

Project Inquiry: Developing Lowcountry In-service Professionals in Science

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### Introduction

School districts in the Lowcountry of South Carolina, Charleston and Berkeley Counties, are rising to the challenge of improving scientific literacy of its student body by investing in the development of their teachers. In 2000, Berkeley County School District teamed with Charleston County School District to seek funding from the National Science Foundation (NSF) for a five-year project, called "Project Inquiry: Building a Presence for Science in the Lowcountry." This project is aimed at serving the teachers and students in sixty-four elementary and twenty-six middle schools in the two counties. This local initiative is part of a broader professional development program supported by NSF entitled Local Systemic Change (LSC). This LSC is designed to assist school districts in improving science and math instruction in elementary and middle schools.

In this age of content standards and the push for obtaining highly qualified status, teachers must possess the content knowledge in order to meet the demands of the No Child Left Behind (NCLB) legislation. This legislation was put into place with the notion such teachers would cause student achievement to improve within this country. Another concern is that the US remains competitive on international tests with other countries in science and mathematics. The release of *A Nation at Risk: The Imperative for Education Reform* by the National Commission on Excellence in Education in 1983 warned of a national education crisis striking our youth, particularly in the fields of science and mathematics, and threatening our nation's position as a world leader. This point is still relevant today when reviewing the levels of science achievement of our

students in South Carolina. In 2000, fourth and eighth grade students enrolled in South Carolina's schools scored lower than the national average in science (U.S. Department of Education, 2001).

### Funding

A vital method for improving student achievement, as well as school reform rests in the professional development of teachers (Loucks-Horsley, Hewson, Love, & Stiles, 1998; Fraser-Abner, 2002). Project Inquiry brings \$5,180,000 of professional development into the school districts to enhance standards-based science teaching and learning. The idea of professional development is to bring a “positive change in teaching and learning” (Fraser-Abner, 2002, p 12). This funding provides South Carolina's teachers with a broad spectrum of opportunities to deepen both their content knowledge and pedagogy so that they can improve their effectiveness in the science classroom. The money from this grant offers at least 135 hours of professional development for every teacher of grades three through eight in both districts, impacting nearly 1,200 teachers, including special education teachers. Institutes and workshops are offered after school, during scheduled teacher workdays, and in the summer. Teachers also receive a \$500 stipend and funding for two classes from The Citadel or the College of Charleston to be applied toward an advanced degree in a science education or math education program.

### Use of Effective Practices and Materials

The design of the Project Inquiry model, as well as the adopted instructional resources it uses, is consistent with the *South Carolina Science Curriculum Standards*

*and Framework* and the *National Science Education Standards* (National Research Council, 1996; South Carolina Department of Education, 2000). Both school districts aim to fully implement standards-based science teaching in every school. Therefore, the school districts collaboratively developed the model focused on curriculum standards and current research in science education. The Project Inquiry model used the findings from their study to select the training and resources to make the model a reality. For example, inquiry-based instruction has been identified as an effective instructional practice. One goal of science education is for students to recognize and apply the scientific concepts to their daily situations (National Research Council, 2000; Driver, Leach, Millar, & Scott, 1996). When students learn scientific concepts through inquiry-based instruction, they become more self-sufficient in developing their own cognitive processes (Llewellyn, 2002). To meet current science standards and frameworks through research-based means Project Inquiry is driven by two major goals: 1) to deepen teachers' scientific content knowledge, 2) to help teachers become more familiar with the selected inquiry-based instructional materials, such as science kits, and understanding of the pedagogy required to implement these materials.

### Institutes

Deepening teachers' content knowledge is an important goal in the project, so Institutes are offered to increase teachers' content understandings of physical science, earth and space science, life science, and marine science. The enhancement of teachers' science understandings occurs in several ways including the requirement of completion of at least six hours of graduate coursework in these science disciplines. Project Inquiry

offers eleven science standards institutes for elementary (grades three through five) and middle grades (six through eight). The recommended first institute for both elementary and middle level teachers is how to effectively use science kits for their grade level. An integral component of Project Inquiry is training teachers in the use of science kits, such as Full Option Science System (FOSS), Science Education for Public Understanding Program (SEPUP), Science, Technology, and Children (STC), and Great Explorations in Math and Science (GEMS). These kits promote inquiry-oriented and student-centered learning in a standards-based curriculum. Forty-five of the minimum 135 hours of professional development are earned by completion of the kit-training component. These hands-on science curricula offer science modules that teachers use with students over a nine-week period that incorporate. The kits provide students with numerous opportunities to construct their understandings of big ideas in science in an in-depth manner, rather than offering only a few shallow experiences. In grades three through five, four different kits are available at each grade level, and at the middle grades (six through eight), six different kits are offered per level.

Secondly, content-based workshops and courses for elementary and middle level teachers include: We Will Share (W.W. Share), EarthKam (program funded by NASA), EarthForce (an environmental groundwater program), 4 Blocks Language Arts and Science, Integrating Full Option Science System (FOSS) Science Stories and language arts, S.C. MAPS, S.C. Aquarium Curriculum Course, Charleston Soil and Water Conservation's Teacher Institute, Roper Mountain Professional Development course, STEMS (Sharing Teaching Experiences in Math and Science), Teaching Science Through the Arts, Curriculum Leadership Institute, GK-12, Lowcountry Partners for

Inquiry Teaching and Learning, Jason Project, and the Annenberg professional development video series on the teaching and learning connection and scientific concepts. Teachers select from this menu of institute choices to best meet their needs and to attain the 135 hours of in-service credit.

Thirdly, to increase teachers' understanding of appropriate pedagogical methods, along with the use of the designated instructional materials, Project Inquiry also employs standards institutes, assessment institutes, and an inquiry institute. The latter prepares teachers to incorporate inquiry processes in their science teaching. Program leaders engage participants in hands-on activities whereby they have the opportunity to explore scientific process skills. The same principles that apply to student learning are effective with teachers as they learn through direct experience by constructing personal meanings from their previous knowledge (Loucks-Horsley, et al, 1998). Additional instructional strategies emphasized include the effective use of science notebooks and questioning strategies. All teachers are encouraged to attend these institutes.

Fourthly, all of the inquiry and assessment institutes provide teachers with opportunities to develop and practice their own understanding and utilization of these skills with their peer group. The program leaders create an environment where teachers are encouraged to reflect and discuss the pedagogical issues related to scientific inquiry and assessment. Teachers are afforded multiple experiences in using open-ended questions, communicating their reasoning, working cooperatively, and considering alternative methods and explanations. As a result, teachers become more comfortable implementing hands-on activities, designing and/or conducting their own investigations, using models and simulations, reflecting on their experiences, conducting and using

appropriate assessments, and incorporating language arts in the development of science journals.

Finally, to further enhance teachers' understanding and implementation of best practices in science instruction, inquiry and technology institutes are also offered. Workshops on assessment strategies, as well as the incorporation of language arts in science instruction are provided throughout the school year. The integration of language arts into science instruction is vital for students in the development of their ability to articulate judgments about knowledge claims from scientists (Driver, et. al., 1996). The assimilation of language arts with science instruction also "provides opportunities for reading and reflection, which can help students incorporate new concepts" (National Research Council, 1997, p 25).

#### Science Education Community Involvement and Support

Project Inquiry has provided the foundation for teachers to collaborate and learn from their peers who are more prepared in science content and pedagogy. The two districts have established a system involving master teachers and professionals in science and education fields who support teachers during the implementation of their training. Project Inquiry currently employs seven Science Resource Teachers (SRT's). They are veteran science teachers who have been released from their classroom responsibilities. Working closely with the SRT's are the Lead Science Teachers (LST's), who are classroom teachers identified within each elementary and middle school as master teachers and serve as liaisons for the project within each school. The LST's support the implementation of materials and methods in the elementary and middle schools in which

they teach and participate in 180 hours of professional development training. Project Inquiry also collaborates with school administrators to promote a clearer understanding of the needs and benefits of inquiry-based teaching and learning in order to foster support for the schools' science faculty and their instruction.

Faculty in the sciences and education from local higher education institutions such as the College of Charleston, Medical University of South Carolina, the Citadel, Charleston Southern University, and Trident College are involved to assist teachers as they increase their understanding in various scientific content areas. Working closely with scientists, provides teachers with role models, brings a clearer perspective, and affords access to real world applications (Loucks-Horsley, et al, 1998). The scientists also serve as judges for the science fair, participate in career day as presenters, and provide teachers with on-going support if they have science questions.

Each school district is committed to having materials and supplies readily available so that teachers can begin using them immediately after the training. The consumable and durable goods used in the kits and other curricula are kept at both counties Science Resource Center for distribution. The staff at the center inventories each kit and refurbishes the materials as necessary before delivering the goods to each school. An LST at each school coordinates the distribution of the kits from the Science Resource Center. Because all schools receive kits at the same time for each grade level, the staff at the center works closely with the LRT's, SRT's, and Co-Principle Investigators in adhering to a tight schedule.



## Summary

There is a momentum for systemic change in science teaching and learning in South Carolina classrooms. The vested interest of Berkeley County and Charleston County School districts in the development of elementary and middle level teachers of science demonstrates the desire to make science meaningful in the lives of students. Project Inquiry provides the resources and support to propel teachers to, not only become proficient in the knowledge and skills as dictated by the standards, but also to become engaged in the learning process with their students. Their training in content, pedagogy, inquiry, and curricula provides teachers with the resources, as well as preparation to support the learning of all students.

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