Ecological Stewardship and Gifted Children

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In even the earliest studies of giftedness in young children (Burks, Jensen, & Terman, 1930; Hollingworth, 1926), researchers noted distinct character traits among gifted students, which included global awareness, sensitivity to complex issues, and a tendency to worry about injustice and dangers that often are beyond a child's control. Dabrowski and Piechowski (1977) described what they called emotional overexcitabilities that can be observed among gifted students as great depth and intensity of emotional life expressed through a wide range of "feeling, attachments, compassion, heightened sense of responsibility, and scrupulous self-examination" (p. 287). This sensitivity of students is one of the positive gifts they bring to a classroom and the world. Yet, characteristics of sensitivity in gifted children can sometimes frustrate or annoy classmates and, unfortunately, some teachers who do not have the same sense of global awareness and responsibility. It can be difficult to reassure young gifted students that solutions will be found to complex problems without patronizing them or minimizing their concerns.

This article describes ways in which gifted students explored issues of ecological concern through a description of student projects that addressed coastal erosion and habitat reduction in meaningful ways. Through projects such as these, children who were impacted by Hurricanes Katrina and Rita became empowered to help restore their environment.

The Need for Action

One of the most heartbreaking aspects of the devastation caused by Hurricanes Katrina and Rita has been the impact on children in the coastal regions of Louisiana and Mississippi (McHardy, 2008). Uncertainty about what was happening during the evacuations, and in some cases, separation from family members, threw the children involved into turmoil. Children suffered further trauma when those who could return to their houses were faced with the long-term task of rebuilding their homes and their lives. Thus, uncertainty about the passing storms was replaced by uncertainty about the future. Mona Herbert, a fifth-grade teacher of the gifted in New Orleans, LA, described the dilemma this introduced to classrooms:

> I really saw on the part of the children . . . this sense of helplessness . . . I almost resented people saying that the children were resilient. And that they were just going to bounce back . . . [They would say,] "My mom and dad were laying new floor last night, so I didn't get a chance to do my homework," and they were pushed out of the way somewhere else and they couldn't help. (M. Herbert, personal communication, May 20, 2008)

But teachers found that their students very much wanted to and needed to help. Herbert noted:

> Because gifted kids see into the future, that's the problem. They get so affected; they get caught up in it . . . They are almost paralyzed at times because . . . they see it as doom . . . I wanted the kids to be able to say, "I'm helping." (M. Herbert, personal communication, May 20, 2008)

Fortunately, several ecological programs were already in place in Louisiana and Mississippi that could give children the means to play a part in the recovery efforts. As quickly as teachers were able to access the resource personnel who designed these programs, assistance was provided to either restore activities that had been underway before the storms or to begin new activities in schools that were looking for a meaningful way to meet their students' emotional needs.

Ecological Stewardship Defined

The U.S. Environmental Protection Agency (2005) defined environmental stewardship as:

> the responsibility for environmental quality shared by all those whose actions affect the environment, reflected as both a value and a practice by individuals, companies, communities, and government organizations. Positive stewardship behavior demonstrates acceptance of this responsibility through the continuous improvement of environmental performance to achieve measurable results and sustainable outcomes. (p. 8)

Worrell and Appleby (2000) defined ecological stewardship in similar terms:

> Stewardship is the responsible use (including conservation) of natural resources in a way that takes full and balanced account of the interests of society, future generations, and other species, as well as of private needs, and accepts significant answerability to society. Ecological stewardship focuses on the living components of an ecosystem, while keeping in mind larger ecosystem and environmental concerns. Thus ecological stewardship projects can generally be grouped into plant-based and animal-based projects. (p. 269)

Connecting Ecological Stewardship to Environmental Education Theory

In planning ecological stewardship projects, it is useful for project organizers to keep two frameworks in mind: Roth's (1992) Four Stages of Environmental Literacy and Kolb's (1984) Learning Cycle. In a paper outlining the evolution of the term *environmental literacy*, Roth postulated that while there is some variability in the sequence, people's development of environmental literacy progresses through four levels: awareness, concern, understanding, and action. See Table 1 for a detailed description of Roth's four Stages of Environmental Literacy.

In order for students to develop environmental literacy, they first need a certain level of awareness and factual knowledge about the context of the stewardship activity. Ultimately, the stewardship opportunity will become a significant activity within the "action" stage of the participants' journey. Therefore, managers of ecological stewardship projects, whether they are teacher-driven or agency-driven, must recognize these four stages and plan activities that will provide students with the opportunities to move from one stage to the next.

In summarizing recent neuroscience research into the way the human brain learns, Zull (2002) wrote that learning is physical. The structure of the brain is

Table 1
Stages of Environmental Literacy

Awareness	Perception of human/nature interactions and consequences in general or around a particular issue.
Concern	Perception of real or potential negative consequences of a set of human/nature interactions and a feeling that some changes in those interactions need to occur.
Understanding	Acquisition of detailed information about the present and future implications and consequences of current human/nature interactions and alternative interactions. Acquisition of thinking and decision-making skills and their use in processing acquired information.
Action	Application of understandings to individual and corporate behavioral changes that alter human/nature interactions in what is perceived as a responsible way that reduces or eliminates negative consequences.

Note. From Roth (1992).

the foundation of the structure of the learning cycle. Zull referred to David Kolb's (1984) learning cycle framework. The learning cycle has been described in a number of variations, with the number of phases varying from three to five across models (Atkin & Karplus, 1962; Bybee, 1997; Kolb, 1984), but all suggest that instruction can be sequenced into a series of teaching or learning stages or phases. For a review of the history of the learning cycle, see Lawson, Abraham, and Renner (1989) and Lawson (1995).

Kolb's four-part learning cycle has its roots in the theories of Dewey and Piaget, and is based on the idea that learning begins with concrete experience. For learning to be complete, the learner must progress through four phases of action (Kolb, 1984): concrete experience, reflective observation, abstract hypotheses, and active testing. Zull (2002) suggested that each phase of Kolb's learning cycle takes place in a particular physical structure in the brain. Furthermore, he argues that the learning cycle is complete only when we have tested, or acted upon, our ideas. Ideas without action remain lifeless and motionless until they are tested.

Connecting Ecological Stewardship to Gifted Education Theory and Practice

Theorists concerned with learning opportunities for gifted students agree that such curricula and opportunities should be relevant to their experiences and their lives; have a product focus; provide opportunities for them to apply and extend what they have learned to the solving of problems, addressing of issues, and creating of products that are purposeful and meaningful to them; and allow, indeed require, students to use the concepts, language, materials, and methodologies of professionals in the field (Tomlinson, 2005).

A useful framework for providing such opportunities to students has been described by Renzulli (1976). The Enrichment Triad Model proposes that teachers and students engage in three types of enrichment teaching and learning instead of traditional academic training for students and traditional teaching by teachers. Type I enrichment consists of exploratory activities on a variety of topics, areas of interest, and fields of study that students may not experience in the regular curriculum. These experiences may be presented in a variety of formats such as invited speakers, field trips (real or virtual), picture books, videos, and demonstrations. Students who exhibit high interest in the topics presented during Type I enrichment, and are eager to pursue questions regarding these topics, are introduced to skills training, or Type II enrichment. Type II enrichment consists of group and individual training in thinking and feeling processes, learning-to-learn skills, research and reference skills, and written, oral, and visual communications skills. These "how-to" skills are the kinds of skills students need to pursue their questions or areas of concern about the topics introduced during Type I enrichment. In their pursuit of answers to their questions or solutions to their concerns, students may engage in Type III enrichment activities, which are defined as firsthand investigations of real problems (Renzulli & de Wet, in press).

This delineation of Type III enrichment activities has had a great impact on the field of gifted education in that it provides a rationale for and describes the means whereby teachers can mentor students in self-selected areas of interest. Students assume the role of a firsthand inquirer, seeking to answer questions and provide solutions for problematic situations in their schools, neighborhoods, and communities. One of the benefits of students engaging in Type III activities is the collateral learning that takes place—learning of advanced content and skills necessary to complete these projects that are of great interest to the student. This kind of learning might not occur in the general classroom and in general curriculum. The Enrichment Triad Model has been incorporated into the Schoolwide Enrichment Model (Renzulli & Reis, 1997) and has become the framework for teaching in many schools. (A

research base detailing the effectiveness of the Enrichment Triad Model as well as the Schoolwide Enrichment Model is available at http://www.gifted.uconn.edu/sem/semresearch.html). This model will be used to analyze three ecological stewardship programs described in this paper, and can provide a framework for creating similar projects across the country.

The Coastal Roots Program—Preserving a Coastline

In the Coastal Roots Program, designed by Louisiana State University (LSU) professor Pamela Blanchard (2007), students from more than 25 schools across south Louisiana grow native seedlings in tree nurseries located on their school grounds. This program was designed to engage teachers and students in critical coastal environmental issues such as ecological stewardship, wetlands functions/values, wetland loss, habitat restoration, and conservation, while at the same time teaching basic geologic and horticulture concepts and skills. The purpose of Coastal Roots is to provide a program based upon active learning about coastal erosion and restoration issues in Louisiana. Fourth-grade participant Karen Wang stated that "Coastal Roots is an educational and fun program. Every 45 minutes one football field of wetlands is lost. I feel really good about planting trees at a national park where lots of people will come to visit."

Representatives of the Coastal Roots Program disseminate information about the program to schools in a variety of ways, including visiting schools to describe the ecological issues involved (Type I enrichment). Through this project, elementary, middle, and secondary students learn about how ecosystems are being damaged by coastal land loss and storms (Roth's Awareness and Concern Phases, as well as Renzulli's Type I enrichment).

After a scientist's visit to Mona Herbert's school in New Orleans, she debriefed students to gauge interest in pursuing the goals of the Coastal Roots Program. Not surprisingly, her students overwhelmingly chose to participate in the Coastal Roots Program based at their school (see Figure 1).

Wetlands in Louisiana have a number of important functions, such as flood mitigation, storm buffer, and juvenile fish habitat. Teachers connect the hands-on stewardship activities in the Coastal Roots Program to appropriate classroom lessons so that students are able to put their new knowledge into action through a meaningful outdoor learning experience.

> Coastal Roots is important to me because my house flooded from Hurricane Katrina. I hope the Coastal Roots Program will help protect us in future storms or hurricanes. (Caitlin Leiva, fifth grade)

> I feel that the CR program will stop my home from flooding again during a hurricane. I also feel that if the wetlands disappear there will be less delicious seafood for the locals to enjoy. (Mason Varuso, fourth grade)

Students in the program planted their restoration seeds in "can yards" during the early spring and tended their seedlings over the next 9 months as they grew in the school nurseries. The following fall, students transported their seedlings and planted them at a partner restoration site that had been established to protect the fragile wetlands and forests of south Louisiana (see Figure 2).

Figure 1. Students at an elementary school digging trenches to install their school's plant nursery.

Photo by Pam Blanchard, LSU.

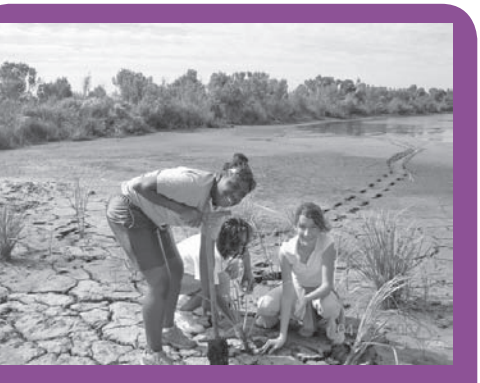


Figure 2. Middle school students planting marsh grass on a hurricane protection levee near Montegut, LA.

Photo by David Bourgeois, LSU AgCenter/Louisiana Sea Grant College Program.

These students are learning how to germinate and grow seedlings that can help restore the damaged ecosystems (Roth's Knowledge Phase and Renzulli's Type II enrichment), and how to plant their seedlings in an area in need of habitat restoration (Roth's Action phase and Renzulli's Type III activities). They come to understand effective ways to sustain marsh habitats, maintain habitat diversity, and provide food for coastal animals and birds. This type of stewardship project is a year-round, long-term project, and the type of project that is

Figure 3. Tree protectors decorated by students.

Photo by Deborah Schultz, Barataria-Terrebonne National Estuary Program.

recognized by environmental educators as the way to make a real difference in students' thinking and actions (Barnett et al., 2006; Basile & White, 2000). When students were asked to reflect on their experiences, the impact on their thinking was clear:

> Coastal Roots is important because it is saving our coastline and that is helping to save the world, one tree at a time. To me, Coastal Roots isn't just a school project; it is an opportunity to raise awareness for Louisiana's coast and every little piece helps. (Sarah Rogers, fifth grade)

> The CR program challenged us mentally where we learned about the wetlands and challenged us physically where we had to a lot of digging and physical work. We did this to help the world be better little by little. (James Konen, fourth grade)

This type of project also provided students with a variety of activities in which they chose to participate. Important hallmarks of Type III projects were students pursuing questions of particular interest and concern to them personally, engaging in activities that they personally found stimulating, and creating a product or service of their own choosing. The Coastal Roots Program allowed students to engage in a variety of activities and produce different end products. Students involved in this project began their participation from the first day by helping install the plant nurseries (see Figure 1). At school, they planted the seeds and tended the seedlings.

> Coastal Roots is important not only for the effect it has on the environment but also the impact on the children who participate in it. Planting trees made me feel like I, at a young age, can do something about our environment and how to save it. It feels awesome to make an impact on our environment. (Shelby Dwyer, fifth grade)

The Coastal Roots Program also provided the opportunity for out-of-state students to partner with a Louisiana school by conducting penny drives to raise funds to purchase tree protectors (see Figure 3).

These slim tree protectors are needed to protect young seedlings from the appetite of hungry nutria (large semiaquatic rodents native to the area). Children from a New York school, who wished to become involved with children in Louisiana, decorated the tree protectors with permanent markers and shipped them to a Coastal Roots school to use when they install seedlings at the restoration site. The drawings on the tree protectors often showed students' understanding of the problem and solutions to coastal land loss in Louisiana.

One of the things that coastal residents learned after the recent hurricanes was that our coastal forests provided an important wind break to the hurricane-force winds that swept over southern Louisiana. Students in the LSU Coastal Roots Program are helping to replant some of the coastal forests that were severely damaged during the storms.

> Hurricanes such as Katrina, Gustav, and Rita affected New Orleans with devastating force. If we keep planting saplings, they will grow into towering trees that will act as our first line of defense from these natural disasters. My class and I have been learning about erosion and hurricanes' effects on us. It was actually fun to go out and be stewards by planting over 700 trees to help Louisiana. (Andrew Souther, fourth grade)

Paddlefish Incubators to Preserve a Species

A second example of environmental stewardship is the Native Fish in the Classroom Project supported by the Louisiana Department of Wildlife and Fisheries (Capello, Somers, Bihm, & Smith, 2005). In this project, students at schools in central Louisiana are helping to restore populations of paddlefish, a threatened species living in the sluggish bayous and streams that cross the coastal plain of south Louisiana (Kolb's Action stage and Renzulli's Type III).

In the past, paddlefish have been harvested for their eggs, which are considered "American caviar." The species is threatened due to overharvesting and the disruption of their nesting grounds during the hurricanes. Children at schools in central Louisiana near

Figure 4. Thomas Blanchard showing an elementary student how to put sawdust into a wood duck box that he made.

Photo by Pam Blanchard, LSU.

Figure 5. Thomas Blanchard checking wood duck eggs in a nest box he maintains in the Atchafalaya Basin.

Photo by Pam Blanchard, LSU.

Alexandria and Ville Platte, with the help of Louisiana Department of Wildlife and Fisheries agent Angela Capello, are raising paddlefish in their classrooms. Each spring, students are given harvested paddlefish eggs, which are large enough to be seen with the naked eye. Students feed and maintain the fish in circulating system aquariums in the classroom until they are finger length in size. Then the fish are taken back to the Booker Fowler Fish Hatchery, where they finish growing and are eventually released by Wildlife and Fisheries biologists into local streams to help sustain the paddlefish populations in the region (Capello et al., 2005).

Wood Duck Boxes to Preserve a Habitat

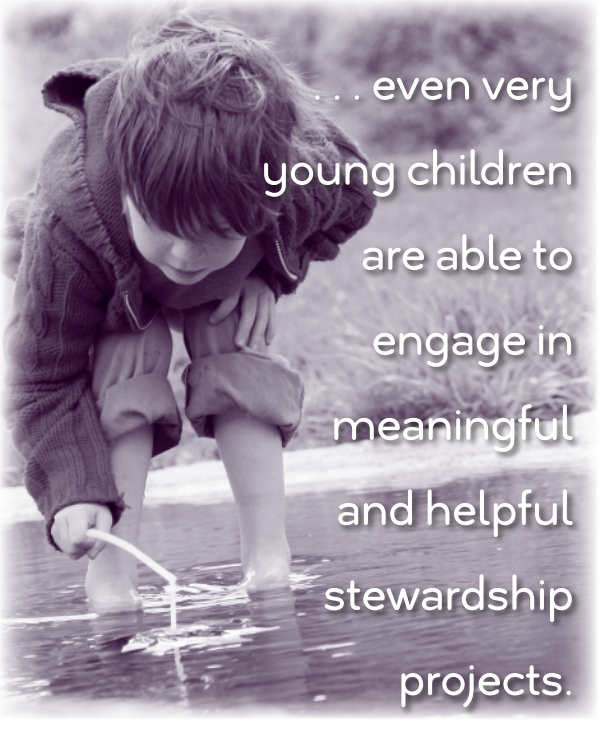
A third example of appropriate ecological stewardship for young children is the wood duck nesting project. Over the last 100 years, natural predators, the harvesting of trees, and increasing farmland acreage have significantly reduced the number of wood ducks in southern Louisiana's Atchafalaya Basin. Wood ducks, which migrate more than 500 miles through Louisiana, normally lay their eggs in naturally occurring holes in trees. Unfortunately, predators, including raccoons, snakes, and humans, find wood duck eggs an easy meal. This pressure on successful egg hatching has reduced the number of wood ducks in the Atchafalaya ecosystem to dangerously low levels.

In response to this problem, the Louisiana Department of Wildlife and Fisheries, as well as many environmentally concerned hunters, have built and deployed wood duck boxes throughout the Atchafalaya Basin and most of southern Louisiana to help sustain the wood duck population. The wood duck boxes are built of cypress or red cedar and are attached to a tall pipe. The boxes usually have a predator collar attached to prevent raccoons and snakes from climbing up the pole to get to the nest in the box.

Maureen Mabile, a pre-K teacher in Pierre Part, LA, incorporated the wood duck nesting project into her unit on forest animals. She invited local resident and avid hunter Thomas Blanchard, Sr. to help children learn about wood duck nesting habits, their predators, and current efforts to sustain their populations in the Atchafalaya Basin (Roth's Awareness and Concern phases and Renzulli's Type I). He brought a wood duck caller, male and female wood duck decoys, and a wood duck box he built. He showed a homemade video of baby wood ducks flying out of the box (Roth's Knowledge phase). Ms. Mabile let her students show what they had learned through their drawing and art projects, dictation, and journal writing in the various learning centers around the classroom (Roth's Action phase; see Figures 4 and 5).

An appropriate extension of this lesson that would provide students the opportunity to participate in stewardship themselves (Renzulli's

Type III activities) might be to have students help build or decorate a wood duck box in one of the learning centers in their classroom. They could arrange the wood shavings in the box and help install it on their school grounds. A parent might film the installation of boxes the students made as they are placed in the Atchafalaya Basin. This project demonstrates that even very young children are able to engage in meaningful and helpful stewardship projects. Abdi, Taylor, and Freilich (1998) provided more ideas for such science projects suitable for young children.



A Framework for Creating Ecological Stewardship Projects in Your School

Teachers can create opportunities for their students anywhere in the country to engage in ecological stewardship projects using the framework described below.

Step 1: Find Appropriate Projects

Use local newspapers and governmental agency literature, as well as community resources, to identify ecological threats and endangered animals and/or habitats in your area. Each state has a wildlife or natural resources department that would be happy to invite students to partner with it in its preservation and stewardship efforts. An ecological stewardship project does not have to part of a statewide or national program. It can be as simple as replanting and preserving indigenous plants on the school grounds. Investigate your schoolyard and local community for possible ecological issues.

Step 2: Help Students Become Informed

Utilize resources to provide students with information according to Roth's Awareness phase and Renzulli's Type I enrichment.

Step 3: Debrief Students

After completion of Type I experiences, hold discussions to identify those students who exhibit Roth's Concern phase, or what Renzulli (1976) refers to as "excitement and interest in the project" (p. 16).

Step 4: Establish a Partnership With Experts

Both professionals and volunteers who are interested in the topic or field of study can provide knowledge, resources, and opportunity support for the project. They can help to procure the materials students will need to complete their project. Materials might be donated by community groups concerned with the same issue, or the professional organization partnering with classes involved in the project. Consider writing a grant for funding the project.

Step 5: Establish Roles and Responsibilities

Engage students in the planning process to establish material and people needs and a timeline for the project. Help them delineate responsibilities or jobs needed to complete the project and allow them to choose which jobs and responsibilities they might wish to assume.

Step 6: Help Students Master the Skills Needed

Ask your professional partners to provide the how-to training in skills students will require to successfully complete their project (Type II training). These skills should approximate the skills professionals in the field would use.

Step 7: Help Students Carry Out the Project

This meets Roth's Action stage and, if students are engaged in pursuing a part in the project based on their individual interest and concern, it also conforms to Renzulli's Type III activities.

Step 8: Find Audiences for Student Products

Be sure to celebrate and advertise the students' progress at various appropriate times. This will meet two goals: It offers encouragement to students to remain engaged, and it provides

an authentic, real-world audience for students' work. The element of authenticity in language, materials, methodology, and audience is an essential part of effective curriculum for gifted students (Renzulli & de Wet, in press; Renzulli, Leppien, & Hays, 2000; Tomlinson, 2005).

Gifted students often display intense awareness and concern for their environment. When natural or man-made disasters occur, their very real need to take productive action can be stymied by adults' needs to move children out of the way or adult perceptions that children will not be able to make substantial impacts on complex environmental problems. We might even suggest that oft-heard statements about the resilience among children who experience disasters firsthand could be an unfounded assumption as well. Programs such as Coastal Roots and others can be vehicles for coming to terms with what has happened in a disaster such as a hurricane.

By providing opportunities for these students to be of service in an authentic and meaningful way, teachers can be of great help in the development of their students' active participation in crucial issues of the day, as well as the development of strong affective skills. Most importantly, these types of opportunities suffuse gifted students in the immediacy of positive citizenship and stewardship, regardless of their ages or circumstances. Or, as fourth grader Dawson Eiserloh noted, "You see the stats on the news about what we need to do to save our wetlands. Now, we need to stop watching and start doing." GCT

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