



Investigating the impact of the ACMES STEM summer camp on 6-8th graders' environmental perceptions

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INTRODUCTION

- The Assimilating Computational and Mathematical Thinking into Earth and Environmental Science (ACMES) STEM Summer Camp reached out to students interested in STEM entering grades 6-8 in Fall 2019.
- Studies show that early exposure to environmental education can help students become more aware of urgent environmental threats ([Arcury and Johnson 1987](#); [Bodzin 2012](#)).
- Constructive, extracurricular activities with peers help improve environmental awareness ([Karahana and Roehrig 2015](#)).
- Research analyzing the relationship between children's' perception of the environment and relevant contributing factors is scarce; this study aims to address this gap
- Camp participants were asked to complete surveys before and after a trip to Stokes State Forest to provide insight on potential factors affecting environmental perception after engaging in collaborative activities with their peers.



Figure 1. Images from the ACMES 2019 STEM Summer Camp. Participants played STEM-based games, visited different labs to gain deeper understanding of scientific processes, and visited Stokes State Forest for a day of nature.

OBJECTIVES

- Analyze different factors contributing to environmental perception in children after participating in collaborative, constructive activities with their peers after a day-long outing in nature.
- Determine the effectiveness of the ACMES Summer Camp program in positively affecting participants' environmental views.

DATA AND METHODS

- Survey
 - Compare survey results conducted before and after an excursion to Stokes State Forest.
 - Surveys included ordinal-response questions about feelings of being in nature, perceptions of human impact on nature, and outlooks concerning environmental issues.
- Statistical data analysis
 - Cochran-Armitage trend test – test for trends in binomial proportions
 - Contingency analysis with chi squared values – determines whether relationships are significant
 - Cochran-Mantel-Haenzel (CMH) test – used for data presented in a 2x2 matrix, tests for difference

RESULTS

- Contingency analysis and the Cochran-Armitage test suggest a significant relationship between respondents and the ordinal-response questions “I am optimistic about the future” (left) and “Nearly all human activity is damaging to the environment” (right).

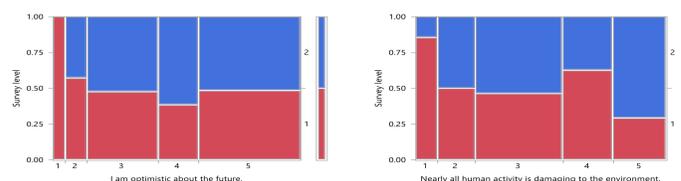


Figure 2. Results from the Cochran-Armitage test. “1” (in red) represents responses from the pre-survey while “2” (in blue) represents the post-survey. Values 1-5 on the horizontal axis represent beliefs ranging from 1 (“Strongly disagree”) to 5 (“strongly agree”).

- Contingency analysis has a likelihood ratio of 0.088, showing attitude towards human contribution to environmental problems varies with grade.
- With a significant CMH test statistic of 0.097, the test shows respondents in grade 6 strongly felt that human activity damaged the environment more than those in grades 7 and 8.
- The Cochran-Armitage Trend test, with a z statistics of 0.097, shows that respondents felt more optimistic about the future after the excursion.
- Results showed that respondents felt safer being in nature after the time in the forest, with fewer respondents stating that gangs or crimes make natural areas unsafe.
- Boys generally showed more improvement in feelings of safety after the excursion than the girls.

DISCUSSION

- After the trip to Stokes, respondents were more optimistic about the future and more strongly agreed that humans negatively impacted the environment.
- 6th grade campers responded more positively to the camp than 7th and 8th graders, suggesting younger campers might be more flexible in their perceptions.
- Boys felt safer in the woods after spending more time in them; therefore, perhaps exposure to nature is helpful in improving environmental perceptions.
- Girls' levels of comfort in the woods did not change significantly because of the time at Stokes.

CONCLUSIONS AND FUTURE WORK

- Perhaps the ACMES STEM Summer Camp and other similar programs should target children in grades 6 and below for maximum impact and consider utilizing different outreach methods for 7th and 8th graders.
- Campers were more optimistic about the future and more strongly agreed that humans negatively impacted the environment after the excursion, suggesting that the ACMES camp may be helpful in environmental education.
- Future research can also delve into understanding how respondents feel about prospective career options in STEM after collaborative, constructive outings like that to Stokes.

REFERENCES

- Arcury, T. A., and T. P. Johnson. 1987. Public environmental knowledge: A statewide survey. *The Journal of Environmental Education* **18**:31-37.
- Bodzin, A. 2012. Investigating urban eighth-grade students' knowledge of energy resources. *International journal of science education* **34**:1255-1275.
- Karahana, E., and G. Roehrig. 2015. Constructing media artifacts in a social constructivist environment to enhance students' environmental awareness and activism. *Journal of Science Education and Technology* **24**:103-118.

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