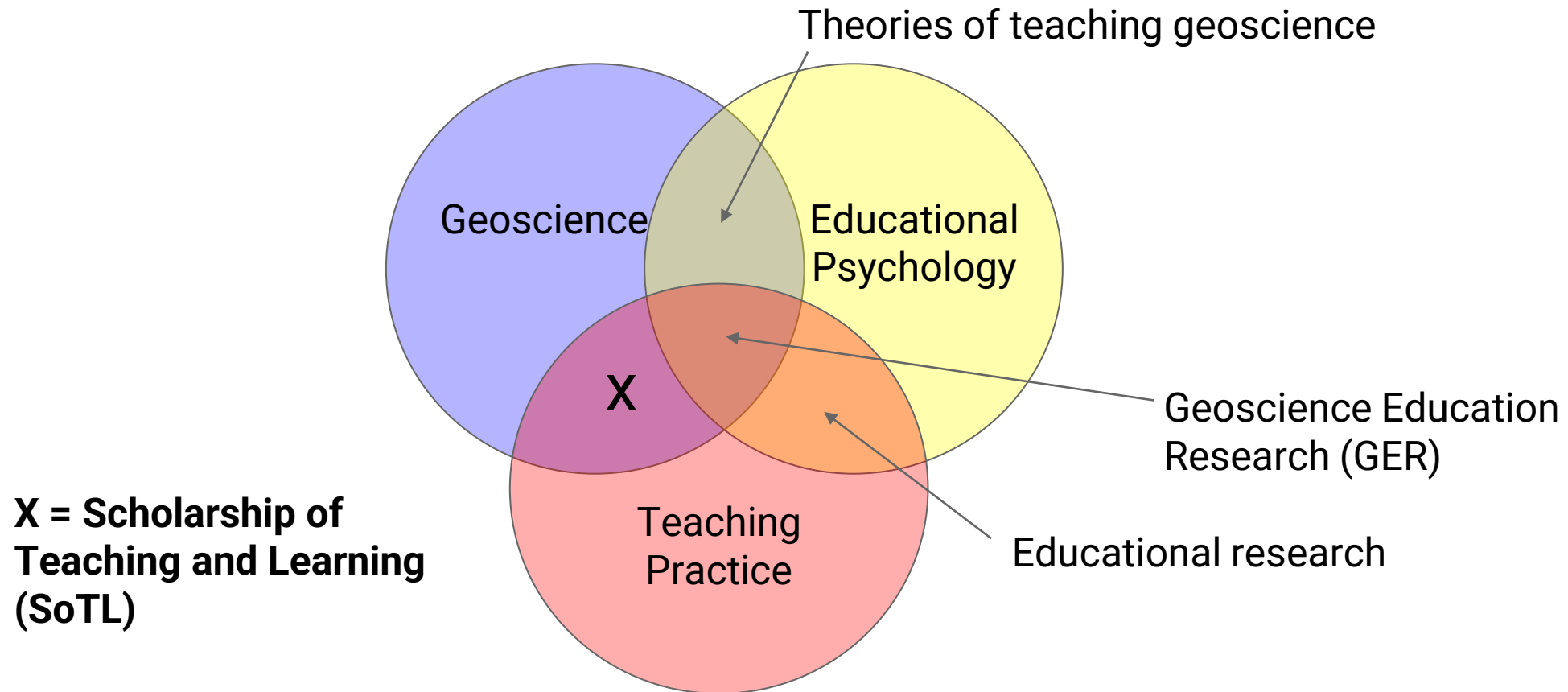
Why engage in SOTL?



How can you share your SOTL
research?

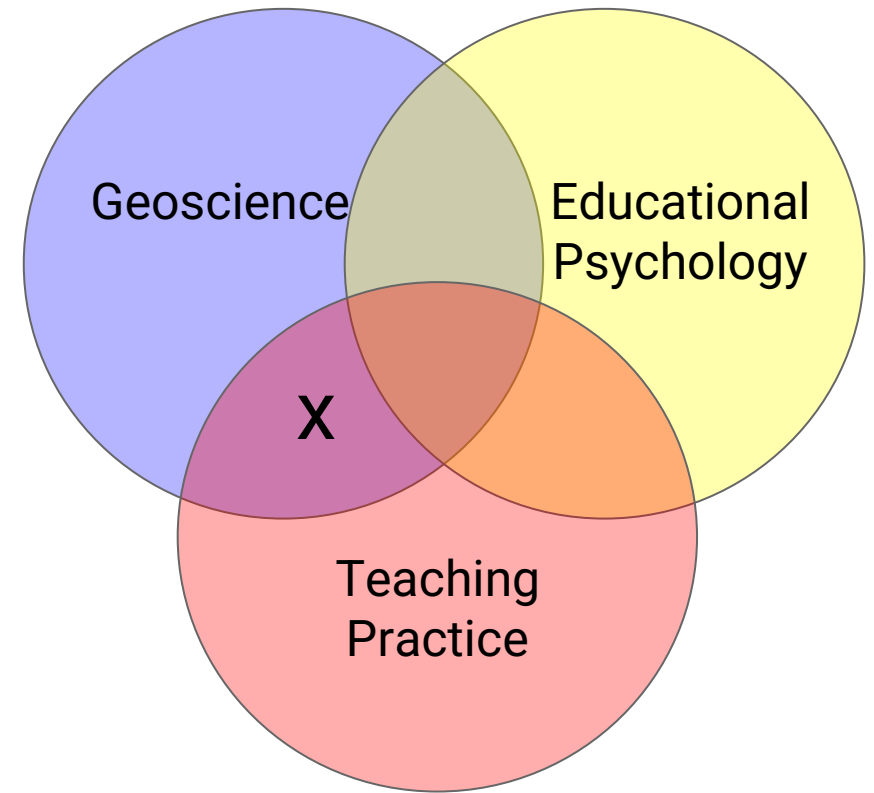
Where are you on your SOTL
journey?

An introduction to SoTL



An introduction to SoTL

- “**Systematic study of teaching and/or learning** and the **public sharing and review** of such work through presentations, performance, or publications” (McKinney, 2006; p. 39)
- “**Marries scholarly inquiry to...the work of teaching** – designing a course, facilitating classroom activities, trying out new pedagogical ideas, advising, writing student learning outcomes, evaluating programs” (Schulman, 1998)
- “Encompasses a **broad set of practices** that engage teachers in looking closely and critically at student learning in order to improve their own courses and programs, and to **share insights with other educators** who can evaluate and build on their efforts” (Hutchings et al., 2011; p. xix)



Things to Keep in Mind about SoTL

- SoTL is an opportunity to think deeply, gather data purposefully, and disseminate your teaching excellence.
- SoTL research is a good option as a first foray into education research.
- SoTL is also a sustainable research direction for those who plan to maintain their geoscience research career while also branching into GER.
- Think broadly about where to submit your work.
- The SoTL presence in newsletters (e.g. GSA today, In the Trenches), scientific meetings, and professional development workshops means that there are multiple outlets to disseminate your work.
- Recognize that SoTL publications may not be highly cited, (i.e., a challenge with using metrics as measures of impact).

SoTL vs. Discipline Based Education Research (DBER)

SoTL

- Goal is to improve one's own teaching practice through innovations in pedagogy and curriculum
- Studies are usually descriptive
- Requires systematic data collection
- Typically, specific to a course and the instructor's personal context

DBER

- Tests theory and produces generalizable findings focused on teaching, learning, and ways of thinking in a science discipline
- Findings should be broadly applicable beyond a single course or instructional context

Human subjects research is any research or clinical investigation that involves human subjects. This includes SoTL and related education research! However, not all human subjects research carries the same risk.

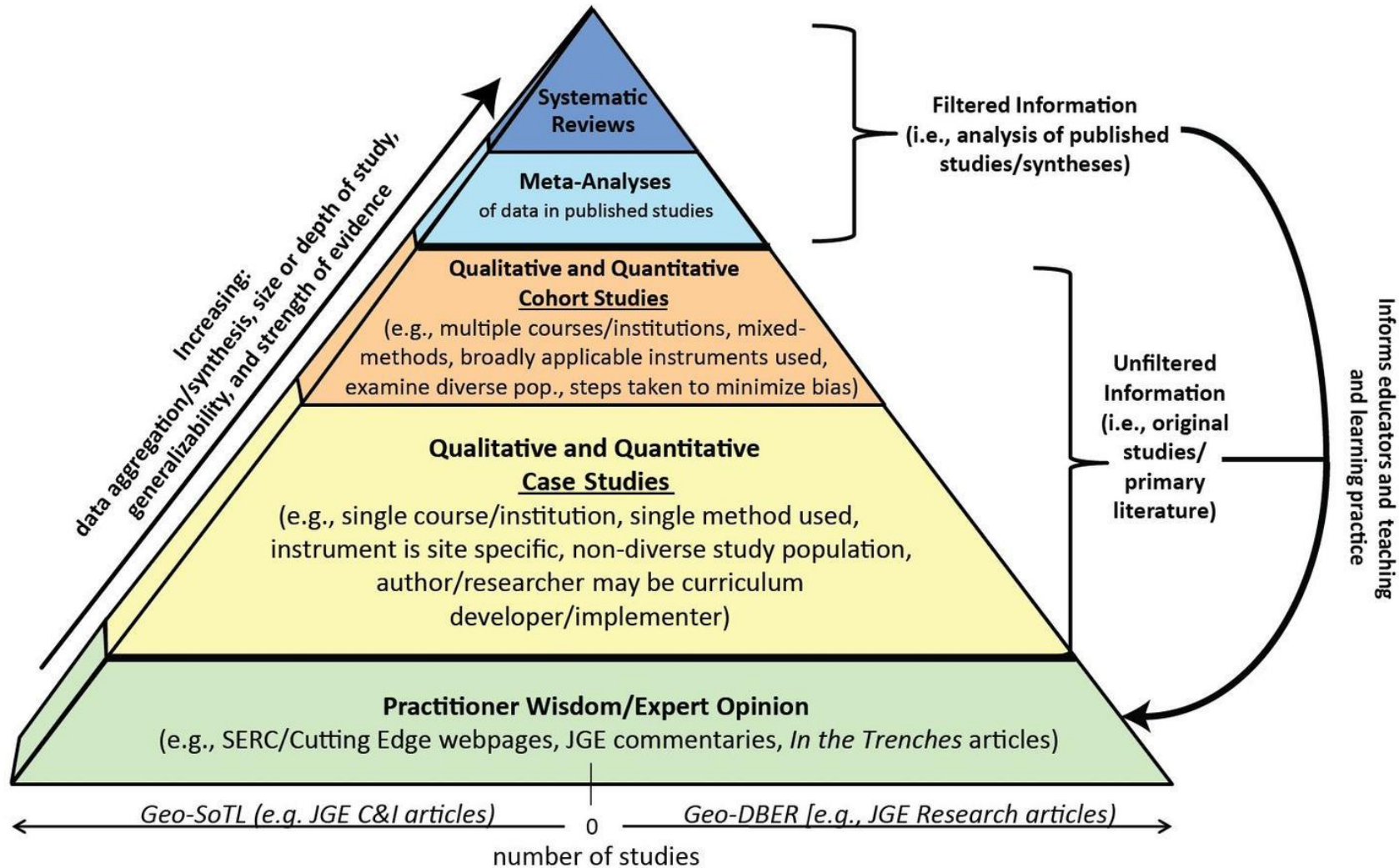
Exempt Category 1: Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.



Example applications: <https://www.usi.edu/ospra/institutional-review-board-irb/irb-examples/>

IMPORTANT BEFORE DOING RESEARCH WITH HUMAN SUBJECTS!

Strength of Evidence Pyramid



Steps

- Define your question
 - Consider your specific context and population
- Consider existing literature
 - What has been done? Are there holes?
- Define your learning goals
- Determine how you will measure if students achieved the learning goals
 - Choose tools, methods, etc.
- Implement and Collect Data
- Analyze Data
- Interpret Data
- Share Results
- THIS IS RARELY A LINEAR PATH AND THAT'S OK

Quantitative and Qualitative Research Approaches

Quantitative Tools

- Pre-post tests
- Likert-type surveys
- Grades/ Scores
- Rubrics

Qualitative Tools

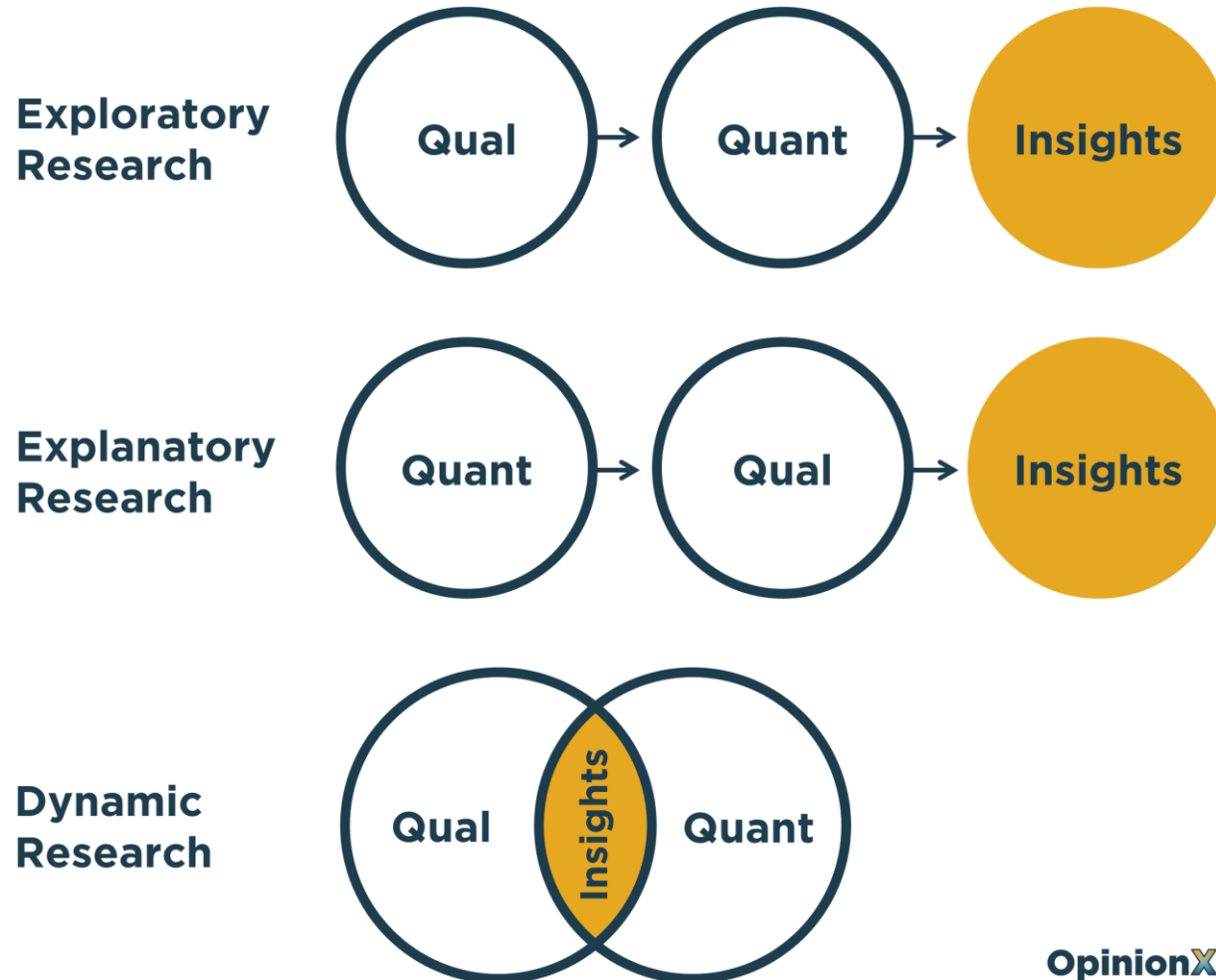
- Interviews and Focus Groups
- Open-ended surveys
- Artifact analysis
- Classroom Observations

QUALITATIVE		QUANTITATIVE	
PROS	CONS	PROS	CONS
Rich data	Expensive	Less time intensive	Missing data
Personal approach	Difficult to interpret	Increased reliability and validity	Potential to misunderstand meaning of questions
Easily adapted for cultural sensitivity	Takes more time	Easy to administer	Needs larger sample size
Compelling information	Difficult to make comparisons	Findings can be compared between groups	More expensive

Advantages of qualitative research	Limitations of qualitative research
<p>Rich, in-depth detail is possible (e.g. participants can elaborate on what they mean)</p> <p>Perceptions of participants themselves can be considered (the human factor)</p> <p>Appropriate for situations in which detailed understanding is required</p> <p>Events can be seen in their proper context / more holistically</p>	<p>Not always generalizable due to small sample sizes and the subjective nature of the research</p> <p>Conclusions need to be carefully hedged</p> <p>Accusations of unreliability are common (different results may be achieved on a different day/with different people)</p>

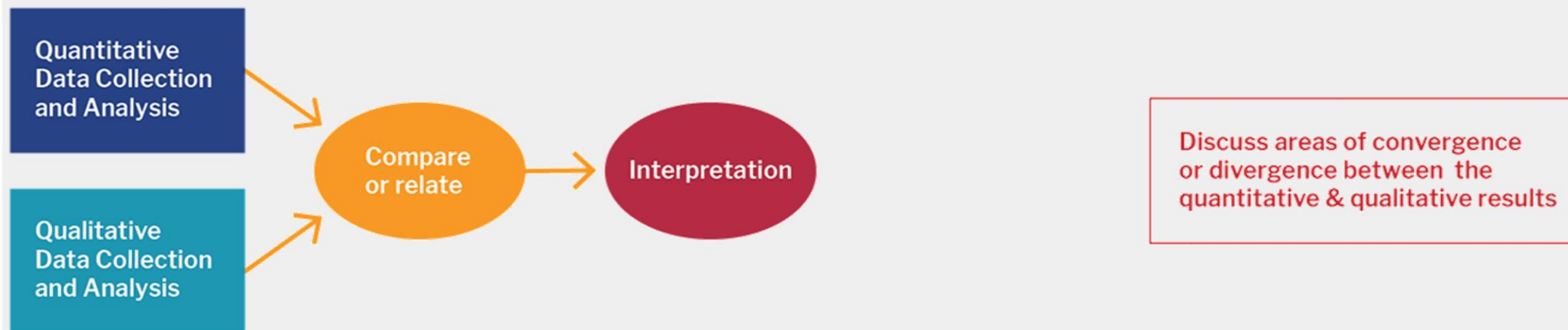
Criteria	Qualitative Research	Quantitative Research
Purpose	To understand and interpret social interactions	To test hypotheses, look at cause & effect, and make predictions
Group studied	Smaller & not randomly selected.	Larger & randomly selected
Variables	Study the whole, not variables	Specific variables studied
Type of data collected	Words, images or objects	Numbers and statistics
Form of data collected	Open-ended responses, interviews, participant observations, field notes and reflections	Data based on precise measurements using structured & validated data-collection instruments
Type of data analysis	Identify patterns, features, themes	Identify statistical relationships
Most common research objectives	Explore, discover & construct	Describe, explain & predict
Focus	Wide-angle lens; examines the breadth & depth of topic	Narrow-angle lens; test a very specific topic.
Results	Findings that are more generalized and directional	Findings that are projectable over population base.

Modes of Mixed Method Research



BASIC MIXED METHODS RESEARCH DESIGNS

Convergent Parallel Design



Explanatory Sequential Design



Exploratory Sequential Design



Where can I find research tools and other great information?

- GER Tool Kit: <https://nagt.org/nagt/geoedresearch/toolbox/index.html>

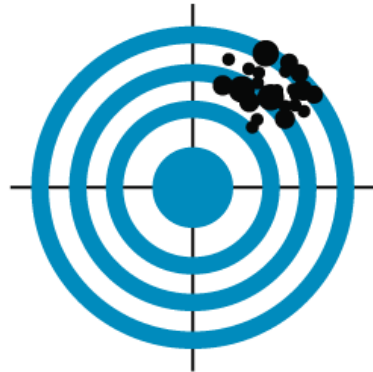
Reliability and Validity in Educational Research



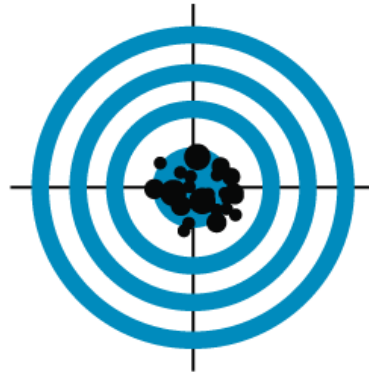
unreliable & invalid



unreliable, but valid



reliable, not valid



both reliable and valid

Sharing Results?

- Within your department/ institution
- Conference posters or talks
 - EER, GSA, AGU
- Publications
 - In the Trenches, Journal of Geoscience Education, etc.

Tips from JGE

1. Use the learning goals of their activity to provide the backbone to their paper. These learning goals can be knowledge-based, but they can also relate to affective factors. The background information, methods, results, and discussion should all tie to their learning goals. For example:
 1. Background: Why are the learning goals important?
 2. Lit review: What have other people done? Why do you think your activity would help students achieve the learning goals (what does the literature say works)?
 3. Methods: How will you measure if students achieved the learning goals?
 4. Results: Did students achieve them?
 5. Discussion: Why do you think they were/weren't achieved, what parts or the activity were particularly helpful, etc.
2. Measure student achievement of learning goals directly. Many authors use a questionnaire or survey, but I think that evaluating student work itself (using a rubric designed around the learning goals, not student grades) can be powerful evidence. If a questionnaire/survey is used, it should be carefully written, again ensuring that it's measuring achievement of learning goals. I commonly see questions that aren't aligned with learning goals (e.g. asking shallow knowledge instead of deeper understanding or asking students about their attitudes when changing them wasn't one of the listed goals).
3. Use the headings provided in the C&I guidelines to structure your paper. That's not required, but it's helpful for first-time authors to ensure they're including everything needed in the paper in an orderly way. I also encourage authors to include sub-headings to make sure things are organized and clear.
4. I think qualitative data helps to add richness to results, especially when there are small numbers of students in the study. However, the qualitative data should be evaluated systematically, and the methods used should be included in the evaluation methods section. Quotes from students should support the results, but they shouldn't be the only results.

Wrap-Up

- Where are you on your journey?
- What additional information do you need to take the next steps?
- What is your end game? What do you need to get there?
- What happens next?
- What questions or concerns do you still have?