

# ReadforScience®

## *A Curriculum for Improving Science Literacy in Grades 5-8*

created by,  
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### What is literacy?

Literacy can be defined as READING, WRITING, COMPREHENDING, APPLYING, and COMMUNICATING - regardless of subject matter. (McKenna and Robinson, *Teaching Through Text*)

- Because the language of science is often perceived as difficult by students, many have a negative attitude toward reading in science. If they avoid reading in general, they will avoid reading in science in particular. In order to help students overcome this resistance to reading in science, teachers should be put into place 1) specific motivators to read science, 2) cooperative student ownership of the lesson and its content, and 3) relevance of the subject matter to students' lives.

### Suggested Literacy Improvement Strategies and Techniques (LISTs)

- The suggested framework is based on empirical findings that the most effective lessons have a high degree of the following: 1) relevancy to students' (and teachers') lives, 2) visual content, 3) interdisciplinary connections, 4) "strangeness" (or that which is unexpected on the part of the student), and 5) sustained silent reading of trade and other books which bring the content alive. (McKenna and Robinson, *Teaching Through Text*).
- *NB:* Many students lack any prior knowledge of much or all of the content presented in their science curricula, making it difficult for them to become fully engaged (or care about what they're being required to learn.) Thus, the suggested teaching strategies should begin with a cooperative group process based on inviting participants to share their prior knowledge (or lack thereof) in a group effort with the goal of gaining the necessary confidence before teacher presentation of content knowledge.

### Key qualifications of the author of the *ReadforScience®* Curriculum:

Merrie Koester Southgate has 25 years of experience as a middle, high school, and graduate level classroom science teacher, is the author of three science education novels and companion standards based lesson plans, and the science education website, [www.agnespflumm.com](http://www.agnespflumm.com). She holds a graduate degree from the University of Hawaii, the focus of which was the research and development of methodology for teaching science through literature and the creative arts. She is a *Phi Beta Kappa* graduate of Furman University, with a degree in biology. Since 1992, she has delivered presentations and keynote addresses at state, regional and national level science conferences.

Her most recent endeavor, entitled *The Last Book Project* (the research and development phase of which was funded by the National Marine Sanctuaries Foundation), is the creation of a literacy-based, arts-infused, science-centered, technology-driven **ocean science curriculum** for middle school. It will include the creation of a middle grade novel about **ocean exploration** and an online portal for exploring a huge array of **ocean education** websites, especially N.O.A.A.'s Ocean Explorer site, [www.oceanexplorer.noaa.gov](http://www.oceanexplorer.noaa.gov), the National

Marine Sanctuaries Foundation site, [www.nmsfocean.org](http://www.nmsfocean.org), the Bridge Ocean Education, [www.vims.edu/bridge](http://www.vims.edu/bridge), the Sea Grant Association, [www.sga.seagrant.org](http://www.sga.seagrant.org), and the websites for prominent aquaria around the nation. A key focus of *The Last Book Project* will be a strong emphasis on the recently completed [Essential Principles of Ocean Literacy](http://tinyurl.com/ma69jr), <http://tinyurl.com/ma69jr>.

Consultants for *The Last Book Project* include Paula Keener-Chavis, Education Director of NOAA's Office of Ocean Exploration, Dr. Lundie Spence, Director of COSEE-SE, Dr. Leslie Sautter, Director of Project Oceanica, Dr. Mel Goodwin, Director of the Harmony Project, Dr. George Sedberry, Superintendent of Gray's Reef National Marine Sanctuary, Ruperto Chaparro, Director, Sea Grant Puerto Rico, Captain Anthony Arrow of the tall ship, the Spirit of South Carolina, and Sarah Piwinski, Education Director of the Charleston Maritime Foundation.

The pilot for *The Last Book Project* was begun in the fall of 2007 with the selection of school applicants, whose teachers attended the SCMEA fall conference. The three schools selected had high diversity, low-income, reading-challenged student bodies.

## Lesson Plan Outline\*

\*(Detailed lesson plans for each novel can be downloaded free from [www.agnesplumm.com](http://www.agnesplumm.com).)

### Grade 5: *Agnes Pflumm and the Stonecreek Science Fair*

Science Literacy Objectives:

- 1) To make the science research process less painful (and even appealing!) to students (and thus, their parents and teachers).
- (2) To teach science content through the powerful medium of storytelling.
- (3) To promote literacy, critical thinking, problem solving (both independent and cooperative), anti-procrastination skills, and a LOVE for science. (Note: Many 4-6th grade teachers use my books as part of their language arts curriculum, too.)
- (4) To create an atmosphere where metrics and accurate measurement are both absorbed *and* put into practice.
- (4) Very importantly, to teach the N.S.T.A. standards for scientific inquiry and science literacy in an active, engaging way.

### Grade 6: *No Place Like Periwinkle*

Science Literacy Objectives:

- (1) To inspire students to experience the natural world with all their senses.
- (2) To encourage students to see and learn about biological specimens through drawing them, and, through doing so, become naturalists themselves.
- (3) To educate students about Eastern coastal geology, ecology, and meteorology (in particular, to create an awareness of the importance of early hurricane preparation and safe behavior before, during, and after a storm.)
- (4) To discourage the over-involvement of parents in homework projects, particularly the science project assignment.
- (5) To fulfill N.S.T.A. science standards in inquiry, environmental science, ecology, and Earth science.

Science Literacy Objectives:

(1) **To promote content literacy** in your science classroom through a series of lessons which have been designed to:

- a. reinforce content knowledge.
- b. provide students with a clear idea of purpose.
- c. activate prior learning and advance new content knowledge.
- d. ask questions at three levels: literal, inferential, and critical.
- e. improve student writing skills through journaling.
- f. improve vocabulary skills and content knowledge through graphic organizers.
- g. create logical connections between new and previous knowledge.
- h. encourage independent reading, and above all,
- i. bring about positive change in student attitudes toward reading science related materials.

(2) To teach students the **concept of biodiversity** in a community, factors which may affect biodiversity, and how indicator species can be vital clues to environmental quality.

(3) To strengthen student knowledge of **the way scientists classify living things**.

(4) To improve student understanding of the **flow of energy through a pond ecosystem** as well as the roles of producers, consumers, and decomposers in a food web.

(5) To give students the opportunity to **collect, classify, and work with pond water micro- and macro- invertebrates**, and to teach them to document their observations in field study journals.

(6) To introduce students to the science of and **history of microbiology** and especially to give them confidence in **using microscopes and preparing slides** for study.

(7) To enhance student understanding of the **effect of human activities on the stability of ecosystems in a watershed**, especially with regard to the introduction of pollutants into the water and soil:

- a. To enable students to learn about the effects of **uncontrolled sediment run-off** into streams.
- b. To enable students to discuss the differences between **point and nonpoint pollution** into watersheds.
- c. To inform students about **genetic mutations** which may occur in organisms as a result of the introduction of chemical pollutants into their habitat.
- d. To encourage discussion of amphibians and fish as important **indicator species**.

(8) To encourage students to **identify and meet local citizens** who have worked tirelessly to protect the environment, effect **mitigation** with commercial land developers, and petition for legislation to insure that habitats are safeguarded in the future.

(9) To familiarize students with the many governmental environmental protection organizations and their work.

(10) To drive home the fact that “perfectly designed solutions do not exist” and that people must work together to solve problems through the 4 steps of problem solving (as defined in the national standards.)

(11) To convince students that they can truly make a difference for positive change in the world.

Grade 8 / 9: *Agnes Pflumm and the Quest for The LAST BOOK* (to be released by Spring, 2010).

The *Last Book Project* Summary: By the time 8<sup>th</sup> grade students get to the LAST *Agnes Pflumm* book, they will be ready to take on the most important task of all - that of becoming OCEAN LITERATE, of understanding the ocean's influence on them and their influence on the ocean.

### Desired Outcomes of the Last Book Project

- Eighth and ninth grade students will participate in online ocean explorations as they follow the journey of a crew of middle school students and their captain aboard the schooner *Quest* from the waters of South Carolina to the Caribbean and Gulf coast. History, social studies, science, and art will all merge in an experience whose purpose is to inspire and to teach.
- Students will be invited to create works of creative art inspired by the science and history they learn from *Agnes Pflumm and the Quest for the Last Book*.
- A middle grade Cohort of Ocean Learners (C.o.O.L Club) will be created. These students will then be mentored in the ocean sciences throughout high school, thus ensuring both experiential and content learning in ocean science at the secondary level. Ideally, these high school mentors would then direct these C.o.O.L students to those colleges and universities with strong S.T.E.M.s programs.

Teacher Professional Development Workshops funded in the Pilot (2007-2008) with three Charleston area schools, McClellanville Middle, Memminger Elementary, and C.E. Williams Middle:

- The Science and Art of the SC Aquarium - Drawing as a Tool for Learning about Science
- Science: A Reason to Read
- Reading in the Science Content Area - Literacy Improvement Training for Science Teachers
- Communicating About Science and the Environment through Murals.
- Build Your Own ROV (sponsored by SE-COSEE) - completed by a team of elementary teachers and paid for with this grant.

Student experiences in the Pilot:

- Storytelling aboard the Spirit of SC tall ship with Memminger Elementary 5<sup>th</sup> grade.
- Student assemblies at each school on the importance of reading, learning science, and understanding our ocean planet.
- Nature drawing excursion at Barrier Island Environmental Center with Memminger Elementary 5<sup>th</sup> grade
- Spring - Summer, 2008 - Special Art Projects for an 8<sup>th</sup> grade class at C.E. Williams School, focusing on the creation of a mural celebrating the North Atlantic Right Whale, to be displayed at the city wide Charleston Harbor Fest May-16-18, 2008 and the National Marine Educators Association (NMEA) conference in Savannah.

*Notes*