2007 NAAEE Annual Conference Proceeding
November 14-17, 2007
Virginia Beach, VA

Community and Conservation Education

Community-based EE: Students Team with Town Planners and University Researchers

Bo Ae Chun[a*], Geoffrey Howard[b], Lari Korniczky[c]
[a] *Department of Geography, University at Buffalo, Buffalo, NY*
[b] *Department of Learning and Instruction, University at Buffalo, Buffalo, NY*
[c] *Sweet Home Middle School, Amherst, NY*

ABASTRACT

Student scientists learned how they could become involved in town planning while participating in a project, "Environmental Education with GIS within Community (EEGISC)" to monitor water quality and analyze land use changes based on collaboration between a University, local school district and a Town. By involving students in this process and developing strong community support, students deepened their understanding and respect for the environment while gaining the sense of empowerment that their "voice" counts. This article introduces the EEGISC project including its mission and goals, a description of the community and education providers involved, and examples of activities undertaken. It describes qualitative research methods used to document diverse perspectives, issues, and suggestions related to student learning and evaluation of the project. The article also highlights its preliminary findings from a pilot study with local middle school students in Amherst, New York. Particular emphasis is placed on relationships that emerged between student investigation, their learning based on the community, and service learning.

Key words: environmental education, community-based environmental education, service learning, Geographic Information Systems.

* Corresponding author: Department of Geography, University at Buffalo, 105 Wilkeson Quad. Buffalo, NY 14260, USA. Email: boaechun@buffalo.edu

INTRODUCTION

On a June 2007 evening, 7 eighth-grade students from a local middle school in Amherst, New York gathered at the Town Hall to present their experiences as participants in a community-based environmental education project before the Amherst Conservation Advisory Council (ACAC). Following a poster presentation session, the students reported findings from water quality tests they had conducted, and discussed their conclusions about community participation in a stormwater management project.

A Town Council member asked, "What did you learn from this project?" ; a student responded: "Before this project, I didn't know about our watershed, like how what we do matters to Lake Erie and what we drink and everything," (Sarah, 14 yrs). Another student responded proudly: "[I like this project because it is] Helping Amherst watch their stormwater *thingy* and like, getting kids involved, too. And helping out with environmental *stuff*," (Hannah, 13yrs).

Environmental Education with GIS within Community (EEGISC) is a form of community-based environmental education developed by a team comprised of a middle school science teacher and researchers from the Departments of Geography and Learning and Instruction at the University at Buffalo (UB). During the spring semester of 2007, a

series of curricula that integrated science with social studies were designed and implemented to an 8th grade Biology classroom, and was enhanced by a service learning component lead by a social studies teacher. The project also featured a collaborative effort among the students, their teacher, researchers from UB and professional staffs from the town. Students worked closely with planners and engineers from the Town of Amherst Planning and Engineering Departments and GIS Analysts from the Town Office of Information Technology.

This article introduces the EEGISC project including its mission and goals, a description of the community and education providers involved, and examples of activities. It describes qualitative research methods used to document the diverse perspectives, issues, and suggestions related to student learning and their evaluation of the project. The article also highlights preliminary findings. Particular emphasis is placed on the relationships between student investigation, learning about their community, and service learning as an approach to environmental education.

DESCRIPTION OF PROJECTS AND ASSOCIATED ACTIVITIES

The Mission and Tools of the EEGISC

Environmental Education with GIS within Community (EEGISC) offered the Town of Amherst, New York a community-based watershed approach to educating students about the relationships between stormwater, land use, and the local environment. Particularly, EEGISC seeks to develop and implement effective, results-oriented stormwater education and outreach programs that can assist the Town to meet United States Environmental Protection Agency (U.S. EPA) Phase II Stormwater requirements and satisfy local environmental and economic needs.

To achieve this goal, the students learned about watersheds and watershed geography from a regional and local perspective through the school year. They learned to use geographic information systems (GIS), global positioning systems (GPS) and other technologies to compile maps that helped them become more familiar with local hydrology and land use. They also studied the relationships between water resources and land use by conducting a field visit to collect water samples at several stormwater outfalls along the Ellicott Creek Diversion Channel near the Audubon Industrial Park. They analyzed their results, and teams of 2-3 students worked together to prepare posters documenting their results and experiences using the GIS and Microsoft Office utilities.

The Partners and Goals of the EEGISC

Originally, the project emerged through a series of serendipitous connections in the community that served to enhance and extend learning in the classroom. With time, these connections have been deepened and strengthened. And with a growing commitment to sustainability and civic education, we are developing these partnerships into a formal program that is integrated into group and special curricula. Researchers of the Departments of Geography and Learning and Instruction at UB, and a Biology teacher from a public school in Amherst jointly served as core education providers in close cooperation with three local agencies of the Town of Amherst: the Planning Department; Engineering Department; and Office of Information Technology. Through this collaborative approach to community environmental education, the consortium's goals were to: maximize efficiency of stormwater education efforts by using a regional watershed approach; help a local community meet federal requirements for stormwater education and outreach; facilitate collaboration among local service providers to best meet local educational needs; develop a regional stormwater education plan; and create a model for collaborative stormwater education that could be applied throughout Western New York and beyond.

The Examples of Activities of the EEGISC

EEGISC serves K-12 education by: providing a better understanding about the watershed with various classroom activities; offering field trip experiences with GPS units focusing on water quality monitoring and stormwater education; and providing students with hands-on GIS laboratory activities. EEGISC works with stormwater professionals who provide basic knowledge about the stormwater systems and handouts for students. Members of the consortium also provided technical assistance for GIS operations including spatial data, local data and maps for outfall locations, and watershed management plans.

METHODOLOGY

Qualitative research methods were used to document the diverse perspectives, issues, and ideas related to student learning and evaluation of the project. Data were collected through in-depth interviews with participants after the completion of the project. Interviews were recorded, transcribed and analyzed using Atlas.ti, a software package that facilitates computer-assisted qualitative data analysis, for 10 pairs of students (N=21) as groups of two or three individuals.

For a measurable indicator of inter-coder agreement, the Kappa statistic was used. Following Krippendorf (1980)'s suggestion that K>.80, coders discussed observed disagreements, resolved the discrepancies, revised the code list and descriptions, and markedup the data again to meet the Krippendorf's desired parameter. The resulting value for this study was K=.82, which is considered highly reliable.

With regards to coding, during the first pass through the data in-vivo coding and free coding methods were employed; 59 codes emerged. Through a second coding procedure, codes were either combined or divided, this resulted in 21 codes.

RESULTS AND DISCUSSION

Student's Investigation and their Learning Based on the Community

"Letting people know how our drinking water is being affected, negatively and positively [is very important]"

(Aimee, 13 yrs, interviewed after the completion of the project)

This project fostered active participation in town planning and local environmental issues while engaging students as active scientists. Students collaborated with the town and university researchers to assist with the development of a plan that will help to monitor

the health of community streams as they relate to human health, habitat maintenance, recreation and aesthetic values. Water sample results collected during the project were loaded into a spatial database for mapping with GIS Mapping software and to accommodate future sampling and analyses. The multidisciplinary team used the database to demonstrate how land use development might affect water quality in Amherst, New York.

Throughout this project, students have been debating essential questions such as, "How can citizens become involved in the planning their community and surrounding towns and communities?" and "How can local organizations – government, private organizations and individuals – work together to protect the environment?" As Schukar (1997) argued, service learning components can be strengthened by integrating curriculum across content areas. We integrated science with social studies and students were able to make a connection between their roles as citizens of community and the impact a population has on land. Their understanding about the whole picture of community was established as the students worked on their maps and prepared posters for a presentation, and practiced oral communication skills in front of the public.

From researcher observations and the qualitative data analysis, most students (among 9 out of 10 groups) showed very positive attitudes toward this project and obvious

confidence in their work. One group responded neutrally or moderately positive responses to most questions when asked about the experience. Their environmental conception was dramatically changed in terms of their awareness of "connectedness" throughout the watersheds. Most students (8 out of 10 groups) answered that they had no idea about the watershed before the project and now they have a sense of the concepts of watershed, sub-watershed, up-stream watershed, and down-stream watershed. They also mentioned that they had a better understanding about the connection between their own personal behavior and its effects on the Niagara River and Lake Erie. Figure 1 is a Network View of the analysis of interview data, which illustrates preliminary findings from student reactions to the project.

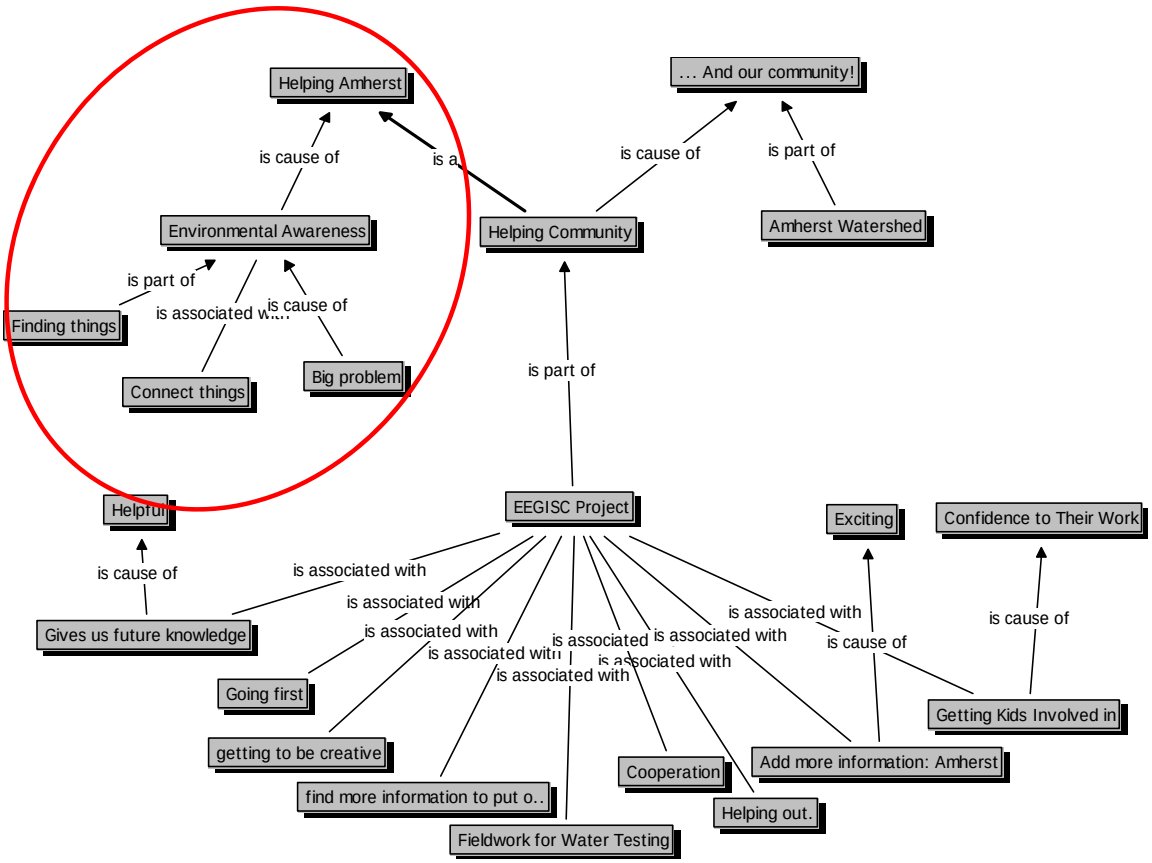

Figure 1. A Network View of Data Analysis using Atlas.ti

Note that among the 21 codes for the theme of the community, "environmental awareness" has the greatest numbers in groundedness or the code frequency (i.e., the number of quotations to which the code is applied) and second greatest in density. "EEGISC Project" has the biggest number in density (i.e., number of links to other codes).

Relationships between Student's Learning Based on Community and Service Learning

This project was also reviewed with respect to the National and Community Service Act of 1990, which provided a framework of goals and methods for service learning (Cairn

and Kielsmeier 1991). Comparing those goals with the goals of this project and the methods and results from the interviews, we believe that EEGISC approach covers the objectives of service learning for students to:

(a) foster active citizenship through practical experiences to serving community needs while collaborating with local government and school personnel;

(b) provide an opportunity to integrate social studies and science curriculum into the classroom, at the field trip site, and GIS laboratory in a seamless manner;

(c) apply the skills and content knowledge they acquired at both the testing sites and the ACAC presentation; and

(d) improve student's interest and views about community issues and promote environmental awareness throughout the Town.

CONCLUDING REMARKS AND FUTURE RESEARCH

This project featured the collaborative use of geographic information technologies by students and researchers to work together with the Town of Amherst in meeting new federally mandated requirements to monitor and manage stormwater infrastructure; a stated goal of the new regulations, other school districts in the area may replicate this project and

contribute to a long-term goal of developing a regional database that can be used to help monitor conditions in local streams and lakes in a next phase of the project.

As a long term goal, the researchers hope that this project will expand to include other local school districts, helping to grow: (a) a sense of geographic awareness; (b) civic participation and environmental responsibility and stewardship; and a group informed and engaged young adults who constitute the future "civic infrastructure" of our community. By involving students in this process and developing strong community support, students deepened their understanding and respect for the environment while gaining a sense of empowerment learning that their "voice" counts and they can have a stake in the environmental quality of their community.

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