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"Shreveport/Bossier SciNet: Using information technology resources to develop interdisciplinary life science education enhancements in Freshman/Sophomore life science and high school curricula"

PI: Dalton Gossett

Lead Institution: LSU – Shreveport

Contents:

Proposal Narrative (without appendices)

002PKSFI-E-07

COVER PAGE FOR POST-KATRINA SUPPORT FUND INITIATIVE PRIMARILY EDUCATION SUBPROGRAM PROPOSALS BOARD OF REGENTS SUPPORT FUND, FY 2006-07

1. Primary Submission Discipline: (check only one) **G Biological Sciences** G Information Technology G Materials Science	(For BoR Use Only) Application Number:
2. Name of Lead Institution of Higher Education: (Include Branch/Campus/Other Components) **Louisiana State University Shreveport (LSUS)**	
3. Address of Lead Institution of Higher Education: (Include Dept/Unit, Street Address/P.O. Box Number, City, State, Zip Code) LSUS **Department of Biological Sciences** One University Place Shreveport, Louisiana 71115	
4. Title of Proposed Project: **Shreveport/Bossier SciNet: Using information technology resources to develop interdisciplinary life science education enhancements in Freshman/Sophomore life science and high school curricula**	

5. Funds Requested:	P-KSFI Year 1:	ESIP (Year 1 only):	Total Project Request:	6. Proposed Duration: (Circle # of Yrs.) 1 2 3 4 **5**
	$133,175	$0	$406,075	

7. Name(s) of Partnering Institution(s):

8. Does This Proposal Contain Confidential or Proprietary Information Which Falls Into a Category Described in R.S. 44:4(16)?
G YES **G NO** (NOTE: If YES, the proposal MUST be appropriately marked.)

By signing and submitting this proposal, the signators are certifying that: (1) the proposed project has not already been funded/is not currently being funded/has not been promised funding; (2) this proposal has been reviewed and approved by an Institutional Screening Committee; and (3) the institution and the proposed project are in compliance with all applicable Federal and State laws and regulations, including, but not limited to, the required certifications set forth in: (a) Grants for Research and Education in Science and Engineering, NSF Grant Proposals Guide (GPG), NSF 03-2, effective 10/1/02, and (b) 45CFR 620, Subpart F (Requirements for a Drug-Free Workplace).

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(Form 1-PKSFI-PES, 1-2007)

PROJECT SUMMARY

Name(s) of Lead Institution (Include Branch/Campus and School or Division) and Partnering Institution(s):
Louisiana State University Shreveport (LSUS)

Address of Lead Institution:
One University Place, Shreveport, Louisiana 71115

Principal Investigators:
Hutchings, N.R., Paul Sisson, John Sigle, Cynthia Sisson, Deborah Shepherd

Title of Project:
Shreveport/Bossier SciNet: Using information technology resources to develop interdisciplinary life science education enhancements in Freshman/Sophomore life science and high school curricula

Abstract (DO NOT EXCEED 250 WORDS):

According to our analysis of life science general education assessment data and discussions with area high school science teachers, the level of science preparedness of incoming college freshmen in Northwest Louisiana has been declining in recent years, and the catastrophic effects of two major hurricanes have further exacerbated this phenomenon state wide. Nevertheless, the number of students entering LSUS with intentions of pursuing degrees related to the life sciences is on the rise. This creates a critical need to develop the appropriate educational culture in Northwest Louisiana that will (1) improve the freshman/sophomore life science experience at LSUS (and therefore improve retention and recruitment), (2) increase the level of college preparedness for students interested in life science careers, and (3) enable high school teachers to make positive changes in their science classrooms by utilizing LSUS faculty-developed teaching modules and resources in their classrooms. These goals will create an interdisciplinary mentoring culture among the high school and PhD educational community as well as among high school and college-level science students. The educational modules and collaborative learning environments that are developed through the **Shreveport/Bossier SciNet** project will focus heavily on experiential and inquiry-based learning using modern computer-based applications to emphasize key knowledge and skills in life science education. As additional technology /biotechnology companies emerge from and migrate into the Shreveport/Bossier area, this initiative will help create a coordinated workforce pipeline to support life science economic development, which will have a major impact on Northwest Louisiana's efforts to increase our knowledge-based economy. (249 words)

(Form 2, rev.2006)

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Goals and Objectives

Overcoming the current obstacles that are preventing high school students and freshman/sophomore college students from being nationally competitive in the life sciences requires making significant changes to the life-science educational culture of Northwest Louisiana. Currently, there is little dissemination of specialized knowledge and tools from the university level to the high school classroom, and little communication of opportunities for collaboration between high school science teachers and college professors. Likewise, there is little communication between high school students and successful life science college students. Thus, Northwest Louisiana currently has two distinct science education cultures: that among the secondary educators and that among the colleges and universities, with only isolated collaboration and information sharing between them.

To create a new, collaboration-rich, interdisciplinary, and communication-rich life science education culture in Northwest Louisiana, the funds requested in this proposal will be used to develop the **Shreveport/Bossier (SB) SciNet**, which will achieve the following goals:

(1) Improve the freshman/sophomore life science experience at LSUS (and therefore improve retention and recruitment) by enabling LSUS faculty and students to develop 'front-of-the-wave' educational learning modules for the 100 and 200-level LSUS life science curricula.

(2) Increase the level of college preparedness for students interested in life science careers by enabling high school students to participate in experiential learning opportunities at LSUS.

(3) Enable high school teachers to use LSUS faculty-developed teaching modules and resources in their classrooms by providing area high school science teachers with training and access to the newly developed coursework modules in the life science curricula.

(4) Create an interdisciplinary mentoring culture among the high school and PhD educational community by having LSUS faculty train the high school teachers in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, and by creating a mentoring culture among high school and college-level science students by enabling successful LSUS science students to participate in the training and mentoring of area high school science students.

(5) Create a coordinated workforce pipeline to support regional life science economic development and life science-based industries by creating a pool of life science high school and college graduates with current knowledge, technical and practical experience, and realistic understanding of the life skills required to succeed in life science careers.

Successful completion of these goals will result in a communication-rich unified life science education culture in Northwest Louisiana with a seamless K-PhD pipeline into the region's life science workforce.

Narrative and Bibliography

A. Project Rationale and Structure

A1. Context for the project

The LSUS Department of Biological Sciences has been monitoring the proficiency level of incoming biology students for two years. In doing so, it has become obvious that significant knowledge deficiencies, technical skills deficiencies, and critical thinking skills deficiencies are becoming more prevalent among incoming freshmen. For example, based on answers to ten general (high school-level) science education questions administered to Biology Principles I and II (BIOS 110/120) students, fewer than 25% of the students can answer half of the questions correctly. Similar incoming freshman deficiencies have also been observed and/or documented in General Chemistry I (CHEM 121), Introduction to Computer Science (CSC 115) and College Algebra (MATH 121). Due to the increasing prevalence of these deficiencies, the number of students scoring D's and F's in introductory courses has increased; this has driven attrition rates to close to 50% in the Department of Biological Sciences. Between the spring semester of 2006 and the fall semester of 2006, 191 out of 390 biology students did not re-enroll at LSUS. Although some of these students may have transferred to other schools or found successful placement into a professional or allied health training program, the vast majority of these students dropped out due to poor performance in their freshman course work. Creating further challenges is the fact that students with low ACT/SAT scores and weak science grades in high school are increasingly choosing to pursue life science-related degrees. These students not only have to overcome the knowledge deficiencies but also must enhance their studying/learning habits to an appropriate baccalaureate level. Thus, to address these issues, the freshman and sophomore-level life science curricula need to include learning modules and create interactive environments that reinforce critical knowledge components and improve problem-solving skills through guided inquiry. Furthermore, LSUS must create mechanisms to increase our participation and influence in area high school science curricula with the expectations of addressing many of these issues before the students enroll in college.

Although the data above might paint an apparently bleak picture of life science education in the Shreveport/Bossier area, there are also many encouraging statistics that demonstrate LSUS's programmatic strengths. Nearly 50% of the LSUS life science graduates that seek admission to medical or dental school are accepted and nearly 80% of the life science graduates that seek graduate school admission are successful. Enrollment in life science degree programs is on the rise, and all departments within the College of Sciences have recently updated their curricula to increase flexibility, concentration options, inquiry-based learning, and scientific problem solving. Nevertheless, without a long-term strategic plan to address the lack of communication and collaboration between area high schools and LSUS, and thereby improving the preparedness of existing and incoming freshman, the curricular updates and experiential learning opportunities might have little long-term significance. To fully reap the benefits of a modernized and elective-rich college curriculum, incoming students must have a quality freshman experience and the necessary skills to achieve success in the sciences.

Until recently, there has been little communication between area high school science teachers and the LSUS College of Sciences. However, in a series of recent meetings with the Caddo Parish Math Science and Technology (MST) coordinator and area high school principals, several innovative and valuable collaborations have emerged (see letters of support). For example, the LSUS College of sciences is now offering an expanded selection of freshman/sophomore level courses in the early afternoon time slots, enabling college-bound high school seniors to take these courses for dual credit. Also, the Departments of Biological Sciences and Chemistry/Physics are considering offering laboratory experiences to support the basic curriculum of high school students enrolled in the Southwood High School Biotechnology Magnet Program. The historical lack of mechanisms to create community, establish meaningful mentoring relationships, and build scientific collaborations that involve faculty, students, and HS teachers has hindered the progress of science education for too long. Likewise, the lack of dissemination vehicles for shared resources, opportunities for participation, and positive outcomes across the K-PhD science education system has prevented the efficient transfer of information to interested parties.

Therefore, to enhance educational resources and build a thriving regional science education community, LSUS College of Sciences has committed to developing **SB SciNet**, which will (a) create and disseminate new learning modules to supplement the high school/LSUS freshman-sophomore curriculum, (b) enhance the knowledge retention and thinking skills among area STEM students, and (c) develop initiatives that will increase communication, training, and collaboration among LSUS and area high school science teachers and students.

A2. Project focus

The project will focus on building new life science educational resources, building a life science community with open lines of communication, and developing means to integrate experiential learning opportunities and coordinated curricula for both high school students and freshman/sophomore college students. **The project focus addresses all three primarily education subprogram initiatives**: (1) converting existing STEM curricula to include interdisciplinary learning modules; (2) introducing programs to encourage a culture of mentoring and support; and (3) developing learning experiences for students, including research experiences, service learning, guided discovery, and independent discovery, to enhance traditional learning activities.

The development of education resources will focus on the introductory courses in the life science curricula, which include Principles of Biology I and II, Introductory Chemistry I and II, Introductory Computer Science, and Mathematics (algebra through calculus), all of which represent STEM subject areas and all of which have AP equivalents in area high schools.

The communication forums and experiential learning opportunities will be focused on creating mentoring environments between college professors and high school teachers, college students and high school students, and college professors and high school students. These activities will include, but are not limited to, developing the SB SciNet interactive webpage, face-to-face

informational meetings, curricular coordination workshops, educational training workshops, collaborative summer research projects, and community development projects related to the application of life sciences throughout the region.

The senior project personnel will not only focus on ensuring project outcomes, financial oversight, and programmatic planning, but also on engaging and motivating faculty, students, and teachers to participate in the various initiatives. All project personnel will focus on increasing the participation of under-represented groups in the life sciences through targeted recruiting of women and minorities for program activities. The various faculty and students who participate will focus on creating tangible outcomes related to the project's milestones and on building genuine and fruitful relationships among the participants.

By facilitating these focus areas, a new life science educational community capable of overcoming the current obstacles in education will develop.

A3. Personnel

The PI and Co-PI's have collective expertise in science education, basic and applied research, leadership, outcomes assessment, project management, program development, and collaborative team building.

All five senior personnel have served as Department Chair or Dean, giving them experience in curriculum reform, budget management, outcomes assessment, personnel and project management, recruiting, outreach, and program building. Additionally, for the past three years, Drs. P. Sisson and Hutchings led the management team of the NSF-funded North Louisiana Partnership for Innovation (NLPI), which facilitated the submission of over 20 technology patents from North Louisiana Universities and which built numerous interdisciplinary collaborative research groups between academia and industry across the State. Drs. Sisson, Sisson, Shepherd, Hutchings, and Sigle have collectively participated in more than twenty grant-funded science education enhancement projects, including NSF-funded, Department of Education-funded, and Board of Regents-funded projects. Dr. Sigle has many years of experience in developing computer-based demonstration and learning modules, which will help guide other faculty members in the development of educational modules. Dr. Shepherd taught math and physics at C.E. Byrd, a high school in Caddo Parish, for 4 years. She will be able to interact well with the high school teachers and their needs. Dr. P. Sisson has many years of experience teaching *Abstract Algebra I & II*, *History of Math*, and a special topics class entitled *The Math Behind High School Math* to education majors, and routinely visits local high school math classrooms and math clubs.

The LSUS administration and College of Sciences Faculty are fully committed to the outcomes of this project. This commitment is illustrated by the level of financial support, faculty input into the project development, and on-going activities related to enhancing life science education within the LSUS College of Sciences.

B. Work Plan

B1. Proposed work

To accomplish the goals and objectives, this project will concentrate on the following five action plans.

1. LSUS faculty and students will develop 'front-of-the-wave' educational learning modules throughout the LSUS life science curricula.

   Strategy and Methods: Faculty within the College of Sciences will be invited to submit proposals to develop a 45-minute guided inquiry-based learning module for one of the courses in the freshman/sophomore life science curricula.

   A number of orientation and training sessions will be held in order to familiarize the LSUS Science faculty with the objectives of this project and the mechanisms and guidelines for their proposals. These sessions will also discuss and describe methods and tools that can be used for the development of these learning modules. Examples of successful modules and assessment strategies will be presented. The methods and tools that could be incorporated include but are not limited to: (a) recording an interactive lecture (audio and computer screen video) using a product such as Camtasia; (b) developing an Excel spreadsheet (with accompanying instructions) that will provide an interactive model or simulation of a quantitative experiment; (c) developing PowerPoint presentation files with animation and multimedia used to model and describe dynamic processes; (d) developing Java applets for a web site which would provide an interactive (and perhaps animated) simulation of a process or procedure; (e) developing Dreamweaver/Flash web pages which would provide an interactive and animated simulation of a process or procedure; and/or (f) developing learning modules using traditional CBT systems such as Macromedia Director, Authorware, Asymetrix Toolbook and Quest.

   The PI and Co-PI's will collectively and objectively review the proposals for content, appropriateness, and relevance to the SB SciNet overarching objectives. Each faculty member that receives funding to develop a module will be required to meet the following expectations: (1) the knowledge content must be an appropriate interdisciplinary extension of a freshman/sophomore course within the life science curricula, (2) the module must contain an objective learning outcomes assessment, (3) the module must be used in at least one section of an LSUS 100 or 200-level course within one year of its completion, (4) the module must be made available to high school teachers via the SB SciNet website, and (5) the faculty member must present their module in a high school teacher training session.

   Significance: Creating interactive, interdisciplinary learning modules that guide students to a deeper understanding and/or application of essential knowledge will improve student experience in the freshman/sophomore STEM courses at LSUS, where there is currently a lack of practical application for much of the course content. Helping students understand how to use guided inquiry to deepen their understanding will transfer into their learning

approaches in other science courses. Furthermore, training high school teachers to use the learning modules and having high school students experience the guided inquiry and content of the modules will enhance the STEM preparedness of these high school students and thereby increase success rates in freshman/sophomore science courses – regardless of where these graduates attend college.

Limitations: Only a fraction of the knowledge content of each of the freshman/sophomore life science curricula courses will be represented in the learning modules that are developed, and aligning the content of the modules with the area high school curricula will require careful planning and grade-level appropriate assessment. To overcome this limitation, faculty members who are developing a module will be expected to consult with an area high school teacher regarding the knowledge content and assessment tools. To increase coverage of the curriculum within the limited number of modules being developed, the module developers will be encouraged to target central themes for the course, but also encouraged to integrate as many applicable interdisciplinary concepts as possible.

Implications on the quality of STEM education: In area high schools and at LSUS, the STEM curriculum has become almost completely 'knowledge content' driven, and few courses currently utilize inquiry-based learning and concept application. To improve the quality of STEM education in the region, students will be exposed to guided-inquiry and knowledge application early in their science training (high school through freshman/sophomore at LSUS), which will significantly enhance the educational strengths within the STEM disciplines.

2. High school students will participate in experiential learning opportunities at LSUS.

Strategy and Methods: LSUS College of Sciences faculty will be allowed to request support to mentor area high school students and/or teachers in basic or applied research related to an interdisciplinary life science project.

Interdisciplinary projects, such as mathematical/computer modeling, bioinformatics, biochemistry, molecular biology, environmental biology, analytical chemistry, and biophysics will be strongly encouraged. Many faculty members within the College of Sciences are currently conducting this type of research. Dr. Gary Boucher (Physics) has developed electronics and robotics to facilitate neurologically disabled patients' ability to communicate and similar technology has been adapted to enable Oil/Gas Operators to communicate between pieces of oil/field equipment; both projects involve integrating physiology and or chemistry with electronic engineering. Drs. Marjan Trutschl and Urska Cvek (Computer Science) have several projects related to data mining, micro-array analysis, and data visualization, all of which incorporate genetics and computer science. Drs. Dalton Gossett and Steven Banks (Biology) are conducting food chain metal accumulation studies, research which integrates chemistry, biochemistry, and ecology. Drs. Brian Salvatore and Elahe Mahdavian (Chemistry) are synthesizing novel compounds to be used as potential chemotherapeutic agents, and one such compound is in

early clinical trials. Although these projects only illustrate a small amount of the interdisciplinary project underway, they provide a reasonable cross-section to show how freshman-sophomore undergrads and high school students can be engaged in meaningful, front-of-the-wave, interdisciplinary research at LSUS.

The LSUS College of Sciences has a long-standing tradition of providing undergraduate students with quality research experiences. As individual research assistants and as collaborative research teams, LSUS undergraduate students have received many local and State-level accolades for their accomplishments. Expanding this rich tradition to include a focus on freshman-sophomore and high school students promises to further enhance the impact and recognition of our students on the regional science community.

The support provided to the faculty mentors will be used to purchase materials and supplies for summer projects and to provide modest compensation for the participants. Each faculty member that receives funding to conduct research with a high school student or teacher will be required to present the results, outcomes, and implications of their work at the LSUS College of Sciences Symposium or other similar public dissemination venue. Summaries of each project will also be posted on the SB SciNet website.

Significance: Experiential learning is most fruitful when both the faculty and students are engaged in the creation or application of new knowledge. Thus, creating opportunities for young scientists to engage in front-of-the-wave research will result in a rich collaborative mentoring environment among faculty, college underclassmen, and high school students. Providing access to basic research experiences has been a successful recruitment and retention tool for college and universities across the nation through programs like the National Science Foundation Research Experiences for Undergrads (REU's) [1]. LSUS will be employing this model on a smaller scale and include high school students in the model.

Limitations: Research experiences often require more than one summer to result in major outcomes. Faculty will be expected to clearly define the focused objective that the undergraduate and high school students will be trying to accomplish to help ensure that the experience is meaningful within the limited time frame. Faculty will also be expected to help these students understand the larger perspective of the project so that they can appreciate how their work contributes to a larger body of knowledge.

Implications on the quality of STEM education: STEM education across secondary and post-secondary education has been increasingly content-rich, but increasingly application- and experiential-learning poor. As stated in the NSF-funded National Academy of Sciences Book entitled *BIO2010: Transforming Undergraduate Education for Future Research Biologists* [2], "Equally important, teaching and learning must be made more active to engage undergraduates, fully prepare them for graduate study, and give them an enduring sense of the power and beauty of creative inquiry." Although other professional education advisory boards such as the National Research Council and Sigma Xi continue to advocate for inquiry-based learning throughout all levels of science education, only

shallow reflections of these initiatives have made their way into Louisiana's curricula. This project outcome creates a mechanism for students to experience inquiry in its most pure form.

3. High school science teachers will be trained in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, including the newly developed coursework modules for the LSUS life science curricula.

   The LSUS College of Sciences will host informational and training workshops for area high school teachers to learn about the content and expectations within the LSUS science curricula and will be encouraged to develop collaborative uses of the LSUS teaching and research lab facilities. Area high school science teachers (from Caddo and surrounding parishes) will be invited to these workshops, and each qualified pre-registrant will be compensated for their participation in the workshop. The topics and attendees of each workshop will vary, but example include: core concepts in the life science curricula, scientific equipment and research capacity at LSUS, and learning to use inquiry-based modules to reinforce essential life science concepts. In each workshop, interactive discussions and collaboration building will be central themes to help LSUS faculty understand and respond to the issues presented by the high school teachers.

   Significance: The historical lack of communication between high school teachers and college science faculty has delayed problem identification and the creation of innovative solutions to our local STEM curricula. A forum that rewards high school teachers for participating in the development of feasible enhancements to the STEM curricula represents a significant advancement in the region's science community.

   Limitations: Not every high school science teacher in the parish will be able to participate in the workshops, and we anticipate only a handful of teachers being able to participate in multiple consecutive workshops. Thus, the PI and Co-PI's will be responsible for identifying topics and issues that need to be addressed by a larger, more representative, audience. These topics will guide the content of regional symposia or other meetings in which larger groups of science teachers can be simultaneously reached. Additionally, the Louisiana Grade Level Expectations (GLE's) for high school science classes are dictated by the Board of Elementary and Secondary Education, which limits the content that can be adapted for use in the high school classrooms. To help reduce the impact of this limitation, LSUS faculty members developing educational modules and participating in curricular discussions will be educated on the Louisiana GLE's according to the guidelines available on the Louisiana Department of Education website: http://www.doe.state.la.us/lde/saa/1819.html.

   Implications on the quality of STEM education: By creating a bi-directional communication conduit for STEM curricula reform and collaborative enhancement, the quality, integrity, and assessment of outcomes related to the STEM curricula at LSUS and area high schools will improve. Having a shorter feedback loop and a more responsive collaborative environment for curriculum development will dramatically enhance the

science education community in the region.

4. Successful LSUS science students will participate in the training and mentoring of area high school science students.

   The LSUS Biology Club, Alpha Epsilon Delta Pre-Health Care Honor Society, Tri-Beta Life Science Honor Society, the Minority Association of Pre-Professional Students, the Chemistry Club, the Math-Physics Club, and/or the Computer Science Club will host activities to engage area high school science students in interactive applications related to life science in the region. The organizations will be invited to submit proposals (through their respective faculty advisors) for projects that will create mentored experiences among members of their organization and a target group of high school students. For example, The Biology Club has historically conducted a field day in the 600 acre nature preserve (C. Beckham Dickson Park) located adjacent to the LSUS campus, where students are introduced to wetlands preservation and biodiversity. With additional funding support, this project would be appropriate to expand into a field day for bus-loads of high school biology students to experience a notable local life science resource and learn directly from an LSUS undergraduate mentor. Interdisciplinary collaborations among the various organizations will be strongly encouraged, and the inclusion of underclassmen in the design and execution of each event will be expected.

   Significance: With appropriate guidance and funding, each of these student organizations can dramatically increase the impact and relevance of the SB SciNet outcomes for high school students, and simultaneously enhance the interdisciplinary student community within the College of Sciences.

   Limitations: The LSUS student organizations do not currently have a means to contact area high schools and draw a large audience to their events. The faculty sponsor of each organization along with the Co-PI's will facilitate mailings and communication with the area schools to help increase participation. In subsequent years of the project, well-planned events will grow via word-of-mouth and by exposure during our educational workshops, so quality program planning will be strongly emphasized during year 1 of the project.

   Implications on the quality of STEM education: high school students will relate more closely to their near peers (college students) than they will to college professors. To foster a genuine and sustainable mentoring environment, the LSUS College of Sciences students must be engaged in the mentoring of high school students. The implications are far reaching, but include the creation of student-led collaborative initiatives that involve both high school and college students throughout the region, resulting in a grass-roots science culture for young scientists.

5. A pool of life science high school and college graduates with current knowledge, technical and practical experience, and realistic understanding of the skills required to succeed in life science careers will be created.

Through the collective outcomes of this project, life science students will exhibit enhancements in knowledge, job-relevant experiences, and career development. Juniors and graduating seniors in biological sciences and biochemistry will complete a survey to assess these outcomes. Both Biology majors and Biochemistry majors take a Major Field Test prior to graduation in their senior year. Students will be expected to answer questions that allow the Co-PI's to assess student-perceived enhancements in knowledge, experience, and career development.

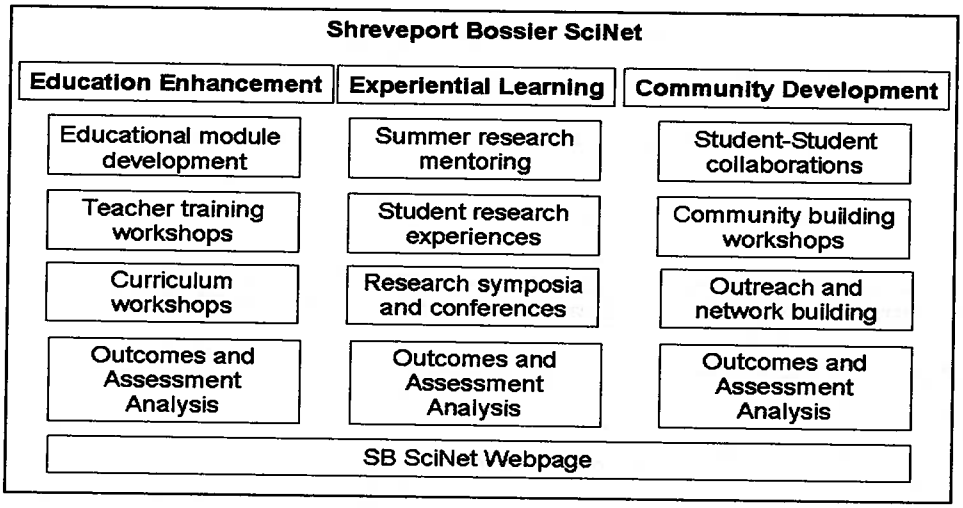
Significance: Student feedback regarding their perceptions of the academic and experiential learning environments at LSUS is critical to the improvement of programs, curricula, and planning. Currently, no mechanism exists for the university to provide departments with this critical feedback.

Limitations: Survey instruments are limited primarily by two factors: the quality of the questions being asked, and the motivation of those surveyed to provide thoughtful responses. Seniors students are often 'one foot out the door' by midway through their senior year, and capturing accurate sentiments can be difficult. To try to overcome this limitation, the Co-PI's will carefully construct the instrument to ask questions to which students can provide meaningful and objective answers, and the students will be informed of the importance of their responses. To provide a point of comparison for the graduating seniors' responses, the same survey will be given to a sampling of underclassmen each year. This will provide critical information about how perspectives shift at different stages in the curriculum.

Implications on the quality of STEM education: Understanding where students are struggling and where students are thriving within our programs will enable the college leadership to adjust initiatives and priorities into areas that might otherwise go unnoticed. Creating an environment in which students feel that they are enabled to be successful is paramount to establishing a culture of excellence within the College of Sciences.

B2. Project structure

The SB SciNet Project is structured into three interconnected activity veins, each corresponding to one of the Primarily Education Subprogram Initiatives.



The PI and Co-PI's will meet at least quarterly to discuss ongoing program activities, plan time lines and establish deadlines, review financial matters, and evaluate outcomes. For each specific activity-type (i.e. Teacher training workshops), at least one Co-PI will assume responsibility for administrative oversight as well as monitoring and reporting to the other Co-PI's on the activity's progress.

Each specific SB SciWeb supported activity will have a faculty member or collaborative group of faculty members that will be responsible for planning and execution of the specific task within the guidelines provided by the Co-PI's. Requisitioning and reporting mechanisms will be standardized for like activities to allow the Co-PI's to effectively manage the program. The specific activities include: faculty developing learning modules, faculty developing experiential research opportunities, teacher training workshops, student-student mentoring projects, outcomes assessment , and website development and maintenance.

B3. Project impact

The impacts of the SB SciNet project are far reaching. First, through enhancements to the freshman-sophomore science courses at LSUS, the student experience within life science curricula at LSUS will be positively impacted. Second, through increased communication among and between high schools and the LSUS College of Sciences, the science community within the region will also be positively impacted. Third, through more concentrated efforts on engaging underclassmen and high school students in experiential learning, the preparedness of areas students for life science-related careers will also be positively impacted.

Over the long term and beyond the term of this proposal, the project outcomes will have lasting

impact on recruitment and retention within the LSUS College of Sciences and on the overall quality of K-12 and undergraduate science education. With a stronger, more collaborative, and significantly enhanced science education environment in the region, a stronger life science workforce and an environment of interdisciplinary innovation will be developed.

With a successful model for creating a new communication-rich life science education culture in this region established, similar models can be expanded throughout the state.

B4. Performance measures and milestones

The following performance measures and milestones will be used to assess project outcomes:

Year 1 performance measures and milestones:

1. Educational Modules: in year 1, at least 6 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula.
2. Student-faculty mentoring: during the summer of year 1, at least 5 high school students will participate in a LSUS faculty-mentored research project.
3. HS Teacher training workshops: in year 1, at least three teacher training workshops will be held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.
4. Student-student mentoring: in year 1, at least two LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 1, all equipment and computers to facilitate computer-based learning modules will be purchased and installed, and the SB SciNet website will be developed.
6. Educational improvement measures:
    a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
    b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
    c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
    d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 2 performance measures and milestones:

1. Educational Modules: in year 2, at least 5 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula.
2. Student-faculty mentoring: during the summer of year 2, at least 10 high school students will participate in a LSUS faculty-mentored research project.
3. Teacher training workshops: in year 2, at least four teacher training workshops will be

held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.

4. Student-student mentoring: in year 2, at least three LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 2, all equipment and computers to facilitate computer-based learning modules will be utilized in LSUS courses, and the SB SciNet website will be expanded to enable module downloads and outcome reporting.
6. Educational improvement measures:
   a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
   b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
   c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
   d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 3 performance measures and milestones:

1. Educational Modules: in year 3, at least 4 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula, and modules created in years 1 and 2 will be revised and updated.
2. Student-faculty mentoring: during the summer of year 3, at least 15 high school students will participate in a LSUS faculty-mentored research project.
3. Teacher training workshops: in year 3, at least four teacher training workshops will be held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.
4. Student-student mentoring: in year 3, at least four LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 3, the SB SciNet website will continue to report outcomes and make learning modules available for download.
6. Educational improvement measures:
   a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
   b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
   c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
   d. Community impact will be measured by monitoring the number of year-to-year high

schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 4 performance measures and milestones:

1. Educational Modules: in year 4, at least 3 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula, and modules created in years 1 and 2 will be revised and updated.
2. Student-faculty mentoring: during the summer of year 4, at least 15 high school students will participate in a LSUS faculty-mentored research project.
3. Teacher training workshops: in year 4, at least two teacher training workshops will be held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.
4. Student-student mentoring: in year 4, at least four LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 4, the SB SciNet website will continue to report outcomes and make learning modules available for download.
6. Educational improvement measures:
   a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
   b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
   c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
   d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 5 performance measures and milestones:

1. Educational Modules: in year 5, all learning modules assessment data will be collected, compiled, and analyzed.
2. Student-faculty mentoring: in year 5, high school students participation in a LSUS faculty-mentored research project and student outcomes related to college performance of previous participants will be assessed.
3. Teacher training workshops: Teacher training workshops: in year 4, two teacher training workshops will be held to and assemble outcomes for reporting.
4. Student-student mentoring: Student-student mentoring: in year 5, at least four LSUS student organization hosted workshops for high school students will be held.
5. Junior/Senior Assessment: infrastructure and equipment: in year 5, the SB SciNet website will continue to report outcomes and make learning modules available for download.
6. Educational improvement measures:

a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

B5. Sustainability and scalability

To sustain the project beyond the period of this award, the PI and Co-PI's will pursue extra mural funding from other sources such as the National Science Foundation, The Shreveport Bossier Community Foundation, Howard Hughes Medical Institute, and the LSUS Foundation. Furthermore, the collaborative environment created by opening communication channels and curricular coordination should be self-sustaining; whereas funding for special projects that emerge from the collaboration will be pursued on a case-by-case basis as appropriate. LSUS will continue to maintain and host the website to facilitate communication and dissemination of resources and opportunities throughout the community.

The program is scalable in both directions. Smaller, more focused collaborations can be developed around special topic area as interest and momentum emerge, and larger regional or statewide programs can also be developed that mimic the collaborative spiral mentoring environments of this project. Likewise, the model can be expanded to include other disciplines beyond the life sciences to reap similar benefits in those subject areas.

The long-range impacts of this project will create a long lasting, self-sustaining life-science education culture throughout northwest Louisiana and perhaps the entire State of Louisiana.

C. Leveraging of resources

To fully enable the SB SciNet Project, LSUS has opted to leverage over $330,000 of institutional resources including but not limited to PI and Co-PI time, College of Science laboratory equipment and space, faculty mentors' time, College of Sciences educational facilities, LSUS computing resources, and the free use of all educational resources developed during this project. Much of these resources are the result of recent grants to acquire research equipment, teaching laboratory equipment, and support students and faculty on educational and research projects. In the 2005-2006 academic year alone, the College of Sciences was awarded over $2,000,000 in extramural funding, a significant portion of which has created the infrastructure necessary to complete the SB SciNet Project. Each department within the College of Sciences is also

leveraging the dedication of our faculty to provide the highest quality science education in the region to further facilitate the outcomes of this project.

The Caddo Parish School District, several area life sciences businesses, the Biomedical Research Foundation of Northwest Louisiana, and philanthropic supporters have recently invested over $500,000 in resources into the development of a biotechnology magnet program at Southwood high school. Through discussions with the area's MST coordinator, Mr. Jeff Roberts, LSUS will collaborate with the students and science teachers at Southwood high school to ensure the laboratory coursework and advanced curriculum are aligned with the SB SciNet program objectives. This cooperative use of existing resources exemplifies the level of regional leveraging going into the SB SciNet project.

D. Bibliography

[1] Research Experiences for Undergraduates (REU). Date: 06/09/05.NSF 04-584. http://www.nsf.gov/pubs/2005/nsf05592/nsf05592.txt

[2] *BIO2010: Transforming Undergraduate Education for Future Research Biologists*. (2003). Committee on Undergraduate Biology Education to Prepare Research Scientists for the 21st Century, National Research Council. ISBN: 0-309-08535-7, 208 pages, 6 x 9,

BOARD OF REGENTS SUPPORT FUND
POST-KATRINA SUPPORT FUND INITIATIVE, FISCAL YEAR 2006-07

BUDGET
PROJECT YEAR (CIRCLE ONE):

[1] 2 3 4 5 COMPOSITE

Title of Proposed Project: **Using information technology resources to develop interdisciplinary life science education enhancement modules in Freshman/Sophomore life science and high school curricula**

Principal Investigator(s): **Hutchings, N.R., Paul Sisson, John Sigle, Cynthia Sisson, Deborah Shepherd**

Institution(s) of Higher Education: **Louisiana State University Shreveport (LSUS)**

I. PROPOSED BUDGET:

	Support Fund Money Requested*	Institutional Match**	Private Sector/ Other Match***
1. Research Salaries	$ 27,800	$ 16,371	$
2. Clerical Salaries	0	864	
3. Subtotal	27,800	17,235	
4. Fringe Benefits (% of A.3)	6,950	4,309	
5. Graduate Asst.	0	0	
6. Student(s)	5,500	5,000	
7. Endowment(s)****	0	0	
8. Subtotal A	$ 40,250	$ 26,544	
B. Supportive Expenses:			
1. Travel	$ 250	$ 250	
2. Supplies	12,000	2,000	
3. Consultants	13,000	0	
4. Rentals	0	0	
5. Printing	0	500	
6. Equipment	60,000	10,000	
7. Other Expenses (Identify)			
a. Teacher stipends	5,000	0	
b. HS students RA's	2,675	0	
8. Subcontracts	0	0	
9. Subtotal B	$ 92,925	$ 12,750	
C. Overhead:			
1. 41% of Sub A	NOT PERMITTED	$ 27,836	$
TOTAL PROJECT COST:	$133,175	$ 67,130	$

*In the budget justification, distinguish between funds requested from the P-KSFI principal program and the Enhancement for Severely Impacted Institutions (ESIP). Note that ESIP funds may be used only at the institutions listed in Appendix A of this RFP.
**Stipulate whether in-cash or in-kind.
***The budget page(s) must reflect and the budget justification page(s) must explain any external funds that are claimed in the proposal. These funds must be itemized and their expenditure accounted for in the same manner as Support Fund money and institutional match. Refer to Section III.G of this RFP for details on matching requirements.
****Matching funds for the endowment of chairs may be requested through P-KSFI, though such requests must adhere to all regulations governing the BoRSF Endowed Chairs for Eminent Scholars Program.

BOARD OF REGENTS SUPPORT FUND

POST-KATRINA SUPPORT FUND INITIATIVE, FISCAL YEAR 2006-07

BUDGET
PROJECT YEAR (CIRCLE ONE):

1 [2] 3 4 5 COMPOSITE

Title of Proposed Project: **Using information technology resources to develop interdisciplinary life science education enhancement modules in Freshman/Sophomore life science and high school curricula**

Principal Investigator(s): **Hutchings, N.R., Paul Sisson, John Sigle, Cynthia Sisson, Deborah Shepherd**

Institution(s) of Higher Education: **Louisiana State University Shreveport (LSUS)**

I. PROPOSED BUDGET:

	Support Fund Money Requested*	Institutional Match**	Private Sector/ Other Match***
1. Research Salaries	$ 32,300	$ 16,371	$
2. Clerical Salaries	0	864	
3. Subtotal	32,300	17,235	
4. Fringe Benefits (% of A.3)	8,075	4,309	
5. Graduate Asst.	0	0	
6. Student(s)	10,000	5,000	
7. Endowment(s)****	0	0	
8. Subtotal A	$ 50,375	$ 26,544	
B. Supportive Expenses:			
1. Travel	$ 250	$ 250	
2. Supplies	15,000	2,000	
3. Consultants	3,000	0	
4. Rentals	0	0	
5. Printing	0	500	
6. Equipment	0	10,000	
7. Other Expenses (Identify)			
a. Teacher stipends	5,000	0	
b. HS students RA's	5,350	0	
8. Subcontracts	0	0	
9. Subtotal B	$ 28,600	$ 12,750	
C. Overhead:			
1. 41% of Sub A	NOT PERMITTED	$ 31,537	$
TOTAL PROJECT COST:	$ 78,975	$ 70,831	$

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****Matching funds for the endowment of chairs may be requested through P-KSFI, though such requests must adhere to all regulations governing the BoRSF Endowed Chairs for Eminent Scholars Program.

BOARD OF REGENTS SUPPORT FUND
POST-KATRINA SUPPORT FUND INITIATIVE, FISCAL YEAR 2006-07

BUDGET
PROJECT YEAR (CIRCLE ONE):

1 2 [3] 4 5 COMPOSITE

Title of Proposed Project: **Using information technology resources to develop interdisciplinary life science education enhancement modules in Freshman/Sophomore life science and high school curricula**

Principal Investigator(s): **Hutchings, N.R., Paul Sisson, John Sigle, Cynthia Sisson, Deborah Shepherd**

Institution(s) of Higher Education: **Louisiana State University Shreveport (LSUS)**

I. PROPOSED BUDGET:

	Support Fund Money Requested*	Institutional Match**	Private Sector/ Other Match***
1. Research Salaries	$ 35,300	$ 16,371	$
2. Clerical Salaries	0	864	
3. Subtotal	35,300	17,235	
4. Fringe Benefits (% of A.3)	8,825	4,309	
5. Graduate Asst.	0	0	
6. Student(s)	9,500	5,000	
7. Endowment(s)****	0	0	
8. Subtotal A	$ 53,625	$ 26,544	
B. Supportive Expenses:			
1. Travel	$ 250	$ 250	
2. Supplies	17,500	2,000	
3. Consultants	3,000	0	
4. Rentals	0	0	
5. Printing	0	500	
6. Equipment	0	10,000	
7. Other Expenses (Identify)			
a. Teacher stipends	5,000	0	
b. HS students RA's	8,025	0	
8. Subcontracts	0	0	
9. Subtotal B	$ 33,775	$ 12,750	
C. Overhead:			
1. 41% of Sub-	NOT PERMITTED	$ 32,869	$
TOTAL PROJECT COST:	$ 87,400	$ 72,163	$

*In the budget justification, distinguish between funds requested from the P-KSFI principal program and the Enhancement for Severely Impacted Institutions (ESIP). Note that ESIP funds may be used only at the institutions listed in Appendix A of this RFP.
**Stipulate whether in-cash or in-kind.
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****Matching funds for the endowment of chairs may be requested through P-KSFI, though such requests must adhere to all regulations governing the BoRSF Endowed Chairs for Eminent Scholars Program.

BOARD OF REGENTS SUPPORT FUND
POST-KATRINA SUPPORT FUND INITIATIVE, FISCAL YEAR 2006-07

BUDGET
PROJECT YEAR (CIRCLE ONE):

1 2 3 [4] 5 COMPOSITE

Title of Proposed Project: **Using information technology resources to develop interdisciplinary life science education enhancement modules in Freshman/Sophomore life science and high school curricula**

Principal Investigator(s): **Hutchings, N.R., Paul Sisson, John Sigle, Cynthia Sisson, Deborah Shepherd**

Institution(s) of Higher Education: **Louisiana State University Shreveport (LSUS)**

I. PROPOSED BUDGET:

	Support Fund Money Requested*	Institutional Match**	Private Sector/ Other Match***
1. Research Salaries	$ 27,300	$ 16,371	$
2. Clerical Salaries	0	864	
3. Subtotal	27,300	17,235	
4. Fringe Benefits (% of A.3)	6,825	4,309	
5. Graduate Asst.	0	0	
6. Student(s)	9,000	5,000	
7. Endowment(s)****	0	0	
8. Subtotal A	$ 43,125	$ 26,544	
B. Supportive Expenses:			
1. Travel	$ 250	$ 250	
2. Supplies	15,500	2,000	
3. Consultants	2,000	0	
4. Rentals	0	0	
5. Printing	0	500	
6. Equipment	0	10,000	
7. Other Expenses (Identify)			
a. Teacher stipends	5,000	0	
b. HS students RA's	8,025	0	
8. Subcontracts	0	0	
9. Subtotal B	$ 30,775	$ 12,750	
C. Overhead:			
1. 41% of Sub-	NOT PERMITTED	$ 28,564	$
TOTAL PROJECT COST:	$ 73,900	$ 67,858	$

*In the budget justification, distinguish between funds requested from the P-KSFI principal program and the Enhancement for Severely Impacted Institutions (ESIP). Note that ESIP funds may be used only at the institutions listed in Appendix A of this RFP.
**Stipulate whether in-cash or in-kind.
***The budget page(s) must reflect and the budget justification page(s) must explain any external funds that are claimed in the proposal. These funds must be itemized and their expenditure accounted for in the same manner as Support Fund money and institutional match. Refer to Section III.G of this RFP for details on matching requirements.
****Matching funds for the endowment of chairs may be requested through P-KSFI, though such requests must adhere to all regulations governing the BoRSF Endowed Chairs for Eminent Scholars Program.

BOARD OF REGENTS SUPPORT FUND
POST-KATRINA SUPPORT FUND INITIATIVE, FISCAL YEAR 2006-07

BUDGET
PROJECT YEAR (CIRCLE ONE):

1 2 3 4 [5] COMPOSITE

Title of Proposed Project: **Using information technology resources to develop interdisciplinary life science education enhancement modules in Freshman/Sophomore life science and high school curricula**

Principal Investigator(s): **Hutchings, N.R., Paul Sisson, John Sigle, Cynthia Sisson, Deborah Shepherd**

Institution(s) of Higher Education: **Louisiana State University Shreveport (LSUS)**

I. PROPOSED BUDGET:

	Support Fund Money Requested*	Institutional Match**	Private Sector/ Other Match***
1. Research Salaries	$ 14,300	$ 16,371	$
2. Clerical Salaries	0	864	
3. Subtotal	14,300	17,235	
4. Fringe Benefits (% of A.3)	3,575	4,309	
5. Graduate Asst.	0	0	
6. Student(s)	2,500	2,000	
7. Endowment(s)****	0	0	
8. Subtotal A	$ 20,375	$ 23,544	
B. Supportive Expenses:			
1. Travel	$ 250	$ 250	
2. Supplies	6,000	2,000	
3. Consultants	1,000	0	
4. Rentals	0	0	
5. Printing	0	500	
6. Equipment	0	10,000	
7. Other Expenses (Identify)			
a. Teacher stipends	5,000	0	
b.	0	0	
8. Subcontracts	0	0	
9. Subtotal B	$ 12,250	$ 12,750	
C. Overhead:			
1. 41% of Sub-	NOT PERMITTED	$ 18,007	$
TOTAL PROJECT COST:	$ 32,625	$ 54,301	$

*In the budget justification, distinguish between funds requested from the P-KSFI principal program and the Enhancement for Severely Impacted Institutions (ESIP). Note that ESIP funds may be used only at the institutions listed in Appendix A of this RFP.
**Stipulate whether in-cash or in-kind.
***The budget page(s) must reflect and the budget justification page(s) must explain any external funds that are claimed in the proposal. These funds must be itemized and their expenditure accounted for in the same manner as Support Fund money and institutional match. Refer to Section III.G of this RFP for details on matching requirements.
****Matching funds for the endowment of chairs may be requested through P-KSFI, though such requests must adhere to all regulations governing the BoRSF Endowed Chairs for Eminent Scholars Program.

BOARD OF REGENTS SUPPORT FUND
POST-KATRINA SUPPORT FUND INITIATIVE, FISCAL YEAR 2006-07

BUDGET
PROJECT YEAR (CIRCLE ONE):

1 2 3 4 5 COMPOSITE

Title of Proposed Project: **Using information technology resources to develop interdisciplinary life science education enhancement modules in Freshman/Sophomore life science and high school curricula**

Principal Investigator(s): **Hutchings, N.R., Paul Sisson, John Sigle, Cynthia Sisson, Deborah Shepherd**

Institution(s) of Higher Education: **Louisiana State University Shreveport (LSUS)**

I. PROPOSED BUDGET:

	Support Fund Money Requested*	Institutional Match**	Private Sector/ Other Match***
1. Research Salaries	$137,000	$ 81,859	$
2. Clerical Salaries	0	4,320	
3. Subtotal	137,000	86,179	
4. Fringe Benefits (% of A.3)	34,250	21,544	
5. Graduate Asst.	0	0	
6. Student(s)	34,000	22,000	
7. Endowment(s)****	0	0	
8. Subtotal A	$205,250	$129,723	
B. Supportive Expenses:			
1. Travel	$ 1,250	$ 1,250	
2. Supplies	66,000	10,000	
3. Consultants	22,000	0	
4. Rentals	0	0	
5. Printing	0	2,500	
6. Equipment	60,000	50,000	
7. Other Expenses (Identify)			
a. Teacher stipends	25,000	0	
b. HS students RA's	24,075	0	
8. Subcontracts	0	0	
9. Subtotal B	$198,325	$ 63,750	
C. Overhead:			
1. 41% of Sub-	NOT PERMITTED	$137,338	$
TOTAL PROJECT COST:	$406,075	$332,283 (82%)	$

*In the budget justification, distinguish between funds requested from the P-KSFI principal program and the Enhancement for Severely Impacted Institutions (ESIP). Note that ESIP funds may be used only at the institutions listed in Appendix A of this RFP.
**Stipulate whether in-cash or in-kind.
***The budget page(s) must reflect and the budget justification page(s) must explain any external funds that are claimed in the proposal. These funds must be itemized and their expenditure accounted for in the same manner as Support Fund money and institutional match. Refer to Section III.G of this RFP for details on matching requirements.
****Matching funds for the endowment of chairs may be requested through P-KSFI, though such requests must adhere to all regulations governing the BoRSF Endowed Chairs for Eminent Scholars Program.

Budget justification

1. Research Salaries

Budget Year	Requested	In-kind match	% matching
Composite	$137,000	$81,859	60%
Year 1	$27,800	$16,371	59%
Year 2	$32,300	$16,371	51%
Year 3	$35,300	$16,371	46%
Year 4	$27,300	$16,371	60%
Year 5	$14,300	$16,371	114%

Research salaries are requested to support faculty conducting essential activities within the scope of the SB SciNet Project objectives including: developing teaching modules and assessments, mentoring summer research students, and conducting high school teacher training workshops. Each of these duties is above and beyond their normal responsibilities and all extra-compensation for faculty will strictly BORSF and State of Louisiana guidelines. The total five year request for research salaries is $137,000, and the total five year in-kind match from LSUS is $81,859.

In year 1, up to six LSUS faculty will be paid up to $2,000 each to develop an educational module for one of the freshman/sophomore life sciences courses ($12,000). Since each faculty member must also develop appropriate high school and college assessments and train high school teachers to utilize the modules in their classrooms, rewarding the faculty for these duties is essential to the project outcomes. In addition to the learning modules, up to five LSUS faculty will be paid $1000 each to mentor high school and or LSUS freshman/sophomore summer research students ($5,000). Also in year 1, LSUS will sponsor three teacher training workshops, an essential component to building a stronger STEM educational community. Up to nine faculty members will each be paid $500 to conduct these workshops ($4,500). The responsibility of fiscal oversight, project planning, scheduling of workshops, and evaluation of projects will be the Principal Investigator's responsibilities. As compensation for these responsibilities, the PI will be paid the equivalent of one months salary ($6,300). The total year 1 funds requested are $27,800, and LSUS will contribute 5% of each PI/Co-PI's time during the academic year to the project as in-kind support. Composite nine-month salaries for the five Co-PI's is $327,436, 5% of which equates to a $16,371 in-kind match for each year of the project.

Each essential activity recurs annually within the SB SciNet Project.

In year two, five additional educational modules will be developed ($10,000), ten faculty will serve as summer research mentors ($10,000), twelve faculty will be facilitating four high school teacher training workshops ($6,000), the PI will continue project management and oversight ($6,300), and the PI and Co-PI's will contribute 5% of their academic year time to the project as in-kind support. Thus, the total year 2 funds requested are $32,300, and the LSUS in-kind match for year two is $16,371.

In year three, four additional educational modules will be developed ($8,000), fifteen faculty will serve as summer research mentors ($15,000), twelve faculty will be facilitating four high school teacher training workshops ($6,000), the PI will continue project management and oversight ($6,300), and the PI and Co-PI's will contribute 5% of their academic year time to the project as

in-kind support. Thus, the total year 3 funds requested are $35,300, and the LSUS in-kind match for year three is $16,371.

In year four, three additional educational modules will be developed ($6,000), fifteen faculty will serve as summer research mentors ($15,000), six faculty will be facilitating two high school teacher training workshops ($3,000), the PI will continue project management and oversight ($6,300), and the PI and Co-PI's will contribute 5% of their academic year time to the project as in-kind support. Thus, the total year 4 funds requested are $27,300, and the LSUS in-kind match for year four is $16,371.

In year five, no new educational modules will be developed ($0), but a committee of five faculty members will be compensated $1,000 each to compile and analyze the 5-year outcomes of the module assessments ($5,000). Additionally, due to the start/stop date of the funding, no faculty will be compensated from this project as summer research mentors in year five($0). However, six faculty will be facilitating two high school teacher training workshops ($3,000), the PI will continue project management and oversight ($6,300), and the PI and Co-PI's will contribute 5% of their academic year time to the project as in-kind support. Thus, the total year 5 funds requested are $14,300, and the LSUS in-kind match for year five is $16,371.

2. Clerical Salaries

Budget Year	Requested	In-kind match	% matching
Composite	$0	$4,320	na
Year 1	$0	$864	na
Year 2	$0	$864	na
Year 3	$0	$864	na
Year 4	$0	$864	na
Year 5	$0	$864	na

The Department of Biological Sciences will contribute 5% of their Administrative Assistant's time as an in-kind contribution ($864/year in-kind match). The administrative assistant will facilitate communications, record keeping, and requisitioning related to the project activities.

3. Subtotal

Budget Year	Requested	In-kind match	% matching
Composite	$137,000	$86,175	63%
Year 1	$27,800	$17,235	62%
Year 2	$32,300	$17,235	53%
Year 3	$35,300	$17,235	49%
Year 4	$27,300	$17,235	63%
Year 5	$14,300	$17,235	121%

Amounts were calculated as the sum of lines 1 and 2 for each column, respectively.

4. Fringe Benefits

Budget Year	Requested	In-kind match	% matching
Composite	$34,250	$21,544	63%
Year 1	$6,950	$4,309	62%
Year 2	$8,075	$4,309	53%
Year 3	$8,825	$4,309	49%
Year 4	$6,825	$4,309	63%
Year 5	$3,575	$4,309	121%

Fringe benefits at LSUS are calculated as 25% of salaries and wages. For each budget year, the salaries requested were multiplied by 0.25 to calculate the fringe benefit requests and in-kind matching, respectively.

5. Graduate Assistants $0 requested $0 in-kind match

6. Student(s)

Budget Year	Requested	In-kind match	% matching
Composite	$34,000	$22,000	65%
Year 1	$5,500	$5,000	91%
Year 2	$7,500	$5,000	67%
Year 3	$9,500	$5,000	53%
Year 4	$9,000	$5,000	55%
Year 5	$2,500	$2,000	80%

Students will be utilized to facilitate the development of the educational modules and the interdisciplinary research projects supported by the SB SciNet Project. Faculty-student mentoring is a critical aspect to the project's overarching objectives, and the student's labor contribution to each activity will improve the efficiency, scope, and quality of each activity. Therefore, $22,000 in support funds are requested over five years to compensate 44 undergraduate assistants $500 each to support the faculty members funded to complete a specific activity.

In year 1, each of the six faculty members that are funded to develop an educational module can request funds to pay an undergraduate research assistant up to $500 to help develop the necessary graphics, texts, computer programming, and assessment development ($3,000). Each of the five faculty summer research mentors will be allowed to request up to $500 to pay for an undergraduate (freshman/sophomore) research assistant ($2,500). LSUS will sponsor up to ten other undergraduate research assistants as in-kind match from other BORSF grants and/or College of Sciences' funds ($5,000).

In year 2, each of the five faculty members that are funded to develop an educational module can request funds to pay an undergraduate research assistant up to $500 to help develop the necessary

graphics, texts, computer programming, and assessment development ($2,500). Each of the ten faculty summer research mentors will be allowed to request up to $500 to pay for an undergraduate (freshman/sophomore) research assistant ($5,000). LSUS will sponsor up to ten other undergraduate research assistants as in-kind match from other BORSF grants and/or College of Sciences' funds ($5,000).

In year 3, each of the four faculty members that are funded to develop an educational module can request funds to pay an undergraduate research assistant up to $500 to help develop the necessary graphics, texts, computer programming, and assessment development ($2,000). Each of the fifteen faculty summer research mentors will be allowed to request up to $500 to pay for an undergraduate (freshman/sophomore) research assistant ($7,500). LSUS will sponsor up to ten other undergraduate research assistants as in-kind match from other BORSF grants and/or College of Sciences' funds ($5,000).

In year 4, each of the three faculty members that are funded to develop an educational module can request funds to pay an undergraduate research assistant up to $500 to help develop the necessary graphics, texts, computer programming, and assessment development ($1,500). Each of the fifteen faculty summer research mentors will be allowed to request up to $500 to pay for an undergraduate (freshman/sophomore) research assistant ($7,500). LSUS will sponsor up to ten other undergraduate research assistants as in-kind match from other BORSF grants and/or College of Sciences' funds ($5,000).

In year 5, five students will be hired to help data entry and collection regarding the educational module outcomes assessment ($2,500). LSUS will sponsor up to four other undergraduate research assistants as in-kind match from other BORSF grants and/or College of Sciences' funds ($2,000).

7. Endowment(s) $0 requested $0 in-kind match

8. Subtotal A

Budget Year	Requested	In-kind match	% matching
Composite	$205,250	$129,720	63%
Year 1	$40,250	$26,544	66%
Year 2	$47,875	$26,544	55%
Year 3	$53,625	$26,544	50%
Year 4	$43,125	$26,544	62%
Year 5	$20,375	$23,544	115%

Calculated as the sum of Part A, lines 1-7 for each column, respectively

B. Supporting Expenses

1. Travel

Budget Year	Requested	In-kind match	% matching
Composite	$1,250	$1,250	100%
Year 1	$250	$250	100%
Year 2	$250	$250	100%
Year 3	$250	$250	100%
Year 4	$250	$250	100%
Year 5	$250	$250	100%

Travel funds are requested to enable the PI and/or one of the Co-PI's to present the project outcomes at the Louisiana Academy of Sciences meeting or equivalent regional conference each year. The funds requested would pay for one night in a hotel at $90 per night and up to 390 miles of round trip travel at $0.41 per mile. LSUS will match these funds dollar for dollar as in-kind matching funds for one night in a hotel and up to 390 miles of round-trip travel at $0.41 per mile. Dissemination of the projects is essential to the long-term impact and state-wide implications of the project outcomes.

2. Supplies

Budget Year	Requested	In-kind match	% matching
Composite	$66,000	$10,000	15%
Year 1	$12,000	$2,000	17%
Year 2	$15,000	$2,000	13%
Year 3	$17,500	$2,000	11%
Year 4	$15,500	$2,000	13%
Year 5	$6,000	$2,000	33%

Supply funds are requested to support the following expenditures. Each faculty member developing educational modules can request up to $1000 for supplies related to the development of the module. These supplies include but are not limited to software, literature, graphic art, media editing, and lab supplies related to the cost of demonstrations for the module. Each of the summer research mentors will receive up to $500 in supply funds to purchase the necessary laboratory supplies and reagents for the student's project. To purchase printed materials and meeting supplies for the teacher training workshops, $500 is requested for each of the 15 workshops planned over the five year award period. For the seventeen LSUS student organization outreach events, we are requesting $1,000 to buy laboratory demonstration supplies, pay for materials related to the event, to pay honoraria for guest lecturers, and/or to pay for light refreshments during the event. The College of Sciences has committed to provide up to $2,000 of general supplies to the various project as in-kind match per year. In year 5, there will be no new teaching modules developed, but $1000 in supplies costs are anticipated related to the assessment of outcomes, data analysis, and dissemination of results.

The following table summarizes our anticipated supply expenditures based on the number of events

planned in each focus area per year:

	Educational Modules	Supply cost per module	Total Cost of modules	Research mentor	Supply cost per mentor	Total cost of mentors	Teacher workshops	Supply cost per workshop	Total cost of workshops	Student-Student mentoring	Supply cost per event	Total Cost of student mentoring	Total supply costs
Comp.	**19**	**$1,000**	**$19,000**	**45**	**$500**	**$22,500**	**15**	**$500**	**$7,500**	**17**	**$1,000**	**$17,000**	**$66,000**
Year 1	6	$1,000	$6,000	5	$500	$2,500	3	$500	$1,500	2	$1,000	$2,000	$12,000
Year 2	5	$1,000	$5,000	10	$500	$5,000	4	$500	$2,000	3	$1,000	$3,000	$15,000
Year 3	4	$1,000	$4,000	15	$500	$7,500	4	$500	$2,000	4	$1,000	$4,000	$17,500
Year 4	3	$1,000	$3,000	15	$500	$7,500	2	$500	$1,000	4	$1,000	$4,000	$15,500
Year 5	1*	$1,000	$1,000	0	$500	$0	2	$500	$1,000	4	$1,000	$4,000	$6,000

3. Consultants $22,000 requested $0 in-kind match

In year 1, $10,000 is requested to pay a professional web page developer to design the SB SciNet web page. The SB SciNet web page is an essential communication and dissemination vehicle for the project, and thus, the quality of the web page needs to be professional-grade. For twelve of the planned teacher training workshops, a consultant will be hired at $1000 per meeting ($12,000) to present and/or facilitate discussion of special emphasis topics, such as curriculum development and integration, outcomes assessment, or module development. These training sessions represent a major team building and community building event, and having an experienced consultant present the material is essential to validate the importance and credibility of the workshop experiences.

4. Rentals: $0 requested $0 in-kind match

5. Printing $0 requested $2,500 in-kind match

LSUS will provide up to $500 per year for printing and PR-related expenses

6. Equipment

Budget Year	Requested	In-kind match	% matching
Composite	$60,000	$50,000	83%
Year 1	$0	$10,000	na
Year 2	$0	$10,000	na
Year 3	$0	$10,000	na
Year 4	$0	$10,000	na
Year 5	$0	$10,000	na

In year 1, 30 HP (portable computer) Tablets will be purchased to equip two classrooms with 15 workstations each. A set of 15 tablets with one teacher's control workstation costs $30,000. The portable computers are an essential tool to enable electronic learning modules to be utilized in the classroom. Most of our College of Sciences Classrooms only have a single computer/project system, which limits student use of digital tools during class time. With the portable HP tablet system, an instructor can schedule time to utilize one of the sets of tablets in order to employ the digital learning modules and interactive lessons in their classrooms. In subsequent years of the project, no additional equipment is requested. In each of the five project years, the College of Sciences will commit up to $10,000 of equipment as in-kind contribution. This equipment includes the smart classroom usage, lab equipment to develop modules, lab space utilization, time on shared research equipment, and general equipment such as printers and copiers.

7. Other Expenses (Identify)

a. High School Teacher Stipends $25,000 requested, $0 in-kind contribution

In each budget year, up to 20 high school teachers who pre-register for the teacher training workshops will compensated up to $250 for their participation in a workshop. Providing an incentive and reward for the teacher who go above and beyond their normal responsibilities to participate in this project is essential to building morale and expecting quality outcomes from the project.

b. High School Student Stipends $24,075 requested, $0 in-kind contribution

Each high school student who is accepted into a summer research project will be compensated $5.35 per hour to work for 25 hours per week for a four-week project (100 hours/$535). Over the five year project, we anticipate funding 45 high school students to participate in summer research experiences, for a total request of $24,075.

8. Subcontracts $0 $0

9. Subtotal B $0 $0 in-kind

Budget Year	Requested	In-kind match	% matching
Composite	$198,325	$63,750	
Year 1	$92,925	$12,750	na
Year 2	$28,600	$12,750	na
Year 3	$33,775	$12,750	na
Year 4	$30,775	$12,750	na
Year 5	$12,250	$12,750	na

10. Indirect costs

LSUS will contribute 41% of salaries and wages as in-kind match, which equals a $137,338 in-kind contribution over the 5-year award period.

Budget Year	Total SW&F	In-kind match	% matching
Composite	$334,970	$137,388	41%
Year 1	$66,794	$27,836	41%
Year 2	$76,919	$31,537	41%
Year 3	$80,169	$32,869	41%
Year 4	$69,669	$28,564	41%
Year 5	$43,919	$18,007	41%

Total project costs

Budget Year	Requested	In-kind match	% matching
Composite	**$406,075**	**$332,283**	**82%**
Year 1	$133,175	$67,130	50%
Year 2	$78,975	$70,831	90%
Year 3	$87,400	$72,163	83%
Year 4	$73,900	$67,858	92%
Year 5	$32,625	$54,301	166%

Calculated at the sum of lines A8, B9, and C1. Total project costs requested from BORSF equal $406,075 and total LSUS in-kind matching contribution equals $332,283 (82%).

BIOGRAPHICAL SKETCH			
Provide the following information for the key personnel and consultants and collaborators. Begin with the principal investigator/program director. Photocopy this page for each person.			
Name Dr. Nathan R. Hutchings		Position Title Chair, Assoc Professor of Biological Sciences	
EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training.			
INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
University of Illinois, Urbana, Illinois	Post Doctoral	2002	Cell and Structural Biology
University of Iowa, Iowa City, Iowa	Ph.D.	2001	Genetics
Eureka College, Eureka, Illinois	B.S.	1996	Biology, Chemistry

RESEARCH AND PROFESSIONAL EXPERIENCE:

8/2005 – Present	Chair and Associate Professor, Department of Biological Sciences Executive Director, LEAD-LSUS: Leadership Education and Development Program Louisiana State University Shreveport
7/2002 – 8/2005	Assistant Professor of Biology, Graduate Faculty, and IDEAS Program Co-director Northwestern State University of Louisiana
7/2001 – 6/2002	Post-doctoral research, University of Illinois
8/1996 – 6/2001	Ph.D. in Genetics, University of Iowa Thesis: Trypanin is novel microtubule-associated protein in the African trypanosome, *Trypanosoma brucei*
8/1992 – 5/1996	B.S. in Biology and Chemistry, Eureka College, Eureka, Illinois
2/1994 – 6/1994	Macquarie University, Sydney, Australia. Study Abroad

RESEARCH PUBLICATIONS

1. Ludu, Andrei and Nathan R. Hutchings (2007). "Internally Generated Nonlinear Waves in Filament Bundles". Andrei Ludu and Nathan R. Hutchings. *Mathematics and Computers in Simulations.*74:179-189.
2. Hutchings, Nathan R., Kent L. Hill, and John E. Donelson. (2002). "TLTF is a cytoskeletal linker protein involved in flagellar attachment and cell motility in African trypanosomes". *Journal of Cell Biology* 156: 867-877.
3. Hill, Kent L., Nathan R. Hutchings, Paul M. Grandgenett, and John E. Donelson. (2000). "T-Lymphocyte Triggering Factor of African trypanosomes is associated with the flagellar fraction of the cytoskeleton and represents a new family of proteins that are present in several divergent Eukaryotes". *Journal of Biological Chemistry.* 275(5): 39369-39378.
4. Hill, Kent L., Nathan R. Hutchings, and John E. Donelson (1999). "A novel protein targeting domain directs proteins to the anterior cytoplasmic face of the flagellar pocket in African trypanosome". *Journal of Cell Science.* 112 : 3091-3101.

Editorships, Books, Book chapters, and Other texts:

1. Ludu, Andrei, Darrell R. Fry, and Nathan Hutchings, Co-editors. (2005). *Proceedings of the International Symposium on Interdisciplinary Science.* AIP Publishing. ISBN 073540240X. January, 2005.
2. Hutchings, Nathan R., and Andrei Ludu. (2004). "Flagellar dynamics in African trypanosomes". *Proceedings of the International Symposium on Interdisciplinary Science.* AIP Publishing. ISBN 073540240X
3. Westergard, Anna and Nathan R. Hutchings (2004). "Divalent Cation Control of Trypanosome Flagellar Motility". *Proceedings of the International Symposium on Interdisciplinary Science.* AIP Publishing. ISBN 073540240X

4. Ludu, Andrei and Nathan R. Hutchings. (2004). "Internal mKdV waves in flagellum beats, 1+2 dimensional coupling of waves and analysis of coherence of molecular motors". *Proceedings of the International Symposium on Interdisciplinary Science.* AIP Publishing. ISBN 073540240X
5. "A model for African trypanosome cell motility and quantitative description of flagellar dynamics". arXiv: q-bio.QM/0406033. 16 Jun 2004.
6. Ludu, Andrei and Nathan R. Hutchings (2004)."Geometry of Axoneme-like Filament Bundles: Bending and Twisting". arXiv:q-bio.CB/0411026 v1 11 Nov 2004
7. Fry, Darrell, Nathan Hutchings, and Andrei Ludu. (2003). "Dynamics of Immobilized Flagella". ArXiv:physics/0309026v1. September 3, 2003.

FUNDED GRANTS AND CONTRACTS:

1. Co-PI. Spring 2006. "Enhancing Physiology Instruction Through Computer Interfaced, Equipment at LSUS". Louisiana Board of Regents Support Fund. Funding amount: $22,097.
2. Co-PI. Spring 2006. "Enhancement of the Applied Biotechnology Course at LSUS". Louisiana Board of Regents Support Fund. Funding amount: $33,000.
3. Co-PI. Spring 2006. "Computer Interfaced Equipment and its Role in Freshman Biology Laboratory Instruction at LSUS". Louisiana Board of Regents Support Fund. Funding amount: $29,745.
4. Co-PI. Spring 2005. "ISIS Symposium Proceedings". Northwestern State University Enrichment Fund, Professional development subprogram. Funding amount: $2400
5. PI. Spring 2004. "NLPI mini-grant, provisional patent application for cell separation". North Louisiana Partnership for innovation mini-grant subprogram. Funding Amount: $5000
6. Co-PI. Spring 2004. "North Louisiana Partnership for Innovation". National Science Foundation Partnership for Innovation. Funding Amount: $600,000
7. PI. Fall 2003. "Mechanisms of African Trypanosome Motility". Nathan R. Hutchings and Andrei Ludu. Louisiana State Board of Regents, Research competitiveness subprogram proposal. Funding Amount: $74,457
8. PI. Spring 2003. "RNA interference analysis of the Trypanosome PF20 gene". Nathan R. Hutchings. Northwestern State University CURIA program. Funding amount: $2000
9. Co-PI. Spring 2003. ISIS Symposium Co-organizer. The 1st Annual IDEAS Symposium on Interdisciplinary Science in Scheduled for October 6-10, 2004 at NSU. Funding Amount: $25,000
10. PI. Fall 2002. "Comparative analysis of trypanosome growth rates in fetal bovine serum and newborn bovine serum". Nathan R. Hutchings. Northwestern State University CURIA program. Funding Amount: $2000
11. Co-PI. Fall 2002. "CERT Biomedical informatics Initiative Planning Grant". NSF EPSCoR Planning Grants for Major Initiatives RFP 2002-13. Funding Amount: $49,642

BIOGRAPHICAL SKETCH			
Provide the following information for the key personnel and consultants and collaborators. Begin with the principal investigator/program director. Photocopy this page for each person.			
Name Paul D. Sisson		Position Title Dean and Professor of Mathematics	
EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training.			
INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
New Mexico Tech, Socorro NM	B.S.	1987	Mathematics and Physics
University of South Carolina, Columbia SC	Ph.D.	1993	Mathematics

PROFESSIONAL EXPERIENCE:

1993 – 1998 Assistant Professor of Mathematics, Louisiana State University in Shreveport, Shreveport, Louisiana

1998 – 2003 Associate Professor of Mathematics, Louisiana State University in Shreveport, Shreveport, Louisiana

2001 – 2005 Chair of Mathematics and Computer Science, Louisiana State University in Shreveport, Shreveport, Louisiana

2003 – present Professor of Mathematics, Louisiana State University in Shreveport, Shreveport, Louisiana

2005 – present Dean, College of Sciences, Louisiana State University in Shreveport, Shreveport, Louisiana

RESEARCH PUBLICATIONS

1) Sisson, Paul D., *A Rigid Space Admitting Compact Operators.* Studia Mathematica, **112** (1995), *no.* 1, 137-147.

2) Howard, Ralph, and Sisson, Paul D., *Capturing the Origin with Random Points.* College Mathematics Journal, **27** (1996), *no.* 3, 186-192.

3) Sisson, Paul D., *The Ratio of Volume to Surface Area.* Published solution to Problem **10352**, American Mathematical Monthly, **104** (1997), *no.* 1, 80-81.

4) Sisson, Paul D., *Integrating Calculus and Algebra to the Benefit of Both.* Proceedings of the 10th International Conference on Technology in Collegiate Mathematics, 1997.

5) Nhu, Nguyen To, and Sisson, Paul D., *A Rigid Space Homeomorphic to Hilbert Space.* Proceedings of the American Mathematical Society, **126** (1998), *no.* 1, 85-95.

6) Sisson, Paul D., *Polynomials of Arbitrarily High Degree, Descartes' Rule of Signs, and the Calculation of Effective Rate of Return.* Proceedings of the Spring 2000 LA/MS MAA Meeting.

7) Avidon, Michael, Mabry, Richard, and Sisson, Paul D., *Row Enumeration of Three Species.* Mathematics Magazine, **74** (2001), *no.* 2, 130-134.

8) Jaworowski, Jan, Nhu, Nguyen To, Sisson, Paul D., and Trinh, Pham Quang, *Rigid Spaces and the AR-Property.* Tsukuba Journal of Mathematics, **25** (2001), *no.* 2, 413-442.

9) Sisson, Paul D., *College Algebra*, Published by Hawkes Publishing. © 2003. ISBN 0-918091-70-5.

10) Sisson, Paul D., *Precalculus*, published by Hawkes Publishing © 2006. ISBN 0-918091-89-6.

11) Sisson, Paul D., *Fractal Art Using Variations on Escape Time Algorithms in the Complex Plane.* Journal of Mathematics and the Arts (2007, to appear).

12) Sisson, Paul D., *College Algebra, 2nd ed.*, Published by Hawkes Publishing. © 2008. ISBN 1-932628-27-4

FUNDED GRANTS AND CONTRACTS:

1) PI on *Incorporation of Technology into the Upper-Level Math/Physics Curriculum.* Louisiana Education Quality Support Fund Grant, 1996. Funded at $71,680.

2) PI on *Integrated Calculus/Algebra Project.* Louisiana Education Quality Support Fund Grant, 1996. Funded at $97,102.

3) Co-PI on *Humanities Learning Center.* Board of Regents Support Fund Grant, 1997. Funded at $54,000.

4) PI on *Broadening Access to Computer Science, Engineering, and Mathematics Careers.* NSF-CSEMS Grant #0123105, 2001. Funded at $400,000.

5) PI on *Advanced Technology Initiative Scholars Program.* NSF-CSEMS Grant #0220442, 2002. Funded at $400,000.

6) Co-PI on *North Louisiana Partnership for Innovation.* NSF Grant #0332614, 2003-2005. Funded at $600,000.

7) PI on *North Louisiana Partnership for Innovation.* NSF Grant #0542068, 2005-2006. (Continuation of above.)

8) PI on *CERT Instititue for Biomedical Informatics.* NSF EPSCOR Major Initiatives Planning Grant, 2003. Funded at $50,000.

9) Principal Campus Liaison and Steering Committee Member on *Idea Networks of Biomedical Research Excellence.* NIH Grant 2 P20 RR016456, 2005. Funded at $1,805,102.

BIOGRAPHICAL SKETCH			
Provide the following information for the key personnel and consultants and collaborators. Begin with the principal investigator/program director. Photocopy this page for each person.			
Name Dr. John W. Sigle		Position Title Chair, Professor of Computer Science	
EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training.			
INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Northeastern St. College	B.A.	1965	Mathematics
University of Okalahoma	M.S.	1978	Mathematics
Texas A&M University	Ph.D.	1977	Computer Science

PUBLICATIONS/EXPERIENCE RELATED TO PROPOSAL

Relevant Employment History

1987-04 Professor, Louisiana State University, Shreveport, Louisiana
1997 - Outstanding Faculty Performance Award
1981-87 Associate Professor, Louisiana State University, Shreveport, Louisiana
1977-81 Assistant Professor, Trinity University, San Antonio, Texas

Relevant Journal Articles

"Tools for Hybrid Instruction – Classroom and Distance Instruction in Synchronous and Asynchronous Modes", with Jeff Key, Adrienne Critcher, and Jamie Prince, To be published in the Proceedings of ISECON 2004, Newport, RI, November 4-7, 2004

"At the Crossroads of Traditional Computing and Applied Computing", with Adrienne Critcher, Krishna Agarwal, and Dave Foley, Proceedings of ISECON 2001, Cincinnati, OH, November 1-4, 2001.

"Synchronous Distance Learning Via the Internet – Experience and Status Report", The Journal of Computing in Small Colleges, Proceedings of the Sixth Annual CCSC Northeastern Conference, April 2001, Middlebury, Vermont

Setting up a Classroom Lab, with Krishna Agarwal, Adrienne Critcher, Dave Foley, and Reza Sanati, The Journal of Computing in Small Colleges, Proceedings of the Seventh Annual CCSC Central Plains Conference, April 2001, Austin Texas.

"Experience and Experiments in CS1", with Adrienne Critcher and Krishna Agarwal, The Journal of Computing in Small Colleges, Proceedings of the Eleventh Annual CCSC South Central Conference, April 2000, Corpus Christi, Texas.

"Tutorial on the Technology of Distance Learning", with William Mitchell, The Journal of Computing in Small Colleges, Proceedings of the Eighth Annual CCSC Rocky Mountain Conference, October 1999, Colorado Springs, Colorado.

"Workshop on the Technology of Distance Learning", with William Mitchell, The Journal of Computing in Small Colleges, Proceedings of the Sixth Annual CCSC Midwestern Conference, Sept. 1999, Franklin, Indiana.

"Electronic Classrooms and Instructional Technology: Preparing for the Future", with William Mitchell, The Journal of Computing in Small Colleges, Proceedings of the Tenth Annual CCSC South Central Conference, April 1999, Austin Texas.

Relevant Grants, Awards, Fellowships

LEQSF "Development of Computer Assisted Instructional Materials on Health and Safety in the Workplace for Entry-level Workers" 1992-1996

- LEQSF "Curriculum Initiative in Internet/Multimedia" 7/1/97
  LEQSF "Curriculum Initiative in Data Communications" 7/1/97
  LEQSF "An Internet-based Teaching Laboratory" 7/1/98
  NSF "A Collaboration Laboratory for Computer Science Education" 7/1/98
  LEQSF "Research and Application of High Bandwidth Synchronous/Asynchronous Instruction" 7/1/03
  BORSF "Experience and Experiments with a Full Collaboration Classroom" 7/1/06

BIOGRAPHICAL SKETCH	
Provide the following information for the key personnel and consultants and collaborators. Begin with the principal investigator/program director. Photocopy this page for each person.	
Name Dr. Cynthia J. Sisson	Position Title Chair and Professor of Physics

EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training.

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
New Mexico Tech	BS	1988	Physics
University of South Carolina	PhD	1993	Computational Physics

RESEARCH AND PROFESSIONAL EXPERIENCE:

Louisiana State University in Shreveport: 2004 – present **Professor** of Physics

2003 – present **Chair**, Department of Chemistry and Physics

2001 – 2003 **Elmer N. Simon, Jr. Distinguished Teaching Professor**

1999 –2004 **Associate Professor** of Physics

1994 – 1999 **Assistant Professor** of Physics

Appalachian State University: 1993 – 1994 **Lecturer** in Physics

SCIENCE EDUCATION RELATED GRANTS AND EXPERIENCES:

(applied for) **"Tablet-based Learning in Math and Physics via Student Exemplars,"** PI, Hewlett-Packard, 2007. This grant will fund a classroom of 21 tablet-computers as well as curricular changes and student stipends. **$74,000 requested.**

Team leader (LUMCON field station) and faculty participant, **FIRST 3, "Faculty Institutes for Reforming Science Teaching,"** 2005 – present. (Diane Ebert-May, PI) FIRST 3 is an NSF-funded science education effort focused on teaching science faculty to engage in active, inquiry-based science teaching. FIRST 3 is centered on disseminating best practices, and has at its core a database to track the effectiveness of curricular reform in science teaching. More information is available in the article available at http://www.lifescied.org/cgi/content/full/5/1/27

Faculty participant, **FIRST 2, "Faculty Institutes for Reforming Science Teaching,"** 2003 – 2005. (Diane Ebert-May, PI) FIRST 2 was dedicated to training science faculty members in methods of student-centered, research-based teaching methods. Information about FIRST 2, including teaching modules developed by FIRST 2 faculty, is available at http://www.first2.org

Elmer N. Simon, Jr. Distinguished Teaching Professor, 2001 – 2003. This is a two year endowed chair established to recognize "Effectiveness in Instruction and Innovational Teaching Techniques." All faculty at LSUS are eligible for this professorship, which rotates among recipients on a two year cycle; 2001 was the first year it was granted.

"Science Certification for Pre-service and In-service Teachers: Physics and Chemistry," 2002 – 2004. PI (Wayne Gustavson and Deborah Shepherd co-PIs). Board of Regents Support Fund (BORSF). This grant funded the development of several new courses to support pre- and in-service teachers in the pursuit of additional endorsements in Physics and Chemistry and provided a small amount of money for stipends to students taking courses towards those additional endorsements. **$28,080.**

"Enhancing Astronomy and Physics Laboratories for the 21st Century," 1999-2000. PI (Decker Moore co-PI). Board of Regents Support Fund (BORSF). This grant added and replaced aging equipment in lower-level and upper-level physics labs and lower-level astronomy labs. **$68,640.**

"Campus Renewal Grant," 1999 – 2000. co-PI (Judith Covington, Math Dept, PI). Louisiana Collaborative for Excellence in the Preparation of Teachers (LaCEPT). This grant funded a series of seminars for in-service teachers in northwest Louisiana on current techniques in teaching math and science. **$39,000.**

"Renovation of Science Research Facilities," 1997 – 1999. co-PI (Lyle Cook PI), National Science Foundation – Academic Research Infrastructure Program. Renovation of LSUS science building and facilities. **$1,469,846.**

"Preparing Elementary School Teachers," 1995 – 1996, renewed for 1996 – 1998. co-PI (Judith Covington, Math and Wayne Gustavson, Chemistry PIs). Louisiana Collaborative for Excellence in the Preparation of Teachers (LaCEPT). This grant allowed LSUS faculty to re-write the science curriculum for pre-service elementary school teachers into a sequence of three multidisciplinary courses. **$75,000 + $112,000 renewal.**

"Incorporation of Technology into the Upper-level Math and Physics Curriculum," 1995. co-PI (Paul Sisson, PI) Louisiana Education Quality Support Fund (LEQSF). This grant funded a computer lab for *Mathematica*-based upper level math and physics courses. **$72,000.**

RESEARCH PUBLICATIONS:

1. R. J. Creswick and C. J. Sisson, "Monte Carlo Study of the spin-1/2 Heisenberg Model in 1, 2, and 3 Dimensions," Mod. Phys. Lett. B 5, 907 (1991).
2. C. J. Sisson and R. J. Creswick, "Decoupled Cell Monte Carlo Calculations of spin-1/2 Heisenberg Critical Properties," In Computer Simulations in Condensed Matter Physics VI, eds. D. Landau, K. Mon, and H. Schuttler (Springer Verlag, Berlin, 1993).
3. R. J. Creswick and C. J. Sisson, "Decoupled Cell Monte Carlo Study of the Critical Properties of the spin-1/2 Ferromagnetic Heisenberg Model in Three Dimensions," In Quantum Monte Carlo Methods, ed. M. Suzuki (World Scientific, 1993).
4. C. Sisson, "Decoupled Cell Quantum Monte Carlo: How Should We Calculate the Energy?" In Computer Simulations in Condensed Matter Physics VII, eds. D. Landau, K. Mon, and H. Schuttler (Springer Verlag, Berlin, 1994).
5. C. Sisson, "Critical Dynamics in the 3D spin-1/2 Heisenberg Model: A Decoupled Cell Monte Carlo Study." Intl. Jnl. Mod. Phys. C 7, 441 (1996).
6. J. Rodriguez, C. Quarles, C. Sisson, and H.D. Battarbee. "High bandwidth optical tomography" in Medical Imaging 1999: Physics of Medical Imaging, J.M. Boone and J.T. Dobbins Editors, Proceedings of SPIE Vol. 3659, pp. 375-383 (1999).
7. I. Yaroslavsky, A. Yaroslavsky, H. Battarbee, C. Sisson, and J. Rodriguez. "Non-Jacobian nonlinear image reconstruction technique in diffuse optical tomography" Inter-Institute Workshop on In Vivo Optical Imaging at the NIH (Bethesda, 1999), P 21-22.
8. I. Yaroslavsky, A. Yaroslavsky, H. Battarbee, C. Sisson, and J. Rodriguez. "Self-calibrating distributed-source image reconstruction technique for diffuse optical." Biomedical Topical Meetings, OSA Technical Digest (Optical Society of America, Washington DC, 2000), pp. 487-488.
9. J. Rodriguez, C. Sisson, C. Hendricks, C. Pattillo, M. McWaters, C. Quarles, I.V. Yaroslavsky, A.N. Yaroslavsky, and H. Battarbee. "Feasibility of using diffuse reflectance spectroscopy for the quantification of brain edema." in Saratov Fall Meeting 2000: Optical Technologies in Biophysics and Medicine II, Valery Tuchin Editor, Proceedings of SPIE Vol. 4241, pp. 88-97 (2001).
10. J. Rodriguez, C. Sisson, C. Pattillo, C. Hendricks, M. Mcwaters, C. Quarles, M.Hardjasudarma, I.V. Yaroslavsky, A.N. Yaroslavsky, and H. Battarbee. "Experimental assessment of the CSF contribution to light propagation the adult brain", Trends in Optics and Photonics (TOPS) Vol 56, Conference on Lasers and Electro-optics (CLEO 2001), Technical Digest, Post-conference Edition (Optical Society of America, Washington DC, 2001), pp. 401-402.
11. W. Gustavson, S. Lynch, and C. Sisson, "Integrating Science: Explorations in Biology, Chemistry, and Physics," LSUS Internal publication (lab manual), 1998 – 2004.

BIOGRAPHICAL SKETCH

Name	Position Title
Deborah Kay Shepherd	Assistant Professor and Chair, Department of Mathematics, LSUS

EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training.

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Southern Illinois University, Edwardsville, IL	BS	1990	Mathematics Education
Southern Illinois University, Edwardsville, IL	MS	1996	Mathematics
Louisiana Tech University, Ruston, LA	Ph.D.	2001	Computational Analysis and Modeling

PROFESSIONAL EXPERIENCE:

2005-2006 Assistant Professor and Chair, Department of Mathematics, LSUS, Shreveport, LA

2001-2005 Assistant Professor, LSUS, Shreveport, LA
Teaching classes in statistics, algebra, and calculus

1993-1997 Math/Physics Teacher, C.E. Byrd High School, Shreveport, LA
Taught classes in physics, statistics, algebra, and geometry.
Conducted physics labs for college bound students.

1990-1992 Teaching Assistant, Southern Illinois University, Edwardsville, Illinois Taught classes in statistics, calculus, and intermediate algebra.

PRESENTATIONS:

"Correlation Analysis of Variables Associated with Lung Function," invited talk—presented Jan 20, 2003 at the Asthma 2003 Group, Shreveport, LA.

"An Attribute Chart for Monitoring a Markov Process," presented talk—MAA Conference, Mississippi State University, Feb 2003.

"Two Attribute Charts for Monitoring A Markov Process Using Runs Rules," presented talk—Joint Statistical Association Meeting, San Francisco, Aug 2003.

PUBLICATIONS:

"Attribute Charts for Monitoring a Dependent Process",
Deborah K. Shepherd, Charles W. Champ, Steven E. Rigdon, Howard T. Fuller, in *Quality and Reliability Engineering International,* Published Online: 23 May 2006, DOI: 10.1002/qre.793. In press.

"Risk in Case-Control Studies," Deborah K. Shepherd and Raja Nassar, in *Proceeding of the SWDSI 2003 Conference*, Houston, TX 2003.

"Two Attribute Charts for Monitoring A Markov Process Using Runs Rules," submitted for the *Proceeding of the Joint Statistical Association Meeting 2003,* San Francisco, CA.

INVITED PAPERS:

"k-out-of-n-systems", Deborah K. Shepherd, to be published in *Encyclopedia of Statistics in Quality and Reliability,* edited by Dr. Fabrizio Ruggeri, Dr. Ron Kenett and Mr. Frederick Faltin, scheduled for print, 2007.

"Moving Range, *R*, and *S* Charts", Charles W. Champ and Deborah K. Shepherd, to be published in *Encyclopedia of Statistics in Quality and Reliability,* edited by Dr. Fabrizio Ruggeri, Dr. Ron Kenett and Mr. Frederick Faltin, scheduled for print, 2007.

GRANTS:

Sisson, P., Critcher, A., Shepherd D., "Advanced Technology Initiative Scholars Program," $400,000 grant awarded by NSF Contract # DUE- 0220442, 2002-2006.

Sisson, C., Shepherd, D., and Gustavson, W. "Science Certification for Pre-service and In-service Teachers," $28,080 grant awarded by the Louisiana Board of Regents contract no. LEQSF-ENH-TR-35, 2002-2004.

Shepherd, D. "Using Individual Control Charts as a Method to Determine a Statistically Significant Change in the Patient's Condition and Determination of Relationships between Variables associated with Asthma," $5,000 grant awarded by the Biomedical Research Foundation, January 2004-May 2004.

Shepherd, D. "Analysis of Lung Function Data in Conjunction with the Asthma-Allergy Clinic and Research Center," $500.00 awarded by LSUS Faculty Research and Development Grant Monies. June 2003-2004

Shepherd, D. "Using Individual Control Charts as a Method to Determine a Statistically Significant Change in the Patient's Condition and Determination of Relationships between Variables associated with Asthma," $4,800 grant awarded by the Biomedical Research Foundation, September 2003-December 2003.

Trutschl, M., Austin J., Banks S., Aamodt S., Boucher G., Sisson C., Salvatore B.,McCallum M., Shepherd D., Hanson G.,Vekovius A., "Multidisciplinary Computational Analysis Enhancement" $55,000 grant awarded by the Louisiana Board Regents, 2005-2006.

Shepherd, D. and Sisson, P. "Enhancement of the Undergraduate Actuarial Science Concentration at LSUS," $17,330 grant awarded by the Louisiana Board of Regents contract no. LEQSF-ENH-TR-41, 2005-2008.

AWARDS:

2004 Awarded George and Regina Khoury Professorship in Sciences.

PROFESSIONAL ACTIVITIES

Book Review Editor, *Quality & Reliability Engineering International*, 2003-present.

Referee for *Quality and Reliability Engineering International,* 2000-present.

Referee for *Journal of Statistical Computation and Simulation,* 2000-2002.

Member of American Statistical Association, 2001-present.

PROFESSIONAL SERVICE

- Coordinator, Actuarial Science Concentration, LSUS Mathematics Program, 2001-present.
- Louisiana State University in Shreveport Tech Fee Committee, 2001-2006.
- Louisiana State University in Shreveport Planning Committee, 2003-present.
- Secretary, LSUS Faculty Senate, 2003-2004.
- Math Club Faculty Advisor, 2003-2005.

UNDERGRADUATE STUDENTS SUPERVISED:

Pratima Ram, "Applications of Utility Functions in Actuarial Science," Spring 2003.
Haller Jackson, "Models of Coercion in Animal Groups," Spring 2003.
Alicia Matlock, "Six Sigma," Spring 2003.
Brian Stentz, "Copulas," Spring 2004.

LSUS
Office of the Chancellor

March 12, 2007

Dr. Kerry Davidson
Deputy Commissioner for Sponsored Programs
Board of Regents
P. O. Box 3677
Baton Rouge, LA 70821-3677

Dear Dr. Davidson and PKSF proposal reviewers:

It is with great pleasure that I commit my support for the SB SciNet Project's goals and objectives. Throughout my tenure as LSUS Chancellor, I have strived to support programs that foster an environment of excellence and opportunity in the sciences. Recognizing the need for strong science training programs and strong communication networks between area high schools and colleges in order to support the growing life science professional sectors in Northwest Louisiana, I fully support the SB SciNet Project. I feel this is a value-rich and necessary project to enhance the science education culture of Louisiana, and I have confidence in the PI and Co-PI's ability to conduct this project excellently.

The SB SciNet Project represents one of the most innovative culture changing programs that I have witnessed in over forty years of academic experience. The project will build community, promote educational excellence, and open doors of opportunity for students, teachers, and faculty alike. The collaborative environment between LSUS and area high schools will help with the short and long-term recruiting of excellent high school science students, and improve the LSUS science experience. I am pleased to be able to leverage the institutional resources described in this proposal to facilitate these exciting outcomes.

As Chancellor, I support this project to the fullest extent of my abilities. Thank you for giving this proposal your full consideration.

Sincerely,

Vincent J. Marsala
Chancellor

VJM:jr

Dr. Kerry Davidson
Deputy Commissioner for Sponsored Programs
Board of Regents
P. O. Box 3677
Baton Rouge, LA 70821-3677

Dear Dr. Davidson and PKSF proposal reviewers:

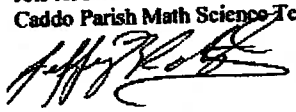
As the Caddo Parish Math Science and Technology (MST) Coordinator, I have been in conversation with Drs. Sisson and Hutchings regarding means to co-leverage our respective resources in order to create a synergistic high school to university biotechnology and life science educational pipeline. I am happy to express my support for the SB SciNet project.

I have experienced the frustrations and limitations of not having a fruitful communication forum for high school science teachers to interface with area college professors. I have also experienced the difficulties in teaching front-of-the-wave curricular concepts to high school students without access to the appropriate equipment and reagents. Through the SB SciNet project, many of these limitations can be addressed, and the impact on science education will be significant.

For too long, the region has lacked a good forum through which high school teachers and students can interact with the area's science professors. The fact that LSUS has opened their doors to the collaboration process with high schools speaks volumes about their commitment to educational excellence throughout the area. I have confidence that our teachers and students will take full advantage of the opportunities to participate in educational trainings, research collaborations, and community-building projects. As MST Coordinator, I am happy to facilitate communication and dissemination among the regions high school teachers, and to help keep our respective resources aligned to gain the maximum collective impact.

Thanks for giving this proposal your full consideration.

Jeff Roberts
Caddo Parish Math Science Technology (MST) Coordinator



Contract Work Plan

APPENDIX B: WORKPLAN & SCOPE OF SERVICES

CONTRACT #: LEQSF(2007-12)-ENH-PKSFI-PES-02
PI: Nathan R. Hutchings

TITLE: ***Shreveport/Bossier SciNet: Using information technology resources to develop interdisciplinary life science education enhancements in Freshman/Sophomore life science and high school curricula***

SCOPE OF SERVICES: The PI hereby agrees to furnish the following services:

A. GOAL AND OBJECTIVES:
Overcoming the current obstacles that are preventing high school students and freshman/sophomore college students from being nationally competitive in the life sciences requires making significant changes to the life-science educational culture of Northwest Louisiana. Currently, there is little dissemination of specialized knowledge and tools from the university level to the high school classroom, and little communication of opportunities for collaboration between high school science teachers and college professors. Likewise, there is little communication between high school students and successful life science college students. Thus, Northwest Louisiana currently has two distinct science education cultures: that among the secondary educators and that among the colleges and universities, with only isolated collaboration and information sharing between them. To create a new, collaboration-rich, interdisciplinary, and communication-rich life science education culture in Northwest Louisiana, the funds requested in this proposal will be used to develop the **Shreveport/Bossier (SB) SciNet**, which will achieve the following goals:
(1) Improve the freshman/sophomore life science experience at LSUS (and therefore improve retention and recruitment) by enabling LSUS faculty and students to develop 'front-of-the-wave' educational learning modules for the 100 and 200-level LSUS life science curricula.
(2) Increase the level of college preparedness for students interested in life science careers by enabling high school students to participate in experiential learning opportunities at LSUS.
(3) Enable high school teachers to use LSUS faculty-developed teaching modules and resources in their classrooms by providing area high school science teachers with training and access to the newly developed coursework modules in the life science curricula.
(4) Create an interdisciplinary mentoring culture among the high school and PhD educational community by having LSUS faculty train the high school teachers in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, and by creating a mentoring culture among high school and college-level science students by enabling successful LSUS science students to participate in the training and mentoring of area high school science students.
(5) Create a coordinated workforce pipeline to support regional life science economic development and life science-based industries by creating a pool of life science high school and college graduates with current knowledge, technical and practical experience, and realistic understanding of the life skills required to succeed in life science careers.

Successful completion of these goals will result in a communication-rich unified life science education culture in Northwest Louisiana with a seamless K-PhD pipeline into the region's life science workforce. To accomplish the goals and objectives, this project will concentrate on the following five action plans.

1. LSUS faculty and students will develop 'front-of-the-wave' educational learning modules

throughout the LSUS life science curricula.

Strategy and Methods: Faculty within the College of Sciences will be invited to submit proposals to develop a 45-minute guided inquiry-based learning module for one of the courses in the freshman/sophomore life science curricula.

A number of orientation and training sessions will be held in order to familiarize the LSUS Science faculty with the objectives of this project and the mechanisms and guidelines for their proposals. These sessions will also discuss and describe methods and tools that can be used for the development of these learning modules. Examples of successful modules and assessment strategies will be presented. The methods and tools that could be incorporated include but are not limited to: (a) recording an interactive lecture (audio and computer screen video) using a product such as Camtasia; (b) developing an Excel spreadsheet (with accompanying instructions) that will provide an interactive model or simulation of a quantitative experiment; (c) developing PowerPoint presentation files with animation and multimedia used to model and describe dynamic processes; (d) developing Java applets for a web site which would provide an interactive (and perhaps animated) simulation of a process or procedure; (e) developing Dreamweaver/Flash web pages which would provide an interactive and animated simulation of a process or procedure; and/or (f) developing learning modules using traditional CBT systems such as Macromedia Director, Authorware, Asymetrix Toolbook and Quest.

The PI and Co-PI's will collectively and objectively review the proposals for content, appropriateness, and relevance to the SB SciNet overarching objectives. Each faculty member that receives funding to develop a module will be required to meet the following expectations: (1) the knowledge content must be an appropriate interdisciplinary extension of a freshman/sophomore course within the life science curricula, (2) the module must contain an objective learning outcomes assessment, (3) the module must be used in at least one section of an LSUS 100 or 200-level course within one year of its completion, (4) the module must be made available to high school teachers via the SB SciNet website, and (5) the faculty member must present their module in a high school teacher training session.

Significance: Creating interactive, interdisciplinary learning modules that guide students to a deeper understanding and/or application of essential knowledge will improve student experience in the freshman/sophomore STEM courses at LSUS, where there is currently a lack of practical application for much of the course content. Helping students understand how to use guided inquiry to deepen their understanding will transfer into their learning approaches in other science courses. Furthermore, training high school teachers to use the learning modules and having high school students experience the guided inquiry and content of the modules will enhance the STEM preparedness of these high school students and thereby increase success rates in freshman/sophomore science courses – regardless of where these graduates attend college.

Limitations: Only a fraction of the knowledge content of each of the freshman/sophomore life science curricula courses will be represented in the learning modules that are developed, and aligning the content of the modules with the area high school curricula will require careful planning and grade-level appropriate assessment. To overcome this limitation, faculty members who are developing a module will be expected to consult with an area high school teacher regarding the knowledge content and assessment tools. To increase coverage of the curriculum within the limited number of modules being developed, the module developers will be encouraged to target central

themes for the course, but also encouraged to integrate as many applicable interdisciplinary concepts as possible.
Implications on the quality of STEM education: In area high schools and at LSUS, the STEM curriculum has become almost completely 'knowledge content' driven, and few courses currently utilize inquiry-based learning and concept application. To improve the quality of STEM education in the region, students will be exposed to guided-inquiry and knowledge application early in their science training (high school through freshman/sophomore at LSUS), which will significantly enhance the educational strengths within the STEM disciplines.

2. High school students will participate in experiential learning opportunities at LSUS.
Strategy and Methods: LSUS College of Sciences faculty will be allowed to request support to mentor area high school students and/or teachers in basic or applied research related to an interdisciplinary life science project.

Interdisciplinary projects, such as mathematical/computer modeling, bioinformatics, biochemistry, molecular biology, environmental biology, analytical chemistry, and biophysics will be strongly encouraged. Many faculty members within the College of Sciences are currently conducting this type of research. Dr. Gary Boucher (Physics) has developed electronics and robotics to facilitate neurologically disabled patients' ability to communicate and similar technology has been adapted to enable Oil/Gas Operators to communicate between pieces of oil/field equipment; both projects involve integrating physiology and or chemistry with electronic engineering. Drs. Marjan Trutschl and Urska Cvek (Computer Science) have several projects related to data mining, micro-array analysis, and data visualization, all of which incorporate genetics and computer science. Drs. Dalton Gossett and Steven Banks (Biology) are conducting food chain metal accumulation studies, research which integrates chemistry, biochemistry, and ecology. Drs. Brian Salvatore and Elahe Mahdavian (Chemistry) are synthesizing novel compounds to be used as potential chemotherapeutic agents, and one such compound is in early clinical trials. Although these projects only illustrate a small amount of the interdisciplinary project underway, they provide a reasonable cross-section to show how freshman-sophomore undergrads and high school students can be engaged in meaningful, front-of-the-wave, interdisciplinary research at LSUS.
The LSUS College of Sciences has a long-standing tradition of providing undergraduate students with quality research experiences. As individual research assistants and as collaborative research teams, LSUS undergraduate students have received many local and State-level accolades for their accomplishments. Expanding this rich tradition to include a focus on freshman-sophomore and high school students promises to further enhance the impact and recognition of our students on the regional science community. The support provided to the faculty mentors will be used to purchase materials and supplies for summer projects and to provide modest compensation for the participants. Each faculty member that receives funding to conduct research with a high school student or teacher will be required to present the results, outcomes, and implications of their work at the LSUS College of Sciences Symposium or other similar public dissemination venue. Summaries of each project will also be posted on the SB SciNet website.
Significance: Experiential learning is most fruitful when both the faculty and students are engaged in the creation or application of new knowledge. Thus, creating opportunities for young scientists to engage in front-of-the-wave research will result in a rich collaborative mentoring environment among faculty, college underclassmen, and high school students. Providing access to basic research experiences has been a successful recruitment and retention tool for college and universities across the nation through

programs like the National Science Foundation Research Experiences for Undergrads (REU's) [1]. LSUS will be employing this model on a smaller scale and include high school students in the model.

Limitations: Research experiences often require more than one summer to result in major outcomes. Faculty will be expected to clearly define the focused objective that the undergraduate and high school students will be trying to accomplish to help ensure that the experience is meaningful within the limited time frame. Faculty will also be expected to help these students understand the larger perspective of the project so that they can appreciate how their work contributes to a larger body of knowledge.

Implications on the quality of STEM education: STEM education across secondary and post-secondary education has been increasingly content-rich, but increasingly application- and experiential-learning poor. As stated in the NSF-funded National Academy of Sciences Book entitled *BIO2010: Transforming Undergraduate Education for Future Research Biologists* [2], "Equally important, teaching and learning must be made more active to engage undergraduates, fully prepare them for graduate study, and give them an enduring sense of the power and beauty of creative inquiry." Although other professional education advisory boards such as the National Research Council and Sigma Xi continue to advocate for inquiry-based learning throughout all levels of science education, only shallow reflections of these initiatives have made their way into Louisiana's curricula. This project outcome creates a mechanism for students to experience inquiry in its most pure form.

3. High school science teachers will be trained in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, including the newly developed coursework modules for the LSUS life science curricula. The LSUS College of Sciences will host informational and training workshops for area high school teachers to learn about the content and expectations within the LSUS science curricula and will be encouraged to develop collaborative uses of the LSUS teaching and research lab facilities. Area high school science teachers (from Caddo and surrounding parishes) will be invited to these workshops, and each qualified pre-registrant will be compensated for their participation in the workshop. The topics and attendees of each workshop will vary, but example include: core concepts in the life science curricula, scientific equipment and research capacity at LSUS, and learning to use inquiry-based modules to reinforce essential life science concepts. In each workshop, interactive discussions and collaboration building will be central themes to help LSUS faculty understand and respond to the issues presented by the high school teachers.

   Significance: The historical lack of communication between high school teachers and college science faculty has delayed problem identification and the creation of innovative solutions to our local STEM curricula. A forum that rewards high school teachers for participating in the development of feasible enhancements to the STEM curricula represents a significant advancement in the region's science community.

   Limitations: Not every high school science teacher in the parish will be able to participate in the workshops, and we anticipate only a handful of teachers being able to participate in multiple consecutive workshops. Thus, the PI and Co-PI's will be responsible for identifying topics and issues that need to be addressed by a larger, more representative, audience. These topics will guide the content of regional symposia or other meetings in which larger groups of science teachers can be simultaneously reached. Additionally, the Louisiana Grade Level Expectations (GLE's) for high school science classes are dictated by the Board of Elementary and Secondary Education, which limits the content that can be adapted for use in the high school classrooms. To help reduce the impact of this limitation, LSUS faculty members developing educational modules and

participating in curricular discussions will be educated on the Louisiana GLE's according to the guidelines available on the Louisiana Department of Education website: http://www.doe.state.la.us/lde/saa/1819.html.
Implications on the quality of STEM education: By creating a bi-directional communication conduit for STEM curricula reform and collaborative enhancement, the quality, integrity, and assessment of outcomes related to the STEM curricula at LSUS and area high schools will improve. Having a shorter feedback loop and a more responsive collaborative environment for curriculum development will dramatically enhance the science education community in the region.

4. Successful LSUS science students will participate in the training and mentoring of area high school science students.
The LSUS Biology Club, Alpha Epsilon Delta Pre-Health Care Honor Society, Tri-Beta Life Science Honor Society, the Minority Association of Pre-Professional Students, the Chemistry Club, the Math-Physics Club, and/or the Computer Science Club will host activities to engage area high school science students in interactive applications related to life science in the region. The organizations will be invited to submit proposals (through their respective faculty advisors) for projects that will create mentored experiences among members of their organization and a target group of high school students. For example, The Biology Club has historically conducted a field day in the 600 acre nature preserve (C. Beckham Dickson Park) located adjacent to the LSUS campus, where students are introduced to wetlands preservation and biodiversity. With additional funding support, this project would be appropriate to expand into a field day for bus-loads of high school biology students to experience a notable local life science resource and learn directly from an LSUS undergraduate mentor. Interdisciplinary collaborations among the various organizations will be strongly encouraged, and the inclusion of underclassmen in the design and execution of each event will be expected.

   Significance: With appropriate guidance and funding, each of these student organizations can dramatically increase the impact and relevance of the SB SciNet outcomes for high school students, and simultaneously enhance the interdisciplinary student community within the College of Sciences.
   Limitations: The LSUS student organizations do not currently have a means to contact area high schools and draw a large audience to their events. The faculty sponsor of each organization along with the Co-PI's will facilitate mailings and communication with the area schools to help increase participation. In subsequent years of the project, well-planned events will grow via word-of-mouth and by exposure during our educational workshops, so quality program planning will be strongly emphasized during year 1 of the project.
   Implications on the quality of STEM education: high school students will relate more closely to their near peers (college students) than they will to college professors. To foster a genuine and sustainable mentoring environment, the LSUS College of Sciences students must be engaged in the mentoring of high school students. The implications are far reaching, but include the creation of student-led collaborative initiatives that involve both high school and college students throughout the region, resulting in a grass-roots science culture for young scientists.

5. A pool of life science high school and college graduates with current knowledge, technical and practical experience, and realistic understanding of the skills required to succeed in life science careers will be created.

Through the collective outcomes of this project, life science students will exhibit enhancements in knowledge, job-relevant experiences, and career development. Juniors and graduating seniors in biological sciences and biochemistry will complete a survey to assess these outcomes. Both Biology majors and Biochemistry majors take a Major Field Test prior to graduation in their senior year. Students will be expected to answer questions that allow the Co-PI's to assess student-perceived enhancements in knowledge, experience, and career development.

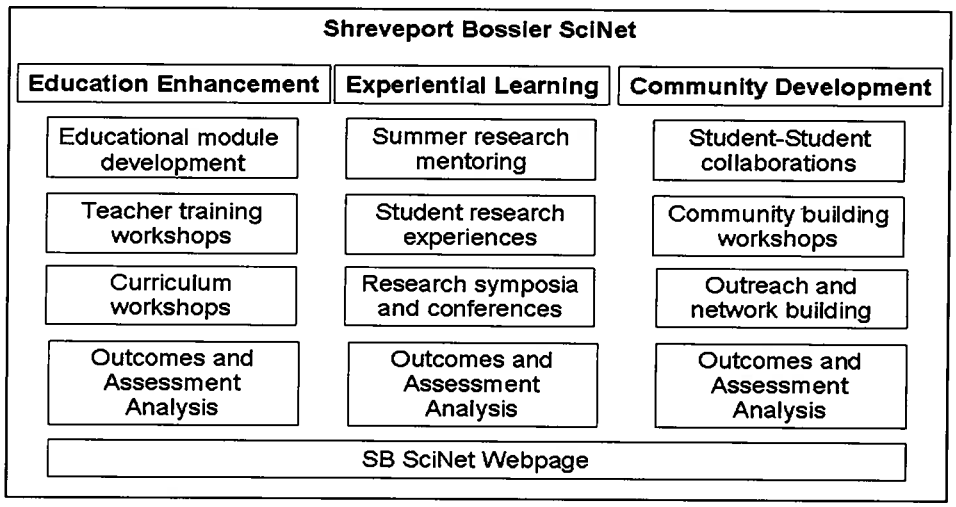
Significance: Student feedback regarding their perceptions of the academic and experiential learning environments at LSUS is critical to the improvement of programs, curricula, and planning. Currently, no mechanism exists for the university to provide departments with this critical feedback.

Limitations: Survey instruments are limited primarily by two factors: the quality of the questions being asked, and the motivation of those surveyed to provide thoughtful responses. Seniors students are often 'one foot out the door' by midway through their senior year, and capturing accurate sentiments can be difficult. To try to overcome this limitation, the Co-PI's will carefully construct the instrument to ask questions to which students can provide meaningful and objective answers, and the students will be informed of the importance of their responses. To provide a point of comparison for the graduating seniors' responses, the same survey will be given to a sampling of underclassmen each year. This will provide critical information about how perspectives shift at different stages in the curriculum.

Implications on the quality of STEM education: Understanding where students are struggling and where students are thriving within our programs will enable the college leadership to adjust initiatives and priorities into areas that might otherwise go unnoticed. Creating an environment in which students feel that they are enabled to be successful is paramount to establishing a culture of excellence within the College of Sciences.

Project structure

The SB SciNet Project is structured into three interconnected activity veins, each corresponding to one of the Primarily Education Subprogram Initiatives.



The PI and Co-PI's will meet at least quarterly to discuss ongoing program activities, plan time lines and establish deadlines, review financial matters, and evaluate outcomes. For each specific activity-type (i.e. Teacher training workshops), at least one Co-PI will assume responsibility for administrative oversight as well as monitoring and reporting to the other Co-PI's on the activity's progress. Each specific SB SciWeb supported activity will have a faculty member or

collaborative group of faculty members that will be responsible for planning and execution of the specific task within the guidelines provided by the Co-PI's. Requisitioning and reporting mechanisms will be standardized for like activities to allow the Co-PI's to effectively manage the program. The specific activities include: faculty developing learning modules, faculty developing experiential research opportunities, teacher training workshops, student-student mentoring projects, outcomes assessment, and website development and maintenance.

TIMELINE/SCHEDULE: Project duration is July 2007 through June 2012.
The project schedule/timeline is outlined in Section C below.

B. DELIVERABLES: The Project Director will submit to the Board of Regents the following reports, in accordance with the BORSF time table, and in the format specified by the Board: Annual Project Reports and Financial Status Reports by June 30, 2008; June 30, 2009; June 30, 2010; and June 30, 2011. Final Project Report by June 30, 2012; and Final Expenditures Report by September 30, 2012. All publications, presentations, etc. that result from this work will cite the support of the Louisiana Board of Regents through the Board of Regents Support Fund, with the appropriate contract number cited.

C. PERFORMANCE MEASURES:
The following performance measures and milestones will be used to assess project outcomes:

Year 1 performance measures and milestones:

1. Educational Modules: in year 1, at least 6 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula.
2. Student-faculty mentoring: during the summer of year 1, at least 5 high school students will participate in a LSUS faculty-mentored research project.
3. HS Teacher training workshops: in year 1, at least three teacher training workshops will be held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.
4. Student-student mentoring: in year 1, at least two LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 1, all equipment and computers to facilitate computer-based learning modules will be purchased and installed, and the SB SciNet website will be developed.
6. Educational improvement measures:
    a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
    b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
    c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
    d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 2 performance measures and milestones:

1. Educational Modules: in year 2, at least 5 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula.

2. Student-faculty mentoring: during the summer of year 2, at least 10 high school students will participate in a LSUS faculty-mentored research project.
3. Teacher training workshops: in year 2, at least four teacher training workshops will be held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.
4. Student-student mentoring: in year 2, at least three LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 2, all equipment and computers to facilitate computer-based learning modules will be utilized in LSUS courses, and the SB SciNet website will be expanded to enable module downloads and outcome reporting.
6. Educational improvement measures:
    a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
    b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
    c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
    d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 3 performance measures and milestones:

1. Educational Modules: in year 3, at least 4 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula, and modules created in years 1 and 2 will be revised and updated.
2. Student-faculty mentoring: during the summer of year 3, at least 15 high school students will participate in a LSUS faculty-mentored research project.
3. Teacher training workshops: in year 3, at least four teacher training workshops will be held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.
4. Student-student mentoring: in year 3, at least four LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 3, the SB SciNet website will continue to report outcomes and make learning modules available for download.
6. Educational improvement measures:
    a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
    b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
    c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
    d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 4 performance measures and milestones:

1. Educational Modules: in year 4, at least 3 new forty-five minute learning modules will be developed for 100/200-level courses in the life science curricula, and modules created in years 1 and 2 will be revised and updated.
2. Student-faculty mentoring: during the summer of year 4, at least 15 high school students will participate in a LSUS faculty-mentored research project.
3. Teacher training workshops: in year 4, at least two teacher training workshops will be held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences.
4. Student-student mentoring: in year 4, at least four LSUS student organization hosted workshops for high school students will be held.
5. Infrastructure and equipment: in year 4, the SB SciNet website will continue to report outcomes and make learning modules available for download.
6. Educational improvement measures:
    a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
    b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
    c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.
    d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

Year 5 performance measures and milestones:

1. Educational Modules: in year 5, all learning modules assessment data will be collected, compiled, and analyzed.
2. Student-faculty mentoring: in year 5, high school students participation in a LSUS faculty-mentored research project and student outcomes related to college performance of previous participants will be assessed.
3. Teacher training workshops: Teacher training workshops: in year 4, two teacher training workshops will be held to and assemble outcomes for reporting.
4. Student-student mentoring: Student-student mentoring: in year 5, at least four LSUS student organization hosted workshops for high school students will be held.
5. Junior/Senior Assessment: infrastructure and equipment: in year 5, the SB SciNet website will continue to report outcomes and make learning modules available for download.
6. Educational improvement measures:
    a. Improved student performance will be measured through course assessment and student feedback regarding the learning environments on an annual basis.
    b. Increased enrollment in STEM discipline will be measured by monitoring year-to-year incoming freshman, grade-level retention rates, and comparative graduation rates among the STEM degree-programs.
    c. Increased preparation for graduate school and workforce will be measured by assessing the year-to-year number of graduating seniors in STEM disciplines planning on attending graduate schools, professional school, or entering the life science workforce via grade-level professional development surveys.

d. Community impact will be measured by monitoring the number of year-to-year high schools, private sector, and non-profit organizations that participate in SB SciNet events and activities.

D. MONITORING PLAN: The services to be undertaken shall commence promptly after execution of the contract. The Board and its representatives shall have the right to inspect the progress of the work as well as financial records pertaining to the work. Upon expiration of the contract term, the Board reserves the right of future inspection as stipulated in Section X of the contract. As evidence of timely progress of the completion of services, to ensure fiscal responsibility, and to enable the Board to fulfill its constitutional responsibilities relative to the comprehensive evaluation of the BORSF program and the projects funded under its aegis, the PI shall submit to the Board the following reports, in accordance with the indicated time table and in the format specified by the Board: Annual Project Reports and Financial Status Reports by June 30, 2008; June 30, 2009; June 30, 2010; and June 30, 2011. Final Project Report by June 30, 2012; and Final Expenditures Report by September 30, 2012. (Due dates and formats for reports are subject to change by the Board.) All publications, presentations, etc. that emanate from the work supported by this contract shall cite the support of the Board through the BORSF program, and the appropriate contract number shall also be cited.

E. UTILITY OF THE FINAL PRODUCT: The primary value accrued to the State of Louisiana from the results of this project will be enhanced life science academic programs that produce well-educated students to contribute to a sustainable knowledge-based economy for the State. Better educated students will directly contribute to the educated workforce needed to address the goals and objectives of Louisiana's Vision 2020 economic development plan which targets several sectors for "cluster development; including heavily science-oriented sectors such as "Information Technology" and "Biomedical Technology". Development of strong, integrated, and dynamic science education programs will have a most significant and long lasting impact on the Louisiana economy.

Annual Report for Year 3 (ending 6/30/2010)

I. Personnel

A. Oversight Personnel

1. Dalton Gossett – PI and Project Director – responsible for coordinating all aspects of the project.
2. Stephanie Aamodt – responsible of arranging and coordinating high school teacher workshops
3. Amy Erickson – responsible for coordinating high school student research participation
4. Beverly Burden – responsible for coordinating LSUS undergraduate student research participation
5. Cran Lucas – responsible for project web site
6. Cindy Sisson – responsible coordinating computer purchases
7. James Ingold – responsible for coordinating social activities

B. Personnel Involved in Supervising Student Research Projects

1. Kui Chen - LSUS Assistant Professor of Chemistry
2. Tara Williams-Hart – LSUS Assistant Professor of Biology
3. Beverly Burden – LSUS Associate Professor of Biology
4. James Ingold – LSUS Professor of Biology
5. Cran Lucas – LSUS Professor of Biology
6. Matyas Buzgo – LSUS Assistant Professor of Biology
7. Elahe Mahdavian – LSUS Assistant Professor of Chemistry
8. Brain Salvatore – LSUS Associate Professor of Chemistry
9. Gary Boucher – LSUS Associate Professor of Physics
10. Amy Erickson – LSUS Assistant Professor of Biology

C. Undergraduate Students

1. Annie Wilson – worked with Dr. Chen
2. Sarah Oncle – worked with Dr. Williams-Hart
3. Trey King – worked with Dr. Williams-Hart
4. Chris Young – worked with Dr. Buzgo
5. Aaron Lincoln – worked with Dr. Ingold
6. Matthew Semmons – worked with Dr. Mahdavian
7. Bonnie Buckley - worked with Dr. Mahdavian
8. Lurah Welch – worked with Dr. Williams-Hart
9. Shavondrea Lawrence – worked with Dr. Williams-Hart
10. Bunyamin Kocabasoglu – worked with Dr. Boucher
11. Clint Naquin – worked with Dr. Boucher
12. Cassie Cole – worked with Dr. Buzgo
13. Jonette Green– worked with Dr. Buzgo
14. Lauren Woodward– worked with Dr. Buzgo
15. Renee Edwards – worked with Dr. Lucas
16. Kathleen Moody – worked with Dr. Erickson

17. Dakota Boston – working with Dr. Mahdavian
18. Tracy Morlock – working with Dr. Erickson
19. Katie Moak – working with Dr. Aamodt
20. Eric Osborn – working with Dr. Aamodt
21. David Poe – working with Dr. Boucher
22. Candice Faith – working with Dr. Erickson
23. Reid Grimes – working with Dr. Salvatore
24. Tameko James – working with Dr. Williams-Hart
25. Mickeal Key – working with Dr. Williams-Hart

D. High School students

1. Jeffrey Irwin – working with Dr. Burden
2. Elizabeth Burford – working with Dr. Lucas
3. Kimberly Mosier – working with Dr. Burden
4. Lindsay Westerfield – working with Dr. Aamodt
5. Carlee Ward – working with Dr. Ingold
6. Kaitlin Flattmann – working with Dr. Lucas
7. Daniel Felty – working with Dr. Williams-Hart

II. Activities and Findings

A. Teacher Workshops

Goal: High school science teachers will be trained in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, including the newly developed coursework modules for the LSUS life science curricula. To accomplish this goal, the LSUS College of Sciences will host informational and training workshops for area high school teachers to learn about the content and expectations within the LSUS science curricula and will be encouraged to develop collaborative uses of the LSUS teaching and research lab facilities. Area high school science teachers (from Caddo and surrounding parishes) will be invited to these workshops, and each qualified pre-registrant will be compensated for their participation in the workshop. The topics and attendees of each workshop will vary, but example include: core concepts in the life science curricula, scientific equipment and research capacity at LSUS, and learning to use inquiry-based modules to reinforce essential life science concepts. In each workshop, interactive discussions and collaboration building will be central themes to help LSUS faculty understand and respond to the issues presented by the high school teachers.

1. Outcomes for HS Teacher training workshops in year 2: No Teacher Workshop has been held this year; however, Dr. Stephanie Aamodt, LSUS Director for Teacher Workshops for the Post-Katrina Grant and Catherine Williamson, Caddo Parish

representative are planning a teachers workshop in the future to give teachers an introduction to the teaching modules that have been developed by LSUS faculty. Coursework Modules As the result of input from the Teacher Workshop held in 2008, four modules have been completed, and additional modules are either being developed of being planned for completion during the summer and fall of 2010.

Complete Modules:

a. Photosynthesis – The Light Reaction - The module provides a discussion of the importance of photosynthesis and an overview of the basic processes that occur during photosynthesis. The light reactions of photosynthesis are discussed in detail. This module covers the structure of the chloroplast, the mechanisms of harvesting light energy, photosystem I reactions, photosystem II reactions, the electron transport system, and photophosphorylation.
b. Photosynthesis – The Carbon Dioxide Fixation Reactions - The module provides a discussion of the importance of photosynthesis and an overview of the basic processes that occur during photosynthesis. The Calvin Cycle is discussed in detail with additional information on C_4 plants and CAM plants.
c. Snail shells in a practical application of statistical procedures - This module contains the materials for a laboratory exercise which introduces the concepts of probability, normal distribution, standard deviation, homogeneity of variance and Student's *t*-Test in a biological context. The module is designed for biology students in high schools or those taking introductory biology laboratory courses in colleges and universities. Using this module requires a ruler, a pencil and a calculator. Students can use photographs of snail populations to measure shell height, width and aperture from snails collected from two habitats; *Alpha* and *Beta*. The data collected can then be processed to determine if the dimensions of the shells are significantly different using a *t*-Test. The module also contains an *Excel*™ spread sheet containing measurements of shell height, width, aperture and weight for shells collected from both habitats so that instructors can have the option of carrying out the exercise without requiring the students to measure the shell dimensions themselves. The module represents essentially a cost effective means by which students can be introduced to some of the fundamental aspects of statistics.
d. Simulation of Predation Experiment: This module provides students with the means by which a simulation of predation can be carried out in a classroom. Most students enjoy this exercise because of its "hands on" engagement. It is designed to be used in conjunction with an explanation of feeding preference referencing published works on selective predation such as those dealing with industrial

melanism and the peppered hawk moth, *Biston betularia*, and the effect of polymorphism on predation in the banded snail *Cepaea nemoralis*.

Modules in Development

a. Endosymbiont Theory – This module covers the theory that mitochondria and chloroplasts, organelles of eukaryotic cells originated as prokaryotes that were taken up by eukaryotic cells. The module will allow students to explore the scientific definition of "theory", types of evidence and evaluation of evidence, and evidence based on subjects that the students will have learned in BIOS 120.

b. Cellular Respiration – Glycolysis - - The module will provide a discussion of the importance of respiration and an overview of the basic processes and metabolic steps that occur during glycolysis.

c. Cellular Respiration – The Kreb's Cycle – The module will provide a discussion of the importance of respiration and an overview of the basic processes and metabolic steps that occur during the Kreb's cycle.

d. Cellular Respiration – Electron Transport - The module will provide a discussion of the importance of respiration and an overview of the basic processes and metabolic steps that occur during electron transport.

Modules Being Planned

a. Mitosis
b. Meiosis
c. Bioinformatics

B. Faculty Mentored Research Projects

1. Research Results For 2009:

a. Carotenoid Pigments in the Feathers of Louisiana Birds, Especially the Northern Cardinal (*Cardinalis cardinalis*): Carotenoid pigments are the second most prevalent pigment in the avian integument. Birds are incapable of synthesizing these compounds and rely on diet as a source. Common avian food sources, such as fruits and berries, contain carotenoids like lutein and zeaxanthin. It is thought that the carotenoid present in the plumage of a bird has a direct correlation with the carotenoids present in that bird's food source. The purpose of this study was to confirm the presence of carotenoids in berries that may serve as potential avian food sources and to compare these carotenoids to those present in birds. The carotenoid profile of five species of berries was determined. Birds and other animals can exhibit bright colors based on the carotenoid content of the skin or feathers. Carotenoids also can also serve an additional role as anti-oxidants. Although birds do not biosynthesize carotenoids, they can metabolically convert dietary carotenoids into different forms. To better understand the ecological role of color in birds we need to catalog the types of carotenoids associated with different colors. This preliminary study analyzed the carotenoid content of three species of birds. Faculty Director - Dr. Jim Ingold and Dr. Cran Lucas; undergraduates - Renee Edwards,Aaron Lincoln; high school student – Elizabeth Burford.

b. Plant/Insect Interactions: Chinese tallow tree seeds collected in the winter of 2006 were first tested for viability using XXX and sterile technique. All of the seeds were viable. In Experiment one, Amelia Irwin's involved single treatments of seeds in different environments and monitor them (in Petri dishes) for germination. All groups were soak in distilled water for 24 hours and had a continuous water rinse for 48 hours. There were five treatment groups of ethyl alcohol, sulfuric acid, hydrochloric acid and acetic acid. In both experiments, they were soaked in either acid or alcohol for 24 hours and then rinsed in water for 24 hours. In addition scarification was used on seed coat for a treatment. The controls germinated but also had significant mold growing on them. The seeds that were scarified did succeed in germinating and developed into healthy seedlings. In Experiment two, Stephanie Mosier's experiments consisted of a combination (multiple treatments) of soaks, alcohol and acid rinses including scarification. In experiment two the controls germinated but only after a mild treatment of sodium hypochlorite to control the mold problem. This may suggest that a mild alkaline treatment may be a faster method of germination. A combination of ethyl alcohol, hydrochloric acid and scarification resulted in germination as did a treatment of ethyl alcohol, acetic acid and scarification. In both experiments the success of germination was divided into three main phases: seed coat swelling, seed coat splitting and growth of the radicle. Once radicle growth was observed, the seeds were planted in commercial potting soil. Significant moisture was maintained and the seedling development was 100%. Due to the significant growth of mold a third experiment was designed and implemented. Kimberly Mosier volunteered to determine an optimal regimen of sodium hypochlorite spraying schedules to prevent the growth of mold but to maximize seed germination. Our controls did not receive any sodium hypochlorite spray. The treatments consisted of daily sprays, and then spraying every 2, 3, 4, 5, 6 and finally a weekly spraying. The two concentrations were 10% and 50%. The results indicate that spraying sodium hypochlorite did inhibit mold growth and the most efficient germination with the least amount of spraying was to spay with concentration X every X days. We were able to detect several different types of mold growth based on the observation of hypha growth and hypha color. The classification of the different molds warrants further experimentation. Faculty Director - Dr. Beverly Burden; undergraduate - Stephanie Mosier; high school students - Kimberly Mosier and Amelia Irwin.

c. Nanosensors for Reactive Oxygen Species:

Reactive oxygen species (ROS) has been implicated as an important underlying cause in cancer and many neurodegenerative diseases. However, the molecular mechanisms that connect ROS to carcinogenesis and these pathological conditions remain insufficiently understood. This is mainly because most of our current understanding of the effects of ROS has come from *indirect* endpoint measurements such as DNA, protein damage and lipid peroxidation. These measurements only assess the cumulative effects of ROS and provide limited information on the molecular mechanisms of such effects. We proposed the development of novel fluorescence-based photonic nanosensors capable of direct and selective detection of ROS. We will use the

proposed nanosensors to monitor changes in intracellular ROS concentration and distribution directly during carcinogenesis. By correlating these changes to the regulation of key cancer biomarker from parallel bioassays, we hope to further elucidate the differential roles of individual ROS in carcinogenesis and the molecular mechanisms of such roles. To achieve these goals, we have synthesized several potential ROS probes by introducing various benzenesulfonyl groups onto the fluorescein molecule. Unlike traditional ROS probes, these benzenesulfonyl-fluorescein derivatives detect ROS based on non-oxidative mechanisms, rendering selectivity toward different ROS. By varying the type and position of the substituent on the benzenesulfonyl group, the reactivity of the fluorescein derivative can be tuned. The selectivity of these probes toward different ROS is the topic of an on-going study. The outcome of this study will be used in further assisting the design of ROS probes with improved specificity toward individual ROS. We have also prepared amine-modified silica nanoparticles as the nano-platform for the ROS probes. Several parameters were varied in an effort to reduce the size of the nanoparticles and produce nanoparticles with more uniform size. In a proof-of-concept experiment, we successfully incorporated fluorescein isothiocyanate (FITC) onto the amine-modified silica nanoparticles. The feasibility of obtaining functional nanosensors through covalent attachment of benzenesulfonyl-fluorescein-based ROS probes was demonstrated. We plan to use these preliminary results to guide our synthesis of additional ROS probes and conduct more extensive selectivity study. We also plan to evaluate the performance of the nanosensors using a model cell system in the near future. Faculty Director – Dr. Kui Chen; undergraduate – Annie Wilson.

d. Using Budding Yeast to Identify Molecular Targets for a Putative, Novel Anti-Cancer Drug, Fusarochromanone (FC-101a): The objective of this research project is to utilize *Saccharomyces cerevisiae* (baker's yeast) as a tool to more quickly determine how cancer cell growth is inhibited by a promising new drug called fusarochromanone (FC-101). We plan to identify molecular targets for this putative, novel anti-cancer drug and its analogues. We hypothesize that genetic characterization of baker's yeast at sub-lethal concentrations of FC-101a can be used to identify a molecular target common to other eukaryotes. This ongoing investigation will serve as a preliminary *in vivo* study to identify the molecular targets of FC-101a and its analogues for future animal model and clinical trials. This research project involves molecular genetics, computational biology, molecular mechanism of disease and preventive medicine. We performed drug sensitivity assays and determined that the growth rate of baker's yeast is inhibited 50% by 0.343 mM FC-101a. We began the genetic screen of the yeast deletion collection exposed to FC-101A with the *yca1/mca1* deletion strain. *YCA1* encodes the single yeast metacaspase that is required for cell cycle progression. Drug sensitivity assays with the *yca1/mca1* deletion strain revealed that the loss of *YCA1* causes yeast cell hypersensitivity to FC-101a ($IC_{50} \leq 0.0685$)**.** Initially this finding seemed contradictory with the discovery that overexpression of caspase-3 causes cell growth inhibition.However, we propose two explanations for the inconsistency. Although FC-101a has an inhibitory effect on melanoma cell growth at 1-2 nm concentrations, FC-101a also has a stimulatory effect on melanoma cell growth at 10 – 100 fold higher doses. Furthermore, the presence of multiple caspases in mammalian cells, some of which have roles specific to apoptosis and some of which regulate cell cycle progression, indicate that activation of apoptosis does not fully explain the effects of FC-101a on cell growth. The presence of a single metacaspase in yeast with multiple cellular functions and the cellular resistance of yeast to

FC-101a may explain further the seemingly contradictory results. We hypothesize that the resistance of yeast cells to FC-101a may be caused by (1) the cell's ability to efficiently export the compound, (2) differential gene expression or (3) post-translational mechanisms that quickly rescue the cell from unfavorable environmental changes**.**

To continue our genetic screen and initiate microarray analysis of cells exposed to FC-101a at 0.343 mM, we obtained the APHIS PPQ 526 permit from the USDA to receive and maintain *Fusarium equiseti* at LSUS. We obtained two FC-101a producing strains (R-4482 and R-8502) of *Fusarium equiseti* from the *Fusarium* Research Center at Penn State University. We are storing and maintaining these strains to have a constant source of FC-101a. Regularly, we inoculate rice cultures with seven-day old agar plugs in 10 ml of inoculate containing *F. equiseti* mycelium (10^3 to 10^5 macroconidia/mL) and maintain cultures at room temperature. During the first week, the flasks are hand-shaken daily to stimulate uniform growth of the mycelium. After one to two more weeks, the rice cultures will be stored in the freezer until used. Crude mixtures of *F. equiseti* metabolites will be extracted by Dr. Elahe Mahdavian for isolation of FC-101a. Faculty Director – Dr. Tara Williams-Hart; undergraduates - Zenita Wilson, Trey King, Lurah Welch, and Shavondrea Lawrence.

e. The C-fern™ protocol: Fern Gametophytes, in vitro Cultivation, Fertilization and Genetics: The Rapid Development from Gametophyte to Sporophyte in Ceratopteris: The development from gametophyte to sporophyte in Ceratopteris (c-Fern) is easily observed due to its rapid growth. The thallus and rhizoids appear after seven days of incubation. The notch meristem is fully developed in eleven days. Clusters of cells that will develop into an archegonium or antheridium are visible within thirteen days. The meiosis of the sperm cells occurs at the same time the egg cell becomes visible. After fertilization, phenolic compounds appear to seal off the neck cells of the archegonium. Four weeks after germination, the first growth of the sporophyte is observed. The Mysterious Wisk fern, Grape fern, and Adder's Tongue: Higher land plants consist of two lineages: ferns and seed plants (Euphyllophytes). Based on molecular genetics, ferns comprise five lineages, whereas the specific relationships among these lines are yet unresolved. Surprisingly, Ophioglossaceae and Psilotaceae result as each other's closest relatives - much in contradiction to classical morphological data. Is this the result of flawed taxon sampling (long-branch attraction)? Is this the result of inaccurate morphological analysis? Is there a developmental-genetic explanation for the morphology-gap? We recode the morphological matrix according to our own recent findings, and include developmental genes in the molecular comparison.

Where is WUSCHEL*? What gene drives shoot development in ferns?:*WUSCHEL (WUS) is the main regulator gene for shoot meristem development in seed plants, where it has been widely studied. However, little research has been done on WUS in non-seed plants, like ferns (Monilophytes). On NCBI-GenBank, no sequences of its WOX gene family are found in ferns. Luckily, sequences for Gymnosperms are found, indicating that this Homeobox gene family is very old and likely to be present in ferns. In this study, we subject genes from Gymnosperms and basal-most angiosperms to a phylogenetic analysis, evaluating their evolutionary relation.

Ferns, Shoots, and Leaves: is the development of fern leaves regulated by KNOX genes?: KNOX genes are Homeobox genes that regulate the development of meristems in plants. Classically, KNOX genes up-regulate cell division. In seed plants, KNOX gene transcription can stop locally, and then be reactivated, for example in the extending lobes of leaves that are dissected or 'complex'. In plants with simple leaves, these KNOX genes are never reactivated. In contrast to seed plants,

in ferns no evidence has been found that KNOX genes are reactivated during leaf development. Ironically, KNOX genes also play a role in shoot growth; interestingly fern leaves grow similar to shoots. Faculty Director – Dr. Matyas Buzgo; undergraduates – Christopher Young, Cassie Cole, Jonette Green, Lauren Woodward.

f. Mitochondria-Sequestered Anti-Cancer Compounds: This project involved the synthesis of a mitochondria-sequestered anti-cancer agent, which we called MitoVES. This compound, which we synthesized in our lab at LSUS, was shown to induce the rapid generation of reactive oxygen species that lead to the selective apoptosis of cancer cells. The student worked on the synthesis of chemical intermediates that were later used in the preparation of the final target. This is a collaborative research project with Prof. Jirka Neuzil at Griffith University in Southport Queensland Australia. Faculty Director – Dr. Brian Salvatore; undergraduate - Dakota Boston.

g. Development of Novel Anti-Cancer Agents Based on Fusarochromanone: Progress was towards the biological synthesis of FC101a, whereby the fungus, *Fusarium equiseti*, is induced to produce metabolite FC101a. Five isolates of *F. equiseti* (218, 265, 379, 381, 408 - Dr. Hamed K. Abbas in USDA-ARS) were obtained and maintained on PDA at 24 °C as described previously. Seven-day old agar plugs in 10 ml of inoculate containing *F. equiseti* mycelium (10^3 to 10^5 macroconidia/mL) were transferred to 250 g of autoclaved rice in ddH_2O. The rice was inoculated with the mycelium agar plugs from the five-day old PDA cultures and maintained at room temperature. During the first week, the flasks were hand-shaken daily to stimulate uniform growth of the mycelium. After one to two more weeks, the rice cultures were stored in the freezer until used. Crude mixtures of *F. equiseti* metabolites were extracted twice in $CHCl_3/CH_3OH/NH_4Cl$ (90/10/0.1%). The extracts was concentrated and used without further purification for FC101a detection. A simplified method of thin layer chromatography (TLC) for the detection of FC101a in culture extracts was used. A sample of authentic FC101a dissolved in chloroform was spotted as a positive reference on a TLC plate. Then a sample of crude extract from each culture was spotted next to the positive control. FC101a fluoresced with a characteristic bright blue color under long-wavelength UV light (364 nm) and appeared as a light brown colored spot under short-wavelength UV light (350 nm). A comparison of TLC characteristics of the crude extracts with the control FC101a confirmed that none of the five *F. equiseti* screened so far produced FC101a as a metabolite. These results also confirmed previous findings that the biosynthesis of FC101a was rare and was only detected in three isolates of F. equiseti, namely R-4482 (barley, Germany), R-6137 (barley, Alaska), and R-8508 (potato, Denmark), among all the sixty two isolates tested from various geographic sources. Currently, Dr. Williams-Hart and I are working on obtaining a USDA permit (APHIS PPQ 526) for storage and maintenance of *F. equiseti strains.* Upon acquisition of this USDA license, we will be able to obtain the FC101a-producing strains of *F. equiseti from the* Fusarium Research Center in Penn State University.

An authentic sample of FC101a was obtained from Dr. Furmanski, a new collaborator at the St. Jude Cancer Center in Memphis. We have purified this sample and submitted it to Dr. Clifford for *in-vitro* cell culture studies and *in-vivo* studies on animal models for skin cancer. We also submitted a pure sample of FC101a to Dr. Tara Williams-Hart for the assessment of the mechanism of FC101a's biological function in *Saccharomyces cerevisiae* or budding yeast. The initial *in-vitro* experiments were carried out using the SRB12-p9 human skin squamous cell

carcinoma (SCC) cell line. SCC is the most clinically aggressive form of non-melanoma skin cancer, which has been increasing in incidence as much as 10% annually in recent years. SRB12-p9 cell lines are routinely studied in Dr. Clifford's laboratory. They grow rapidly, with a doubling time of ~20 hours, and they are easy to work with. For the mouse experiments, Dr. Clifford needed an ultra pure sample of FC101a in its salt form (for solubility concerns). We had originally received the sample of FC101a from Dr. Furmanski in its phosphate salt form, but this sample contained some impurities, judging by the appearance of its free base on the thin layer chromatography (TLC) plate. We considered purifying this phosphate salt by recrystallization, but we did not want to take the risk of losing any material during crystallization. Additionally, we could not purify the salt using normal phase chromatography, because of its insolubility in most organic solvents. Therefore, we first converted the phosphate salt of FC101a to its free base by first suspending the salt in $CHCl_3$ and then washing it with 5% Na_2CO_3. We then purified the free base using preparative TLC in methylene chloride/methanol (87:13) containing about 0.2% aq. NH_4OH. Following the purification, we converted the free base FC101a back to its salt by treating it with excess phosphoric acid in isopropanol. After repeating this process twice, we were able to obtain ~ 44 mg of pure FC101a salt for the in-vivo experiments. The purity was confirmed by proton and carbon NMR. The parent FC101a inhibited the growth of human SCC cancer *in-vitro*. This activity was both potent (IC_{50} < 1 mM, 72 h) and dose-dependent. Yet, despite its very high *in vitro* anti-cancer activity, the molecule shows substantially less anti-cancer activity *in vivo*, requiring the administration of 8 mg/kg in mice for 24 days to achieve a 20% reduction in tumor growth. Therefore, we also confirmed the previous reports that FC101a is less potent *in-vivo* than *in-vitro*.

These studies in SCC models of cancer reconfirmed the previous reports that FC101a is less potent *in-vivo* than *in-vitro*. Thus, we view FC101a as a good candidate for structure-based lead optimization. This goal is significant because the use of bioactive natural products as new lead compounds has proven to be (and will likely continue to be) the best new small molecule cancer chemotherapeutic drug candidates. Further development of this lead compound as a drug requires that we devise a reliable source for obtaining FC101a both through chemical as well as biological synthesis. The completion of both the chemical and biological syntheses of FC101a will enable us to subsequently prepare a series of novel structural analogs with improved *in-vivo* potency, bioavailability, and metabolism. Additionally, our studies will further establish quantitative structure activity relationships (QSAR) among FC101's potent analogs. Faculty Dirctor – Dr. Elahe Mahdavian; undergraduates - Matthew Semmons, Bonnie Buckley.

h. Development of Medical Monitoring Equipment: One project centered on the feasibility of constructing a low energy charged particle accelerator. It was required that the device be built using readily available laboratory components. This accelerator would impart energy equal to approximately 350 KV and would accelerate electrons, protons or deuterium nuclei. A student machined all of the components used as well as constructing the electrical components required. He also did mathematical analysis on representing the relativistic based velocities and momentums of such accelerated particles. This research proved that only a modest effort is

necessary to equip a laboratory with such an accelerator. Although the research is a proof of concept only and the uses of such a low energy machine is limited, it was determined that a small physics laboratory equipped with the necessary vacuum pump and machining tools can construct such a device. A machine of this nature can be used in both biological as well as physics research, but is limited in energy and would require shielding to be operated in a laboratory environment near personnel. Numerous problems were encountered especially with vacuum sealing, but these can be overcome with the correct use of both techniques and proper materials. This student learned both new skills and knowledge in carrying out this effort.

For some time LSUS has been engaged in developing devices to aid the unvoiced with synthetic speech. Two units have been created in our laboratory for various levels of handicap and are currently in use at local facilities. A second project involved a student working on a third unit developed in our physics/electronics laboratory intended to span a large variety of possible solutions for problems existing in most, if not all, currently available units now on the market. This effort required a considerable application of both hardware and software expertise. Most of the hardware and low level programming components were developed by Dr. Gary Boucher with the higher level software to drive a custom USB interface along with providing access to the device itself as well as a remote FTP server was developed by the student. This was a huge effort requiring considerable time and effort on the student's part. The student's contribution, the higher level interface software, required a graphics interface capable of placing and sizing icons representing phrases to be spoken at locations on a screen area designed by the user. These icons are then printed using the student's software onto a paper template which can be cut to size and inserted behind the touch screen of the talker machine. The high level software maintains the phrases and icons in matched pairs and is responsible for loading the unit with both coordinates of each icon and the audio files representing the phrases for that coordinate. Ultimately the system came together well and performed in a nearly seamless manner. Currently LSUS is preparing to test the unit in the field. This effort greatly enhanced the student's skills in the C# programming language in ways not normally encountered in class work. Faculty Director – Dr. Gary Boucher; undergraduates – Clint Naquin and Bunyamin Kocabasoglu.

i. Hebibivory and Feeding Preferences in Crabs: Nutrient additions impact the structure of marine ecosystems by altering feeding relationships of organisms that live within them. Specifically, elevated nutrient concentrations may lead to increased herbivory if: 1) plant nutritional value is raised and herbivores become tolerant of chemical defenses or 2) plants start to produce fewer defenses. At the same time, nutrient additions may lead to decreased herbivory if plants start to produce greater amounts or types of defenses. Therefore, to examine how nutrient additions impact feeding relationships, a fertilization study is being conducted that will assess how changes in plant chemistry affect crab feeding in mangrove ecosystems. This past year, equipment was purchased and repaired to start research. Students have been working on processing leaves for chemical analysis. They have been drying, weighing, and grinding mangrove leaf material. Faculty Director – Dr. Amy Erickson; undergraduates – Tracy Morlock, Kathleen Moody, C. Faith

2. Faculty Mentored Research Projects For 2010

a. Development of Novel Anti-Cancer Agents Based on Fusarochromanone: The primary goal of this research is to develop novel anti-cancer agents based on fusarochromanone (FC101a), a natural mycotoxin and a fungal metabolite produced by *Fusarium equiseti*. FC101a has been identified as an attractive lead drug candidate because of its diverse biological properties, including potent anti-angiogenic and direct anti-tumor activity. Like most other bioactive natural compounds, the potency of FC101a is compromised *in-vivo*, and the project's goal involves the establishment of structure-function relationships among some of FC101a's more potent analogs. The PI of this project, Dr. Elahe Mahdavian has expertise in synthetic organic chemistry and medicinal chemistry. Progress has been made towards the total synthesis of FC101a and several novel analogs in Dr. Mahdavian's research laboratory at LSUS. A total of six undergraduate LSUS students have been involved in the synthetic pathway of FC101a. Progress has also been made in optimizing the biosynthesis of FC101a, whereby the fungus, *Fusarium equiseti*, is induced to produce FC101a. Several strains of *Fusarium equiseti* have been obtained and tested for the presence of FC101a. We have also obtained an authentic sample of FC101a from a new collaborator at the St. Jude Cancer Center in Memphis, which was purified and submitted to Dr. Clifford, for i*n-vitro* and *in-vivo* studies on models of skin cancer. We have also submitted a sample to Dr. Tara Williams-Hart at LSUS for the assessment of the mechanism of FC101a's biological function in *Saccharomyces cerevisiae* or budding yeast. The specific aims of the project are as follows:

I. Obtain FC101a through chemical synthesis using commercially available starting materials.
II. Obtain FC101a through biological synthesis using isolates of *F. equiseti.*
III. Assessments of *in-vitro* and *in-vivo* biological activity of parent FC101a in Squamous skin cancer models.

These aims will be accomplished in the following manner:

I. We will continue our progress to obtain a reliable source for the parent FC101a compound through both the chemical and biological syntheses. Once we obtain larger quantities of FC101a, we will subsequently prepare a series of structural analogs as proposed in the original proposal.

II. We will improve the analyses & visualization of our *in-vivo* SCC tumor suppression data including the treatment of outliers, boxed plots, and etc.

III. We will examine the tumor morphology from our *in-vivo* SCC mouse experiments for general, gross anatomical, and gross pathological observations.

IV. We will perform analyses of tumor histology, immunohistochemistry (ELISA), blood vessels and angiogenesis, mRNA/protein expression levels (western & northern blotting).

V. We will determine the expression levels of several known proteins involved in skin cancer including the active caspase-3 in the SCC tumor masses from our mouse experiments. It was previously reported that active caspase-3 was over-expressed in tumor masses of mice with Melanoma cancer treated with FC101a compared with controls.

VI. For future mouse experiments, we will use larger number of mice per group to improve error analysis and statistical significance. We will explore alternative modes of delivery of injecting the mice 7 days/week instead of 5 days/week. We will also explore alternative modes of drug administration including intraperitoneal, intravenous, gavage, etc. Faculty Director – Dr. Elahe Mahdavian; undergraduate – Dakota Boston

b. Carotenoid Pigments in the Feathers of Louisiana Birds, Especially the Northern Cardinal (*Cardinalis cardinalis*): Carotenoid pigments produce red, yellow and orange feather colors. These pigments are not manufactured by birds but must be obtained in their diet. Upon assimilation from the digestive tract, these pigments are modified before being placed in the feathers or other avian structures such as skin. We will continue to use both spectrophotometry and thin layer chromatography (TLC) to determine the exact carotenoid pigments in feathers of local Northern Cardinals as well as a variety of other local birds. In addition, the study will be expanded to include and analyses of local food sources. Faculty directors - Dr. Jim Ingold and Dr. Cran Lucas; high school students - Carlee Ward, Kaitlin Flattmann

c. Hebibivory and Feeding Preferences in Crabs: Nutrient additions impact the structure of marine ecosystems by altering feeding relationships of organisms that live within them. Specifically, elevated nutrient concentrations may lead to increased herbivory if: 1) plant nutritional value is raised and herbivores become tolerant of chemical defenses or 2) plants start to produce fewer defenses. At the same time, nutrient additions may lead to decreased herbivory if plants start to produce greater amounts or types of defenses. Therefore, to examine how nutrient additions impact feeding relationships, a fertilization study is being conducted that will assess how changes in plant chemistry affect crab feeding in mangrove ecosystems. This past year, equipment was purchased and repaired to start research. Students have been working on processing leaves for chemical analysis. They have been drying, weighing, and grinding mangrove leaf material. This plant matter will be analyzed for CNP values as well as for mangrove defenses including phenolics, condenses tannins, and terpenes. This summer, analysis of nutritional chemistry will be contracted out. In addition, methods will be developed for the isolation and characterization of terpenes within mangrove leaves. Students will be trained in column chromatography, TLC, and HPLC. If time permits, phenolics, tannins, and terpenes will be quantified as well. Faculty Director – Dr. Amy Erickson; undergraduates – Tracy Morlock, Kathleen Moody, C. Faith

d. Analysis of Behavior in *C. elagans*: Quantitative behavior assays will be performed on strains of the nematode, C. elegans. C. elegans is a well-established model organism for the study of neurobiology and development. A computer vision system developed for C. elegans, the Worm-Tracker, will be used to digitally record and measure movement of nematodes. Analyses will be performed on wild-type and mutant strains, as well as strains treated with anti-psychotic drugs. The project will be performed in collaboration with Dr. Eric Aamodt, Dept. of Biochemistry and Molecular Biology, LSUHSCS. The long-term goal of the project is to elucidate and understand of the molecular targets of the drugs and the genetic pathways affected by the drugs. Faculty Dirctor – Dr. Stephanie Aamodt; undergraduates -

e. Assessment of the Molecular Target of Fusarochromanone in *Saccharomyces cerevisiae* Baker's Yeast): The objective of this research project is to utilize *Saccharomyces cerevisiae* (baker's yeast) as a tool to more quickly determine how cancer cell growth is inhibited by a promising new drug called fusarochromanone (FC-101a). We plan to identify molecular targets for this putative, novel anti-cancer drug and its analogues. We hypothesize that genetic characterization of budding yeast at sub-lethal concentrations of FC-101a can be used to identify a molecular target common to other eukaryotes. This investigation will serve as a preliminary *in vivo* study to identify the molecular targets of FC-101a and its analogues for future animal model and clinical trials. This research project involves molecular genetics, computational biology, molecular mechanism of disease and preventive medicine.

Molecular genetics will be utilized to identify intracellular targets of FC101a and its analogues. To do so, we will perform microarray analysis of yeast cells exposed to FC-101a and a genetic screen of deletion strains of yeast. Strains, media and genetic crosses: For this study students will make at least three different media types: 1.5% carnation leaf agar (CLA), YPA agar, YPD agar and YPD liquid. RNA isolation: Isolation of *S. cerevisiae* RNA will be carried out using the Ribo-Pure™-Yeast Kit (Ambion). Cells will be counted with a hemacytometer to achieve the expected target RNA yield of approximately 1 µg. Microcentrifuge tubes, each containing 1.0 mL of cells, will be centrifuged for one minute at 13,000 rpm and the supernatant will be removed, pooled and prepared according to the kit protocol. Based on the drug sensitivity assays that were performed in the Summer and Fall 2010 semesters by students financially supported by the SCI-NET, RNA will be isolated from yeast cells exposed to 0.343 mM FC-101a (IC for budding yeast strains used) after 7, 9, 11 and 12 hours at 30 degrees Celsius. RNA will be frozen for later delivery to the LSU- HSC-S core facility for hybridization, fluorescence labeling and microarray analysis. Microarray Analysis: Affymetrix GeneChip® cDNA technologies will be used for the genome-wide expression profiling of *S. cerevisiae.* Genetic Screens: We will continue with the genetic screen conducted during the 2009 summer and fall semesters to identify genes that when deleted confer drug resistance or reverse the drug sensitivity phenotype of the wild-type strain. We hypothesize that the corresponding genes may represent specific molecular targets. We will screen the yeast deletion collection for strains that contain a deletion of some of the approximately 4,200 non-essential genes. Yeast deletion strains derived from BY4741 and generated by the *S. cerevisiae* deletion consortium have been obtained from collaborator, Dr. Kelly Tatchell. This collection will be maintained in an ordered array in 96-well plates. Drug screens will be performed in 96-well plates containing 0.343 mM FC-101a and growth assays will be performed as described above for drug sensitivity assays. Putative chemical-genetic interactions will be confirmed by serial-dilution spot assays in a second round of analysis, such that a final data set should contain few false positives. Faculty Director – Dr. Tara Williams-Hart; undergraduates - Mickeal Key, Sarah Oncale, Tameko James, Danny Felty.

f. Ferns, Shoots, and Leaves: The Quest for the Evolutionary Link of Shoot Development in Higher Land Plants: In the past research, we re-examined the shoot development of a group of ferns that are isolated from other ferns and that differ morphologically that much that they were considered at the opposite poles of fern evolution until recent molecular studies united them. 1) Frond development of Psilotaceae may not differ as much from Ophioglossaceae as expected; actually, the spore bearing structure characteristic for Ophioglossaceae is also found in

Psilotaceae; 2) Psilotaceae are not really without leaves: much more does the aerial frond represent a "leaf" in Ophioglossaceae; and differences are less due to reduction (of the leaf), but due to homeotic changes of sporophore position and lamina expansion; 3) All ferns (Monilophytes) studied have the shoot and leaf development driven by a single apical cell, not by a group of apical cells as found in seed plants. Interestingly, in Ophioglossaceae this apical cell is less distinct than in other ferns, and the shoot apex is more similar to extant gymnosperms (except Cycadales); 4) This major difference in apical shoot development between ferns and seed plants is also reflected in the absence of reported WOX genes for ferns in our previous datamining projects. WOX genes (WUS-like Homeobox genes) are the key to the regulation of the shoot apical meristem in seed plants, diverse and extensively studied in flowering plants. In Gymnosperms, only few sequences were found (Pinus) and for any fern, they are completely absent.

The points (1) and (4) mentioned above are most promising to be pursued. 1**)** The development of the axillary spore bearing structure (sporophore) in Psilotaceae and Ophioglossaceae needs further investigation. This requires histological thin sections of developing frond apices embedded in paraffin, and histological staining. These procedures can integrate students who are skilled and reliable to learn this basic task within due time and reach a productive level. Histological thin sections are a common practice in medicine, physiology, and histology (e.g., cancer biopsies), and for many students a vital technique to be familiar with. A histological lab has been set up. The questions are:

a) Does the scale of *Psilotum* grow with an apical cell, similar to the leaf or leaflet in Ophioglossaceae (object genus: *Botrychium*)?

b) Does the sporophore in *Botrychium* also grow with an apical cell (likely yes) and if yes, does this apical cell derive from the apical cell of the stem, or the one of the leaf?

c) Does the sporophore in *Psilotum* also grow with an apical cell, and if yes, does this apical cell derive from the apical cell of the stem, or the one of the leaf?

d) How many steps of existing morphological matrices need to be changed until the position of Psilotaceae and Ophiolglossaceae within ferns correspond in both analyses: morphological datasets and molecular datasets?

A deeper search for WOX genes and also KNOX-genes (the other homeodomain family involved in shoot and leaf development) needs to be undertaken. The previous search on Genbank was possibly incomplete, as several homologs of these genes are not annotated as Homeobox genes. However, sequence-oriented BLAST searches did not add any sequences to our list, and such sequences truly may not have been reported. The plan is to perform a standard genomic DNA extraction from several ferns, namely Psilotaceae, Ophioglossaceae (core interest), Ceratopteris (the model organism of ferns, a Leptosporangiate fern) and the second distinct eusporangiate family: Equisetaceae. DNA from these taxa will then be probed for WOX

and KNOX-homologs using leniently specific primers, and captured sequences be followed-up in depth with more specific primers. As an outlook beyond this, the YABBY-gene family should also be tested for, which may be part of a smaller datamining student project, corresponding to previous studies. DNA extraction and PCR-amplification of specific genes are standard molecular procedures with well-established protocols. Students should encounter this technique on the way to a Biology major. The task can be carried out by students who have some bench skills (from basic chemistry labs) or who are ready to follow instructions diligently. The questions are:

a) Do WOX and KNOX genes even occur in ferns?

b) If yes, how do they relate to the ones in seed plants? (Phylogenetic analysis)

c) Are these genes monophyletic between the common ferns (independent evolution within ferns) or are their radiation histories parallel or convergent between seed plants and ferns (similar developmental constraints in common Euphyllophyte ancestors).

Faculty Director – Dr. Matyas Buzgo

g. Plant/Insect Interactions: Previous research has demonstrated that Chinese Tallow tree leaves are toxic to the larve of Tobacco budworms. The data was generated using frozen leaves soon after they were picked. In order to standardize the weight we dried the leaves in an oven. Oven drying the leaves reduced the toxic effects by approximately 50%. Using regular frozen tissue, mature leaves were bioassayed and compared to smaller juvenile leaves. The mature leaves were 30% more toxic than the juvenile leaves. Future research will determine the toxicity of regular frozen mature leaves to freeze dried leaves. Faculty Director – Dr. Beverly Burden; high school – Kimberly Moiser and Jeffrey Irwin.

h. Fluorescent Analogs of Mito VES, a Potential Anticancer Drug: This project will involve the synthesis of new fluorescent analogs of MitoVES. These analogs will be used to study the uptake of these compounds by the mitochondria of cancer cells. The project also shows promise for potential collaboration with the Bioinformatics (LABi) group at LSUS. The student will prepare chemical intermediates and work toward the synthesis the fluorescent target compounds this summer. The target compounds will be sent to Prof. Prof. Jirka Neuzil at Griffith University in Southport Queensland Australia for confocal microscopy studies on live cells using "MitoTracker" mitochondrion-selective probes, in conjunction with the new synthetic compounds. Faculty Director – Dr. Brian Salvatore; undergraduate - William Grimes.

i. Theory and Practice of Discrete Time Signal Processing: This research will be centered on the theory and practice of discrete time signal processing as it pertains to closed loop control systems. It is the desire of the researchers to accomplish two goals. The research plan is to first focus on the creation of software tools using Mathematica for the analysis and design of open and close loop linear time invariant systems, a major component of many electronics

applications. It is a secondary goal of this research to create a generic digital control system using a Rabbit microprocessor, which can be used in a variety of robotic applications. Both of these areas will be combined to produce an easily programmed discrete time control system useful in a wide variety of applications. Faculty Director - Dr. Gary R. Boucher; undergraduate - David Poe.

Student Training: Undergraduate and/or high school students were involved in every aspect of the projects described above. As participants in these projects, they received training in scientific methodology and laboratory and/or field techniques that will prove useful when they eventually join the workforce. Techniques learned during these projects include, but are not limited, to the following: bird banding, field sampling techniques, field testing techniques, analytical laboratory techniques, plant and tissue culture, sample preparation, histological staining techniques, the use of the scanning electron microscope, microchip data analysis, and techniques used in the synthesis of organic molecules.

Community Outreach: Through the high school teacher workshops and the involvement of high school students in faculty-directed research projects, both described above, this project has allowed LSUS to begin to bridge the gap between science education at the high school level and science education at the university level.

Problems Encountered: No major problems were encountered during the last year of these project activities.

A. Contributions:

A. LSUS faculty and students are developing 'front-of-the-wave' educational learning modules throughout the LSUS life science curricula. Creating interactive, interdisciplinary learning modules that guide students to a deeper understanding and/or application of essential knowledge will improve student experience in the freshman/sophomore STEM courses at LSUS, where there is currently a lack of practical application for much of the course content. Helping students understand how to use guided inquiry to deepen their understanding will transfer into their learning approaches in other science courses. Furthermore, training high school teachers to use the learning modules and having high school students experience the guided inquiry and content of the modules will enhance the STEM preparedness of these high school students and thereby increase success rates in freshman/sophomore science courses – regardless of where these graduates attend college.

B. LSUS undergraduates and area high school students are participating in experiential learning opportunities at LSUS. Experiential learning is most fruitful when both the faculty and students are engaged in the creation or application of new knowledge. Thus, creating opportunities for young scientists to engage in front-of-the-wave research has resulted in a rich collaborative mentoring environment among faculty, college underclassmen, and high school students. Providing access to basic research experiences has been a successful recruitment and retention tool for college and universities across the nation through programs like the National Science Foundation Research Experiences for Undergrads (REU's) [1]. LSUS has employed this model

on a smaller scale and include high school students in the model.

C. High school science teachers are being trained in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, including the newly developed coursework modules for the LSUS life science curricula. The historical lack of communication between high school teachers and college science faculty has delayed problem identification and the creation of innovative solutions to our local STEM curricula. A forum that rewards high school teachers for participating in the development of feasible enhancements to the STEM curricula represents a significant advancement in the region's science community.

D. Successful LSUS science students are participating in the training and mentoring of area high school science students. The utilization of LSUS undergraduate and high school students in the faculty directed research projects has provided the opportunity for the undergraduate students to mentor the high school students in the project.

E. A pool of life science high school and college graduates with current knowledge, technical and practical experience, and realistic understanding of the skills required to succeed in life science careers is being created. Through the "hands-on" experiential learning research projects, students are learning valuable laboratory techniques and the proper work ethic necessary to succeed in careers in the life sciences.

B. Project Revision:

The project has been much more successful in recruiting undergraduate students than high school students; therefore as we approach the fourth year of student research funding, it will be necessary to transfer funds from the high school student stipend line to the undergraduate student stipend line.

Annual Report for Year 2 (ending 6/30/2009)

Annual Report for Year 1 (ending 6/30/2008)

I. Personnel

A. Oversight Personnel

1. Dalton Gossett – PI and Project Director – responsible for coordinating all aspects of the project.
2. Stephanie Aamodt – responsible of arranging and coordinating high school teacher workshops
3. Amy Erickson – responsible for coordinating high school student research participation
4. Beverly Burden – responsible for coordinating LSUS undergraduate student research participation
5. Cran Lucas – responsible for project web site
6. Cindy Sisson – responsible coordinating computer purchases
7. James Ingold – responsible for coordinating social activities

B. Personnel Involved in Supervising Student Research Projects

1. Stephen Banks, LSUS Professor of Biology
2. Tara Williams-Hart – LSUS Assistant Professor of Biology
3. Beverly Burden – LSUS Associate Professor of Biology
4. James Ingold – LSUS Professor of Biology
5. Cran Lucas – LSUS Professor of Biology
6. Matyas Buzgo – LSUS Assistant Professor of Biology
7. Elahe Mahdavian – LSUS Assistant Professor of Chemistry
8. Brain Salvatore – LSUS Associate Professor of Chemistry

C. Undergraduate Students

1. Trinidy Fisher – working with Dr. Banks
2. Torey Kennedy – working with Dr. Williams-Hart
3. Michael Key – working with Dr. Williams-Hart
4. Annie Miller – working with Dr. Buzgo
5. Stephanie Mosier – working with Dr. Burden
6. Pradeep Pramanik – working with Dr. Ingold
7. Matthew Raley – working with Dr. Mahdavian
8. Jay Story - working with Dr. Mahdavian
9. Zenita Wilson – working with Dr. Williams-Hart
10. Sarah Witherington – working with Dr. Buzgo

D. High School students

1. Carson Allgood – working with Dr. Lucas
2. Makaela Brewer – working with Dr. Lucas
3. Amelia Irwin – working with Dr. Burden
4. Meghan Mussehl – working with Dr. Salvatore
5. Tenitra Rye - working with Dr. Williams-Hart
6. Whitney Chaney – working with Dr. Banks

II. Activities and Finding

A. Teacher Workshops

Goal: High school science teachers will be trained in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, including the newly developed coursework modules for the LSUS life science curricula. To accomplish this goal, the LSUS College of Sciences will host informational and training workshops for area high school teachers to learn about the content and expectations within the LSUS science curricula and will be encouraged to develop collaborative uses of the LSUS teaching and research lab facilities. Area high school science teachers (from Caddo and surrounding parishes) will be invited to these workshops, and each qualified pre-registrant will be compensated for their participation in the workshop. The topics and attendees of each workshop will vary, but example include: core concepts in the life science curricula, scientific equipment and research capacity at LSUS, and learning to use inquiry-based modules to reinforce essential life science concepts. In each workshop, interactive discussions and collaboration building will be central themes to help LSUS faculty understand and respond to the issues presented by the high school teachers.

Outcomes for HS Teacher training workshops in year 1:

1. Dr. Stephanie Aamodt, LSUS Director for Teacher Workshops for the Post-Katrina Grant and Catherine Williamson, Caddo Parish representative met eight times between January and June 2008 to organize and evaluate teacher workshops.
2. One teacher training workshop was held to discuss the life science curricula at LSUS and introduce learning modules and opportunities for experiential learning within the College of Sciences. This Teacher Workshop entitled “Shreveport/Bossier SciNet: Resources to develop life science education enhancements in high school curricula” was led by Stephanie Aamodt, PhD, Department of Biological Sciences, Louisiana State University-Shreveport and Cathy Williamson, Education Coordinator, Sci-Port Discovery Center and was held April 19, 2008, 9:00 am – 3:00 pm at Louisiana State University-Shreveport in Sciences Building, Room 228. SciNet Professional Development Workshop attendees included the following teachers from both Caddo Parish and Bossier Parish high schools:
   Jackie Gallion
   Cynthia Henderson
   Penny Pate
   Yvette Hays-Edwards
   Ramona Green
   Helen Odita
   Barbara Petteway
   Elizabeth Mire

Sassy Williams
Karen Merritt

3. Two reports were made on information from the workshop to faculty involved with Post-Katrina grant projects.
4. The workshop was very successful and generated support and enthusiasm. Several teachers volunteered to work with LSUS faculty in developing modules. Teacher input will be essential for alignment of curricula, pedagogy, and assessment. In the next workshop, these teachers will meet with LSUS faculty who are developing modules.
5. Teachers have requested CLU credit for work in developing modules, and for attending workshops and testing modules. We are working with the school systems to implement credit.
6. Modules that highlight LSUS research opportunities and allow teachers to bring classes to LSUS on field trips for first-hand experience with research will be encouraged. No modules have been completed, but due to the input from teachers at this meeting, several are being planned for completion during the summer and fall of 2008.

B. Faculty Mentored Research Projects

1. Water Quality Analysis in a Constructed Wetland: Six sites within a constructed wetlands at the LSU Agriculture Center Red River Research Station were sampled weekly from the middle of May through July. Sites 1 and 2 were located on the two sources of inflow. Site 3 was located at the dam between the upper and lower pond. Site 4 was located in lower pond where the water from the upper pond entered, while Site 5 was located at the dam across the lower pond. Site 6 was located at the drain pipe where the water exited the lower pond. Sites 1 and 2 provided information on the quality of the water before it reached the wetland system. Sites 3, 4 and 5 provided information on the overall improvement of water quality within the wetland system. Site 6 allowed us to evaluate the overall effectiveness of the wetland system. At each site, students recorded the time of day, air temperature, and weather conditions and measure turbidity, pH, conductivity, dissolved oxygen, and temperature. Finally, grab-samples were taken with an alpha-bottle. In the laboratory the water samples were analyzed for ammonia, nitrate, phosphate, and sulfate content. Another portion of the raw water sample were immediately prepared for an analysis of the biochemical oxygen demand (BOD). Within 24 hours of returning to the laboratory, raw samples which were acidified in the field were acid digested for total Kjeldahl nitrogen and total phosphate analysis. Faculty Director – Stephen W. Banks; undergraduate – Trinidy Fisher; high school student – Whitney Chaney.
2. Pre-treatment and Parameters of Germination of Chinese Tallow Seeds: This on-going research project involves the insecticidal activity of Chinese Tallow Tree leaves and caterpillars. There is now need to feed the caterpillars the leaves while they are still on

the tree. Since this is difficult to do outside, the trees need to be grown inside, but first the seeds must be induced to germinate. To identify the pretreatment procedures that will stimulate to seed germination, a matrix of pretreatments was used. A different variable was added at each level of the matrix, including, ethanol wash, scarification and acid washes. To determine the environmental parameters to stimulate and maintain seed germination, the seeds were maintained in a commercial optimally fertilized soil for hardwood tree seed germination. A thermal germination unit (propagation mat) was used to maintain constant soil temperature. The seeds were monitored and germination was noted. Faculty Director – Beverly Burden; undergraduate – Stephanie Mosier; high school student - Amelia Irwin

3. Breeding Territories of the Northern Mockingbird and Loggerhead Shrike in an Urban Environment: In the past, the Loggerhead Shrike has been studied on the LSUS campus, and this project continues that study with the addition of the Northern Mockingbird. The birds were trapped and banded with an aluminum US Fish and Wildlife Service band and with 3 plastic color bands in order to identify birds as individuals. Territories were mapped by following the birds and making marks on a map. Territory size was calculated by walking around the outermost points for each territory with a GPS unit. Nest of these two species were hunted, and information on various aspects of the breeding biology of these two species was collected. Faculty Director – James Ingold; undergraduate - Pradeep Pramanik
4. Is the whisk fern the ancestor of ferns? The whisk fern *Psilotum nudum* (L.) P. Beauv. is an enigmatic species among the ferns. Unlike all other ferns, it has no leaves and no actual roots, and a very archaic stem with a simple vascular system. These features are exactly what would be expected for the first land plants. Current molecular studies disagree about the position of the whisk fern along the evolutionary line leading to the other ferns. The growth of the whisk fern stem was examined by cutting it apart and using sectioning/staining as well as scanning electron microscopy to observe it's development. Data from this project was compared with data from other fern species in order to gain a greater understanding of the evolution of ferns. Faculty Directors – Cran Lucas and Matyas Buzgo; undergraduate - Annie Miller, high school students - Carson Allgood and Makaela Brewer.
5. Salt Stress Response in Budding Yeast: The long term goal of this research program is to investigate cell signaling pathways that regulate salt stress. Aberrant regulation of ion transport can lead to physiological defects or death. Yeast cells combat salt stress via transcriptional and post-translational regulation of ion transport genes to maintain internal ion homeostasis. This project was designed to identify specific genes that regulate ion transport in response to salt stress using the model organism *Saccharomyces cerevisiae, a.k.a.* baker's yeast. Classical and molecular genetics techniques were employed to identify novel ion transport pathways in baker's yeast. Specifically, changes in gene expression after wild-type and mutant cells had been salt-stressed in 0.8 M NaCl for 0 and 20 minutes were measured using DNA microchip array analysis. Each student performed cell culturing, genetic crosses with baker's

yeast, spectrometry, microscopy, RNA isolations, and microchip array data analysis. Faculty Director – Tara Williams-Hart; undergraduates - Torey Kennedy, Michael Key, and Zenita Wilson; high school student - Tenitra Rye.

6. Synthesis of *Fusarochromanone* and Its Novel Analogs: Cancer is the number two disease-related killer in the US and therefore there is tremendous need for effective new chemotherapeutic treatments. The ultimate goal of this research project is to discover and develop novel chemotherapeutic agents of more potency and less toxicity for treatment of cancer patients. Increasingly, researchers attempt to optimize bioactive natural products in order to enhance their efficacy and minimize their toxicity. Accordingly, this research project targeted a small natural flavonoid compound, a micotoxin produced by *Fusarium equiseti*, *Fusarochromanone* (*FC-101a*). *FC101a* displays a diverse array of interesting biological activity, including potent anti-cancer and anti-angiogenic properties. Like most other bioactive natural compounds, *FC101a*'s potency is greatly compromised *in-vivo*, suggesting poor *in-vivo* cellular uptake. To further develop *FC101a* as a chemotherapeutic drug, its total synthesis was completed, as well as the synthesis of a series of improved and novel *FC-101a* structural analogs with greater *in-vivo* potency. Faculty Director – Elahe Mahdavian; undergraduates - Matthew Raley and Jay Story.
7. Synthesis of *MitoVES$_1$*, a Mitochondrially Targeted Anti-Cancer Compound*:* From a therapeutic perspective, mitochondria are gaining recognition as the "Achilles heel" of the cancer cell. Mitocans are a new class of anti-cancer compounds that act inside of mitochondria. Tocopheryl succinate is one such compound, which was recently shown by our collaborator (Dr. Jirka Neuzil, Griffith University, Gold Coast Campus, Southport, Australia) to bind at the ubiquinone-binding site within mitochondrial redox complex II. Tocopheryl succinate exhibits this activity despite the fact that it is not structurally targeted to the mitochondria. The overall goal is to synthesize novel analogs of tocopheryl succinate that are targeted to mitochondria. This project focused on the synthesize of a novel analog of tocopheryl succinate, which we call mitoVES$_{11}$. Overall, this is a 9-step synthesis, and this project focused on the preparation of a few of the early intermediates in the synthesis. When the synthesis is complete, the target molecule will be sent to Dr. Neuzil, who will test it in cellular assays with a variety of cancer cells and also in a transgenic mouse breast cancer tumor model. Faculty director – Brian Salvatore; high school student - Meghan Mussehl.

Research Results: Since these research projects are being conducted during June, July, and August of 2008, no meaningful data has yet been generated. A summary of the major findings from this year's projects will be included in the 2009 annual report.

Student Training: Undergraduate and/or high school students were involved in every aspect of the projects described above. As participants in these projects, they received training in scientific methodology and laboratory and/or field techniques that will prove useful when they eventually join the workforce. Techniques learned during these projects include, but are not limited, to the

following: bird banding, field sampling techniques, field testing techniques, analytical laboratory techniques, plant and tissue culture, sample preparation, histological staining techniques, the use of the scanning electron microscope, microchip data analysis, and techniques used in the synthesis of organic molecules.

Community Outreach: Through the high school teacher workshops and the involvement of high school students in faculty-directed research projects, both described above, this project has allowed LSUS to begin to bridge the gap between science education at the high school level and science education at the university level.

Problems Encountered: No major problems were encountered during the last year of these project activities.

C. Contributions:

A. LSUS faculty and students are developing 'front-of-the-wave' educational learning modules throughout the LSUS life science curricula. Creating interactive, interdisciplinary learning modules that guide students to a deeper understanding and/or application of essential knowledge will improve student experience in the freshman/sophomore STEM courses at LSUS, where there is currently a lack of practical application for much of the course content. Helping students understand how to use guided inquiry to deepen their understanding will transfer into their learning approaches in other science courses. Furthermore, training high school teachers to use the learning modules and having high school students experience the guided inquiry and content of the modules will enhance the STEM preparedness of these high school students and thereby increase success rates in freshman/sophomore science courses – regardless of where these graduates attend college.

B. LSUS undergraduates and area high school students are participating in experiential learning opportunities at LSUS. Experiential learning is most fruitful when both the faculty and students are engaged in the creation or application of new knowledge. Thus, creating opportunities for young scientists to engage in front-of-the-wave research has resulted in a rich collaborative mentoring environment among faculty, college underclassmen, and high school students. Providing access to basic research experiences has been a successful recruitment and retention tool for college and universities across the nation through programs like the National Science Foundation Research Experiences for Undergrads (REU's) [1]. LSUS has employed this model on a smaller scale and include high school students in the model.

C. High school science teachers are being trained in the knowledge expectations and use of educational and experiential learning resources within the LSUS College of Sciences, including the newly developed coursework modules for the LSUS life science curricula. The historical lack of communication between high school teachers and college science faculty has delayed problem identification and the creation of innovative solutions to our local STEM curricula. A forum that rewards high school teachers for participating in the development of feasible enhancements to the STEM curricula represents a significant advancement in the region's science community.

D. Successful LSUS science students are participating in the training and mentoring of area high school science students. The utilization of LSUS undergraduate and high school students in the faculty directed research projects has provided the opportunity for the undergraduate students to mentor the high school students in the project.

E. A pool of life science high school and college graduates with current knowledge, technical and practical experience, and realistic understanding of the skills required to succeed in life science careers is being created. Through the "hands-on" experiential learning research projects, students are learning valuable laboratory techniques and the proper work ethic necessary to succeed in careers in the life sciences.

D. Project Revision:

There has been no major revision in the project. There was a minor revision in the number of students recruited to work on research projects during the first year of the project. More students applied to participate in the research projects than had originally been funded for the first year (5 undergraduates and 5 high school students). In order to maintain the high visibility of the project, the additional students were employed with the expectation that in future years, when the number of funded slots increase to 10 or 15), fewer students will be recruited.