Synthesizing Current Literature in Atmospheric Science Education

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Purpose

A critical component for supporting strong undergraduate atmospheric science education is a robust literature base that exemplifies best practices from the science of teaching and learning and describes latest findings from education research conducted within atmospheric science fields. Using strategies described by Scherer, Callahan, McConnell, Ryker, and Egger (2019), we are in the process of conducting an integrative literature review (Torraco, 2005) to review, critique, and synthesize the atmospheric science education research (ASER) literature in order to generate implications, recommendations, and new perspectives for continued ASER.

Motivation

In a forthright paper published in the Bulletin of the American Meteorological Society (BAMS), Charlevoix (2008) charged the community with increasing the pursuit of research in the Scholarship of Teaching and Learning (SoTL). We are addressing this call by surveying the literature published since that time and evaluating the strength of the evidence found in these papers.

Overarching Goal

Charlevoix (2008) writes, "…there is a need for increased participation in SoTL and for improved access to relevant literature on teaching and learning" (p. 1663). Our overarching goal is to prompt atmospheric science educators to be active purveyors of the current SoTL literature and encourage purposeful SoTL research that intentionally provides evidence-based pedagogies for high levels of teaching and learning in atmospheric science.

Research Question 1
What is the breadth of undergraduate SoTL ASER literature?

Research Question 2
What is the rigor of the SoTL research being done?

Inclusion/Exclusion Criteria

We selected papers using explicit sampling criteria to assure representativeness of the sample and to ensure reliability and veracity of findings (Souza, Silva, & Carvalho, 2010). The initial criteria aligned with Charlevoix (2008) and evolved as necessary through the selection process.

Inclusion

- SoTL studies
- Curriculum development
- Is intentional and reflective about improving instruction and learning in atmospheric science
- Peer-reviewed or has editor oversight
- Targets undergraduate instruction (majors or nonmajors), including classroom, field, REU's and internships
- Published after 2005

Exclusion

- Diversity/inclusion papers
- Expert-novice studies
- Program development/history
- Climate change and environmental education literature
- Meeting reports/conference preprints/dissertations
- Misconceptions papers
- DBER studies of spatial thinking or other cognitive aspects of learning
- Education instrumentation

Methods

We began with a list of 43 papers that had been previously compiled as part of an ASER working group and 20 from other sources known to us. To these lists we added 110 papers resulting from a search of 5 databases (Table 1) using 8 search terms (Table 2), which resulted in 173 papers primarily from 5 journals (Table 3).

Data Base	# of Papers
ERIC	47
Academic Search Premier/Ultimate	45
Web of Science	13
PsychInfo	5
Previous compiled lists	63

Table 1. *Twenty-one papers appeared in multiple data bases. Only one database for each paper is reported.

Search Terms	# of papers identified
Undergraduate	58
Education	53
Meteorology	49
Atmospheric Science	38
Research	20
College	16
Cognition	13
Learning	4

Table 2. *Although this table reports individual search terms, we also used different Boolean operators ("and," "or," and "not")

Journal	# of Papers
Bulletin of the American Meteorological Society (BAMS)	55
Journal of Geoscience Education (JGE)	35
Weather, Climate, and Society	27
Journal of College Science Teaching	8
Others	48

Table 3. Sources of papers in the initial collection of 173 papers

Methods (continued)

To the 173 papers, we rigorously applied our inclusion/exclusion criteria as shown in Figure 1.

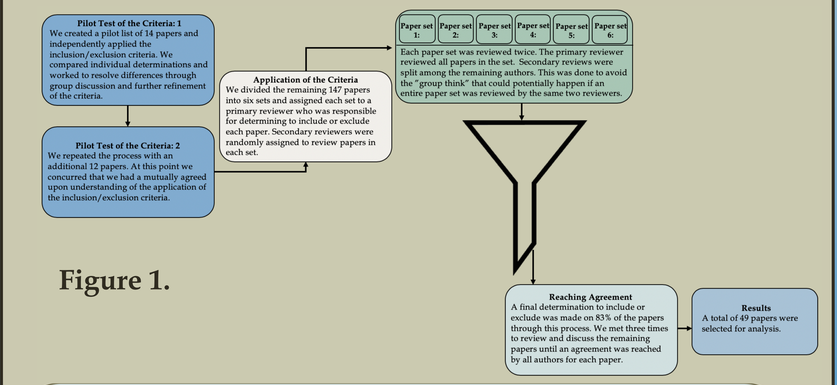

Figure 1.

Initial Findings and Future Work

Sources of the 49 SoTL papers in the final sample are provided in Table 4. We will continue our work through evaluation of the rigor of the research evident in these papers by comparing to the Geoscience Education Research (GER) Strength of Evidence Pyramid (St. John & McNeal, 2017) in Figure 2. We solicit and appreciate feedback on past and future work on the project.

Journal	# of Papers
Bulletin of the American Meteorological Society (BAMS)	22
Journal of Geoscience Education (JGE)	9
Journal of College Science Teaching	6
Others	12

Table 4. Sources of papers in the final sample

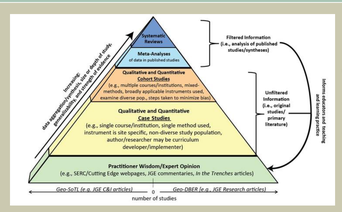

Figure 2. The Strength of Evidence Pyramid

References

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