



# Transforming Climate Change Attitudes for Middle School Students Participating in Energy Monitoring Activities

Rhonda Christensen and Gerald Knezek, University of North Texas

Hawaii International Conference on Education 2017

## About the Project

The **Going Green! Middle Schoolers Out to Save the World (MSOSW)** project aims to direct middle school students' enthusiasm for hands-on activities toward long-term interest in STEM while guiding them to solve real-world problems. MSOSW teachers are provided with professional development, classroom sets of energy monitors, web enhanced teaching resources, curriculum and ongoing support from the project personnel. Students are taught to use energy monitoring equipment to audit standby power consumed by electronic devices in their homes and communities. The focus of the curriculum and activities is standby power – electricity that is being used by appliances when they are plugged in but serving no useful function, and how this waste contributes to greenhouse gas emissions and global climate change.

## Survey Instrument: Climate Change Attitude Survey (CCAS)

Part 1	SD	D	U	A	SA
1. I believe our climate is changing.	○	○	○	○	○
2. I am concerned about global climate change.	○	○	○	○	○
3. I believe there is evidence of global climate change.	○	○	○	○	○
4. Global climate change will impact our environment in the next 10 years.	○	○	○	○	○
5. Global climate change will impact future generations.	○	○	○	○	○
6. The actions of individuals can make a positive difference in global climate change.	○	○	○	○	○
7. Human activities cause global climate change.	○	○	○	○	○
8. Climate change has a negative effect on our lives.	○	○	○	○	○
9. We cannot do anything to stop global climate change.	○	○	○	○	○
10. I can do my part to make the world a better place for future generations.	○	○	○	○	○

Part 1 Christensen & Knezek, 2014

Part 2	SD	D	U	A	SA
1. Knowing about environmental problems and issues is important to me.	○	○	○	○	○
2. I think most of the concerns about environmental problems have been exaggerated.	○	○	○	○	○
3. Things I do have no effect on the quality of the environment.	○	○	○	○	○
4. It is a waste of time to work to solve environmental problems.	○	○	○	○	○
5. There is not much I can do that will help solve environmental problems.	○	○	○	○	○
6. I believe that I can contribute to the solution of environmental problems by my actions.	○	○	○	○	○
7. Environmental problems can be solved without big changes to our way of life.	○	○	○	○	○
8. I think each of us can make a significant contribution to environmental protection.	○	○	○	○	○

Items from Part 2 were adapted from Wisconsin Center for Environmental Education (1994) and LeHebel, Montpied, & Fontanieu (2014)

Christensen, R. & Knezek, G. (2016). CCAS 2.0



Vampire Manor was developed for the Going Green! project and is available to any user with a Whyville login. Users simulate project activities of measuring standby power.

## Research Questions

- To what extent do middle school students who participate in hands-on energy monitoring/greenhouse gas projection activities become more positive in: a) beliefs that human-influenced climate change is happening in our world, and b) intentions to take actions that make a difference in reducing greenhouse gas emission contributions to climate change?
- What gender differences exist for students who participate in hands-on energy monitoring curriculum regarding their beliefs about the existence of climate change and their intentions to take actions to improve the environment?

## Instrumentation

The Climate Change Attitude Survey (CCAS) assesses two constructs – beliefs in climate change and intent to take action based on those beliefs – regarding climate change. CCAS was developed by the authors based on adaptations from other climate-related surveys intended for different audiences or different purposes (Champeau, 1997; Leiserowitz et al., 2013).



## Participants

The survey was completed by middle school students in grades 5-8 participating in the Going Green! Middle Schoolers Out to Save the World (MSOSW) project. Pre-post data were collected from 792 treatment and 508 students from 18 treatment classrooms and 7 comparison classrooms. These students represented schools in the states of Hawaii, Louisiana, Michigan, California, Virginia, North Carolina, Vermont, Maine and Texas. The school locations were selected for their diversity in climate zones, rural vs. urban locations, socioeconomic status of their neighborhoods, and public versus private funding status. The gender representation included 53.6% males and 46.4% girls. The largest percentage of students (47%) were in 6<sup>th</sup> grade. Students were asked to select the ethnicity to which they most identified and the data included 50.7% Caucasian, 14.6% Asian, 12.8% Hispanic, 7.4% African American, 3.5% Native American/Pacific Islander and 11.1% Other.

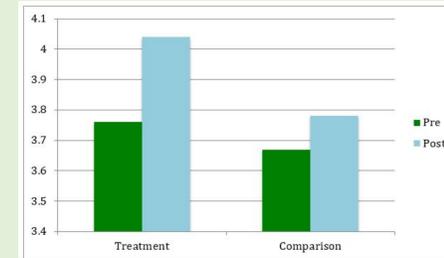
## Project Locations



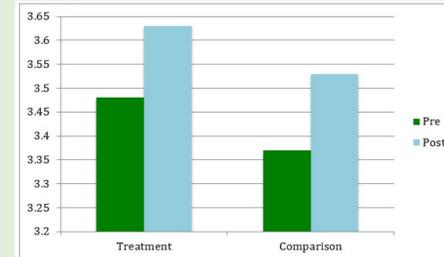
## Findings

For 792 students in treatment classrooms across all grade levels, significant ( $p < .05$ ) positive changes occurred in both beliefs ( $p < .0005$ ) (ES = .43) and intentions ( $p < .05$ ) (ES = .20) to make changes to help address climate change issues. Among 508 students in comparison classrooms, there were also significant increases in positive beliefs ( $p = .02$ ) (ES = .15) from pre to post test time periods, and for intentions the comparison group gains were significant ( $p < .05$ ) as well ( $p = .046$ ) (ES = .21). The gains for the treatment group in Climate Change beliefs (ES = .43) were much larger than for the comparison group (ES = .15), with the treatment group gaining significantly ( $p < .05$ ) more than the comparison group regarding Climate Change beliefs. Effects were especially large for girls.

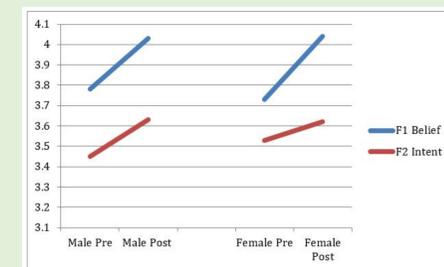
Because of the focus of the project, an item analysis of the Climate Change Attitude Survey was conducted. For the treatment group all of the individual items increased with 13 of 18 items having a significant ( $p < .05$ ) increase. For the comparison group, 10 of the 18 items increased significantly ( $p < .05$ ). For the item, "Environmental problems can be solved without big changes to our way of life", there was a large difference between treatment students and comparison students. Students who participated in the standby power monitoring activities increased significantly ( $p = .03$ ) while the comparison students actually decreased (although NS). Additional items that had significant ( $p < .05$ ) increases pre to post for treatment students but not for comparison students included: "I am concerned about global climate change"; "The actions of individuals can make a positive difference in global climate change"; and "I think most of the concerns about environmental problems have been exaggerated (reversed)."



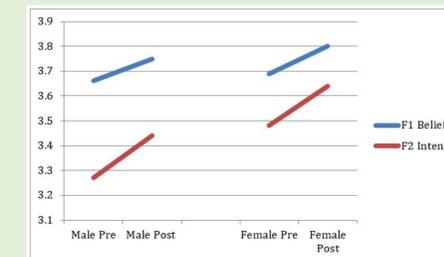
Climate Change beliefs, pre-post, treatment versus comparison students



Climate change intentions, pre-post, treatment versus comparison students



Pre-post changes on Climate Beliefs and Intentions comparing male and female treatment students.



Pre-post changes on Climate Beliefs and Intentions comparing male and female comparison students.

