

ACTIVE WATERSHED EDUCATION

‘It’s AWEsome!’

CURRICULUM GUIDE

for the

RHODE ISLAND WATERSHEDS



Reprinted 2011

The Active Watershed Education Curriculum was Developed by:

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and
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WOOD-PAWCATUCK WATERSHED ASSOCIATION

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INTRODUCTION 2009

By

Denise J. Poyer, Program Director, Wood-Pawcatuck Watershed Association
Veronica Berounsky, Education Director, Narrow River Preservation Association

Environmental education is based on scientific inquiry, requires good scientific skills, builds on knowledge that the learner already possesses, helps individuals construct new knowledge, and encourages the learner to draw conclusions. Students learn best when there is some connection between what they are being taught and their immediate world. The cry for relevance is often heard as, “why do I need to know this stuff?”

Active Watershed Education (*AWEsome!*) is a curriculum developed by the Rhode Island Southern Conservation District and the University of Rhode Island Department of Natural Resource Sciences in 1993. It was written by Martha S. Cheo, Vicky J. O’Neal, Michael Bechdol, and Meredith Slater and based on the environmental education goal defined by Hungerford et al. (1980) (see Introduction).

Students first learn basic ecological concepts, then begin to understand issues and how conflicting values cause issues. The next step involves learning how to investigate and evaluate all aspects of a particular issue, and finally students are trained so they are able to take positive action toward resolving the issue.

A watershed is a natural unit that identifies movement of water over land. Today, watershed-based management has been instituted at all levels of federal, state, and local environmental protection plans. *AWEsome!* uses this watershed-based approach to help students understand their local environment. This curriculum has been especially useful because it encompasses essential but basic concepts of a student’s surroundings. Specifically, the curriculum asks the learner:

- Where do you live?
- What are the features of the land where you live?
- What other creatures share your living space?
- Where does your drinking water come from?
- Where does used water go?
- How do your actions affect the quality of the water in their environment?
- How do the actions of your families and friends, neighbors, community, town, local and state government, and businesses affect the quality of water?
- What can you do to maintain and improve your local environmental quality?

AWEsome! can help formal and informal educators relate science curricula in a way that allows learners to understand their local world. *AWEsome!* is designed to be used in an interdisciplinary fashion. Watershed education encompasses all aspects of human existence, rather than just science. Historically, villages, towns, and cities developed around important rivers and bays. Commerce was largely dependent upon water transportation. Rivers provided a key source of power for manufacturing and

production. In many cases, political agendas have developed around acquisition of water resources. Towns, states, and even countries often use watercourses to delineate political boundaries. In literature, there are endless discourses on the importance of water to the human soul. In our own everyday lives, we use water for all our daily needs. Water-based recreation is important to almost every citizen, even if it is just a walk on the beach. As a result of the central role of water in our lives, it is easy to include some aspect of watershed education into virtually any subject taught.

Introduction (1993)

By

Martha S. Cheo

The Active Watershed Education Program (AWEsome) is a comprehensive, interdisciplinary learning experience based on a thematic approach. The goal of the program is to provide students with a relevant and empowering educational experience in the field of environmental studies. The watershed theme was chosen because of its potential to provide a locally based, action-oriented educational experience. Learning about the watershed in which they live gives students a sense of place, pride, and ownership. Learning about the source of their drinking water makes the learning extremely relevant to their lives, and learning how to help protect and preserve their drinking water makes the program empowering for the students.

In addition, because of its interdisciplinary nature, the watershed theme provides a comprehensive, multi-sensory field for learning. Lesson plans apply to math, social studies, and language arts curricula, and benefit the students by applying to something tangible. Traditional subjects are integrated, as opposed to separate areas of study.

How is the program structured?

The actual program structure and outline of topics within the curriculum is based on the environmental education goal defined by Hungerford, et al. (1980):

“... to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, towards achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.”

To meet this goal, Hungerford, et al. have developed a framework for environmental education that involves four levels:

Level I: Ecological Foundations Level

Level II: Conceptual Awareness Level – Issues and Values

Level III: Investigation and Evaluation Level

Level IV: Environmental Action Skills Level – Training and Application

Students first learn basic ecological concepts, and then begin to understand the issues surrounding those concepts and how conflicting values impact them. The next step involves learning how to investigate and evaluate all aspects of a particular issue, and finally students are trained to take positive action toward resolving the issue. This process is both relevant and empowering for students in that they get involved in real issues in their community, and they are given tools that enable them to get their voices heard.

The overall program structure includes 8 classroom units, 3 field trips, and a final culminating event:

- Unit I: What is a Watershed?
- Unit II: Wetland Ecology
- Unit III: *Wetland Exploration: A Field Trip*
- Unit IV: Water Resources
- Unit V: Soil Resources
- Unit VI: Effects of Land Use on the Watershed
- Unit VII: Cultural Resources in the Watershed
- Unit VIII: Introduction to Water Quality Issues
- Unit IX: *Point Sources of Pollution: A Field Trip*
- Unit X: Non-point Sources of Pollution
- Unit XI: *Farms in the Watershed: A Field Trip*
- Unit XII: Public Hearing and Citizen action: A Final Look

The program begins with exploring what constitutes a watershed and then focuses on basic aquatic ecology, including a field trip exploration of freshwater wetlands. Then the program focuses on the dynamics of water and soil and their importance as natural resources. The next unit explores how land use and cover affect these resources. Units I – V, including the first field trip, represent Hungerford’s first level of environmental education, the “ecological foundations level”, understanding basic concepts that relate to how a watershed functions.

Unit VI focuses on the cultural history of the watershed, and suggests inviting Native American guest speakers and historians. Unit VII introduces the concept of issues and values, specifically as they relate to water quality. Point and non-point sources of pollution are also introduced in this unit. Unit VIII focuses on non-point sources of pollution. The last two field trips help clarify these concepts for the students as they visit actual sources of non-point pollution in the watershed and see how they are and maybe are not, being controlled.

Units VI – VII and the last two field trips represent Hungerford’s second level of environmental education, the “issues and values conceptual awareness level”, which guides students to develop awareness of how human action may influence the relationship between quality of life and the quality of the environment, and how these actions result in issues which must be resolved through various alternatives.

Unit VII also introduces Hungerford’s next level of environmental education, the “issues investigation and evaluation level”, by introducing a real development issue that currently affects the watershed. The issue investigation culminates in a model public hearing, in which students will role play different interest groups in the community and debate the development issue. The hearing is followed by citizen action skills workshops, Hungerford’s fourth and final level of environmental education.

What types of activities constitute the program?

With this structural outline, the types of activities used in the curriculum were chosen on the basis learning styles theory, or whole process learning (Samples et al., 1985). According to learning styles theory, different students have different modes of learning. Some are abstract thinkers and love factual information, some need concrete experiences, others only learn by trying things out for themselves, some are reflective and observant, and others can only learn after sharing their experiences with others. Whole process learning meets the needs of all these different types of students by incorporating all these different modes of learning into an educational program.

A diverse array of activity types were chosen and designed to meet the needs of a diverse array of learners. For the abstract and factual learners, there are activities that involve researching and recording information from various references. The field trips are key for those students who need concrete experiences in order to learn. Three-dimensional models and experiments are utilized which allow students to test out concepts and theories. This helps those students who need to try things out for themselves in order to learn, while those students who are more reflective have an opportunity to observe and discuss the demonstrations. Finally, there are activities in which students are asked to share what they have learned, either through writing, drawing, or role-playing. These activities are designed for those students who learn best from sharing what they are learning with others.

Sponsorship and the piloting of the Program

The Southern Rhode Island Conservation District (SRICD) and the USDA Natural Resources Conservation Service (NRCS) worked together to develop the *AWEsome* program. This curriculum itself was designed with an interdisciplinary yet practical approach in mind.

The SRICD originally received funding to develop an educational program on the Narrow River Watershed because the watershed borders a “Sole Source Aquifer”, this status was designated by the EPA in 1988. “Sole Sources Aquifer” designation signifies that over 50% of the drinking water supply of an area is from ground water and no reasonable alternate source of drinking water exists. In 1990, the USDA chose 37 watersheds across the country to receive special funding to help protect the ground and surface waters from non-point sources of pollution. A portion of these funds was earmarked for the development of an educational program for schools. In this case the Narrow River Watershed has recharge zones in its northern regions that border on the Hunt-Annaquatucket-Pettaquamscutt Sole Source Aquifer System.

Initially, the program was designed as a one to two hour program that could be repeated in many schools. Now, the program is more comprehensive in nature, covering twelve units and significantly more hours. The program has also been made more flexible for teacher tailoring and interpretation. Although the program was designed for the sixth grade level, it is adaptable to all grade levels. The teacher training workshops provide an

excellent opportunity to spread awareness and help the teacher find the approach that works best for him or her.

Program Evaluation:

The intent of the program evaluation was to compare the results of pre- and post-tests. Students are asked to take a pre-test in September before the program begins and a post-test in June after the program is completed. The before and after test is a good yardstick, by which a teacher can measure the effectiveness of the program as well as his or her teaching strategy. A paired t-test seems to be the most effective means of comparing the pre-post results.

The pre- and post-tests were identical. They were designed to measure both knowledge and attitudes about the topics and issues included in the curriculum. The factual portion of the test included 22 true/false questions and 8 multiple-choice questions. The subjective portion of the test comprised of 18 questions. (A copy of the test is enclosed). The two portions were analyzed separately.

A pair t-test indicated that more students scored higher on the post-test factual questions than the pre test factual questions ($T = 2.885$, $sd = 4.147$, $df = 25$, $p < 0.008$). Out of thirty questions total, the mean score was 17.8 for pre tests and 20.1 for post-tests.

Evaluating the attitude questions was less straightforward. The five possible responses for each question included “strongly agree”, “agree”, “undecided”, “disagree”, and “strongly disagree”. For each question, the 26 student responses were given a rank value of 1 through 5 according to environmental sensitivity, with 5 representing the most environmentally sensitive response. The rank values for each question were totaled for all 26 responses. Five questions, numbers 1, 12, 14, 17, and 18, were omitted because the environmentally sensitive ranking did not seem applicable. Out of these thirteen remaining questions, eight had a higher total of rank values in post tests than in pre tests, while four showed the opposite trend and one question did not change in total rank value from pre to post test. A t-test indicated that post test responses, although the difference was not significant ($T = 1.322$, $sd = 6.716$, $df = 12$, $p < 0.211$).

The comparison of pre- and post-test scores allows one to reject the null hypothesis that the *AWEsome* Program did not increase the students’ knowledge about watershed dynamics and water quality issues. The comparison also suggests that student’s attitudes became more environmentally sensitive as a result of the program, although the test responses do not provide conclusive evidence for this.

UPDATE:

During the 1993-1994 school year, 100 sixth grade students at the Babcock Middle School in Westerly, RI used this program in the classroom of Walter A. Cole. The students took both the pre- and post-tests. “The data indicates that the *AWEsome* Program significantly increases the students’ knowledge regarding watersheds and has a positive affect on their attitude regarding watersheds and their environment.”

As seen in the table below, the mean test score on the pre-test was 18.0 and a 19.7 on the post-test. Even though the difference is slight, it is statistically significant at the .01 confidence level. This indicates that the difference in pre- and post-test scores can be attributed in part to the program.

Pre- and Post-test scores of all participants
in the *AWEsome* Program.

	Mean	t-value	Probability
Pre-test	18.0	-4.35	.001
Post-test	19.7		

The data also indicates that the *AWEsome* Program had a positive affect on the attitudes of the students. Two-thirds (12 out of 18) of the post-test attitude scores were significantly different than their corresponding pre-test scores. Students indicated a positive change in attitude between pre and post-program testing on almost all of the 18 attitude statements.

Program Implementation

Since the inception of the *AWEsome* Program, curricula have been developed and adapted for ten of the watersheds in southern Rhode Island. With each new addition updates were added to enhance the effectiveness of the program and to include the most current information on that watershed. Data collected at various points over the last decade indicated that the *AWEsome* curriculum significantly increases the students' knowledge regarding watersheds and that it has a positive affect on their attitude regarding watersheds and their environment. At this juncture, it cannot be overstated how important environmental education promoting sustainable stewardship is for future Rhode Islanders and the natural resources of the state.

Active Watershed Education Program
Narrow River (Pettaquamscutt) Watershed
Acknowledgements
2009, 2011

The Narrow River Preservation Association (NRPA) and the Wood-Pawcatuck Watershed Association (WPWA) would like to thank the RI Rivers Council for awarding a grant to both organizations to offer the 2009 and 2011 classes of “URI NRS 591, Watershed Science for Educators” with a 2009 and 2011 re-printing of the text for the course, the 2005 edition of the Active Watershed Education (It’s AWESome!) curriculum.

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Active Watershed Education Program
Narrow River (Pettaquamscutt) Watershed
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Active Watershed Education Program
Narrow River (Pettaquamscutt) Watershed
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Active Watershed Education Program

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