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SCIENCE COLLABORATION: IMMERSION, INQUIRY, INNOVATION

A proposal responding to the Florida Department of Education request for proposals for the Mathematics and Science Partnership *Florida Science Partnership* program "Innovative Integration"
CFDA # 84.366B

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The FloridaLearns Academy is comprised of the Center for Teaching, Learning and Leadership, the *electronic* Professional Development Connections (ePDC) and the Florida Education Channel of the Panhandle Area Educational Consortium.



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Science Collaboration: Immersion, Inquiry, Innovation

Sc-iii

Math and Science Partnership – Florida Science Partnership – Priority 3
The Panhandle Area Educational Consortium
On Behalf of 13 Panhandle School Districts

We are less certain today about who will create the next generation of innovations, or even what they will be. We know that we need a more secure Internet, more efficient transportation, new cures for disease, and clean, affordable, and reliable sources of energy. But who will dream them up, who will get the jobs they create, and who will profit from them? If our children and grandchildren are to enjoy the prosperity that our forebears earned for us, our nation must quickly invigorate the knowledge institutions that have served it so well in the past and create new ones to serve in the future (Project Kaleidoscope, 2006, p. 12).

1. Abstract

The Panhandle Area Educational Consortium (PAEC) is gravely concerned about the many issues facing our nation and understands that innovative, competent scientists are a necessity if each challenge is to be met successfully. According to Friedman (2007), after secondary school, fewer U.S. students pursue science and engineering degrees than is the case among students in other countries. Only 6% of our undergraduates major in engineering; this is the second lowest percentage among developed countries. Leaders in districts and schools in north central and northwestern Florida share the concerns described in the report, *Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* and *Project Kaleidoscope, Report on Reports*. Therefore, the Washington County School Board, on behalf of the Panhandle Area Educational Consortium (representing 13 small and rural districts) submits this proposal under the Innovative Integration priority, with the belief that participating science educators will become more motivated, more energized, more able, and more innovative to foster student interest in the rigorous and challenging study of science.

In this PAEC project, ***Science Collaboration: Immersion, Inquiry and Innovation, Sc-iii***, science teachers will experience research at the elbow of scientists, becoming both scientist and science educator (Gilmer, 2005). Teachers will have the opportunity to learn and "do" science alongside lauded professors, and knowledgeable representatives of many science-related careers, such as foresters, soil scientists, environmentalists, agronomists, chemists, field-biologists, and entomologists to name a few.

Teachers will also be actively engaged in a variety of collaborative networks, designed to establish important articulation between the teacher team and research scientist, teachers and scientists from universities, agencies and industry, and between and among teachers from different grade spans and schools. The expected result is that, as teachers experience science in the context of a scientist and engage in rich dialogue with scientists and each other, science instruction will become more inquiry-based and important resources that may bring relevance to the classroom will be utilized. Ultimately, students will become increasingly interested and literate in science, there will be a positive difference in student academic achievement, and the number of Florida students interested in careers in science, technology, engineering and mathematics will be positively impacted.

The Panhandle Area Educational Consortium will use its technological infrastructure, wide-ranging experience in managing grants, team of consultants, information technology experts and other professionals in the FloridaLearns Academy, broadcast, and production capabilities to ensure effective communication between and among partners and educators, wise expenditure of grant funds and dissemination of this best-practice and innovative model for professional development. A keen focus will be maintained on the teacher participants and

project goal; providing a meaningful experience of immersion into a scientific culture, one that will forever change the way students experience science in their classrooms.

2. Project Need

“There is a quiet crisis in U.S. science and technology that we have to wake up to,” as stated by Shirley Jackson in the book, *The World is Flat* (Friedman p. 326). This quiet crisis may be giving way to the “perfect storm” that Jackson likened to the meteorological events of October of 1991. According to Friedman, this perfect storm involves the collision of an older generation of American engineers and scientists who are retiring at the same time that a younger generation is not stepping into their shoes in sufficient numbers. Ms. Jackson added, “For the first time in more than a century, the United States could well find itself falling behind other countries in the capacity for scientific discovery, innovation and economic development” (Friedman, 2006 p. 328).

As educators, there is cause for concern about the gaps in our education, teacher pre-service and inservice, teacher effectiveness and currency and, very importantly, student achievement, especially in the area of science. “If we continue to ignore them (gaps), then this won’t be a quiet crisis anymore,” warns Ms. Jackson, “it will be the real McCoy” (Friedman, 2006, p. 329). Friedman’s conclusion is, “We simply are not educating, or even interesting, enough of our own young people in advanced math, science and engineering” (2006, p. 335). Gaps identified by Friedman, which may add to the gathering cloud of the “perfect storm” are gaps in the numbers (retirement versus young aspiring scientists), education at the top, education at the bottom, ambition, funding, and the infrastructure.

Where is the relevance in this for educators? The relevance comes with the responsibility that educational policymakers and educators themselves must shoulder the work to narrow the widening gaps. PAEC and its partners want to address the gaps in teacher inservice or professional development and student achievement that this funding proposal will target. The spark to ignite the interest of students in grades K-12 in the area of science can be fanned into a flame of passion with teachers who are innovative, collaborative and inquiry-based, lifetime learners.

A review of recent data reveals that there are elementary and secondary teachers of science who are in need of content and/or pedagogical professional development. However, Florida does not require minimum degree/coursework in the subject area taught for a beginning teacher certificate, nor does Florida require teachers to pass written tests for beginning teacher certificates in subject specific pedagogy. It should be noted that Florida does require passing of written tests for a beginning teacher certificate at the high school and middle school level in subject knowledge (State Education Reform, 2005-2006, Table 3.2).

A nation-wide study reveals that in 1999-2000, 43% of public school life science classes and 59% of physical science classes in grades 7-12 were taught by teachers not having an academic major or minor in the content area (Wenglinsky & Silverstein, 2007). In Florida, 10% of science teachers are considered to be teaching out-of-field. Data from the Bureau of School Improvement indicate this number is consistent across all geographic regions (Florida Department of Education, Office of Math and Science, 2007). Additionally, Florida's beginning teachers are not assessed in subject-specific pedagogy.

The fact that 10% of Florida’s teachers are out-of field, may not, at first glance, appear to represent a critical need; however, a review of the number of Florida Professional Educator Certificates issued in 2005 indicates a marked decline in number of teaching certificates issued versus the number of teachers needed. In Table 1 are data from 2001, showing the state of Florida issued 1,371 teaching certificates in the areas of Biology, Physics, Chemistry and General Science for grades 6-12. In contrast, in 2005, the state of Florida issued 400 certificates for Biology, grades 6-12; 59 for Physics, grades 6-12; 125 in Chemistry, grades 6-12; and 290 for General Science, grades 5-9, for a total of only 874 Florida certificates in a science area (Florida Department of Education, Office of Math and Sciences, 2007).

Table 1

Number of Florida Professional Educator Certificates Issued, 2001 & 2005

Year	Biology	Physics	Chemistry	General Science	Total
2001	643	88	202	438	1,371
2005	400	59	125	290	874

In a February 2007 report, the Florida Department of Education Office of Evaluating and Reporting expects to need 1,014 science teaching positions for school year 2007-2008 and significantly, science is approved as a critical shortage area. Therefore, we project a shortfall of 497 teaching certificates in science.

A summative review of data referenced above leads to the conclusion that, indeed, there is a pronounced need for content and/or pedagogical professional development for our existing science teachers, to help fill the void. While the data are representative of Florida, the needs of districts represented by this funding proposal are mirrored. However, there is a larger gap in our area in terms of a supply of highly qualified science teachers. In small and rural schools, an advanced science curriculum is often offered on a yearly rotation basis. A common example is the necessity of offering Physics and Chemistry II in alternate years, due to having only one certified teacher who may have at least four classroom preparations.

The impact of these issues with regard to teaching and maintaining currency in instructional content and methods can be reflected in the degree to which student achievement is enhanced through *richness, recursion, relations* and *rigor*. According to Doll (1993), teachers, both beginning and experienced, need professional development support to incorporate richness, recursion, relations, and probably most significantly, rigor into the curriculum and teaching process in order to see gains in science achievement of students. The PAEC project, *Sc-iii*, is a unique and innovative form of professional development for science teachers—one making best use of all available resources to support science educators and bringing inquiry and its concurrent richness, recursion, relations and rigor into science classrooms throughout north central and northwestern Florida.

What is rigor? Washor and Mojkowski (2007) share that *rigor* is the primary component of the new three Rs in education, joining *relevance* and *relationships*. In addition, Mike Rose argues in *The Mind at Work: Valuing the Intelligence of the American Worker* (2004, p.216), that “we mistake narrowness for rigor, but actually we are not rigorous enough... [Rigor] demands more, not less, from those who teach, who organize work...” Washor and Mojkowski explain that truly rigorous learning – both academic and nonacademic – involves deep immersion in a subject over time, with learners using sophisticated texts, tools and language in real-world settings and often working with expert practitioners who are research scientists. Objectives of this funding proposal reflect a variety of opportunities for immersion in the practice of science with expert scientists.

Several years ago, Florida visionary thinkers reflected upon the need for rigor and relevance in curriculum and instruction, as well as accountability to the public for the optimum return of tax dollars in the education arena. The results of this thinking are the Sunshine State Standards and the *Florida Comprehensive Assessment Test (FCAT)*. While the *FCAT* is not supported by national norms, the results do allow measurement against the standards being taught and the ability to determine student achievement growth over time. Florida students participate in the *FCAT*, which measures Reading, Writing, Mathematics, and, most recently, Science. The grades assessed for science are 5, 8, and 11.

A review of *FCAT* data for 13 districts in northwest Florida (Table 1), representing 12 Panhandle Area Educational Consortium (Washington County – District of Record) member districts and one participating district gives room for both optimism and concern. In the science area (Table 2), based upon 2006 *FCAT* results, the highest possible mean scale score is 500, however, among targeted districts, the mean scale score for Grade 5 was 293 (State – 299), Grade 8 was 281 (State – 289) and Grade 11 was 290 (State – 298).

Table 2

Group	Grade 5	Grade 8	Grade 11
State	299	289	298
Project Participants	293	281	290

Of the five achievement levels with level 5 representing highest achievement, the groups mentioned above have 74% of 5th graders scoring in levels one and two; 74% of the 8th graders in levels 1 and 2 and 73% of the 11th graders scoring in levels one and two (Table 3). Perhaps, most disappointing is the low number of students scoring at the highest levels, 4 and 5. If it is a goal that more students pursue a career or academic discipline in science, then the number of students performing at the higher levels is required. Districts included in this proposal, at all three grade levels tested in science, had more students occupying the lower levels than the results indicate for the overall state totals (Table 4). As confirmed by the 2006 *FCAT* results alone, the basis for the need to provide intensive and immersive science inquiry experiences through professional development for teachers, in the catchment area for this funding proposal as well as for Florida, statewide, is compelling.

Table 3

*Percentage of Students in Levels 1 and 2:
Science FCAT 2006*

	Grade 5	Grade 8	Grade 11
Levels 1 & 2	74	74	73

Table 4

Florida Comprehensive Assessment Test (FCAT) Science 2006

	Grade 5						Grade 8					Grade 11						
	Mean Scale Score	% in Each Achievement Level					Mean Scale Score	% in Each Achievement Level					Mean Scale Score	% in Each Achievement Level				
		1	2	3	4	5		1	2	3	4	5		1	2	3	4	5
State	299	29	36	27	6	2	289	35	33	26	5	1	298	32	33	30	4	0
Project Participants	293	33	41	24	3	.7	281	40	34	23	2.8	.5	290	37	36	25	1.9	0
Calhoun	309	19	42	31	7	1	294	33	33	29	4	1	310	24	33	40	2	0
Franklin	304	24	44	26	4	2	278	47	26	24	2	1	283	44	36	19	1	0
Gulf	299	27	35	29	8	0	298	30	36	29	5	0	293	32	43	24	1	0
Holmes	296	29	41	25	5	0	277	40	35	21	3	0	296	35	34	28	4	0
Jackson	302	26	36	31	5	1	282	37	36	23	4	0	292	35	36	26	3	0
Jefferson	249	61	29	9	1	0	240	64	29	7	0	0	283	34	54	13	0	0
Liberty	282	33	49	17	1	0	281	41	40	20	0	0	299	33	36	30	0	0
Madison	265	53	34	12	1	0	259	51	32	16	1	0	252	60	27	13	1	0
Taylor	303	22	45	30	2	1	295	34	30	29	5	1	282	46	31	21	2	0
Wakulla	314	18	39	36	7	1	312	21	34	36	7	2	308	23	37	33	6	0
Walton	312	20	37	34	7	2	303	28	33	33	5	2	302	30	36	31	3	0
Washington	291	31	41	26	1	1	291	30	37	31	1	0	300	31	36	31	2	0
FAMU DRS	284	31	59	10	0	0	249	58	39	3	0	0	280	41	48	10	0	0

Additional data searches extending beyond the Florida-specific measurement include an analysis of the readily recognized, valid and reliable National Assessment of Educational Progress (NAEP) reports. An overview of recent statistics as measured by NAEP in 2005, revealed that, compared to the 1996 results, an increase was noted in the average science score for grade 4, no significant change was noted at grade 8 and a decline was noted at grade 12. This same assessment, as reported by the NAEP organization and *The Nation's Report Card: Science, 2005*, indicates that in Florida 68% of 4th graders were at or above the basic level, 59% of 8th graders were at this same level and 54% of 12th graders were at this level (Table 5). Of the nine states showing overall gain in science between 2000 and 2005, Florida was not included. According to the *Nation's Report Card*, Florida was not a top performer as measured by average scores and average scale scores in the *2005 Science Assessment, Grade 8*.

Table 5

Percentage of Florida Students Scoring at or Above Basic Level: NAEP Science 2005

Grade Level	Percentage
Grade 4	68 %
Grade 8	59 %
Grade 12	54 %

When comparing the statewide FCAT data to the Florida data from the nationally certified NAEP data at similar grade levels, it appears that the FCAT underestimates those at the basic level or higher. If you add the percentage values for levels 3, 4, and 5 together from the FCAT, the sums come into the 32-34% range (Table 4), rather than in the 54-68% range seen in NAEP (Table 5).

The significant need for extensive professional development for practicing science teachers, the kind enabling them to gain knowledge of emerging content and best practice pedagogy, is documented in the literature. After analyzing performance of 8th grade students on the 1996, NAEP science exam and reviewing teacher responses to a NAEP survey of teaching practices, Wenglinsky (2000), as cited by Wenglinsky & Silverstein (2007), reports that higher student science scores are correlated with the professional development experiences of teachers. Three specific areas, indicated by data to be important targets for the professional development of science teachers, are laboratory skills, methods for incorporating hands-on learning activities, and use of instructional technology. Students of teachers who had received professional development in laboratory methods score nearly one-half of a grade level above students whose teachers lacked such training. In addition, teachers who had received training in engaging students in projects and activities are more likely to provide hands-on science activities on a routine basis. Students, experiencing hands-on science activities once a week, are 40 % of a grade level ahead of students who experienced hands-on activities only once a month. Finally, when teachers used technology, such as the Internet in the classroom, students perform better (Wenglinsky & Silverstein). The PAEC project, *Sc-iii*, will address each of these critical professional development areas as teachers become immersed in field and laboratory experiences with their research scientists and use technology in a variety of ways, including an online course for graduate credit.

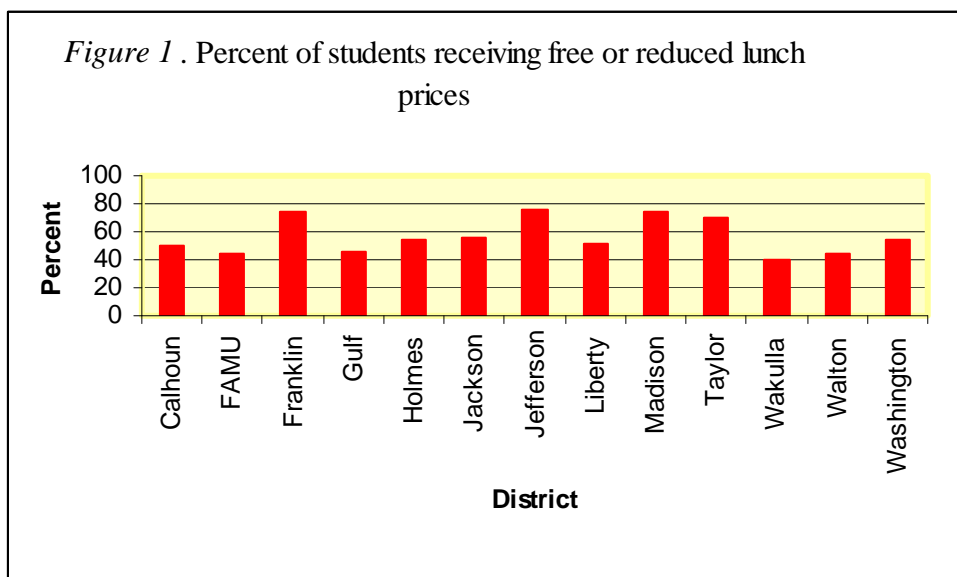
In addition to focusing professional development on laboratory skills, methods for incorporating hands-on learning activities, and use of instructional technology, there is yet another target which should not be neglected. Hapgood and Palinscar (2007) relate it as especially crucial for science teachers to receive training regarding reading strategies requisite for reading and comprehending informational text, because the existing body of scientific knowledge is largely in text. The informational texts commonly used in science classroom use a wide range of text structures, typically communicate information about the world beyond the normal environment of the student, offer many opportunities to expand students' vocabulary and increase student engagement. According to the National Reading Panel Report (2000), as cited by Hapgood and Palinscar, the vocabulary expansion that occurs as a result of reading science texts is strongly related to reading achievement.

This project will address this need by requiring science teachers to attend a two-day workshop, conducted by a national reading consultant, designed to specifically address strategies for teaching vocabulary and comprehension skills in an inquiry science setting.

Hapgood and Palincsar (2007) indicate that writing is also a natural fit with science taught from the context of inquiry. Inquiry science encourages students to express thoughts, digest and critique ideas as they seek to make meaning of science. Additionally, when students discuss ideas, along with reading and writing about them, students' vocabularies expand and they become better able to construct complex sentences. Language is a gatekeeper. Collins, as cited by Moore states, "Not possessing the language, whether written or oral, remains a major device to maintain boundaries between insiders and outsiders" (2007, p. 320). Inquiry science offers students a reason for communicating in multiple genres and forms. Determining how and when to select a particular way of representing ideas is a skill fundamental to literacy (Hapgood and Palincsar, 2007).

The National Research Council (1996), as cited by Charles Eick, (2000) relates that the goal of scientific literacy for all Americans includes more than just understanding the concepts of science. The NRC report reads that scientific literacy also involves knowledge of the processes that create the concepts (or strict inquiry) and the organizing framework that is science (or the nature of science). An emphasis on teaching science through a mode of inquiry has been the present approach for attaining scientific literacy. Although the National Science Education Standards have been in existence since 1996, and it is well established that a hallmark of an effective science teacher is the ability to teach science content from an inquiry perspective, the number of science teachers routinely employing this approach is limited. The majority of teachers in science classrooms were not trained to teach in this manner (Cummings, 2002). In the two-day literacy workshops, project participants will explore opportunities to merge science and how to communicate science in written form in a classroom setting. "In today's classroom environment of ever-increasing demands, every instructional minute must count. Finding time for science instruction and literacy instruction does not have to be an either/or proposition—in fact, the two subjects can be more powerful when combined" (Hapgood and Palincsar, 2006, p. 60).

All Panhandle Area Educational Consortium districts represented in the *Sc-iii Project* are rural and sparsely populated with the population density ranging from 10-65 people per square mile. The total student population in the districts range from 464 at Florida A & M Research School to 7,500 in Jackson County. These districts have a majority of schools eligible for Title I services and all of the districts participating in this project have greater than 40% of students on free and reduced price lunches.



3. Project Design and Implementation

A. Vision

The vision of this Panhandle Area Educational Consortium project, *Science Collaboration: Immersion, Inquiry and Innovation, Sc-iii*, is to improve student academic achievement in science in grades 3-12 in participating school districts.

Project Goals

1. Science teachers will experience research at the elbow of a scientist, becoming both scientist and science educator (Gilmer, 2005). This will allow teachers to bring relevant, inquiry science experiences into the classroom—those that afford students opportunities to become and think like scientists, deepen content knowledge, enable them to make meaning of their experiences and express their knowledge in a variety of ways.
2. Teachers will be actively engaged in collaborative networks, including those occurring between teacher team and research scientist, teachers and scientists from universities, agencies and industry, and between and among teachers from different grade spans and schools to help students become increasingly literate in science and ultimately make a positive difference in student achievement in science.
3. Teachers will effectively implement inquiry experiences in their classrooms so that students will experience the relations, richness, recursion and rigor that are natural and integral aspects of inquiry science.

Project Objectives

1. Developing collaborative research and support partnerships.
2. Establishing articulation by building a community of innovators through experiential research and multiple opportunities and avenues for collaboration.
3. Immersing a cohort of teachers in the culture of science.
4. Increasing teacher knowledge of effective implementation of inquiry-based learning in the classroom.
5. Providing high-quality professional development supportive of the Just Read, Florida! Initiative
6. Identifying and sharing Florida's professional resources, available at no cost to educators.
7. Disseminating a reproducible best-practice model throughout the state through various electronic and television media.

B. Description of Project Activities and Correlation with Objectives

Objective 1: Developing collaborative research and support partnerships.

The Panhandle Area Educational Consortium established collaborative research and supportive partnerships, as agreements with industry, university, state agency and school partners. Also, development of a contact list of potential partners is well underway. PAEC will partner with two major state universities, the Florida State University (FSU) and the University of Florida (UF) and the State of Florida Department of Environmental Protection in carrying out the activities of this project.

University Faculty Coordinators

The university coordinator for the FSU-related project activities is Dr. Penny J. Gilmer. Dr. Gilmer brings a unique perspective to this project, with an educational background that includes two doctorates, in biochemistry and science education. She is a Professor of Chemistry and Biochemistry. It is especially noteworthy that Dr. Gilmer has significant experience fostering successful collaborations between teachers and

scientific researchers. She has authored many papers addressing the nature of these collaborations and was editor and contributor for two SERVE monographs, *Meaningful Science: Teachers Doing Inquiry + Teaching Science*, and *Experiential Learning for Pre-Service Science and Mathematics Teachers*. Additionally, Dr. Gilmer was the recipient of the National Science Foundation's First Annual GK-12 Dissemination Award for another SERVE monograph, similar to the two mentioned.

Dr. Mary Jo Koroly will coordinate the University of Florida project activities. Dr. Koroly is Director of the University of Florida's Center for Precollegiate Education and Training and a faculty member in the Department of Biochemistry and Molecular Biology in the College of Medicine. Her dual roles and experiences in education and research make her another valuable member of the project team. Prior to accepting a position at the University of Florida, she served on the faculties of Bryn Mawr College and Harvard Medical School.

Maximizing Available Resources

While Northwest Florida is not industry rich, there is abundant wealth in natural resources with scientists who devote their time monitoring and protecting the environment. We do have a letter of commitment from the Florida Department of Environmental Protection and its associated agencies, such as the Florida Park Service, the Florida Fish and Wildlife and Conservation Commission. Contacts are being made and verbal commitments are being received to identify additional project partners, such as Oglesby Plant Laboratories, NOAA, and the National High Field Magnetic Laboratories. If the project is funded, efforts will be made to identify additional partners. Once all project partners have been identified, electronic avenues for group communication, as appropriate, will be established and a listserv of partners will be developed. Critical partners will be university representatives and key individuals in the partnering agencies.

Objective 2: Establishing Articulation by building a community of innovators through experiential research and multiple opportunities and avenues for collaboration

A community of innovators will be established through experiential research and collaboration. *Sc-iii* addresses the crucial need for vertical articulation and collaboration within and among schools by supporting collaboration among teachers within a school district, allowing routine discussion of pressing topics such as curriculum and best practices, sharing of resources and provision of skills-based support. Each 2- or 3- person teacher research team will have, as its leader, an experienced high school science teacher, and the team may have any of the following configurations: elementary, middle and high school teachers, elementary and high school teachers or middle and high school teachers. Additional articulation and collaboration will occur between and among teacher participants, scientists, university faculty members, and project mentors.

Web site Development

After districts identify teacher participants, the teachers will become a viable community of learners, as we establish a project Web site. PAEC will maintain the Web site to support ongoing, electronic interaction and collaboration with each other, university and industry research scientists and project mentors. From this Web site, we will utilize threaded discussions between and among all teacher participants and research scientists, as well as discussion boards established expressly for communication between teacher research teams and research scientist. Access to these discussion areas will be password protected.

The Web site will also be a mechanism through which all project communications, including requirements for project participants, project milestones and critical dates, transmittal of necessary forms, and other communications, as necessary, may be facilitated between participants and those directing the activities of the project. Although the Web site will be an important communication portal for project participants and those directing the activities of the project, all project deliverables will also be posted on the Web site for statewide dissemination.

Participant – Faculty Interaction

The Florida State University online graduate course, described later in this proposal, will be an invaluable part of the collaborative process as project participants interact, speak the language of science and establish professional academic relationships with distinguished FSU faculty members, such as Dr. Penny J. Gilmer. These faculty members will guide the participants' reflective process, posing questions for the teachers' consideration.

Objective 3: Immersing a cohort of teachers in the culture of science

Participants in the cohort of teachers in the Panhandle Area Educational Consortium's *Science Collaboration: Immersion, Inquiry, Innovation Project (Sc-iii)* will experience the culture of science while being immersed in the scientific research. "People make sense of their understandings of the world based on their prior experiences. Therefore, we expect that teachers may build new constructions of science based on experiences in a science research context while immersed in the culture of science" (Gilmer, 1999, p. 13). The college educational experience of a typical science teacher did not prepare the teacher to teach using inquiry methods, because the typical educational experience was one in which teachers were taught to master a body of facts and principles. It is difficult to teach science as inquiry when that is not the way you were taught (Loucks-Horsley, 1997), as cited by Gilmer. Crawford (2000) relates that inquiry instruction requires creating environments similar to those of science practitioners, grappling with data, collaborating between and among students and teacher, connecting students with the community, teacher modeling of the behaviors of a scientist, and fostering ownership by students. The teachers foray into inquiry, a key feature of *Sc-iii*, will offer each participant a rigorous and challenging opportunity in the context of authentic research, leading to a classroom practice in which students have the opportunity to engage in true inquiry and construct understanding by solving real-world problems, rather than performing a meaningless series of hands-on activities.

Cohort Logistics

Two *Sc-iii* project cohorts will be identified; a Western cohort and an Eastern cohort. Each cohort will be made up of teams of teacher participants. Grades 3-5 elementary, middle and high school teachers are eligible for project participation. Each district team of 2-3 teachers will be required to have one high school science teacher, willing to serve as team leader. Pre-service Science Education majors from Chipola College will be invited to participate in the field experience, contingent upon slot availability. These pre-service teachers are historically from districts served by the Panhandle Area Educational Consortium.

The number of participants allowed from each PAEC member or participating district will be calculated based on that district's percentage of FTE and the total number of project participants, limited to 120 teachers. Superintendents, professional development and curriculum directors in each district will be informed of the total number of teacher participants allowed for that district and asked to work with school-based administrators to select only those teachers who are well-respected educators and who are willing to commit to participate for the duration of the project. It is expected that there will be 40-50 teams of teacher participants and the potential to impact approximately **12,880** students in a single school year.

Authentic Research Skills

High school science teachers will serve as team leaders, and *Sc-iii* will afford them an opportunity to participate in a 5-day residential immersion in science experience on the University of Florida campus. The purpose of this activity is preparation to lead the field research experience that will follow. Dr. Mary Jo Koroly, Director of the University of Florida's Center for Precollegiate Education and Training has agreed to work with an advisory team of teachers and Panhandle Area Educational Consortium staff to identify the specific needs of participating teachers and to develop the week's curriculum based on those needs.

Historically, the University of Florida has experienced tremendous success offering similar experiences to teachers in the areas of environmental science, biotechnology, and emerging pathogens. In addition to

spending days in the field conducting authentic research with a variety of university scientists, the week will offer opportunities for PAEC project participants to work in partnership and engage in scientific discussion with each other and with teachers having similar interests from around the State of Florida. During two evenings, teachers will be expected to meet as a group for the purpose of sharing best practices, based on personal classroom experiences and on the final evening, each participant will be expected to develop a personal action plan to be shared with the entire group on the following day. In addition to this rich opportunity for immersion and collaboration with practicing scientists, university faculty and other educators, teachers will receive a plethora of classroom resources and an invitation to bring a bus load of students to the University of Florida campus to visit with faculty researchers.

Immersion Experience

Immersion in an authentic research experience, a key component of this project, will be pivotal in helping teacher participants internalize the process of doing science as inquiry. The immersion in research will offer a contextual experience during which teacher teams will be expected to use the language of science, use equipment, logic, creativity, analytical reasoning, inquiry and communication necessary to conduct scientific research. "Contextual learning is a step beyond 'hands-on' and 'minds-on' science. It is actually doing, thinking, speaking, and experiencing science" (Gilmer, 1999, p. 13). When teachers experience this type of contextual learning, it will be transferred into the classroom.

Project participants will be required to conduct 15 days (6 hour minimum/day) of field or laboratory research with a research scientist of their choice. Panhandle Area Educational Consortium staff will work with partners to identify potential research scientists within reasonable geographic proximity of each participating school district. The research scientists will be employed by project partners and will be scientists willing to provide a meaningful research experience for the teacher team assigned to them. During a one-half day presentation, research conducted by the research scientists will be described and teacher teams will have the opportunity to rank their choices of research scientists based on interest and location. PAEC project staff will make final assignments of teams to research scientists, with a concerted effort being made to honor the first or second choice of each team.

Dates for the research experience will be established jointly between each research scientist and teacher team, but a project requirement will be that work is scheduled only on days when at least six hours of work is possible. The participant team leader will be required to provide a work schedule for the group, including specific dates and times to Dr. Gilmer and the designated PAEC Project Coordinator. Teacher team members will be expected to become an active part of the activities of the researcher rather than assume the passive role of observer.

Monitoring of the research conducted by teacher teams will be carried out by a team of project mentors, selected by Dr. Penny J. Gilmer. They will be jointly supervised by Dr. Penny J. Gilmer and the designated PAEC Project Coordinator. Based on projections, there will be 13 project mentors, each one assigned to 4 teacher teams. Their major responsibility will be to conduct a weekly site visit (7 hour minimum, including travel time) for each research team assigned to them. Additionally, each project mentor will be required to keep a record of field observations for weekly posting to Dr. Gilmer and the PAEC Project Coordinator, via the Web site.

Florida State University Graduate Credit

All teacher participants will be enrolled as non-degree seeking/special students in the Florida State University, 3-semester hour online graduate course, *Contextual Research Experiences*, referenced in the graduate bulletin as CHM 5910. A detailed description of the course may be found in the appendix. This course, taught by Dr. Penny J. Gilmer, will begin January 7, 2008, and end August 8, 2008. This course will be initiated prior to and will parallel the research immersion experience. The course will require planning for the summer field experience (including library research), executing experiments, analyzing the results and writing personal

reflections and a summary of the results. All participants will have one set of common readings to do and will be required to log the hours spent in each capacity. Additionally, participants will have remote, electronic access to databases in FSU's Strozier Library and the Dirac Science Library.

Teacher participants will be expected to complete this course and may not receive the last stipend payment until confirmation of completion has been made. The potential exists for the best samples of writing done by the teacher participants to be edited and compiled into a research monograph for dissemination.

Seminars in Emerging Science

An engaging series, *Seminars in Emerging Science*, will be offered three times during the school year. Seminar attendance will be a required project activity. During the course of each seminar day, a minimum of two national and/or local research scientists will share details of their research and explain both the work's context and relevance. Preservice Science Education majors from Chipola College will be invited to participate in this exceptional opportunity. Important features of the seminar activities will be opportunities for participants to ask questions and interact with practicing scientists and to gain knowledge of real-time scientific work; that on the frontier of science. This important series will be disseminated statewide and nationally via broadcast, web-streamed video and available in DVD format.

Objective 4: Increasing teacher knowledge of effective implementation of inquiry-based learning in the classroom

"Authentic problems that students solve collaboratively differ from traditional school science 'experiments' that tend to be verification labs in which students seek the 'right' answer" (Crawford, 2000, p. 99). PAEC's *Sc-iii Project* will ensure that teacher participants gain knowledge of how to effectively implement inquiry based learning in the classroom. In addition to the personal research experience, teachers will receive 1.5 days of intensive professional development in a *Science Lesson Design Workshop* that addresses how to select important science content and how to plan for and design effective inquiry science lessons that allow students to conduct active investigations, learn concepts, apply information and represent their knowledge in a variety of ways. Training activities will be provided by a nationally-known consultant.

Classroom Enrichment

Doing science as inquiry requires a continuing re-investment in purchase of consumable supplies. It is not uncommon for a science teacher to spend several hundred dollars, often from salary, purchasing those supplies. *Sc-iii* will provide classroom enrichment funds to offer financial support for teachers' efforts to teach science as inquiry.

Objective 5: Provide high-quality professional development supportive of the Just Read, Florida! Initiative

Project activities will support the Just Read, Florida! initiatives by offering high quality professional development on the topics of vocabulary and reading comprehension strategies—those shown by research to be especially useful in a Science classroom where teachers must help students make meaning of dense, informational science text. In addition, a variety of methods used to help students synthesize and extend science learning by writing about science will be explored. A national literacy consultant will provide this 2-day training activity. The training activities will be videotaped, and the resulting three-part video series will be broadcast from PAEC's Florida Education Channel (FEC) and web-streamed from the FEC home page and from the *Sc-iii* Web site. In addition, the content will be used to develop a 15-hour online course, accessible through the Panhandle Area Educational Consortium's *electronic* Professional Development Connections (ePDC). Tuition for the online course will be free for the duration of the project and at a minimal cost to cover facilitation of the course after the grant period, for as long as the content is current and useful.

Objective 6: Identifying and Sharing Florida's Professional Resources, Available at No Cost to Educators

As a result of routine communication and collaboration, teacher participants will become aware of a variety of particularly rich classroom resources, those offered by practicing scientists in the teachers' geographic proximity. The practicing scientists will work with a team of teachers in the field experience. Teachers will also view the research scientist as a valuable classroom resource and the location, in which the research immersion experience takes place, as a location that would be of interest to the students in his or her own classroom, as well. In addition, it is expected that through the network of interactions, each teacher will gain knowledge of multiple individuals who are willing to share their scientific knowledge, expertise and experiences with teachers and students. Additionally, participants will become increasingly aware of free resources available from Florida's universities, the Global Education Outreach, for example. Teachers will learn of other opportunities through other teams in the same program that do their research at other facilities.

A priority and deliverable for this *Sc-iii* objective is development of an electronic resource template for use in soliciting information, regarding potential locations for research opportunities for educators, statewide. The PAEC marketing consultant, working in conjunction with a variety of agencies, will identify and contact industries conducting scientific research throughout Florida. A representative of each identified industry will be asked to complete and electronically submit information requested on the online template. A list of contacts and/or resources, identified as a result of responses, will be made available via the project Web site to educators and others planning to conduct a similar collaborative project.

Articulation will occur between and among participants, resulting in teachers and teacher teams becoming resources for each other. The Final Research Forum will enable teacher participants to share what they learned and how the project is expected to impact their professional practice and information regarding resources discovered during *Sc-iii*.

Objective 7

Providing High-Quality Professional Development Supportive of the Just Read, Florida! Initiative

A reproducible best-practice model for high-quality teacher professional development in the area of science will be disseminated throughout the State of Florida. Professional consultants and experts in information technology from the PAEC FloridaLearns Academy, along with the production staff from PAEC's Florida Education Channel will develop and produce:

- *Sc-iii Web site*: The Web site will be established and maintained to support ongoing, electronic interaction and collaboration among participants. In addition, it will be a repository for resource information and allow for project updates and tracking of activities.
- *Documentary Video*: A documentary video capturing the essence of the teachers' experience of immersion in the culture of science and personal reflections regarding the potential impact of project activities on their classroom practice. Drs. Penny J. Gilmer and Mary Jo Koroly will provide narrative for the video. The video content, produced by the Florida Education Channel will be made available via broadcast television and will be web-streamed 24/7 from the Florida Education Channel and project Web sites. Both will be accessible from the PAEC home page. In addition, one copy of the DVD will be sent to every school district in Florida.
- *Teacher as Scientist Series*: There will be a series of ten, 3-4 minute video vignettes that depict the field experiences of selected project participants will be produced and made available on the project Web site via web-streamed video and Podcast.
- *Seminars in Emerging Science*: Each scientist presentation (pending permission of the speaker), will be videotaped for broadcast on the Florida Education Channel and will be shown as web-streamed video from the FEC home page and project Web site. The content will also be available in DVD format.

- *Seminars in Emerging Science*: A poster announcing this series will be developed by the Panhandle Area Educational Consortium (PAEC) graphic designer and posters will be produced in the FloridaLearns Clearinghouse for statewide dissemination to every K-12 public school and university in Florida with details about the series and dates and times of initial broadcast.
- *Seminars in Emerging Science* Online Course Support: The content from six seminar presenters will be used to develop content-specific online courses, each worth ten professional development hours for science teachers. These courses, accessible statewide, will be available at no charge during the grant period, and for a nominal facilitation fee beyond the life of the grant.
- *Literacy in Science: Classroom Strategies for Science Teachers for Vocabulary, Comprehension and Writing about Science*: A three-part video series. The video series will be shown by broadcast television on the Florida Education Channel and web-streamed 24/7 from the Florida Education Channel and project Web-sites, both of which may be accessed at www.paec.org. This training activity will also be made available on DVD.
- *Literacy in Science: Classroom Strategies for Science Teachers for Vocabulary, Comprehension and Writing about Science*: A 15-hour online professional development course on the topics of reading and writing in science, based on the literacy training video series, will be developed and housed in the PAEC Center for Teaching, Learning and Leadership, accessible through the *electronic* Professional Development Connections (ePDC) at PAEC. Tuition for the online course will be free during the grant period and available for a nominal cost (facilitation costs) after the project ends. PAEC will assume responsibility for maintaining the online course after the life of the project for as long as the content remains current.
- *Resource Identification Template*: Information regarding Florida's free, research resources, collected through use of this template will be shared statewide.
- *Monograph or CD-ROM of Teachers' Reflections on Experiences in Science*: The best samples of teacher writing may be edited and compiled for publication as a monograph or in a CD-ROM format in order to facilitate dissemination of this best practice model. This would be a value-added benefit and the materials would be made available through the FloridaLearns Clearinghouse at PAEC.

Table 6
Project Activity Timeline

Project Activity	Projected Timeline/Deadlines	Person(s) Responsible
Notification to Districts Regarding Criteria for Teacher Selection	June 8, 2007	Project Coordinator, Project Secretary
Critical Partner Meeting # One	June 29, 2007	Project Coordinator; Critical Partners
Project Website Completed	July 1, 2007	Webmaster
Research Scientists Identified	August 24, 2007	Project Coordinator
Update of Project Website	Minimum of monthly, through project end date	Webmaster
Teacher Selection and PAEC Notification completed	August 24, 2007	Project Coordinator and District Contacts
Completion of Template for Resource Identification	September 15, 2007	PAEC Marketing Consultant
Identification of Florida State University protocol for Participant Registration in Online Graduate Course Completed	September 15, 2007	Project Coordinator, Dr, Gilmer
Teacher Participant Workshop # One- Science Lesson Design <ul style="list-style-type: none"> • 2 Days – 2 Locations • Project Orientation for Participants • Information regarding FSU admission and registration as non-degree seeking student 	September 30, 2007	PAEC Project Staff; National Consultant
<i>Seminars in Emerging Science</i> – Poster mailed to every Florida school	September 30, 2007	PAEC Graphic Designer, Marketing consultant and Project Coordinator
Production for Documentary Begins	September 30, 2007	FEC Production Manager
Letters to Field Scientists Requesting Information about Research Possibilities with instructions for completing online template	September 30, 2007	Project Coordinator, Webmaster
Identification of Research Industries throughout State of Florida and Letters soliciting information via online template	October 15, 2007	PAEC Marketing Consultant
Field Scientists Research Information Available through Project Participant Portal on Project Website	October 31, 2007	PAEC Project Staff, Webmaster
<i>Seminar in Emerging Science Part One</i> <ul style="list-style-type: none"> • One day- One Location 	October 31, 2007	PAEC Project Staff, Scientists
Teacher Participant Registration for FSU Online Course- <i>Contextual Research Experiences</i>	November 15, 2007	Project Coordinator, Dr. Gilmer
Critical Partner Planning Meeting # Two	November 30, 2007	Project Coordinator, Critical Partners
<i>Seminar in Emerging Science Part One</i> – Production and Course	November 30, 2007	Project Coordinator, FEC Staff
Teacher Participant Workshop – Two Days, Two locations <ul style="list-style-type: none"> • Vocabulary and Comprehension Strategies for Science Teachers • Writing in Science Content Area 	November 30, 2007	PAEC Project Staff, National Literacy Consultant

Project Activity	Projected Timeline/Deadlines	Person(s) Responsible
Planning for UF Summer Science Experience	December 14, 2007	Project Coordinator, Dr. Koroly
Research Industry Information available on Project Website	December 15, 2007	PAEC Marketing Consultant, Webmaster
Post-Production work for Reading and Writing in Science Content Area DVD and Online Course Completed	January 11, 2008	FEC Production Manager
Teacher Participants Begin <i>Contextual Research Experiences</i> , FSU online course	January 8, 2008	Project Coordinator, Dr. Gilmer
<i>Seminar in Emerging Science Part Two</i> Research Experience Q & A	January 31, 2008	PAEC Project Staff, Scientists
Field Experience Selection	February 15, 2008	Project Coordinator
<i>Seminar in Emerging Science Part Two</i> Post-Production work, online courses and DVD available	February 28, 2008	Project Coordinator, FEC staff
Assignment notifications to teacher participants and research scientists	March 10, 2008	Project Coordinator, Project Secretary
Critical Partner Meeting #Three	April 25, 2008	Project Coordinator, Critical Partners
<i>Seminar in Emerging Science Part Three</i> • Afternoon orientation for scientists and teacher teams	April 30, 2008	PAEC Project Staff, Scientists
Research Mentors Identified and Planning Completed	May 16, 2008	Project Coordinator, Dr. Gilmer
<i>Seminar in Emerging Science Part Three</i> Post Production work, online courses and DVD available	May 31, 2008	Project Coordinator, FEC Staff
High School Team Leader UF Course Completed	June 13, 2008	Project Coordinator, Dr. Koroly
Field Experiences Opening Day	June 16, 2008	Project Coordinator, Dr. Gilmer
Research Mentor Visits Begin	June 16, 2008	Project Coordinator, Dr. Gilmer
Classroom Enrichment Supply Orders	July 15, 2008	Project Coordinator, Project Secretary
Field Experiences End Date	July 25, 2008	Project Coordinator, Dr. Gilmer
Participant Research Forum	August 8, 2008	Project Coordinator
FSU Online Course, <i>Contextual Research Experiences</i> ends	August 8, 2008	Dr. Gilmer
<i>Teacher as Scientist Series</i> – Video vignettes Post-Production work completed; DVD available	August 15, 2008	Project Coordinator, FEC Staff
Teacher Participant- Program Evaluations Submitted	August 15, 2008	Project Coordinator
Critical Partner- Debriefing Meeting	August 11, 2008	Project Coordinator, Critical Partners
Documentary Production Completed	August 31, 2008	FEC Production Manager

C. Applicant's Experience/Capacity

The Panhandle Area Educational Consortium boasts a rich history of effectively developing high-quality professional development products and/or implementing professional development projects for educators, spanning a broad variety of content areas. Best use of the extensive and up-to-date, technology-based infrastructure, housed at the consortium home office in Chipley, is a hallmark of the consortium. PAEC has unparalleled capacity to deliver high-quality results and manage large projects. Recent examples of these projects include: 1) *FloridaLearns Academy Math Experts Project*, 2) *Your Child, Your Public Schools*, 3) PAEC Reading Initiative, 4) *Project DELTA/William Cecil Golden School Leadership Development Program*, 5) *Distance Learning Teacher Training*, 6) *Teaching American History Grant*, 7) Teach-in Florida, Teacher Recruitment Initiative, 8) Carol White PE Grant, 9) sPAEC - A Mathematics and Science Partnership Program Grant, 10) United States Department of Education *Teacher-to-Teacher Project* – This project brought successful teachers from all over the United States together to share best practices. The initial 26 presenters were videotaped and produced by the Florida Education Channel. Online professional development, supporting the videos, was developed and the Web site was hosted and maintained by PAEC, 11) *Tuesday Teacher Training Series*, an annual series for teachers with classroom vignettes and expert commentary.

Florida's small and rural districts face challenges which are unique. The population versus geographical range for the Panhandle districts from Walton County to Madison is 10 – 67 people per square mile. Delivering the needed face-to-face professional development across this wide geographical area is not only very costly, but time prohibitive. The FloridaLearns Academy offers professional development delivered in an asynchronous distance-learning format as a cost-effective solution. The FloridaLearns Academy delivers research-evidenced strategies and content in a user-friendly format and is accessible 24/7 to anyone with Internet connectivity. A large variety of online courses with embedded web-streamed video are available to all educators. Course content and educator transcripts are maintained in the *electronic* Professional Development Connections. Additionally, the FloridaLearns Academy at PAEC has the capacity to cost-effectively reproduce and package training materials and make them available in a variety of formats through its FloridaLearns Clearinghouse.

The Panhandle Area Educational Consortium is also home of the Florida Education Channel, a delivery system that broadcasts high-quality, current and relevant programming of special interest to educators. FEC boasts a full, professional production studio, capable of creating products that rival commercial productions. It is in this setting that professional development that sets the standard for comprehensive, uniform distance learning is created, broadcast and video-streamed through the FloridaLearns Academy. The progressive technology infrastructure available at PAEC will also support video conference meetings with a variety of project partners and various forms of electronic communication with university and research partners will save time and costs.

It is evident from the list of projects that PAEC has successfully implemented over the past few years that the consortium has earned the stellar reputation that it has. PAEC has on staff highly-trained educational personnel in the fields of reading, math, science, physical education, student services, testing, exceptional student education, early childhood, educational leadership, and evaluation services. PAEC staff members include former classroom teachers, school and district administrators, risk-management specialists, Florida Department of Education personnel and United States Department of Education personnel. In addition to being highly qualified as professional developers, it is an expectation that PAEC professional staff members stay abreast of cutting-edge, best-practices research that has the potential to positively impact student achievement, the most-recent technology for professional development delivery, National Staff Development Council Professional Development Standards, and the State of Florida Professional Development System Protocol. The FloridaLearns Academy of PAEC that will lead this effort includes instructional staff and staff from the Florida

Education Channel. These professionals work seamlessly to create, produce and deliver high-quality, content-rich professional development for educators at all levels.

D. Project Partnerships

The Panhandle Area Educational Consortium is pleased to have the opportunity to have critical partnerships with two major universities within the State of Florida; Florida State University and University of Florida, and the Florida Department of Environmental Protection to provide professional development training support for the teacher participants. The Florida Center for Research – Science, Technology, Engineering, and Science (FCR-STEM) will partner for the purpose of project evaluation

Florida State University is a Carnegie Doctoral/Research Extensive institution, internationally-recognized as a teaching and research institution committed to preparing graduates for the ever-expanding opportunities of a global society. Students at FSU have the opportunity to work with Nobel laureates, members of the National Academy of Science and American Academy of Arts and Sciences, Guggenheim Fellows, Pulitzer Prize recipients, and others. Graduate students at the university are diverse and come from ninety-five foreign countries and all fifty states. Graduate education is a critical component of the institution's mission. FSU has a MediaSite laboratory called GEO, for Global Educational Outreach, in the Department of Chemistry and Biochemistry for broadcasting presentations, including the option of using PowerPoint to show slides. The speaker can present live by web streaming, but the presentation is also available 24/7. The URL is <http://mediasite.oddl.fsu.edu/mediasite/Catalog/Front.aspx?cid=3bd4c40c-e410-4ba4-8594-5b9891cfeefd>

The University of Florida is a major, public, comprehensive, land grant, and research university. As the state's oldest, largest and most comprehensive university, Florida is one of the nation's most academically diverse public universities. University of Florida has 16 colleges and more than one hundred research, service and education centers, bureaus and institutes and offers professional degree programs in dentistry, law, medicine, pharmacy and veterinary medicine. As a major center for research, the university received a record total of \$518.8 million last year, more than half of which was for health-related research. Among the faculty are winners of a Fields Medal, Pulitzer Prize, NASA's top award for research and Smithsonian Institution's conservation award. Additionally, there are currently more than 60 Eminent Scholar chairs, and nearly 60 faculty elections to the National Academy of Sciences, Engineering, or Arts and Sciences, the Institute of Medicine or a counterpart in a foreign nation.

The Florida Department of Environmental Protection is the lead agency in state government for environmental management and stewardship. The Department is divided into three primary areas: Regulatory Programs, Land and Recreation and Planning and Management. The agency's environmental priorities include restoring America's Everglades, improving air quality, and restoring and protecting the water quality in our springs, lakes, rivers and coastal waters. In addition, the agency is dedicated to conserving environmentally –a sensitive land so today's citizens and those of the future may enjoy the land and water of the State of Florida. Mr. Gregory C. Ira, Director of the Office of Environmental Education, will serve as the agency's point of contact. DEP Chief of the Bureau of Laboratories Dr. William Coppenger and Dr. Gilmer worked together in a similar program for prospective and practicing secondary science teachers. He sees this collaboration as an effort for outreach and education from DEP to science teachers and students in public schools.

Additional partnerships are being sought with the Florida Fish and Wildlife and Conservation Commission, Oglesby Plant Laboratories, NOAA, and the National High Field Magnetic Laboratories. If the project is funded, efforts will be made to identify further partners. Preservice Science Education majors from Chipola College will be invited to participate in selected events, contingent upon space availability.

4. Evaluation

"Grant award recipients will subcontract with the Florida Center for Research in Science, Technology, Engineering, and Mathematics (FCR-STEM) for formative and summative evaluations of their work with the *Florida Science Partnership* grants. Program managers will coordinate with FCR-STEM to establish protocols for providing data and deliverables that will allow FCR-STEM to effectively evaluate their work in a timely manner."

5. Support for Strategic Imperatives

Just Read! Florida Initiative

The Panhandle Area Educational Consortium recognizes reading literacy as one of the most important abilities students acquire as they progress through their school years. Reading is the foundation for learning across all subjects, including science, and is the basis for comprehension of specific and technical subject matter. Essential to a teacher partnering with a child for the purpose of learning to read is also the responsibility to encourage reading to learn. In the context of science, it is especially crucial for science teachers to receive training regarding reading strategies requisite for reading and comprehending informational text, because the existing body of scientific knowledge is largely in text. As Hapgood and Palinscar (National Reading Panel, 2000) report, the vocabulary expansion that occurs as a result of reading science texts is strongly related to reading achievement.

Hapgood and Palinscar (2007) also indicate that writing is a natural fit with science taught from the context of inquiry. When students discuss ideas, along with reading and writing about them, students' vocabularies expand and they become more able to construct complex sentences. The hallmark of an effective science teacher is the ability to teach science content from an inquiry perspective (Crawford, 2000), and the majority of teachers in science classrooms were not trained to teach in this manner, incorporating reading and writing as a part of the curriculum and expected outcomes.

The PAEC *Sc-iii Project* supports the Just Read, Florida! initiatives by offering high quality professional development on the topics of vocabulary and reading comprehension strategies—those shown by research to be especially useful in a science classroom where teachers must help students make meaning of dense, informational science text. In addition, a variety of methods used to help students synthesize and extend science learning by writing about science will be explored. A national literacy consultant will provide this 2-day training activity. The training activities will be videotaped and the content web-streamed from the project Web site. In addition, the content will be used to develop a 15-hour online course, accessible from the PAEC ePDC. Tuition for the online course will be free for the duration of the project and at a minimal cost to cover facilitation of the course after the grant period, for as long as the content is current and useful.

The content from these workshops will be developed into a three-part video series. The series will be broadcast on the Florida Education Channel and available as web-streamed video 24/7 from the Florida Education Channel and project Web site accessible from the PAEC home page and in a DVD format. Additionally, a 15-hour online professional development course, based on the literacy videos, will be developed and available at no cost to teachers during the project period.

SBE Strategic Imperatives

The PAEC *Sc-iii Project* will support the following Florida State Board of Education Strategic Imperatives:

SI 1: Increase the Supply of Highly Effective Teachers

SI 1.2.a Annually increase the number of high-performing teachers as evidenced by Florida teachers that produce significant student learning gains.

A projected outcome of this funding proposal is to increase the number of high-performing science teachers because:

- project participants have had the opportunity to experience science immersion with noted scientists and science educators
- project participants will participate in professional development activities geared toward the inquiry-based approach to teaching of science
- project participants will receive a significant amount of training in teaching areas of writing and reading in the science classroom
- project participants will learn of the nearby resources and scientists, which will help motivate students and encourage them to learn science

SI 3.1 Improve Student Rates of Learning

SI 3.1.a Annually increase the percentage of grade 3-10 students that meet or exceed proficiency levels on the FCAT

A projected outcome of this project is that student learning gains will improve as measured by the FCAT and other appropriate measures because:

- students will have the opportunity to learn from teachers who are innovative and proficient in teaching science, using the inquiry-based approach
- students will receive instruction in science while also incorporating reading and writing for the purpose of increasing vocabulary and comprehension as well as expressing ideas and thoughts in writing
- teachers will encourage the students to “catch the enthusiasm” for learning and reaching for excellence in science-related areas to bring about a transfer of learning into real world experiences and career opportunities

Dissemination Plan

A. Methods and Strategies

Few, if any, educational organizations within the State of Florida have a capacity comparable to that demonstrated by the PAEC for rapid dissemination of critical information. This capacity is vital when considering the large geographic area as compared to relatively low population density of the projected service area. PAEC professional development council members will receive information detailing project key information electronically for use in recruiting team members who are experienced and demonstrate leadership qualities from feeder schools. Project information will be posted on the PAEC home page which is accessed weekly by hundreds of educators from PAEC member districts and across the state. District Superintendents, District Professional Development and Curriculum Directors and site administrators will be provided with flyers and invitations detailing project information for teachers interested in participating on a team. Chipola Science Education faculty will receive notification of selected events. Additionally, Superintendents and Professional Development Directors from LEAs of participating and non-member districts will receive a letter from the PAEC Executive Director. PAEC's *Horizon Newsletter* featuring informative articles about the project will be sent via e-mail to every educator in member and participating districts. Additionally, products for broadcast will be announced in the *Florida Education Channel Electronic Newsletter*. Project updates and photos of local teacher participants will also be sent by the PAEC marketing consultant to local newspapers in participating districts.

In addition to the strategies described above, a poster will be designed by the graphic designer at PAEC, promoting the Seminars in Emerging Science Series. Posters will be sent to every public K-12 school and all universities throughout the State of Florida to herald the important series and detail information regarding the initial broadcast date and time for each program.

B. Shared Services and Benefits to Target Population

The Florida Education Channel and PAEC Web site afford the advantage of sustainability of program materials. These venues will allow availability of project-related materials, not only during the life of the project, but long afterward. Project design elements also allow for dissemination of selected materials far beyond the geographic boundaries of the service area. Design elements that ensure the sharing of services include: selection of participants from a wide geographic area in the Florida panhandle, building research teams with vertical articulation, inclusion of a forum session for sharing of experiences and resources available and production of video vignettes depicting the field experiences of project participants made available through the project Web site, for others to view. Other benefits to the participants include:

- Immersion in the culture of science through relevant authentic research
- Increased awareness of rich classroom resources in geographic proximity
- Experience in utilizing inquiry learning as a tool to build conceptual knowledge
- Partnership, support and collaboration within a learning community

C. Products Developed

Products developed for dissemination are:

- *Science Collaborations: Immersion, Inquiry, Integration Documentary*: developed for sharing the best practice professional development model. This product will be available in a broadcast format and as DVD.
- *Literacy in Science: Classroom Strategies for Science Teachers for Vocabulary, Comprehension and Writing about Science* – A four-part, video series made available by broadcast on the FEC, web-streamed video and on DVD.
- *Literacy in Science: Classroom Strategies for Science Teachers for Vocabulary, Comprehension and Writing about Science* Online Course: A 15-hour professional development credit, online course for teachers, developed from the four-part video series described above.
- *Teacher as Scientist* Series: Ten, 3-4 minute video vignettes, depicting the field experiences of selected project participants, will be produced and made available on the project Web site via web-streamed video, DVD and Podcast.
- *Seminars in Emerging Science* Video Series: Each scientist presentation (pending permission of the speaker), will be videotaped for broadcast on the Florida Education Channel and to be shown as Web-streamed video from the FEC home page and project Web site. The content will also be available in DVD format. It is important to mention that this content will also be appropriate for students throughout Florida.
- *Seminars in Emerging Science* Poster: A poster will be developed, printed in the FloridaLearns Clearinghouse and disseminated to every school in Florida to describe this lecture series and provide information about date and time of the initial program broadcast.
- *Seminars in Emerging Science*: Six, ten-hour professional development online courses, supported by video and specifically for science teachers, will be developed from speaker content and supported by web-streamed video. Educator participation in courses will be at no charge during the grant period and available at a nominal facilitation cost beyond the grant.
- Research Science Template: An electronic template for gathering information about research scientists willing to work with teachers and/or students will be developed and made available statewide.
- *Sc-iii Project* Web site: Available throughout project
- Teacher's Science Resource Document – This document will be a compilation of information gathered as the electronic template is used.
- Research monograph - Once the project has ended, the best participant writings may be selected and developed into a monograph that will be edited by Dr. Penny J. Gilmer for publication. This would be a value-added project and made available, both in print and as a CD-Rom.

D. Stakeholders

Stakeholders involved in public education will receive information regarding the availability of products developed with grant funding electronically, by means of the PAEC *Horizon Newsletter* and the *Florida Education Channel Newsletter*. Project information and updates will also be posted on both the PAEC homepage and *Sc- iii* Web site. This information will be accessible to anyone with an Internet connection.

E. Science Collaborations: Immersion, Inquiry, Innovation Web site

A Web site for the *Sc-iii Project* will be available to the public within one month of project award notification and accessible at <http://www.paec.org/Sc-iii/>. This Web site will be hosted on the PAEC server, currency will be maintained and have sections for public viewing, with information such as a project summary, project proposal, information regarding project partners, list of participating research scientists, and summer research topics. The site will also contain password-protected areas for electronic discussion boards where participants may communicate electronically with each other, synchronously or asynchronously, as the need arises. Additionally, other discussion boards will be available for electronic communications between scientists, university faculty members, project mentors and/or the participant team. In addition, all grant products, including video and Podcast materials may be accessed at the *Sc-iii Project* Web site.

