Utilizing Competing Narratives to Increase Critical Thinking Abilities

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What is Critical Thinking?

- NOT a random compilation of components (Willsen, 1995)
  - Integrated working system for education and life (Willsen, 1995)
- Characterized by ability to transcend disciplines (Kuhn, 1999)
- Analyze and evaluate information (Duron, Limbach, & Waugh, 2006)
- Purposeful, outcome-based thinking (Popil, 2011)

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THE Definition

- Reasoned, purposive, and introspective approach
- To solving problems or addressing questions
- With incomplete evidence and information
- For which an incontrovertible solution is unlikely

Rudd, Baker, & Hoover (2000)

Purpose of Study/Methods

- Examine effects of competing narratives approach to increase students' critical thinking abilities.
  - Entry level, semester-long natural resource management course – NRSM 101 (N = 209)
  - Critical Thinking Assessment Test (CAT)
  - Pre-test/post-test design

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CAT

- NSF supported tool to assess critical thinking and problem solving
- 15 short-answer questions based on real-world situations
- Scoring completed by institution faculty
  - Opens dialogue on critical thinking development
  - Detailed scoring rubrics
- Measure effects of college education, POS, or course
- Evaluate *information*, *creative thinking*, *problem solving*, and *communication*

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CAT Skill Areas

Specific Skill Areas Assessed by the Critical Thinking Assessment Test	
• Summarize the pattern of results in a graph without making inappropriate inferences • Evaluate how strongly correlational-type data supports a hypothesis • Provide alternative explanations for a pattern of results • Identify additional information needed to evaluate a hypothesis • Evaluate whether spurious information strongly supports a hypothesis • Provide alternative explanations for spurious associations • Identify additional information needed to evaluate a hypothesis • Use/apply relevant information to evaluate a problem	• Determine whether an invited inference in an advertisement is supported by specific information • Provide relevant alternative interpretations for a set of results • Separate relevant from irrelevant information when solving a real-world problem • Use basic mathematical skills to help solve a real-world problem • Identify suitable solutions for a real-world problem using relevant information • Identify and explain the best solution for a real-world problem • Explain how changes in a problem situation might affect the solution

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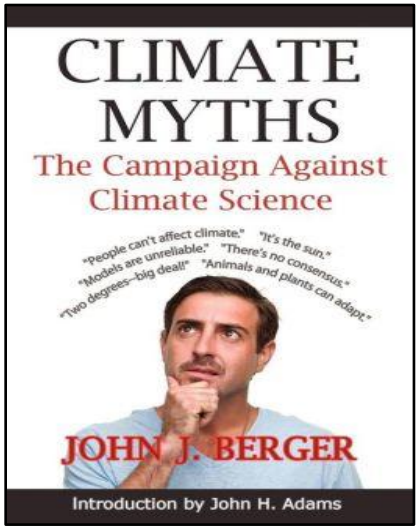
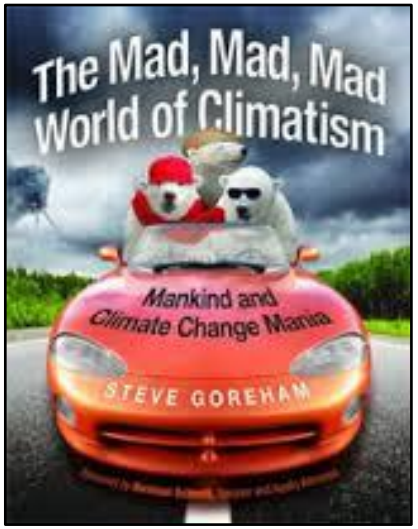
Course Setup

- Competing narratives
- Four writing assignments
  - 1 and 2 introduce students to grading, writing, structure, etc.
  - 3 and 4 to examine biases and information sources





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Writing Assignments

Assignment

- #1- Prove or disprove one of the myths presented by textbook, using at least one scientific source.
- #2 - Determine if the erosion rates on hill slope sites in selected fields are sustainable.

CAT Skill Areas

- Summarize a pattern of results
- Evaluate spurious information
- Separate relevant from irrelevant information
- Identify and explain the best solution

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Writing Assignments

Assignment

- #3 - Is modern global warming abnormal and therefore a cause for concern? Compare and contrast the arguments.
- #4 - Is CO_2 the primary cause of modern global climate change and is it attributed to human activities? Compare and contrast the arguments.

CAT Skill Areas

- Summarize a pattern of results
- Provide alternative explanations
- Separate relevant from irrelevant information
- Identify additional information needed to solve a problem

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Results

- Students scored statistically higher on the post-test in five of the fifteen skill areas as well as on the overall CAT score.

Table 1

Results of Pair Samples t Test of Students Enrolled in NRSM 101 (n=37)

Skill area assessed	Pre-Test	Post-Test	p^a	Eff. Size[b]
Evaluate strength of correlational-type data.	0.81	1.78	**	+0.78
Identify additional info. needed to evaluate a hypothesis.	1.32	0.62	**	-0.68
Summarize pattern of results in a graph.	0.57	0.62	*	+0.61
Identify and explain the best solution for a real-world problem.	1.49	2.59	*	+0.59
Use/apply relevant information.	1.03	1.38	**	+0.51
Identify suitable solutions for a real-world problem.	0.65	1.030	*	+0.40
CAT total score.	15.25	18.05	**	+0.52

[a]Probability of difference; [b]Mean difference divided by pooled group *SD* (0.1-0.3 = small; 0.3-0.5 = moderate; >0.5 = large effect).

*$p < 0.05$. **$p < 0.01$.

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Conclusions

- Enrollment in a course similar to this one (semester-long, lecture/lab base, competing narratives) has the potential to positively influence students' critical thinking abilities.
- Impelled students to construct new knowledge from inspecting their own previous experiences and opinions of global warming.

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Discussion

- Potential for improved CT is evident, but intentionality is a must (curriculum development and delivery).
- CT is neither passive nor random.
  - We must push our students toward this type of thinking.
    - Questioning techniques
- Alternative approach to increasing students' critical thinking abilities.

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Closing Thoughts

- What are we *truly* doing to get our students engaged in critical thinking/ analysis?
- Have we evaluated our CT outcomes or do we just assume we are integrating CT?

Thank You – Questions?

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