



## **“Is the River Healthy” : Aquatic Education Network Pilot Classes**

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### **Executive Summary:**

The Aquatic Education Network, an initiative of Genesee RiverWatch, was formed to build a community of aquatic educators and education and outreach providers in the Genesee River Basin. One of the initial accomplishments of the AEN was to develop educational materials focused on assessing the health of the Genesee River and the role people play, and conduct pilot classes to test these lesson plans and labs. The target audience was high school students, but the lessons can be formatted for all grade levels. In this paper we assess the success of learning outcomes from the classes, and reflect on further development of the models used to build on the successes of these classes. Creating meaningful opportunities for students to engage with the Genesee River lead to an ability to identify evidence of river health, an understanding of how river health is degraded, and what actions may foster improved health. We were also able to find evidence of changing attitudes about the Genesee River and students' feelings about acting to prevent pollution.

### **Introduction:**

The classes were designed around the idea that place based programs offering opportunities for deeper learning build environmental stewardship. Our original goals for the course were specific to testing water quality but as the project developed the goals of the pilot classes were expanded. Each class was designed to provide a meaningful experience on the river, build science knowledge about measures of river health and an understanding of how people impact the river's water quality, habitat and availability for human use. The classes allowed students to understand the importance of clean water and conduct their own water quality analysis and data interpretation. Students and citizens who understand how scientists assess water quality and ecosystem health become advocates for practices that reduce the release of pollutants to their local watersheds. A pre- and post-survey was developed to assess students' understanding and effectiveness of the program for achieving stewardship and pollution prevention goals. Additional data from student work was used to assess the success of the pilot classes.

### **Review of Pilot Class Design**

Two models for teaching Genesee River Stewardship through water testing and environmental study were completed.

In one model, an “After School Regents Lab Experience”, small group of students from World of Inquiry participated in a two hour after school lab. Students were recruited to this experience as a Regents science review and lab experience. We walked to the river from school. Students were split into two groups and completed a modified version of the “Tale



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of Two Waters” lesson plan. This lesson plan, “Under the Bridge Downtown” had students make observations of the river environment and compare phosphorous and turbidity measurements for water collected at the Andrews Street Bridge and tap water from the school. To complete the lab students were expected to produce a claim with evidence and reasoning related to the quality of water in the Genesee River but time prevented us from completing this step. Walking to the river and time along the river provided numerous opportunities for discussing the Genesee River and the health of the ecosystem.

The second pilot class was a day long “Genesee River Ecosystem Summit” that brought 40 students from Allendale-Columbia and World of Inquiry School together at Genesee Valley Park. Students from World of Inquiry were enrolled in the SUNY ESF Dual Credit Global Environment Course. Students from Allendale Columbia were enrolled in a human impacts intensive course. The ecosystem summit began with students from each school discussing their impression of the river’s health with the “Is the Genesee River Healthy” lesson plan as their guide. Students were then split into groups that allowed each of them to participate in 2 of 6 lessons about ecosystem health. After participating in the lessons students returned to groups. They discussed their findings and created a poster that illustrated their answers to the following questions: Is the river healthy?, How do we know? and What role are people playing? Each group shared a summary of their discussion and poster with the entire group. Upon completion of this activity students participated in their choice of stewardship activities. Students could pick up litter, write a letter to legislators or complete a social media public service announcement. All students participated in this activity in some way.

### **Assessment of Effectiveness**

#### Pre and Post Survey

A pre- and post-survey was developed to assess the students current and post-lesson understanding of the Genesee River, pollution prevention and water quality testing. Fifty three students responded to the pre-test while thirty-two students responded to the post-test. Difference in response are due to students not turning in the post test at the end of the experience.

The results of the pre- and post-assessment for both classes did not show an increase of students that could identify a watershed (38%), the direction of flow of the river or what can be done to prevent pollution. Most students (>95%) could correctly identify the direction of flow of the river and what can be done to prevent pollution. The design of the pre- and post-survey could be improved to better capture specific content learning.

The pre- and post-survey did show evidence of changes in attitude. When asked, “How do you feel about the river?” the number of students expressing a neutral feeling about the river went from 81% before the experience to 61% after the experience (Table 1). Students either changed to expressions of liking the river or negative feelings about the level of pollution. These results indicate that they learned something that lead them to change their thinking. In the post-survey five students specifically expressed sentiments of stewardship where in the pre-survey students did not express any sense of stewardship.

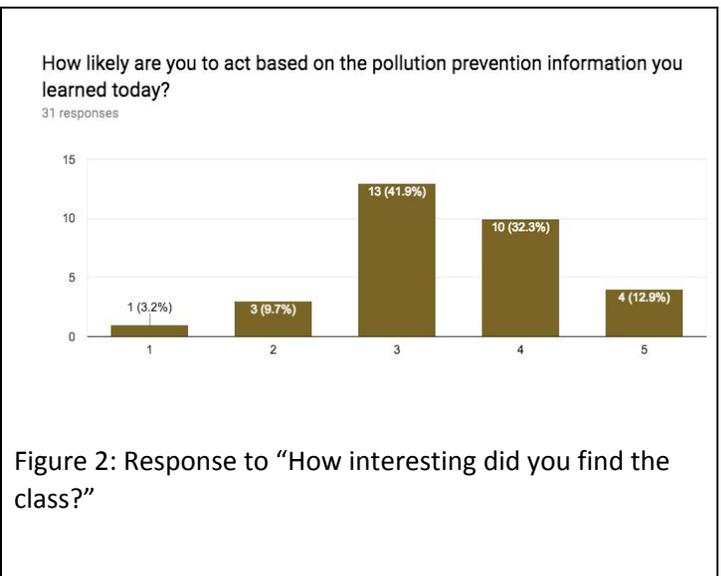
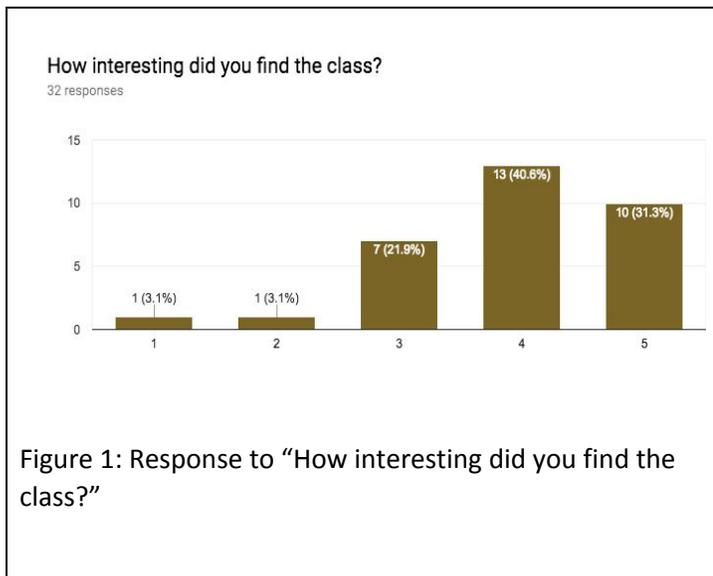
In the post-survey most students shared that they found the topic interesting (Figure 1) and almost half indicated that they were likely to act based on the pollution prevention information provided to them (Figure 2). Significantly, because it indicates an experience that built a sense of connection to the place, eighty percent of students said they would like to return to the river. Many wrote they would like to do return with friends. These results indicate that the approach to building stewardship through place-based deeper learning were successful.

Table 1: Response to “How do you feel about the River”



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Feeling about the river	Pre-test % of students	Post-test # of students
positive	39	29
neutral	31	19
negative	39	55



### Summit Synthesis Assessment

Posters created by groups during the synthesis portion of the all day river ecosystem summit provide evidence of student learning. Students were split into seven mixed-school groups. Two groups indicated the river is not healthy. Five groups identified that the river was both healthy and unhealthy. This illustrated the development of a complex understanding. Three of the posters named specific things people can do to improve the river’s health. When listing human impacts on river health five groups named specific pollutants, three groups named invasive species, three groups named litter and two groups named habitat destruction. When it came to naming specific measurements of river health that were built into the program six groups included levels of phosphorous, three groups included turbidity and seven groups included biodiversity.

### Feedback: Student/Facilitators

During the pilot lessons many students indicated that they enjoyed the experience and appreciated the opportunity to learn authentically in the field. They included comments like, “It was great to do hands on instead of the classroom.”, and, “It was fun, I wish more stuff like this happens.” in their post surveys. While it was not captured in the surveys an interesting piece of data was the number of students and adult chaperones that indicated they had never been to the study locations, specifically Genesee Valley Park. The introduction of places where students and their families can visit and connect to the river is a key outcome of the pilot classes. Another key outcome was the opportunity to engage



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experts during the Genesee River ecosystem summit. Students worked with professors, college students and a member of a local stewardship organization.

### **Next Steps/Revisions**

The two models presented in this paper can be developed further. Genesee RiverWatch can work with teachers and schools to provide after school experiences where students can earn lab minutes for progress towards taking Regents exams. Many other teachers expressed interest in getting their student involved but encountered barriers to participation. Genesee RiverWatch and the members of the Aquatic Educators Network can continue to remove barriers to participation like equipment, expertise, people and resources. An important next step is the engagement of teachers in professional development and providing guidance for getting students involved in the work of Genesee River study and stewardship.

The multi school all day summit is a promising format for building an ethic of stewardship, as it gave an extended opportunity for students to grapple with the ideas and act on what they learned. In the future, there is a need to formalize the plan for the day to transfer facilitation to others.

We can also continue engaging members of the Genesee RiverWatch Aquatic Educator's Network to serve as experts for these experiences, as the inclusion of experts turned out to be a powerful piece of the all day summit. Experts from colleges and local organizations provide knowledge and expertise that teachers often lack or are uncomfortable tackling on their own.

### **Conclusions/Learning**

We were able to create the opportunity for a positive experience that connected students to the river, built knowledge of the scientific study of ecosystem health and developed a desire to act as stewards. These experiences were an effective way to develop an understanding of how river health is monitored. In addition students were able to demonstrate an understanding of how people can positively and negatively affect river health. Most students found the class interesting and indicated a desire to return to the river.

Students and teachers were motivated to participate in the after school session because it met Regents lab requirements, as well as content standards for Living Environment, Earth Science and Chemistry. This is a powerful motivator that can be leveraged for further participation and formal inclusion of this type of learning by schools.

We also found that the collaboration between two schools led to deeper engagement and additional sense of connection. In conversations, students mentioned how much they enjoyed the opportunity to meet students from other schools and how it improved their overall enjoyment and desire to participate in the activity. Our story of students crossing boundaries to work with experts in service of the environment was reported by two news outlets and shared by EL Education, a national education network.

Overall the pilot classes were successful. There is enough evidence to commit further resources to classes specifically designed to engage students in place-based stewardship and education along the Genesee River.

