Global Warming and Middle School: An Argument-Based Intervention

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Abstract

As part of a semester-long intervention to teach middle school students to critically evaluate arguments, 60 sixth- and seventh-graders from a Las Vegas charter school in the Clark County School District discussed issues surrounding global climate change. The presentation will first describe the argument-based intervention used with the students and its effect on attitude change. Most students became accepting of the existence of global climate change and the need to develop alternative modes of transportation. The intervention also provided students with some opportunity to learn about science, political, geography, and economics in an integrated way, as well as an opportunity to develop critical and creative thinking. Second, the overall findings of the research study will be presented, concluding that the skill of “weighing values” may be a productive one to teach to middle school students. Third, some misconceptions that students retained will be described so that future instructional efforts may address them.
Acknowledgments

- Ordene Edwards (coding, co-author)
- Milan Jilenik (video taping/transcribing)
Setting

- Sabbatical
- University of Illinois-Urbana/Champaign
- Urban Charter School (Las Vegas)
  - 7th grade social study classes.
  - 6th grade writing classes.
Argumentation

- Discourse about a topic that evaluates different points of view.
- Collaborative or adversarial
- Collaborative argumentation: students work together to construct and critique different arguments.
  - Can change positions.
Argumentation Relates to:

- Critical Thinking Skills
  - Is there global climate change? What should we do about it?
- Conceptual change
INTEGRATE

Using your answers, explain why one side may be stronger and the other side weaker?
Or is there an “in-between” solution?
Global warming can cause people to die (from drought, oceans rising, etc.)

Driving pollutes; people need to take the bus more.

To slow global warming, should the fed government raise taxes on gas?

The price of gas is already too high.
If people have to buy new cars that pollute less, they’ll have less money to buy their kids holiday presents.

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I think that the arguments side is stronger. Because people can car pool, then people could take the bike. Just anything that wouldn't use that much gas. Then I think that the counterarguments is weak. Why is yeah the gas prices might be too high but not getting presents for the holiday isn't as bad as not having a car. That is just really greedy. I guess they don't care about parents working or helping the environment.
How do you evaluate which side is stronger?

- Douglas Walton’s notion of critical questions.
- For example:
  - Argument from evidence: Is the evidence representative?
  - Argument from expert opinion: Is the expert an authority in the domain being discussed?
Research question (1)

What sort of critical questions would be understandable and meaningful to seventh graders?
Research question (2)

Would including (more) critical questions on the AVDs make student arguments more refutational (refuting counterarguments)?
<table>
<thead>
<tr>
<th>ARGUMENTS</th>
<th>QUESTION</th>
<th>COUNTERARGUMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are any of the arguments <strong>not as important</strong> as others?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Are any of the arguments <strong>unlikely</strong>?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Is there a <strong>creative solution</strong> to any problem raised?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Is the creative solution <strong>practical</strong>? (Consider costs.)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>For any argument, can you think of any <strong>examples to the contrary</strong>? Or other likely explanations?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Using your answers, explain which side is stronger, and why the other side is weaker? Is there an “in-between” solution?
<table>
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<tr>
<th>Question</th>
<th>Circle Yes or No</th>
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Participants and Design (7th Grade)

- $N = 20$ experimental group (2 sections)
- $N = 10$ control group (1 section)
- Quasi-experiment (intact sections)

Teacher reported that the control group had higher ability.
Other materials

- Newsweek
- Film: *An Inconvenient Truth* (sixth grade)
<table>
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<tbody>
<tr>
<td><strong>Phase 1:</strong> Torture</td>
</tr>
<tr>
<td>Relocation of Wild Mustang</td>
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<tr>
<td>Banning Soda Pop/Requiring Uniforms</td>
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<tr>
<td>Banning Prescription Drug Commercials</td>
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<tr>
<td><strong>Phase 2:</strong> Steroid Use in Baseball</td>
</tr>
<tr>
<td>Raising taxes to feed hungry</td>
</tr>
<tr>
<td>CLIMATE CHANGE (CARBON TAX)</td>
</tr>
<tr>
<td>Skateboarding</td>
</tr>
<tr>
<td>Requiring Uniforms/Banning Soda Pop</td>
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</tbody>
</table>
Procedure (for Climate Change/2 days)

1) Student read article out loud, we discussed meaning of terms.
   - Global warming
   - Carbon dioxide
   - Fossil fuels
   - Industrial revolution
   - Retaining walls
   - Hybrid cars
   - Desalinization.
Procedure (for Climate Change)

1) Student read article out loud, we discussed meaning of terms.

2) Their questions, my questions interspersed
   a) Been to San Francisco?
   b) LV drought
   c) Should we raise taxes on gas?
   d) Students: Build cars don’t pollute, run on water.
   e) Some critical questions could ask: who will pay for it?
Procedure (for Climate Change)

3) Pretend to be Congressional representatives, vote.

4) DAY 2
   1) Took arguments, put on the AVD
Global warming can cause people to die (from drought, oceans rising, etc.)

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Procedure (for Climate Change)

3) Pretend to be Congressional representatives, vote.

4) DAY 2
   a) I took arguments, put on the AVD
   b) Students complete AVDs (10-15 mins)
   c) Reviewed ground rules for collaborative argumentation.
   d) Students voted.
   e) Students discussed args. for/against.
   f) Students voted again.
Coded AVDs

For the following integrative/refutational moves:

- Design claims (Defined as alternative way of designing the solution)
  - Practical
  - Costly
- Weighing values
- Other refutations.
Results: Practical Design Claims

Statistically significant differences $W = 101, p \leq .03$
Impractical vs practical design claims

- **Impractical**
  - Trading in old car for a new one, at same price

- **Practical**
  - Raising taxes just on the rich, using funds for research and development, or subsidizing purchase of hybrid.
Results: Value Weighing Arguments

Statistically significant differences $W = 109, p \leq .03$

Experimental trend (sign test): $p \leq .001$, 
Learning a weighing values schema

- Weighing schema:
  - General mental representation that has “slots” for two different values, and evaluation “which is more important?”

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<th></th>
<th>Less money for holiday presents</th>
<th>Saving the earth</th>
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Skill (schema) acquisition might have occurred through:

- Students seeing others do it (modeling)
- Arguing and revaluing
  - Instructor: What’s more important, taking longer to get to work (if take bus) or stopping global warming?
  - Robert: You have to go to work in order live.
  - Estella: If the earth is dying, then you are dying.
More arguing and revaluing: home schooling

| Go to school to learn | Making friends |
Skill (schema) acquisition facilitated by:

- Revaluing weighing arguments
  - In the course of interactive arguments
  - learn something by “using” it
- Use multiple times
A number of students changed opinion, against raising taxes on gas, to for (including Estella).

Critical argumentation (with critical questions)
Grant Proposal

With Gale M. Sinatra and Douglas Lombardi (Dept. of Educational Psychology)

Argument-based intervention using critical questioning.

Refutational texts
- General misconceptions “Climate not getting warmer,” “Climate change not caused by human activity”
- Specific misconceptions (we had a cold winter, so the weather is not changing).

Critical argumentation to address.
Basic premise and conclusion

Global Climate Change Education
- Should teach student to think critically
- Teaching specific critical questions and having students use them in discourse and—when appropriate—with argumentation vee diagrams (AVDs).