



18. Improving Climate Change Education Strategies

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Climate change is a global issue that requires knowledgeable citizens who are able to make informed decisions about mitigation and adaptation activities. Currently, neither adults nor teens are well informed on this issue, suggesting the need for a stronger education effort. However, some teachers may avoid climate change because they are unsure of how to approach a controversial issue. Also, some students enter the classroom with misconceptions and attitudes about climate change that are influenced by sources outside the classroom. Using activities drafted for the Project Learning Tree secondary module (see *Creating Educational Materials to Teach Youth about Forests and Climate*, page 38), the following research questions were investigated:

1. To what extent are student attitudes about climate change influenced by their perception of their parents' opinions of climate change?
2. How does integrating carbon cycle lessons with climate change affect student interest and knowledge about carbon?
3. Is a role play or discussion more effective for encouraging students to respectfully discuss a variety of opinions about climate change?

Methods

Data were collected at two summer science programs organized by the University of Florida's Center for Precollegiate Education and Training: Science Quest (SQ) and Student Science Training Program (SSTP).



Figure 18.1. Science Quest week one students measuring carbon in the forest. Photo by Jessica Ireland.



Figure 18.2. Science Quest week two students moving through the carbon cycle. Photo by Annie Oxarart.

Science Quest

Participants were 47 rising high school sophomores in two offerings of a week-long program. Students in each program engaged in a half-day educational experience about forest carbon. The week one group (SQ1) learned about carbon cycles in the context of climate change (Figure 18.1). The week two group (SQ2) participated in the same activities, but climate change was not mentioned until after the posttest (Figure 18.2). Group interviews were conducted after completing the activities to explore students' attitudes about the lesson (Table 18.1).

Student Science Training Program (SSTP)

Participants were 42 rising high school juniors and seniors in a seven-week research program. All students took a pretest that measured their climate change knowledge and attitudes as well as their perception of their parents' attitudes. Students attended a one-hour lecture introducing climate change science and why people hold different perspectives about this issue. Four days later, all students took a posttest on their climate change knowledge and attitudes. Students were split into small groups. Half of the groups participated in a role play with different climate change perspectives in which they were asked to generate three solutions to climate change that everyone could agree on. The other groups participated in a discussion in which they had to agree on three climate change solutions they felt would be practical given that people in their community hold many different perspectives (the same perspectives as presented in the role play). Students also completed a questionnaire about the lesson.



In the interviews, students explained that linking carbon cycle activities with climate change makes the topic more interesting and relevant, even for students who are less concerned about climate change.

Results

Students' Climate Change Attitudes

A forward stepwise regression was conducted to predict student attitudes about climate change. There was a strong R^2 value for SQ2 and SSTP; the most significant term was perception of parents' climate change attitudes. SQ1 had a weak R^2 value and the most significant term was students' political views. This implies that students come into the classroom already holding opinions about climate change that are partially influenced by outside factors, such as perception of parents' attitude and the political party they favor.

Student Knowledge Gain and Interest

In the SQ1 group, students scored significantly higher ($p < 0.05$) on the posttest than the pretest. The pretest and posttest scores were not significantly different for SQ2.

SQ1 group- Carbon cycle activities in the context of climate change (n=23)	SQ2 group- Carbon cycle activities not in the context of climate change (n=24)
<ul style="list-style-type: none"> • Pretest on carbon cycle knowledge • Activities <ul style="list-style-type: none"> – Students move through the carbon cycle as a carbon atom and discuss human impacts on the carbon cycle – Students measure carbon in a tree, calculate their state's sequestration rate, and compare to emissions rate • Posttest • Interviews 	<ul style="list-style-type: none"> • Pretest on carbon cycle knowledge • Activities <ul style="list-style-type: none"> – Students move through the carbon cycle as a carbon atom – Students measure carbon in a tree and calculate carbon in the forest • Posttest • Discussion of human impacts on the carbon cycle, state's sequestration rate compared to emissions rate • Interviews

Table 18.1. Students' attitudes about the lesson in the SQ1 group and SQ2 group.

There was no significant difference between the week 1 and 2 pretests or posttests. Embedding the carbon cycle lesson in the context of climate change appears to have significantly increased student knowledge about the carbon cycle, although this conclusion would be stronger if there were a significant difference between the posttest scores. In the interviews, students explained that linking carbon cycle activities with climate change makes the topic more interesting and relevant, even for students who are less concerned about climate change.

Role Play and Group Discussion

Students engaged in the role play activity made more frequent mentions of other perspectives but also had a greater frequency of disrespectful comments than students engaging in the discussion activity. Changing the role play to emphasize respect or adding a moderator could make the conversation more respectful. This modified role play offers a potential strategy for teachers to approach the controversy while not confusing students about the science of climate change.

Discussion

Climate change is typically covered in earth science classes, but it can also enhance the biology curriculum by providing an interesting framework for learning about topics such as the carbon cycle. Students come into the classroom with knowledge and attitudes influenced by outside sources, however, which could affect learning. Activities should be designed to offer teachers guidance to approach the types of situations they are likely to face and to facilitate interesting and engaging activities with students.