

Synthesizing Results and Defining Future Directions of Geoscience Education Research

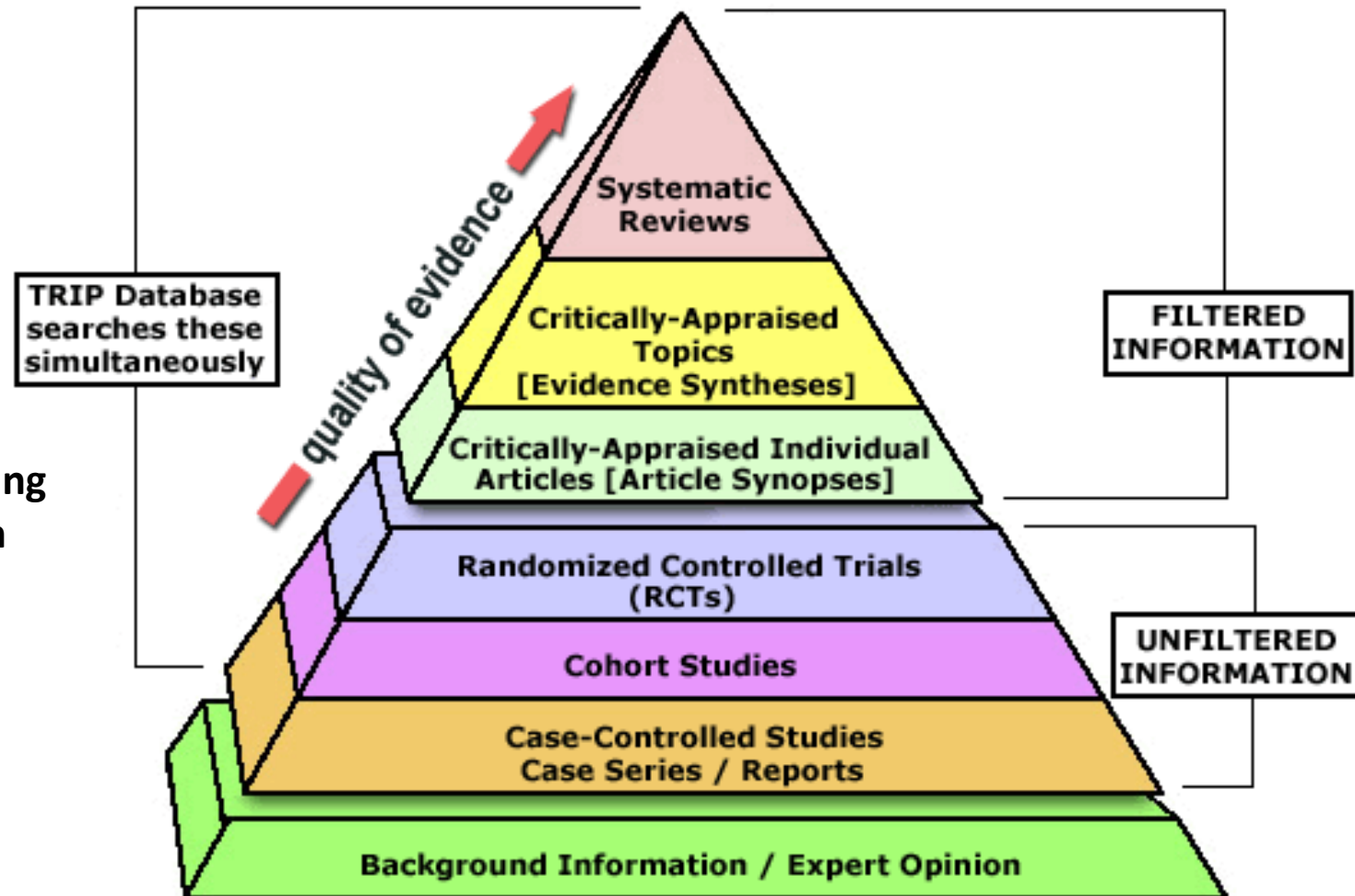
How can we be confident in the conclusions and recommendations we will make?

- It must be evidence-based.
- The strengths & limitations must be transparent.

How can we organize our thinking about the strength of evidence for GER claims?

- Organizing/characterizing GER community claims

Approach Used to Characterize **Health Care** Strength of Evidence



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A Proposed Approach to Characterize GER Community Claims

Strength of Evidence

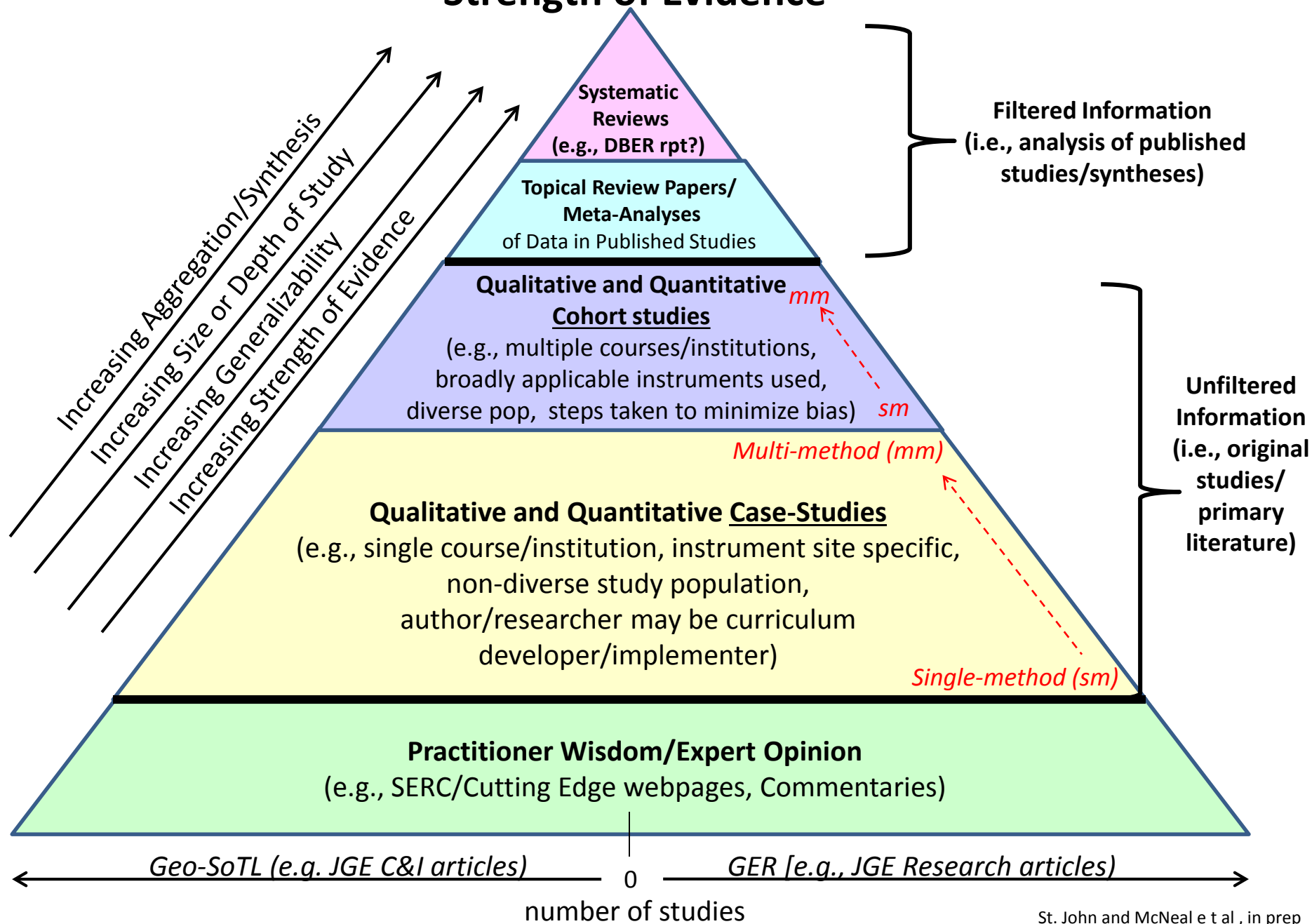
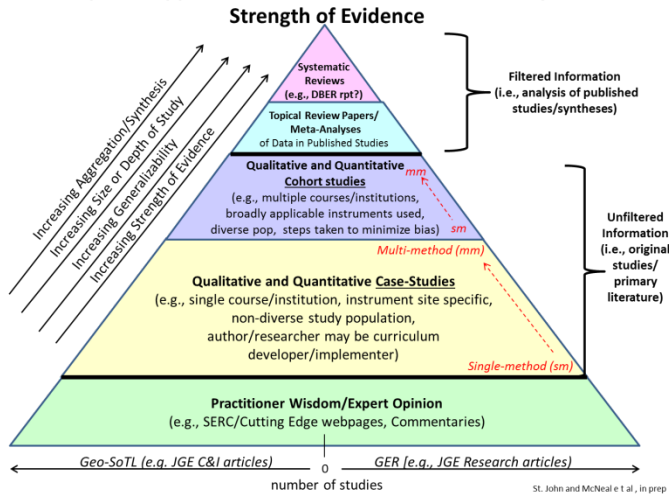


Table Discussions and Reactions

A Proposed Approach to Characterize GER Community Claims



- Is this organizational model useful?
What questions or suggestions do you have?
- What would you need to characterize strength of the evidence *at each level*?

For example:

Topical Reviews/Systematic Review Levels

Do we need rubric(s) for evaluating the literature? What would be the content of such a rubric?

(e.g., starting points: Perkins rubric, DBER rubric)

Does strength of evidence depend on methods used?

Description of Perkins' (2004) rubric for evaluating claims in original studies

Of the research studies chosen for review here, most were published or presented during the period 2001-2010, and two are in press. Most are from the JGE, GSA Special papers, or were presented at GSA meetings. The rest are from a variety of other sources. It is clear that publication of geoscience education research is dominated by JGE and geoscience organizations.

Perkins (2004) reviewed more than 300 articles published in the JGE between 1998 and 2004, and concluded that “209 are success stories...describing some sort of innovative project. 165 are about college education, 38 deal with primary or secondary education.” His rating of these articles is shown in Table 1.

Table. 1 Research Ratings of JGE articles (Perkins, 2004)

RATING	ASSESSMENT	% OF ARTICLES
0	Failed to mention anything about how the project affected student/participant learning	21%
1	Included comments or assertions about learning but gave no evidence in support	51%
2	Gave results of evaluations or some other kind of data to support conclusions about learning	12%
3	Included a complete and well thought out assessment	10%

Text from p. 2 in Pilburn, van der Hoeven Kraft, and Pacheco, 2011, *A New Century for Geoscience Education Research*. A commissioned study to inform the 2012 DBER Report.

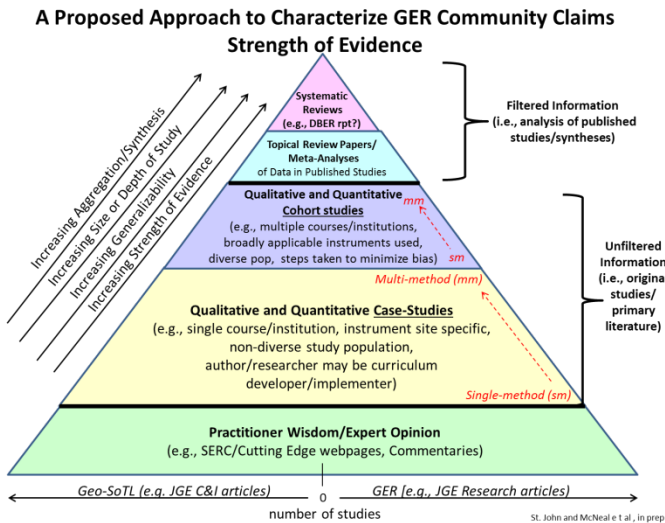
DBER rubric for rating strength of conclusions after evaluating the literature

DBER Report Level of Evidence	Characterized by
Limited	Few peer-reviewed studies of limited scope with: Some converged of findings, OR
	Converge with non-peer-reviewed literature, OR
	Convergence with practitioner wisdom.
Moderate	A well-designed study of appropriate scope that has been replicated by at least one other similar study. Often such evidence will include both quantitative and qualitative data, OR
	A few large-scale studies (e.g., across multiple courses, departments, or institutions) with similar results, OR
	A moderate number of small-scale studies (e.g., in single course or section) with general convergence but possibility with contradictory results. If the results are contradictory, more weight must be given to studies that reflect methodological advances or a more current understanding of teaching and learning, or are conducted in more modern learning environments.
Strong	Numerous well-designed qualitative and/or quantitative studies, with high convergence of findings.

Are there DBER report conclusions that might help us revise/define a rubric to evaluate published studies and relate to Strength of Evidence?

From DBER report (p 54): Challenges to DBER	Potential questions we could include in a rubric for lit review?
<p>Many DBER findings are from studies in which the authors/researchers are the developers or implementers of the curriculum/instructional method/instruments. Therefore there is the potential for bias. And uncommon to find independently reproduced research findings of most studies.</p>	<p>Is the author/researcher the curriculum/method/instrument developer or implementer?</p>
<p>Most DBER studies is on a single course (low scale), and assessments are very course specific, so hard to generalize findings broadly.</p>	<p>Is the study of only a specific course or of a broader? Is the instrument used of broader use to the GER community?</p>
<p>Few DBER studies focus on different sub-populations of students:</p> <ul style="list-style-type: none"> (a) social/economic/ethnic diversity (b) majors vs non-majors in intro courses (c) structural differences among intro courses, service courses for majors in other disciplines and courses for majors 	<p>Is the study addressing different subpopulations of one or more of the following:</p> <ul style="list-style-type: none"> (a) social/economic/ethnic diversity (b) majors vs non-majors in intro courses (c) structural differences among intro courses, service courses for majors in other disciplines and courses for majors

Table Discussions and Reactions - Additional Questions



- How can we best evaluate the evolution of GER?

Do the legacy articles need to be available online for reading, download, and analysis?
- Do we need a GER data repository, much like other geoscience research fields have?
- Does the GER community need a database for practitioners like the health care [TRIP](#) [translating research into practice] database?

Does GEOREF or SCOPUS or EBSCO or SERC serve that purpose?