



Addressing Middle School Science Teachers' Conceptions of Climate Change

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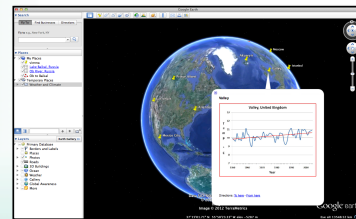
Climate Change Knowledge Assessment

- Designed to assess climate change content knowledge levels
 - 28 Multiple Choice items
 - Cronbach's $\alpha = 0.809$
 - 3 open-ended response items
- Revealed initial knowledge deficits
 - Climate and weather timescale differences
 - Albedo effect
 - Atmospheric composition and the role greenhouse gases play in climate change
 - Specific trace gas influences
 - Anthropogenic source contribution to climate change
 - Relevance of water vapor to climate change
 - Atmospheric vs. ground ozone
 - Heat capacity concepts

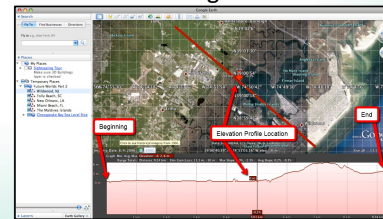
Pre-PD Climate Change Knowledge Assessment Example Questions (n=18)	Correct Answer	Incorrect Answers
Q1 – Climate is defined as weather patterns that change on a scale of at least a few...	Decades (70.6%)	<ul style="list-style-type: none"> Years (17.6%) Months (5.9%) Weeks (5.9%)
Q3 – Which does not act as significant greenhouse gas?	Nitrogen (29.4%)	<ul style="list-style-type: none"> Water Vapor (58.8%) Methane (5.9%) Carbon Dioxide (5.9%)
Q9 – Ozone existing in the lower troposphere is...	A pollutant created from the burning of fossil fuels (41.2%)	<ul style="list-style-type: none"> Beneficial to human and other life (52.9%) Made up of the most abundant element in the atmosphere (5.9%)
Q14 – Argon, carbon dioxide, and other trace gasses make up approximately ___% of the earth's atmosphere	One (50%)	<ul style="list-style-type: none"> Three (31.3%) Ten (12.5%) Five (6.3%)
Q16 – The three greenhouse gases that contribute the most to the total greenhouse effect are...	Carbon dioxide, water vapor, and methane (50%)	<ul style="list-style-type: none"> Carbon dioxide, ozone, and CFC's (25%) Carbon dioxide, nitrogen and carbon monoxide (25%)
Q20 – Materials that absorb lots of energy without a large temperature increase have a...	High heat capacity (37.5%)	<ul style="list-style-type: none"> Low albedo effect (43.8%) High albedo effect (12.5%) Low heat capacity (6.3%)

Environmental Literacy and Inquiry (ELI) Activities Addressing Climate Change Misconceptions

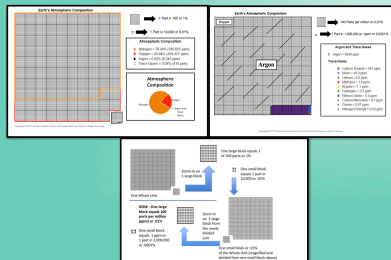
Investigating Weather and Climate with Google Earth



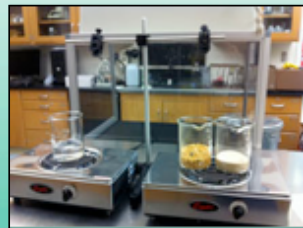
Investigating Future Worlds with Google Earth



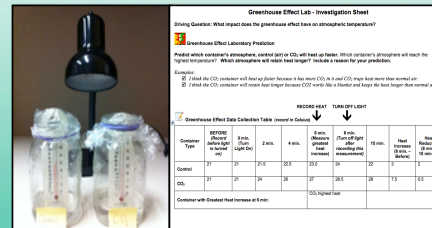
Earth Systems and Atmospheric Gases



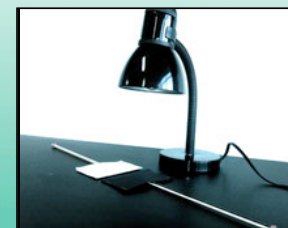
Heat Capacity Demonstration



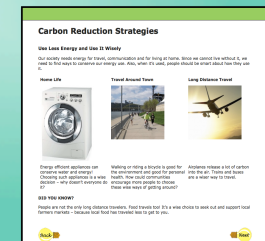
Greenhouse Effect Lab



Investigating Albedo



Carbon Reduction Strategies



Addressing the Issues

Who:

- 17 eighth-grade, urban middle school science teachers
- 1 pre-service intern teacher

How:

- Applied Geospatial Technological Pedagogical and Content Knowledge (GSTPACK) PD Model to ELI Climate Change Curriculum
 - 3-day, 12-hour applied professional development series
 - Embedded educative curriculum materials provide climate change content knowledge and pedagogical supports for implementation with diverse learners
 - Teachers experience a sequence of inquiry-based laboratories, investigations with geospatial investigations and explorations, and web-based activities