LEQSF(2007-12)-ENH-PKSFI-PES-05

"Laboratory Education Experiences for Freshman and Sophomore Level Undergraduate Students in Biological Sciences"

PI: Raj Boopathy

Lead Institution: Nicholls State University

Contents:

I. Proposal Narrative (Without Appendices)
II. Contract Work Plan
III. Year 3 Annual Report
IV. Year 2 Annual Report
V. Year 1 Annual Report

Proposal Narrative (without appendices)

005PKSFI-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: X Biological Sciences G Information Technology G Materials Science (check only one)	(For BoR Use Only) Application Number:
2. Name of Lead Institution of Higher Education: (Include Branch/Campus/Other Components) Nicholls State University	
3. Address of Lead Institution of Higher Education: (Include Dept/Unit, Street Address/P.O. Box Number, City, State, Zip Code) 114, Gouaux Hall, Department of Biological Sciences Highway 1, Thibodaux, LA 70310	
4. Title of Proposed Project: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.	

5. Funds Requested:	P-KSFI Year 1: $ 124,630	ESIP (Year 1 only): $	Total Project Request: $ 623,150	6. Proposed Duration: (Circle # of Yrs.) 1 2 3 4 (5)

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 X 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).

Name/Title Institution (if different from Item #2 above)	Dept./E-mail/Telephone No.	Signature
PI/PD Dr. Ramaraj Boopathy	Biological Sciences, 985-448-4716 Ramaraj.boopathy@nicholls.edu	Ramaraj Boopathy
Co-PI Dr. Rajkumar Nathaniel	Biological Sciences, 985-448-4684 Rajkumar.nathaniel@nicholls.edu	Rajkumar
Co-PI		
Co-PI		
Co-PI		

Campus Head or Authorized Institutional Representative		Dean		Authorized Fiscal Agent	
Name/Title: (type or print) Dr. Stephen Hulbert		Name/Title: (type or print) Dr. Badiollah Asrabadi		Name/Title: (type or print) Mr. Lionel Naquin	
Signature:		Signature: B.R. Asrabadi		Signature: Lionel Naquin Jr.	
Date:	Telephone Number: 985-448-4003	Date: 3/8/07	Telephone Number: 985-448-4385	Date: 3/14/07	Telephone Number: 985-448-4017

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

TABLE OF CONTENTS

		Page
1	**Cover Page**	**i**
2	**Project Summary**	**ii**
3	**Table of Contents**	**iii**
4	**Goals and Objectives**	1
5	**Narrative and Bibliography**	1
	a. Project Rationale	1
	1. Context for Project	1
	2. Project Focus	3
	3. Personnel	5
	b. Work Plan	7
	1. Proposed Work	7
	2. Project Structure	10
	3. Project Impact	11
	4. Performance Measures and Milestones	13
	5. Sustainability and Scalability	14
	c. Leveraging of Resources	14
	d. Bibliography	15
6	**Budget and Budget Narrative**	15
	a. Format	16-31
	b. Project Activation and Anticipated Date of Completion	15
	c. Enhancement for Severely Impacted Programs (ESIP) Funds	15
	d. Disallowed Budgetary Items	15
	e. Funds for Principal Investigators and Support Personnel	15
7	**Biographical Sketches**	32
9	**Letters of Support**	35
10	**Appendix A**	37
11	**Appendix B**	38
12	**Appendix C**	40

PROJECT SUMMARY

Name(s) of Lead Institution (Include Branch/Campus and School or Division) and Partnering Institution(s):

Nicholls State University

Address of Lead Institution: Department of Biological Sciences,
114, Gouaux Hall
Nicholls State University,
Thibodaux, LA 70310.

Principal Investigators: Drs. Ramaraj Boopathy and Rajkumar Nathaniel

Title of Project: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.

Abstract (DO NOT EXCEED 250 WORDS):

This proposal seeks funds to establish a Laboratory Education Experience program for Undergraduates at Nicholls State University. The proposed program will provide freshmen and sophomore level undergraduate students with intensive year-long laboratory instruction and mentoring in multi-disciplines of biology including environmental biology, bioremediation, costal restoration, genetics, immunology, infectious diseases, marine biology, toxicology, ecology, microbiology, ornithology, cell and molecular biology. The project's aim is to involve a diverse group of students from urban environments, minorities, underrepresented groups in science, and women who have been impacted by hurricane Katrina. Each year fifteen students will participate in laboratory instruction with faculty sponsors. The program will also include enrichment activities that help students understand the issues surrounding modern biology and field trips designed to create a better understanding of the environment and a spirit of fellowship among students. Students will have structured opportunities, such as symposia and journal clubs to interact with faculty and peers pursuing biological science careers on campus. Students will be engaged in individual laboratory projects and will work closely with an advisor/mentor. Weekly seminars and group discussions will facilitate learning the practical aspects of doing science and introduce students to projects in other disciplines. The goals of the project are to increase retention of science majors by engaging students' critical thinking capabilities, encouraging independent planning of experiments and developing abilities for interpretation of data and advance presentation skills. Future efforts to sustain this program will be made through National Science Foundation (NSF), United States Department of Agriculture (USDA) and National Institute of Health (NIH).

(Form 2, rev.2006)

4. Goals and Objectives:

The goals of the project are to enhance one-on-one mentoring of freshmen and sophomore level undergraduate students and to increase interest in science through hands on laboratory experiences in biological sciences thereby improving the retention of students in science. The specific objectives are:

(1). To elevate the quality of undergraduate science learning through intensive year-long laboratory instruction and mentoring in multi-disciplines of biology including cell and molecular biology, microbiology, ecology, ornithology, environmental biology, marine biology, genetics, and immunology.
(2). To engage a diverse group of students from urban environments, underrepresented groups in science, minorities, and women who have been impacted by hurricane Katrina.
(3). To enrich activities that help students understand the issues of modern biology through field trips, seminars, and journal clubs.
(4). To improve the basic laboratory skills of undergraduate students in biology.
(5). To develop student abilities to communicate and present scientific data.
(6). To foster meaningful scientific discussion in the classroom.
(7). To increase faculty mentoring culture in the university quantitatively as well as qualitatively.
(8). To produce well qualified science teachers through the mentoring process.
(9). To widen student horizons through undergraduate laboratory experiences and mentoring.
(10). To produce well prepared and trained students as they transition into graduate school, professional school or into the work force.

5. Narrative

(a) Project Rationale

a.1. Context for Project

Current Situation at Nicholls and Current STEM Education Atmosphere

Nicholls State University is located in Thibodaux, Louisiana, in the alluvial basin between the Atchafalaya and Mississippi Rivers. This region encompasses the majority of the Mississippi River delta, and enables easy access to the river, it distributaries, Louisiana's wetlands, and the Gulf of Mexico. The major industry for which the University supplies both service and student training includes hospitals, health providers, pharmacies, oil exploration (onshore and offshore), agriculture (especially sugarcane), fishing and fisheries, shipbuilding, chemical manufacturing, and small businesses and finally environmental services (analytical and clean-up) (bioremediation companies).

A major natural resource of this region is the indigenous peoples, who are the keepers of a rich tradition and culture. Predominantly of Acadian ancestry and otherwise descendants of planters, sharecroppers, American Indians, and a variety of coastal immigrants, the peoples of

this region have largely adopted the pervasive Cajun culture. The University's state-designated service region encompasses thirteen parishes (counties) in the center of what has become commonly known as "Cajun Country". The majorities of Nicholls's students are descendant of natives to the region and were likewise born and raised in the region. While university property was not impacted directly by hurricane Katrina, our student body comes from parishes that have been severely affected by the storm. In addition, a significant number of students from outside the service region, particularly from the New Orleans suburban area and along the Mississippi River are enrolled at the university.

The University is committed to distinguish itself as a quality institution of higher education dedicated to meeting the unique geographic and multicultural needs of the region and beyond through teaching, research, and service while preparing students to interpret and respond changing regional, national, and global societies. The mission of the University is to ensure access to higher education to all citizens of the region, to promote the advancement of knowledge, to provide high-quality academic programs in disciplines that support the needs of the region, and to enhance economic development and strengthen the social and cultural infrastructure of the region.

The Department of Biological Sciences is in the College of Arts and Sciences. With the exception of two marine science teaching and research laboratories, which are located in Peltier Hall, the majority of activity and the residence of faculty are located in Gouaux Hall, a large, single-story building erected in 1980 of which roughly 60% space is allocated to the Department. The main area of the expertise of the faculty include Bioremediation, Water Quality, Seafood Safety, Toxicology, Ecology, Environmental Microbiology, Immunology, Cell and Molecular Biology, Ornithology, Environmental Physiology, Oceanography, Marine Science, and Biotechnology. Research of the faculty is funded by various federal and state agencies such as the Department of Energy (DOE), United States Department of Agriculture (USDA), National Institute of Health (NIH), National Oceanic and Atmospheric Administration (NOAA), National Science Foundation (NSF), the Department of the Interior, the Louisiana Board of Regents, the American Sugarcane League, and several not-for-profit specialty agencies. The majority of department's graduates enter either graduate or professional schools or directly into careers in marine/environmental or biotechnological fields.

The Biological Sciences program resides in the center of nation's major wetland region and serves an agricultural and industrial economy. The department has collaborative ties with numerous governmental agencies and local industries. Some of these agencies are Barataria-Terrebonne National Estuary Program, South Louisiana Economic Council, Louisiana Department of Environmental Quality, United States Department of Agriculture, Louisiana Seafood Marketing and Promotional Board, Louisiana Department of Natural Resources Coastal Management Division, Thibodaux Regional Medical Center and . In addition, Nicholls State University is the nearest to Louisiana Universities Marine Consortium (LUMCON), and this proximity has traditionally been a resource for Nicholls faculty members to engage in collaborative or independent marine research at a national and international level.

The Louisiana Board of Regents has recognized the Marine and Environmental Biology

Program as a Center of Excellence and awarded a $ 79,948 grant under Departmental Excellence through Faculty Excellence (DEFE) program. The department also offers a Masters Program in Marine and Environmental Biology. The department of biological sciences is one of the premier departments in the University. To build on the tower of strength and in anticipation of the unique technological and scientific needs of students entering the new century, the University and the Department of Biological Sciences have sequentially recruited a core of six new faculty members (faculty participants of this proposal) in an effort to bridge the university's respected and popular traditional programs with contemporary research and technological expertise. These young and dynamic faculty members created a vibrant learning culture through many of their research grants and involve as many undergraduate students as possible in research. This type of effort is the basis of our current science, technology, engineering, and math (STEM) education atmosphere in the department. Currently faculty members that have research grants employ undergraduate students in their projects and almost all of these students are either juniors or seniors. The department offers a course Biol. 416 (Research Problems) as part of the STEM curriculum. This course is not a required course and only senior students are allowed to enroll in this class. Although the existing STEM program in the department serves its purpose by allowing some biology students to participate in inquiry based learning, its full potential is not realized as it is limited to junior and senior student participation. This current proposal seeks to enhance the existing STEM curriculum in the department. The successful funding of this proposal will impart laboratory training to undergraduate students at freshmen and sophomore levels. It is anticipated that such early exposure to hands on bench science will increase student interest in science as well as aid in their pursuing science careers. This funding will also empower the new core faculty members to train students in their individual research projects and have one-on-one mentorship with students at a very early stage of students' college career.

The University is committed to have this program in campus. The University administration would support this program by providing release time for the PI and Co-PI of this proposal and also extending administrative helps by waiving indirect cost.

a.2. Project Focus.

As stated above, the current STEM education in the Department of Biological Sciences centers on juniors and seniors. These higher-level students work with faculty members in the department and conduct research. The students that are involved are highly motivated students and already know their career path. Needless to say most of these students are planning to attend professional schools like medical, dental, or physical-therapy school. Through the research participation with faculty members, the students get one-on-one mentorship with faculty and are able to conduct independent research. However, the limitation of this current STEM activity in the department is that it misses opportunity to motivate a large group of students at an early stage of students' college life particularly in their freshmen and sophomore years. The current proposal addresses this issue and will remedy this situation. Most of the students that attend Nicholls are first generation college students who have no role models prior to entering the university. Based on university statistics gathered over the past three years, more than 150 students per year enter the freshman class in the Department of Biological Sciences. These are an academically homogenous population with similar ACT scores and school transcripts (average

ACT of 21.5 and GPA of 3.2 for entering freshman biology majors, Office of Institutional Research, Nicholls). The success rates of these students improve when these students have mentors who will give one-on-one attention to students. One approach to get mentorship established at freshmen level is through laboratory experiences. When these students join the laboratory activities of a faculty, they not only get faculty-student mentorship, but also join a team comprising of many graduate students and junior and senior undergraduate students in the faculty member's lab. First year college students are more likely to thrive when they receive help and mentorship from their seniors. This proposal will provide such an opportunity to freshmen and sophomores. Through hands on laboratory experiences students develop new study habits, independent thinking skills, and gain confidence at an early stage of their college career. This will lead to overall retention of students in the program.

Mentoring is a highly effective and proven way to conduct undergraduate research and it will enhance student horizons. For example, most students when they join our program are pre-med students and their interest in science decrease significantly if they were unable to meet the challenges of pre-med curriculum (attrition rate of 50%). This level of attrition is not peculiar to Nicholls and is in fact the 'PKSFI-Consultants Report' cites this issue as being of chronic epidemic proportions through out undergraduate campuses across the country. One-on-one mentoring and first hand experiences at the bench will help raise the interest levels in science and provide practical information on the wide impact of STEM disciplines on every day applications. This will also encourage students to pursue science careers not limited to clinical settings. An important component of a quality undergraduate education is the experimental learning process which is achieved in science through experiences in the laboratory. Experimental learning can impact many aspects of the STEM pipeline. It has the potential to impact a large and diverse pool of students and helps build lifelong bonds in the learning community.

Additionally, faculty members also benefit from this proposal as they mentor new students they get additional help for their laboratories. Students make significant contributions to results publishable in peer-reviewed journals. Through this grant the faculty members also receive supply funds for the student projects they will mentor, thus providing a very good incentive for faculty to participate in the program. This proposal will focus on one-on-one mentoring with students, but it will also provide numerous tangible benefits to both students and faculty. Some of the benefits include widening student horizons, retention of students in science curriculum, helping students develop written and verbal communication skills critical for life-long learning, building collaboration and teamwork, better preparation of students for graduate and professional schools, enabling students to learn their strengths, weaknesses and interests, positively influencing their career choices, creation of well-qualified secondary STEM teachers and an increase in the number of mentors in the department. All of these will have a dramatic impact on many aspects of the STEM pipeline.

Undergraduate laboratory experiences are one example of experimental learning and should be encouraged at freshmen and sophomore levels. We have an opportunity to ensure student success in a STEM disciple through successful funding for this proposal.

a.3. Personnel.

The following is a series of biographical paragraphs highlighting the individual qualifications of the P.I, Co-PI, and participating faculty members. For further information, including pertinent publications and teaching responsibilities, see attached biographical sketches of PI and Co-PI.

P.I. Raj Boopathy, Ph.D is an environmental scientist with expertise in bioremediation of hazardous chemicals and biological treatment of industrial and agricultural wastewater. Dr. Boopathy is well known for his work on the bioremediation of explosives-contaminated soil, has published over 90 research papers in refereed journals, and has presented his work at various national and international conferences. He has received over $ 4.6 million of research grants to date. Dr. Boopathy's current research includes: (1) Anaerobic bioremediation of petroleum hydrocarbons: The petroleum field is one of the area of priority research importance to the economics and development of the local and state community and petrochemical industries, and one for which he has significant expertise and experience; (2) Biological treatment of industrial and agricultural wastewater: The wastewater problem of sugarcane factories could benefit in finding a cost-effective affordable treatment system; (3) Microbial decomposition of sugarcane leaf litter: A biological method to solve the problems of post-harvest sugarcane residue faced by local farmers will be developed; (4) Effect of pollution on microbial trace gas fluxes in the Barataria-Terrebonne National Estuary: The data collected from this study will be a valuable addition to national and regional flux monitoring programs and the study of green house gas emission and global warming; (5) Ethanol production from post-harvest sugarcane residue: ethanol production from sugarcane biomass such as sugarcane leaf and bagasse has been successful in the lab and scaling up the process to a pilot plant is in works.

Dr. Boopathy is the Editor of *International Journal of Biodegradation and Biodeterioration* and is on the *Editorial Board* of the Journal, *Bioresource Technology* and *Journal of Soil and Sediment Contamination.* He has reviewed manuscripts for the following journals, *Environmental Science & Technology (ES&T), Water Environment Research, Anaerobe, Biotechnology and Bioengineering, Bioremdiation Journal, Environmental Toxicology & Chemistry, Archives of Environmental Contamination and Toxicology, Journal of Industrial Microbiology & Biotechnology, Biotechnology Progress, Bioresource Technology, Canadian Journal of Microbiology, Environmental Progress, Water Research, Journal of Soil and Sediment Contamination, Journal of Phycology, Applied Biochemistry & Biotechnology and International Journal of Biodegradation and Biodeterioration.* He has *reviewed Books for the journals, Environmental Progress and Environmental Pollution.* He has reviewed grants for NSF, DoE, DoD, Swiss government, South African government, and government of Indonesia. His research work is funded by NIH, NOAA, USDA, NSF, DOE, the Louisiana Board of Regents, BP Corporation, Nicholls Research Council, American Sugarcane League, LA department of natural resources (DNR), and Johnston Science Foundation.

Co-PI, Rajkumar Nathaniel, Ph.D will assist Dr. Boopathy in coordinating all aspects of the program. Dr. Nathaniel was hired by the University as an Assistant Professor of Immunology

and Molecular Biology in Spring 2005. Dr. Nathaniel received his PhD in Immunology and Microbiology from University of Florida, in 2002, where he obtained training as a Virologist studying poxvirus modulation of the immune system. Prior to his arrival at Nicholls State University, Dr. Nathaniel was a Post Doctoral Research Scientist studying *Salmonella typhimurium* induced diarrheal response at the Department of Medicine, University of Illinois at Chicago. Dr. Nathaniel started his career as a Clinical Microbiologist, where he became interested in Infectious Diseases. He has worked in both pharmaceutical industry and academia. He maintains an active research laboratory in Infectious Disease and Immunology. His main research focus is on pathogenesis of gastrointestinal pathogens, pathogen-host interactions and modulation of the host immune system in response to infection. He is currently funded by the National Science Foundation, the Louisiana Board of Regents and the Nicholls Research Council. In addition to teaching Immunology, he also lectures freshman Biology and instructs Human Anatomy and Physiology laboratories for Allied Health Sciences students.

Gary LaFleur, Ph.D is a Molecular Physiologist. Dr. LaFleur studies the effect of xeno-estrogen compounds on reproduction and characterizing biomarkers for environmental exposure to xenobiotic compounds. Dr. LaFleur contributes a fresh perspective to the instructional core and brings a repertoire of environmental physiology tools and protocols that have advanced the capabilities of the department of Biological Sciences. His research work is funded by NIH, NOAA, the Louisiana Board of Regents and Nicholls Research Council. LaFleur as a P.I. was recently awarded $ 88,099 for a project titled "Choriogenins as a New Biomarker for Estrogen-Induced Biogenesis". LaFleur has achieved several major benchmarks including estrogen-induction of an experimental group of male fish, harvest of estrogen-induced livers and preparation of RNA.

John Doucet, Ph.D is a Molecular Geneticist. He is one of the few investigators in the state considered expert on indigenous Louisiana populations. Dr. Doucet has unique knowledge of Lafourche Basin's populations, which has led him to identify several unique heritable traits among the historically isolated populations in the Nicholls service region. His research has identified several population isolates that may have been affected by the regional industries such as petroleum, chemicals and agriculture. Dr. Doucet has published numerous research papers and his work is funded by the Louisiana Board of Regents, NIH, and Nicholls Research Council. Doucet's project titled "Gene discovery in Acadian Usher Syndrome" was funded by LA Board of Regents.

Marilyn Kilgen, Ph.D., is a seafood safety specialist. She also does research work in water quality, environmental and public health microbiology. She has received funding of more than $ 5.4 million to date. She has published over 50 peer-reviewed papers. Dr. Kilgen has served on many state, national, and international advisory boards. Her research is funded by the Department of Interior, Louisiana Board of Regents, Barataria-Terrebonne National Estuary Program, USDA, and private industries. Kilgen was recently awarded $ 156,574 by National Sea Grant's Oyster Initiative Program to study the development of commercial oyster marinades for *Vibrio vulnificus* control in oysters.

Enmin Zou, Ph.D is an Environmental Toxicologist. He is well known for his work on

biomarkers and model development of shrimp as biomarker for petroleum hydrocarbon contamination. His research is funded by LA Board of Regents, NOAA, and Nicholls Research Council. He has published quite extensively and is on the advisory board of Chinese National Academy of Sciences.

Quenton Fontenot, Ph.D is an ecologist and our resident statistician. His work includes study of biodiversity in Barataria-Terrebonne estuary, nitrate toxicity in fish, and aquaculture. His research is funded by Barataria-Terrebonne National Estuary Program, National Wildlife Services, and Nicholls Research Council.

Allyse Ferrara, Ph.D is our fishery biologist. She is the expert on Gar fish and is Internationally well known for her research on breeding of gar fish and gar biology. Her work is funded by U.S Wildlife and Park Services, Barataria-Terrebonne National Estuary Program, Natural Resource Conservation Services, and Nicholls Research Council.

Aaron Pierce, Ph.D is an Ornithologist and the newest faculty in the department. He has submitted numerous proposals to various funding agencies including LA Board of Regents, U.S. Wildlife and Park Services, and NSF. He is in great need of student workers and he can mentor many undergraduate students in their research.

Michele Robichaux, D.D.S., is a practicing dentist and is an invaluable member of the department. Her research work is on nutrition biochemistry, enamel matrix protein biochemistry, and oral pathology. She does collaborative research with various faculty members of the department. Her research work is funded by the Nicholls Research Council.

b. Work Plan

b.1. Proposed Work

The Current STEM educational activities in the Department of Biological Sciences are (1) an elective course Biol. 416 (Research Problems) usually taken by senior students where they conduct research with a faculty member and obtain one-on-one mentorship and (2) active research laboratories that hire undergraduate student workers (who are typically juniors or seniors). These students that participate in STEM educational activities already passed through the rigorous biology curriculum, they are highly motivated and are the 'cream of the crop'. What we are missing in the current STEM program in our department is the retention of a large number of our biology majors (50%, from Office of Institutional Research, Nicholls). As mentioned in the 'PKSFI-Consultants Report' this can be overcome by providing STEM related programs targeting freshmen and sophomore level students. One of the main reasons for the lack of interest in science past the freshman/sophomore levels has been cited (PKSFI-Consultants Report) as the apparent disconnect between hard core classroom lectures and an appreciation of how these concepts apply and help our daily life. Our proposal seeks to address this issue by recruiting freshmen and sophomore level students to a mentoring program where they will spend some of their time in the laboratory setting with a faculty and his or her research team comprising

of graduate students and junior and senior undergraduate students. This kind of intellectual atmosphere will nourish the young mind and provide students with sense of fellowship and purpose. It is anticipated that students who are undecided in their career choice will have the opportunity by way of exposure and peer dialogue to a wide variety of potential career paths involving STEM disciplines. This will be an excellent tool for student retention and development of interest in science related career.

Targeted Student Participants. While Nicholls property has not been adversely impacted by hurricane Katrina, our students come from several parishes that have been severely affected by the storm. Priority will be given to freshmen and sophomore level students enrolled at Nicholls that have been severely impacted by hurricane Katrina. Special efforts will be made to recruit minorities and women to the program. Ideally fifteen students will be recruited every year from Nicholls State University and for the five-year duration of the proposal a total of 75 students will benefit from this proposal. Participants of the program will include students from biological sciences, applied sciences, physical sciences, and math and computer sciences. Participating students will receive a stipend of $ 1,500/semester, which will be an incentive for students to participate in the program.

Transforming the first two years of STEM education requires long-term commitment from college administration, department administration, and all faculty members in the department. We are very fortunate to have this commitment from our department and all the participating faculty members. Experimental learning takes many different forms and undergraduate research is one of the strengths of the Department of Biological Sciences. All participating faculty members have active research programs and are willing to take two or more students every year under their wing and establish one-on-one mentoring.

Participant Recruitment and Registration. Upon execution of the grant, promotional materials and cover letters announcing undergraduate laboratory mentoring experiences in Biological Sciences at Nicholls State University will be developed and printed. Recruitment of student participants will be conducted at both the individual student and department level. The selection committee for a given year will consist of faculty who are willing to mentor students. Departments will also be invited to recommend students from their disciplines to the program. Informational Seminars announcing the program will be made at the beginning of each calendar year. The selection committee will screen students based on their course work, students' interest in science (personal statement) and interview. Admission will be limited to 15 stipend-receiving participants for each year and for the entire duration of five years 75 students will benefit from this project.

Nature of Student Activities. The selected students in the program will have a chance to work with a participating faculty member in the department. Students will get one-on-one mentorship from faculty members. All students will be initially supervised and trained to help with ongoing projects. During the later half of the program year, students will have the opportunity to conduct independent laboratory work. The faculty members at NSU have wide variety of research projects that are funded by various national, state, and private agencies. Some participating faculty will mentor two or more students. The participating faculty and their expertise are listed

above. Weekly meetings throughout the semester will be held. Initially for the first two months, the purpose of these meetings will be to introduce students to the multi-disciplines of laboratory research being undertaken within the Department. Subsequent meetings will be for the purpose of giving students an opportunity to present and discuss their findings. Seasoned student workers at the senior level will also present their work. Some of these meetings (once every month) will be used to discuss the latest research that is of broad nature, impact and interest (journal club).

Preparation of Mentors. Recognizing the value of exposure to research and the importance of one-on-one mentorship, a workshop will be conducted with participating faculty. The program details and scheduling will be worked out, including evaluation procedures and general guidelines for the mentoring laboratories. An extensive collaboration will be developed among the faculty in order to co-ordinate the selection process.

Upon selection of students, notification will be sent to students and selected students will be registered for the undergraduate laboratory experience program at Nicholls State University. The program will start with a field trip to Louisiana Universities Marine Consortium (LUMCON) and students will stay at LUMCON for two days and interact with faculty there and learn about marine science. The students will also take a sea cruise trip in one of the research vessels available for the purpose at LUMCON. Upon the return from the field trip, each research faculty will present an overview of their research/laboratory interests. Following this meeting students will be allowed the opportunity to interact with individual faculty for placement in their laboratory.

Student Seminar and Presentation of Results. At the end of each program year, students will be required to present their project work and share their experience with other students and faculty members. This will include formal presentation of data followed by discussion, and one-on-one informal discussion with the faculty mentor. Students will be required to submit a brief written report of their work and experience at the end of the program.

Research Environment. In the five years since the recruitment of the core assistant professors began, the department of Biological Sciences with and through the University has provided the six new faculty members with laboratory space to facilitate their development as teachers, investigators, and mentors of Biology majors. These laboratories include the Environmental Physiology lab, Bioremediation lab, Biotechnology lab, Immunology and Infectious Diseases lab, Molecular Biology lab, Marine Biology lab, Water Quality and Seafood Safety lab, Toxicology lab, and the green house. From the core assistant professors' efforts, the department got the commitment from University administrators to develop an Environmental Analytical Laboratory. Through the individual investigator grants of Boopathy, Doucet, Nathaniel, LaFleur, Kilgen, Zou, Fontenot, and Ferrara together with the Louisiana Board of Regents Support Fund for Undergraduate Enhancement from 2000 to 2006, a number of important pieces of biotechnology equipment have been acquired. Dr. Boopathy received a major NSF grant to acquire many analytical instruments for the department.

The PI and all faculty members listed above have experience in mentoring undergraduate students in research. Some of the undergraduates work as student workers on faculty research

projects. Other students enroll in a 2 credit hour research problem course (BIOL 416, syllabus listed in Appendix C) with one-on-one mentorship of faculty members in the department. Some of the recent undergraduate student projects are listed in Appendix A.

As a result of undergraduate participation in faculty research, many faculty members have published research papers and presented papers in professional meetings with students as co-authors. Some of the published papers are listed in Appendix B (*, denotes student author).

Facilities and Equipment. The Department of Biological Sciences has well over 12,000 sq. ft. of established and fully functional laboratory space dedicated to molecular biology, immunology, marine biology, environmental physiology, toxicology, bioremediation, ecology, microbiology, developmental biology, and water quality and sea food safety. The Department has been successful in the acquisition of several pieces of shared equipment including an electron microscope, gas chromatograph, high performance liquid chromatograph, UV-VIS spectrophotometer, PCR-thermocyclers, real-time PCR machine, high speed centrifuges, fluorescent capable microscopes, anaerobic chambers, freezers, refrigerators, full-size autoclaves, shaker tables, water baths, walk in cold room, green house, gel dryer, transilluminators, dark room facilities, animal room facilities, and numerous miscellaneous small equipment. In addition, each laboratory has several desk top computers dedicated for data processing and analysis. Each investigator has 120 sq.ft. of office space equipped with computers and internet access.

Significance of the Project. Mentoring is a highly effective and proven way to ensure student success. This is evident from our departmental experience with junior and senior level students. Our proposal extends this benefit to freshmen and sophomore level students who have the potential to succeed in science, but may not have the right opportunity to do so. The value of exposure to mentored project work so early in one's career has the capacity to empower the individual thereby having a significantly positive impact on the success of the individual in science. An added benefit from getting personalized attention through this experimental learning process will increase student retention in science curriculum. Participants of our program will gain a passion for life-long learning guiding them in their career choices, understand the advantages of collaboration and teamwork, and will have the opportunity to develop their written and verbal communication skills. Most of our students on campus are first generation college students. The success rate of first generation college students greatly improves when those students have mentors, role models such as other first generation students who preceded them. Our proposal will create an ideal environment for a successful mentoring process in a laboratory setting where a participant can interact with graduate students, junior, senior level undergraduate students as well as the faculty member.

b.2. Project Structure

Organizational Structure. Development of the undergraduate research program at Nicholls State University is a unique collaboration among faculty members in the department of Biological Sciences, together with science faculty members in other departments. The product of this collaboration is a linkage of the state's science educators with the research faculty at Nicholls for the purpose of improving science skills and exposing minority and under-

represented undergraduate students to basic and applied science.

Person Primarily responsible for administrating grant. The undergraduate research program in Biological Sciences at Nicholls State University will be developed and directed by Dr. Raj Boopathy, distinguished professor of biological sciences at NSU. Boopathy has 21 years of research experience at various institutions including University of Notre Dame, University of Iowa, University of Missouri, and Argonne National Laboratory. In his capacity as a scientist, he has supervised undergraduate students and graduate students at Argonne National Laboratory. Currently at Nicholls, Dr. Boopathy trains undergraduate students in research work apart from supervising Masters students in their thesis work. Many students work in Boopathy's many funded research projects and the students after considerable amount of training are allowed to conduct independent experiment with minimum supervision. As a result of association with undergraduate students' research, Boopathy has published many research papers with undergraduate students as co-authors.

As an educator, Boopathy has lectured and evaluated freshman nursing, pre-dental, pre-medicine and graduate students at Nicholls and in the previous jobs. At NSU, among his teaching responsibilities is primary instructor of the biology fundamentals course for freshmen science majors. His continuous and extensive experience in freshman level instruction stems from strategies developed to both engage introductory students and to deconstruct complex concepts to their simplistic foundations. In addition, Boopathy has served on Louisiana Systemic Initiatives Program (LaSIP) committees at NSU for the improvement and enhancement of teacher education.

Other Project Personnel. Assisting Dr. Boopathy is the Co-PI, Dr. Rajkumar Nathaniel and eight research faculty members in the department of Biological Sciences at Nicholls who all have independent research funding and are happy to do one-on-one mentorship with undergraduate students. They have all agreed to use program participants in their laboratories with initial training and may continue to allow students to work in their laboratories beyond the program period. Such a commitment is very important as freshmen and sophomore students get financial support not only during the first year from this grant, but could also avail this support throughout their entire undergraduate years by association with a faculty members' research grant. This extension of help will provide faculty-student mentor relationship for four years. A faculty member after investing his or her time in a student will naturally would like to continue that relationship as students will now be very useful to an investigator's research project. A detailed list of participating faculty with description of their research areas and funding sources has been provided in section 'a.3: Personnel'.

Administrative Personnel. The sponsored program office at NSU has agreed to support this project in the form of administrative support. In addition, the department of Biological Sciences administrative personnel will also assist in the project.

b.3. Project Impact.

Immediate Impact. The benefit of this proposal is enhancement of STEM related activity in

science departments at NSU. The major impact of this proposal will be student retention in science. Retention of students during the critical first two years of college is very important as students may not realize their real potential at the freshmen and sophomore levels. This project will also increase systematic institutionalization of the mentoring process throughout the campus in other departments. Participating faculty members will benefit through student labor in their laboratories through data collection and publication. Very importantly, the participating students will benefit in many ways as stated above. Some of the benefits include widening student horizons, development of written and communication skills, building a sense of collaboration and teamwork, better preparation for graduate and professional schools, awareness about their strengths and weaknesses, development of new interests, and an increase in a passion for life-long learning.

Impact on Broader Level. Through the development of this mentoring program and facilitation of laboratory training to a large number of students including minorities, those underrepresented in science and women, three levels of benefit are envisioned:

(1) *Benefits for state educational system.* This program will enable students to gain knowledge and exposure to modern and cutting edge processes in biological sciences, which are currently unavailable to them. In addition, students will be exposed to basic research, analytical techniques, collection and interpretation of data, literature search, instructional and informative websites, and modern multimedia teaching tools like PowerPoint. Participants will receive valuable one-on-one mentorship with faculty, which will help them in pursuing science careers. Through this project, Louisiana will have an educational system empowered both to address significant science and engineering issues and to better prepare students for their future education and careers.

(2) *Benefits for students.* Through application of new research knowledge and research plans in the program, students will have the opportunity to gain an appreciation of how science and engineering is practically applied in daily life. The consequences of this gain are important and multiple. This program will provide information and basic laboratory skills for classroom application in which students will apply concepts, synthesize information, and evaluate real-life situations. Students will potentially perform better on standardized tests, be better prepared for graduate schools, and become more marketable for twenty-first century careers. In addition, students exposed to laboratory training will be empowered to apply the knowledge learned to social issues and decision-making, thereby becoming better citizens prepared for twenty-first century life.

(3) *Benefits for the State.* This program will provide the State of Louisiana better equipped students who will pursue science careers. The training received will produce a better-educated and skilled workforce that will make the State an attractive destination for industry. This economic development will eventually translate to the improvement of schools, increase in student performance, and raise the visibility and profile of the State.

b.4. Performance Measure and Milestones

The undergraduate laboratory experience program in Biological Sciences at Nicholls State University will be evaluated on several levels annually as well as at the end of the five year funding period.

(1) Self-Assessment. At the end of each year, the participants will engage in a brief but thorough self-assessment with faculty. The text of the assessment will be printed, and the answers from individual participants will be collected, tabulated, and reported to BoR administration. This will allow both the faculty participants and the administrators to immediately evaluate how effective the laboratory training has been to the students.

(2) Program Survey. At the end of the five-year program cycle, we will conduct a written survey that asks participants to comment on the usefulness of the laboratory experience in shaping their career choices. Suggestions solicited from the participants on this evaluation will be incorporated into future training programs.

(3) Student Seminar. The training program calls for student seminars in which the students will present their work and discuss their data. This avenue will provide faculty an opportunity to gauge student progress and development as well as provide information on areas that need improvement and development. The faculty participants will also meet together to discuss the progress made by participating students.

(4) End-of-Year Survey. At the end of each program year, we will survey participants on their ability to gain useful information from the program and on their ability to these experiences to their academic learning. A reporting instrument will be distributed by mail to participants that will evaluate this parameter.

(5) External Evaluation. We will form a panel of three out-of-state external evaluators and invite them every year to the campus to evaluate our program. These evaluators will have previous experience through NSF funded Research Experience for Undergraduate (REU) programs in their campus and will be experts in undergraduate research at national level. Travel expenses for the team of external evaluators will be borne by the grant and are requested as part of travel expenses detailed in the budget section. The external evaluator report will be used to make improvements and to address any changes needed in the program.

Progress Report. The annual progress report will be submitted to BoR through the project report system. The BoR guidelines specific to this proposal on the laboratory training provided and other educational activities will be followed. The data obtained from program evaluations will be included in the annual report.

Accomplishments. The program will improve the knowledge and skill sets of underrepresented Louisiana undergraduate students in basic laboratory science and empower them to apply the

experiences to their studies and future endeavors. The vehicle for this accomplishment is the undergraduate research program in Biological Sciences at the Nicholls State University. The program goals will be accomplished by (i) enrolling minority and women students, (ii) engaging program participants with interesting lectures, seminars, self assessments, and discussion with participating faculty, (iii) instructing program participants on how to incorporate laboratory experiences into their academic learning methods and (iv) guiding the program participants with one-on-one mentorship. The beneficiaries of this program will be freshman and sophomore students affected by hurricane Katrina, who otherwise might not have the opportunity to participate in similar programs and continue on a science career path. Overall success of this program will improve our existing STEM curriculum in the campus.

b.5. Sustainability and Scalability

This project will be sustained after the five-year funding cycle is over from BoR through funding programs in place to foster and encourage undergraduates to pursue careers in science, at the national level from National Science Foundation (NSF), National Institutes of Health (NIH), and the United States Department of Agriculture (USDA). For example the National Center for Research Resources (NCRR), Division for Clinical Research Resources supports the Science Education Partnership Award (SEPA) program, which is designed to create the interest in biomedical careers and to improve public awareness and knowledge of NIH supported research. Proposals involving both educational and research components are encouraged. Proposals are awarded for projects spanning up to 5 consecutive years. The National Science Foundation administers the Science, Technology, Engineering and Mathematics Talent Expansion Program (STEP) with the goal of increasing the number of students receiving undergraduate degrees in these disciplines. Up to $1million may be requested for projects spanning 5 consecutive years. Our experience administering this program will be advantageous in pursuing funding at national level.

Another way to sustain this program is through self-sustenance. This is possible because after five years of faculty-student mentor relationship through this program, participating faculty members will realize the importance of training freshmen and sophomore level students in laboratory science. Through our program it is anticipated that faculty members will begin to recruit freshmen and sophomore level students into their laboratories. The results of our program will provide the impetus and momentum needed for this change. Faculty will realize the benefit of engaging students at an earlier stage and will provide training opportunities for freshman and sophomores which will ultimately increase the productivity of the individual faculty research laboratories. This kind of self-sustenance is possible because of the availability active research laboratories in the Department that are funded from multiple sources enabling the employment of undergraduate student workers.

c. Leveraging Resources.

The existing resources available in the department will be fully utilized for this program.

(1) Resource at the Department Level. The resources available in the department such as computers, printers, poster printers, and photocopiers will be used for the project. The secretarial help from the department will aid in the administration of funds for the program. In addition other resources such as laboratory space for students, water, electricity, and internet will be used by the program.

(2) Resources at the University Level. The sponsored program office at NSU has agreed to support this project in the form of administrative support. The Dean of the College of Arts and Sciences extends his help for the program in the form of release time (in-kind match) for the PI and Co-PI. Finally, to support this program the university has agreed to waive the indirect cost.

(3) Resources at the Faculty Level. Each of the participating faculty members has multiple research grants in their laboratories. All participating faculty members agree to use their existing research programs to train freshmen and sophomore level students. This is a very important resource because various research projects are already in progress and the students participating in this program do not have to wait for a faculty to initiate a new laboratory project. The available existing resources in the form of supplies, equipment and travel monies will aid the quick and smooth transition for freshman and sophomore program participants to start their laboratory training experience without any lag time to build up the program infrastructure.

d. Bibliography

Does not apply.

6. BUDGET NARRATIVE

a. Format
Please refer to the following pages for the budget format and justification.

b. Project Activation and Anticipated Date of Completion
This project will begin in 2007 and be completed in 2012

c. Enhancement for Severely Impacted Programs (ESIP) Funds
Not Applicable

d. Disallowed Budgetary Items
Not applicable

e. Funds for Principal Investigators and Support Personnel
Two months of salary support payable during the summer for the Principal Investigators is being requested. Please refer to the budget justification for each year.

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

Title of Proposed Research: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.

Principal Investigator (s): Dr. Ramaraj Boopathy and Dr. Rajkumar Nathaniel

Institution (s) of Higher Education: Nicholls State University

I. Proposed Budget Year 1:

Section A	Support Fund Money Requested*	Institutional Match**	Type Cash/In-kind	Private Sector/ Other match ***
1. Research	$27,704	$27,704	In-kind	
2. Clerical				
3. Subtotal	$27,704	$27,704		
Fringe %	25%	25%		
4. Fringe Benefits	$6,926	$6,926	In-kind	
5. Graduate Asst.				
6. Students (s)	$45,000			
7. Subtotal A	$79,630	$34,630	In-kind	
Section B Supportive Expenses				
1. Travel	$15,000			
2. Supplies	$30,000			
3. Consultants				
4. Rentals				
5. Printing				
6. Equipment				
7. Other Expenses Identify				
8. Subcontracts				
Subtotal B	$45,000			
Section C Overhead				
Overhead%	25%	25%		
1. Overhead cost	NOT PERMITTED	$8,658		
Total Project Cost	$124,630	$43,288		

*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.

II. BUDGET JUSTIFICATION FOR FIRST YEAR:

A. Proposed Budget

1. Research:
   Money Requested ($27,704) Two months of salary to be paid in summer, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel is being requested.
   Institutional Match ($27,704) Two months of salary, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel will be granted as release time to work on the project.

2. Clerical: N/A

3. Subtotal:
   Money Requested ($27,704)
   Institutional Match ($27,704)

4. Fringe Benefits:
   Money Requested ($6,926) equal to 25% of salary.
   Institutional Match ($6,926) equal to 25% of salary.

5. Graduate Assistant: N/A

6. Student Assistants:
   Money Requested ($45,000) Stipends for 15 student assistants who will receive $3,000 each/year are being requested.
   Institutional Match (None)

7. Subtotal A:
   Money Requested ($79,630), sum of lines 3 through 6.
   Institutional Match ($34,630), sum of lines 3 through 6.

B. Supportive Expenses

1. Travel:
   Money Requested ($15,000) Travel monies ($10,000) to attend scientific meetings as well as transportation to LUMCON are being requested. The P.Is. and students will attend several meetings including the American Society for Microbiology (ASM), South Eastern Chapter of ASM and Louisiana Academy of Sciences meeting and World Aquaculture Society meeting. Funds ($ 5,000) are also requested to bring in external evaluators to the campus to evaluate our program.
   Institutional Match (None)

2. Supplies:
   Money Requested (30,000) for supplies are itemized.
   Reagents and chemicals $10,000

Enzymes $6,000
Disposable plastic lab ware, $10,000
Tissue culture reagents, $4,000
Institutional Match (None)

3. Consultants: N/A

4. Rentals: N/A

5. Printing: N/A

6. Equipment: N/A

7. Other Expenses: N/A

8. Subcontracts: N/A

9. Subtotal B:
Money Requested ($45,000) sum of lines 1 through 8.
Institutional Match (None).

C. Overhead:

1. *Money Requested* (None)
Institutional Match ($8,658), in support of the project, Nicholls State University is waiving its overhead entitlement for application as Institutional Match.

Total Project Cost For Year 1:
***Money Requested* ($124,630)**
***Institutional Match* ($43,288)**

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

Title of Proposed Research: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.

Principal Investigator (s): Dr. Ramaraj Boopathy and Dr. Rajkumar Nathaniel

Institution (s) of Higher Education: Nicholls State University

I. Proposed Budget Year 2:

Section A	Support Fund Money Requested*	Institutional Match**	Type Cash/In-kind	Private Sector/ Other match ***
1. Research	$27,704	$27,704	In-kind	
2. Clerical				
3. Subtotal	$27,704	$27,704		
Fringe %	25%	25%		
4. Fringe Benefits	$6,926	$6,926	In-kind	
5. Graduate Asst.				
6. Students (s)	$45,000			
7. Subtotal A	$79,630	$34,630	In-kind	
Section B Supportive Expenses				
1. Travel	$15,000			
2. Supplies	$30,000			
3. Consultants				
4. Rentals				
5. Printing				
6. Equipment				
7. Other Expenses Identify				
8. Subcontracts				
Subtotal B	$45,000			
Section C Overhead				
Overhead%	25%	25%		
1. Overhead cost	NOT PERMITTED	$8,658		
Total Project Cost	$124,630	$43,288		

*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.

II. BUDGET JUSTIFICATION FOR SECOND YEAR:

A. Proposed Budget

1. Research:
   Money Requested ($27,704) Two months of salary to be paid in summer, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel is being requested.
   Institutional Match ($27,704) Two months of salary, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel will be granted as release time to work on the project.

2. Clerical: N/A

3. Subtotal:
   Money Requested ($27,704)
   Institutional Match ($27,704)

4. Fringe Benefits:
   Money Requested ($6,926) equal to 25% of salary.
   Institutional Match ($6,926) equal to 25% of salary.

5. Graduate Assistant: N/A

6. Student Assistants:
   Money Requested ($45,000) Stipends for 15 student assistants who will receive $3,000 each/year are being requested.
   Institutional Match (None)

7. Subtotal A:
   Money Requested ($79,630), sum of lines 3 through 6.
   Institutional Match ($34,630), sum of lines 3 through 6.

B. Supportive Expenses

1. Travel:
   Money Requested ($15,000) Travel monies ($10,000) to attend scientific meetings as well as transportation to LUMCON are being requested. The P.Is. and students will attend several meetings including the American Society for Microbiology (ASM), South Eastern Chapter of ASM and Louisiana Academy of Sciences meeting and World Aquaculture Society meeting. Funds ($ 5,000) are also requested to bring in external evaluators to the campus to evaluate our program.
   Institutional Match (None)

2. Supplies:
   Money Requested (30,000) for supplies are itemized.
   Reagents and chemicals $10,000

Enzymes $6,000
Disposable plastic lab ware, $10,000
Tissue culture reagents, $4,000
Institutional Match (None)

6. Consultants: N/A

7. Rentals: N/A

8. Printing: N/A

6. Equipment: N/A

7. Other Expenses: N/A

8. Subcontracts: N/A

9. Subtotal B:
Money Requested ($45,000) sum of lines 1 through 8.
Institutional Match (None).

C. Overhead:

1. *Money Requested* (None)
Institutional Match ($8,658), in support of the project, Nicholls State University is waiving its overhead entitlement for application as Institutional Match.

Total Project Cost For Year 2:

***Money Requested* ($124,630)**
***Institutional Match* ($43,288)**

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

Title of Proposed Research: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.

Principal Investigator (s): Dr. Ramaraj Boopathy and Dr. Rajkumar Nathaniel

Institution (s) of Higher Education: Nicholls State University

I. Proposed Budget Year 3:

Section A	Support Fund Money Requested*	Institutional Match**	Type Cash/In-kind	Private Sector/ Other match ***
1. Research	$27,704	$27,704	In-kind	
2. Clerical				
3. Subtotal	$27,704	$27,704		
Fringe %	25%	25%		
4. Fringe Benefits	$6,926	$6,926	In-kind	
5. Graduate Asst.				
6. Students (s)	$45,000			
7. Subtotal A	$79,630	$34,630	In-kind	
Section B Supportive Expenses				
1. Travel	$15,000			
2. Supplies	$30,000			
3. Consultants				
4. Rentals				
5. Printing				
6. Equipment				
7. Other Expenses Identify				
8. Subcontracts				
Subtotal B	$45,000			
Section C Overhead				
Overhead%	25%	25%		
1. Overhead cost	NOT PERMITTED	$8,658		
Total Project Cost	$124,630	$43,288		

*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.

II. BUDGET JUSTIFICATION FOR THIRD YEAR:

A. Proposed Budget

1. Research:
   Money Requested ($27,704) Two months of salary to be paid in summer, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel is being requested.
   Institutional Match ($27,704) Two months of salary, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel will be granted as release time to work on the project.

2. Clerical: N/A

3. Subtotal:
   Money Requested ($27,704)
   Institutional Match ($27,704)

4. Fringe Benefits:
   Money Requested ($6,926) equal to 25% of salary.
   Institutional Match ($6,926) equal to 25% of salary.

5. Graduate Assistant: N/A

6. Student Assistants:
   Money Requested ($45,000) Stipends for 15 student assistants who will receive $3,000 each/year are being requested.
   Institutional Match (None)

7. Subtotal A:
   Money Requested ($79,630), sum of lines 3 through 6.
   Institutional Match ($34,630), sum of lines 3 through 6.

B. Supportive Expenses

1. Travel:
   Money Requested ($15,000) Travel monies ($10,000) to attend scientific meetings as well as transportation to LUMCON are being requested. The P.Is. and students will attend several meetings including the American Society for Microbiology (ASM), South Eastern Chapter of ASM and Louisiana Academy of Sciences meeting and World Aquaculture Society meeting. Funds ($ 5,000) are also requested to bring in external evaluators to the campus to evaluate our program.
   Institutional Match (None)

2. Supplies:
   Money Requested (30,000) for supplies are itemized.
   Reagents and chemicals $10,000

Enzymes $6,000
Disposable plastic lab ware, $10,000
Tissue culture reagents, $4,000
Institutional Match (None)

9. Consultants: N/A

10. Rentals: N/A

11. Printing: N/A

6. Equipment: N/A

7. Other Expenses: N/A

8. Subcontracts: N/A

9. Subtotal B:
Money Requested ($45,000) sum of lines 1 through 8.
Institutional Match (None).

C. Overhead:

1. *Money Requested* (None)
Institutional Match ($8,658), in support of the project, Nicholls State University is waiving its overhead entitlement for application as Institutional Match.

Total Project Cost For Year 3:
***Money Requested* ($124,630)**
***Institutional Match* ($43,288)**

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

Title of Proposed Research: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.

Principal Investigator (s): Dr. Ramaraj Boopathy and Dr. Rajkumar Nathaniel

Institution (s) of Higher Education: Nicholls State University

I. Proposed Budget Year 4:

Section A	Support Fund Money Requested*	Institutional Match**	Type Cash/In-kind	Private Sector/ Other match ***
1. Research	$27,704	$27,704	In-kind	
2. Clerical				
3. Subtotal	$27,704	$27,704		
Fringe %	25%	25%		
4. Fringe Benefits	$6,926	$6,926	In-kind	
5. Graduate Asst.				
6. Students (s)	$45,000			
7. Subtotal A	$79,630	$34,630	In-kind	
Section B Supportive Expenses				
1. Travel	$15,000			
2. Supplies	$30,000			
3. Consultants				
4. Rentals				
5. Printing				
6. Equipment				
7. Other Expenses Identify				
8. Subcontracts				
Subtotal B	$45,000			
Section C Overhead				
Overhead%	25%	25%		
1. Overhead cost	NOT PERMITTED	$8,658		
Total Project Cost	$124,630	$43,288		

*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.

II. BUDGET JUSTIFICATION FOR FOURTH YEAR:

A. Proposed Budget

1. Research:
   Money Requested ($27,704) Two months of salary to be paid in summer, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel is being requested.
   Institutional Match ($27,704) Two months of salary, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel will be granted as release time to work on the project.

2. Clerical: N/A

3. Subtotal:
   Money Requested ($27,704)
   Institutional Match ($27,704)

4. Fringe Benefits:
   Money Requested ($6,926) equal to 25% of salary.
   Institutional Match ($6,926) equal to 25% of salary.

5. Graduate Assistant: N/A

6. Student Assistants:
   Money Requested ($45,000) Stipends for 15 student assistants who will receive $3,000 each/year are being requested.
   Institutional Match (None)

7. Subtotal A:
   Money Requested ($79,630), sum of lines 3 through 6.
   Institutional Match ($34,630), sum of lines 3 through 6.

B. Supportive Expenses

1. Travel:
   Money Requested ($15,000) Travel monies ($10,000) to attend scientific meetings as well as transportation to LUMCON are being requested. The P.Is. and students will attend several meetings including the American Society for Microbiology (ASM), South Eastern Chapter of ASM and Louisiana Academy of Sciences meeting and World Aquaculture Society meeting. Funds ($ 5,000) are also requested to bring in external evaluators to the campus to evaluate our program.
   Institutional Match (None)

2. Supplies:
   Money Requested (30,000) for supplies are itemized.
   Reagents and chemicals $10,000

Enzymes $6,000
Disposable plastic lab ware, $10,000
Tissue culture reagents, $4,000
Institutional Match (None)

12. Consultants: N/A

13. Rentals: N/A

14. Printing: N/A

6. Equipment: N/A

7. Other Expenses: N/A

8. Subcontracts: N/A

9. Subtotal B:
Money Requested ($45,000) sum of lines 1 through 8.
Institutional Match (None).

C. Overhead:

1. *Money Requested* (None)
Institutional Match ($8,658), in support of the project, Nicholls State University is waiving its overhead entitlement for application as Institutional Match.

Total Project Cost For Year 4:
***Money Requested* ($124,630)**
***Institutional Match* ($43,288)**

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

Title of Proposed Research: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.

Principal Investigator (s): Dr. Ramaraj Boopathy and Dr. Rajkumar Nathaniel

Institution (s) of Higher Education: Nicholls State University

I. Proposed Budget Year 5:

Section A	Support Fund Money Requested*	Institutional Match**	Type Cash/In-kind	Private Sector/ Other match ***
1. Research	$27,704	$27,704	In-kind	
2. Clerical				
3. Subtotal	$27,704	$27,704		
Fringe %	25%	25%		
4. Fringe Benefits	$6,926	$6,926	In-kind	
5. Graduate Asst.				
6. Students (s)	$45,000			
7. Subtotal A	$79,630	$34,630	In-kind	
Section B Supportive Expenses				
1. Travel	$15,000			
2. Supplies	$30,000			
3. Consultants				
4. Rentals				
5. Printing				
6. Equipment				
7. Other Expenses Identify				
8. Subcontracts				
Subtotal B	$45,000			
Section C Overhead				
Overhead%	25%	25%		
1. Overhead cost	NOT PERMITTED	$8,658		
Total Project Cost	$124,630	$43,288		

*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.

II. BUDGET JUSTIFICATION FOR FIFTH YEAR:

A. Proposed Budget

1. Research:
   Money Requested ($27,704) Two months of salary to be paid in summer, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel is being requested.
   Institutional Match ($27,704) Two months of salary, based on a 9 month salary of $74,673 for Dr. Boopathy and $49,995 for Dr. Nathaniel will be granted as release time to work on the project.

2. Clerical: N/A

3. Subtotal:
   Money Requested ($27,704)
   Institutional Match ($27,704)

4. Fringe Benefits:
   Money Requested ($6,926) equal to 25% of salary.
   Institutional Match ($6,926) equal to 25% of salary.

5. Graduate Assistant: N/A

6. Student Assistants:
   Money Requested ($45,000) Stipends for 15 student assistants who will receive $3,000 each/year are being requested.
   Institutional Match (None)

7. Subtotal A:
   Money Requested ($79,630), sum of lines 3 through 6.
   Institutional Match ($34,630), sum of lines 3 through 6.

B. Supportive Expenses

1. Travel:
   Money Requested ($15,000) Travel monies ($10,000) to attend scientific meetings as well as transportation to LUMCON are being requested. The P.Is. and students will attend several meetings including the American Society for Microbiology (ASM), South Eastern Chapter of ASM and Louisiana Academy of Sciences meeting and World Aquaculture Society meeting. Funds ($5,000) are also requested to bring in external evaluators to the campus to evaluate our program.
   Institutional Match (None)

2. Supplies:
   Money Requested ($30,000) for supplies are itemized.
   Reagents and chemicals $10,000

Enzymes $6,000
Disposable plastic lab ware, $10,000
Tissue culture reagents, $4,000
Institutional Match (None)

15. Consultants: N/A

16. Rentals: N/A

17. Printing: N/A

6. Equipment: N/A

7. Other Expenses: N/A

8. Subcontracts: N/A

9. Subtotal B:
Money Requested ($45,000) sum of lines 1 through 8.
Institutional Match (None).

C. Overhead:

1. *Money Requested* (None)
Institutional Match ($8,658), in support of the project, Nicholls State University is waiving its overhead entitlement for application as Institutional Match.

Total Project Cost For Year 5:

***Money Requested* ($124,630)**
***Institutional Match* ($43,288)**

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

Title of Proposed Research: Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences.

Principal Investigator (s): Dr. Ramaraj Boopathy and Dr. Rajkumar Nathaniel

Institution (s) of Higher Education: Nicholls State University

I. Proposed Budget Year Composite:

Section A	Support Fund Money Requested	Institutional Match*	Type Cash/In-kind	Private Sector/ Other match **
1. Research	$138,520	$138,520	In-kind	
2. Clerical	$0	$0		
3. Subtotal	$138,520	$138,520		
Fringe %	25%	25%		
4. Fringe Benefits	$34,630	$34,630	In-kind	
5. Graduate Asst.	$0	$0		
6. Students (S)	$225,000	$0		
7. Subtotal A	$398,150	$173,151	In-kind	
Section B Supportive Expenses				
1. Travel	$75,000	$0		
2. Supplies	$150,000	$0		
3. Consultants	$0	$0		
4. Rentals	$0	$0		
5. Printing	$0	$0		
6. Equipment***	$0	$0		
7. Other Expenses Identify	$0	$0		
8. Subcontracts	$0	$0		
Subtotal B	$225,000	$0		
Section C Overhead				
Overhead%	25%	25%		
1. Overhead cost	NOT PERMITTED	$43,290		
Total Project Cost	$623,150	$216,440		

*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.

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 Raj Boopathy, Ph.D	Position Title Distinguished Service Professor

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

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
University of Madras, India	B.S	1979	Zoology
University of Madras, India	Ph.D	1986	Environmental Biology

RESEARCH AND PROFESSIONAL EXPERIENCE: Starting with present position, list, in reverse chronological order, previous relevant employment, experience, and honors. Key personnel includes the principal investigator and any other individuals who participate in the development or execution of the project. Key personnel typically will include all individuals with doctoral or other professional degrees, but in some projects will include individuals at the masters or baccalaureate level provided they contribute in a substantive way to the development or execution of the project. Include present membership on any Federal Government public advisory committee. List, in reverse chronological order, the titles, all authors, and complete references to pertinent publications during the past five years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

August 2004 – Present: Distinguished Service Professor,
Department of Biological Sciences, Nicholls State University, Thibodaux. Teaching, Research, and Service to the University and Community.

August 2003- Present: Jerry Ledet Foundation Endowed Professor in Environmental Biology, Nicholls State University, Thibodaux. Conduct research in Environmental Biology and teach environmental science related courses.

August 2002 – Present: Graduate Program Coordinator for the Masters Program in Marine and Environmental Biology, Nicholls State University, Thibodaux. Coordinate the new MS program in the biology department and teach graduate level courses.

Jan. 1999 – August 2003: Assistant Professor, Department of Biological Sciences, Nicholls State University, Thibodaux, Teaching Senior and Graduate level courses, Research work on Bioremediation of Hazardous chemicals and Anaerobic Microbiology.

Jan. 1993 - Dec. 1998: Scientist, Advanced Environmental Studies, Environmental Research Division, Argonne National Laboratory. Research work on bacterial degradation of trinitrotoluene (TNT); operation of lab scale and field scale soil slurry reactors to study bioremediation of TNT, Petroleum Hydrocarbon, and Chlorinated solvents contaminated soil.

Reviewed manuscripts for the following Scientific Journals:
Environmental Science & Technology (ES&T), Biotechnology and Bioengineering
Biotechnology Progress, Bioresource Technology, Bioremediation Journal
Journal of Industrial Microbiology & Biotechnology, Anaerobe,
Environmental Toxicology & Chemistry, Archives of Environmental Contamination and Toxicology, Water Environment Research, Canadian Journal of Microbiology
Water Research, Journal of Soil and Sediment Contamination, International Journal of Biodeterioration &

Biodegradation, Journal of Environmental Quality, Applied Biochemistry & Biotechnology, Advances in Environmental Research, Journal of Applied Microbiology and Biotechnology, Separation Science Technology, and Environmental Progress.

PUBLICATIONS: Refereed Journals (Selected Publications)

Boopathy, R.,and L. Dawson. 2007. Use of Post-harvest Sugarcane Residue for Ethanol Production. **Bioresoure Technology.** 98: 1695-1699.

Clark, B. and R. Boopathy. 2006. Evaluation of Bioremediation Methods for the Treatment of Soil Contaminated with Explosives in Louisiana Army Ammunition Plant, Minden, Louisiana. **Journal of Hazardous Materials** (in Print).

Doolittle, M., A. Raina, A. Lax, and R. Boopathy. 2006. Effect of Natural Products on Gut Microbes in Formosan Subterranean Termite, *Coptotermes formosanus*. **International Journal of Biodeterioration and Biodegradation** (in Print).

Boopathy, R. 2005. Bioremediation of Tetryl-Contaminated Soil Using Sequencing Batch Soil Slurry Reactor. **International Journal of Biodeterioration and Biodegradation**. 55:293-297.

Adams, L. and R. Boopathy. 2005. Isolation and Characterization of Enteric Bacteria From the Hindgut of Formosan Termite. **Bioresource Technology**. 96:1592-1598.

Boopathy, R., Q. Fontenot, and M. Kilgen. 2005. Biological Treatment of Sludge from a Recirculating Aquaculture System Using a Sequencing Batch Reactor. **Journal of The World Aquaculture Society** 36: 542-545.

Boopathy, R. 2004. Use of Post-Harvest Sugarcane Residue in Coastal Reclamation: A Feasibility Study: **Sugarcane International**. Jan/Feb. 9-13.

Boopathy, R. 2004. Anaerobic biodegradation of No. 2 diesel fuel in the soil: A soil column study. **Bioresource Technology.** 94:143-151.

Boopathy, R. and E. Melancon. 2004. Metabolism of Compounds with Nitro-Functions by *Klebsiella pneumonia* Isolated from a Regional Wetland. **International Journal of Biodeterioration and Biodegradation.** 54:269-275.

Boopathy, R. 2003. Anaerobic degradation of No. 2 Diesel Fuel in the Wetland Sediments of Barataria-Terrebonne Estuary under Various Electron Acceptor Conditions.**Bioresource Technology.** 86:171-175.

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	Rajkumar NATHANIEL, Ph.D	Position Title	Assistant Professor

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

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Bangalore University, India	B. Sc.	1991	Microbiology
University of Central Florida	M.S	1996	Molecular Biology
University of Florida	Ph.D	2002	Immunology & Microbiology
University of Illinois, Chicago	Post Doctoral Training	2004	Digestive Diseases

RESEARCH AND PROFESSIONAL EXPERIENCE: Starting with present position, list, in reverse chronological order, previous relevant employment, experience, and honors. Key personnel includes the principal investigator and any other individuals who participate in the development or execution of the project. Key personnel typically will include all individuals with doctoral or other professional degrees, but in some projects will include individuals at the masters or baccalaureate level provided they contribute in a substantive way to the development or execution of the project. Include present membership on any Federal Government public advisory committee. List, in reverse chronological order, the titles, all authors, and complete references to pertinent publications during the past five years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

Professional Experiences:

Assistant Professor, Nicholls State University, Department of Biological Sciences, 2005 - present
Post-Doctoral Fellow, University of Illinois at Chicago, Department of Medicine, 2002-2005
Graduate Research Assistant, University of Florida, Department of Molecular Genetics & Microbiology, 1996-2002
Graduate Research Assistant, Walt Disney Memorial Cancer Institute, University of Central Florida, Orlando, FL, 1994-1996
Graduate Teaching Assistant, University of Central Florida, Orlando, FL, 1994-1996
Research Assistant, Astra Zeneca Research, Bangalore, India, 1993-1994
Clinical Microbiology Technologist, Department of Clinical Microbiology, Christian Medical College, Vellore, India, 1991-1993

Honors and Awards

2001	American Society of Virology Travel award
1996-2002	Pre-Doctoral Research Assistantship, Interdisciplinary program in Biomedical Sciences, University of Florida.
1994-96	Graduate Research Assistantship, Walt Disney Memorial Cancer Institute, Orlando, FL
1994-96	Graduate Teaching Assistantship, University of Central Florida, Orlando, FL
1992	Best Student Award, Dept of Clinical Microbiology, Christian Medical College, Vellore, India

Recent Publications:

Budvicia aquatica sepsis in an immunocompromised patient following exposure to the aftermath of hurricane Katrina
Corbin A, Delatte C, Besson S, Guidry A, Hoffmann III A, Monier P and **Nathaniel R** (submitted)

Glover S, **Nathaniel R**, Shakir L, Perrault C, Anderson RK, Tran-Son-Tay R, Benya RV.
Transient upregulation of GRP and its receptor critically regulate colon cancer cell motility during remodeling.
Am J Physiol Gastrointest Liver Physiol. 2005 Jun;288(6):G1274-82.

Matusiak D, Glover S, **Nathaniel R**, Matkowskyj K, Yang J and Benya RV.
Neuromedin B and its receptor are mitogens in both normal and malignant epithelial cells lining the colon.
Am J Physiol Gastrointest Liver Physiol. 2005 Apr;288(4):G718-28. Epub 2004 Nov 4.

Matkowskyj K, **Nathaniel R**, Prasad R, Weihrauch D, Rao M and Benya RV
Galanin contributes to the excess colonic fluid secretion observed in dextran sulfate sodium murine colitis *Inflammatory Bowel Dis* 2004; 10: 408-416.

Nathaniel R, MacNeill AL, Wang YX, Turner PC, Moyer RW.
Cowpox virus CrmA, *Myxoma* virus SERP2 and *baculovirus* P35 are not functionally interchangeable caspase inhibitors in poxvirus infections. *J Gen Virol.* 2004;85(Pt 5):1267-78.

Balganesh M, Lalitha MK, **Nathaniel R**
Rapid diagnosis of acute pyogenic meningitis by a combined PCR dot-blot assay. *Molecular and Cellular Probes.* 2000;14(2):61-9

Macen J, Takahashi A, Moon KB, **Nathaniel R**, Turner PC, Moyer RW
Activation of caspases in pig kidney cells infected with wild-type and CrmA/SPI-2 mutants of cowpox and rabbitpox viruses. *J Virology.* 1998;72(5):3524

Dean of the College of Arts & Sciences
P.O. Box 2020
Thibodaux, LA 70310
985.448.4388

NICHOLLS
STATE UNIVERSITY
A MEMBER OF THE UNIVERSITY OF LOUISIANA SYSTEM

March 15, 2007

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

Dear Dr. Davidson:

I am writing this letter of support for the project 'Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences' submitted by Drs. Ramaraj Boopathy and Rajkumar Nathaniel.

As Dean of the College of Arts and Sciences, I am very concerned at the current level of interest in the Sciences, Technology, Mathematics, and Engineering (STEM) programs. I am very pleased to note that this proposal addresses key issues in tackling the attrition rates seen in our college. Funding this project will go along way to help freshmen and sophomore science students in my college gain a better appreciation for their majors and help raise retention rates in the STEM disciplines. Successful funding for this proposal will also give Nicholls an opportunity to impart a greater level of mentorship to these students at the earliest point in their careers.

I strongly recommend funding for this proposal and will do my best to commit our college's available resources to the success of this project.

Sincerely,

B.R. Asrabadi, Dean

Department of Biological Sciences

P.O. Box 2021
Thibodaux, LA 70310
985.448.4700 or 448.4701

NICHOLLS
STATE UNIVERSITY
A MEMBER OF THE UNIVERSITY OF LOUISIANA SYSTEM

15 March 2007

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

Dear Dr. Davidson,

I am writing in support for the project submitted by Drs. Ramaraj Boopathy and Rajkumar Nathaniel titled 'Laboratory Education Experiences for Freshmen and Sophomore Level Undergraduate Students in Biological Sciences'.

Over the course of my academic career spanning more than 30 years, I have had the opportunity to mentor several students in my laboratory. I have noticed the dramatic changes that occur when students are given the opportunity to work in a laboratory with the right guidance and are nurtured into science careers. This proposal will be invaluable to our program in making success stories out of our freshman/sophomore students. As Interim Department Head, I am fully committed to my faculty who will be involved in this project and will do everything I can to help this venture succeed.

I strongly recommend consideration by the LA Board of Reagents to fund this project. If I can be of assistance to you please do not hesitate to contact me.

Sincerely,

Earl J. Melancon, Jr.

Earl J. Melancon, Jr., Ph.D.
Distinguished Service Professor
Biology Interim Department Head

APPENDIX A

SELECTED UNDERGRADUATE STUDENT RESEARCH PROJCTS. Students are enrolled in Research Problems, under the mentorship of a faculty member.

Williams, Koya: Analyses of Environmental Samples for Tetryl Degraders.

Scott, Rowdy: Anaerobic Biodegradation of High Melting Explosive (HMX).

Martin, Richard: Enhanced Biodegradation of Carbon Tetrachloride Under Mixed Electron Acceptor Conditions.

Matherne Ryan: Survey of anaerobic bacteria in the bayou Lafourche for petroleum hydrocarbon degradation.

Toups, Dale: *In-Situ* Composting of Sugarcane Residue.

Zerengue, Randy: Anaerobic Degradation of Petroleum Hydrocarbons Under Sulfate and Nitrate-Reducing Conditions.

Champhone, Bruce: Antimicrobial Activities of Cajun Spices

Leith, Adams: Development of Bacterial Resistance to Triclosane

Lafont, Derek: Influence of Anaerobic Bacteria in Periodontitis

Becknel, Steve: Isolation and Characterization of a Sulfate Reducing Bacterium from Human Dental Plaque

Guezzata, Greg: Microbial Degradation of Dinitrophenol.

Hymel, Brad: Lytic Peptide Assays of Sugarcane Pests.

Hymel, Brett: Lytic Peptide Assays of Sugarcane Pests and Molecular Cloning.

LeJeune Brad: Designing a Laboratory Husbandry Section for Aquaculture.

Truxillo, Jill: Responses of Sugarcane Seedlings on Drought Analysis.

Daigle, John: Assessing Candidacy of New Genes at the Acadian Usher Syndrome Locus.

Clement, Alicia: Gene Discovery in Acadian Usher Syndrome.

Doiron, Carey: Hepatic Synthesis as a Biomarker for Estrogen-Induction.

Guillory, Lisa: Culture of Sugarcane in an *in vitro* lab setting.

St. Germain, Lori: Transformation of Sugarcane Cells with plasma DNA.

Robichaux, Sara: Assessing Candidacy at the Acadian Usher Syndrome Locus.

Falencia, Bras: Isolation of Methanogenic Bacteria from Dental Plaque.

APPENDIX B

As a result of undergraduate participation in faculty research, many faculty members have published research papers and presented papers in professional meetings with students as co-authors. Some of the published papers are given below with * for student authors:

Conference Presentation:

Shields, S*. and R. Boopathy. 2006. Anaerobic Degradation of RDX by Soil Bacteria Isolated from Explosive-Contaminated Soil. Paper Presented at the South Central Branch of American Society for Microbiology Annual Conference. Baton Rouge, LA. Nov. 3-4, 2006.

Daswon, L, J. Chiasson* and R. Boopathy. 2005. Microbial Fermentation of Post-Harvest Agricultural Residue for Energy Production in the form of Fuel Alcohol. Paper Presented at the 66th Annual Meeting of the Association of Southeastern Biologists. Florence, AL, April 13-16, 2005.

Dawson, L., J. Chiasson*, and R. Boopathy. 2004. Ethanol Production from the Post-Harvest Sugar Cane Residue. Paper presented at the South Central Branch American Society for Microbiology Meeting. Starkville, MS. Nov 5-6, 2004.

Hassan, K*., Q. Fontenot, M. Kilgen, and R. Boopathy. 2004. Use of Sequencing Batch Reactor for the Biological Treatment of Shrimp Aquaculture Wastewater. Paper presented at the South Central Branch American Society for Microbiology Meeting. Starkville, MS. Nov 5-6, 2004.

Tabor, J*. and R. Boopathy. 2004. Isolation of a Salt Tolerant *E.coli* and a Need for a New Method to Monitor Water Quality in Oyster Beds of Barataria Bay. Paper presented at the 78th Annual Meeting of Louisiana Academy of Sciences, Lake Charles, LA, March 19, 2004.

Klutts, P*. and R. Boopathy. 2003. Prevalence of Pesticide Resistant Bacteria in Store Bought Vegetables. Paper presented at the Annual Meeting of the Louisiana Academy of Sciences. March 20-21, 2003. Gonzales, LA.

Poole, J*. and R. Boopathy. 2003. Presence of Antibiotic Resistant Bacteria in Bayou Laforuche and Bayou Terrebonne. Paper presented at the Annual Meeting of the Louisiana Academy of Sciences. March 20-21, 2003. Gonzales, LA.

Zeringue, R*. and R. Boopathy. 2002. Fuel Alcohol Production from the Post-Harvest Sugarcane Residue. Paper Presented at the Annual Meeting of the American Society for Microbiology South Central Branch. October 25-26, 2002. Jackson, MS.

Matherne, R*., R. Zeringue*, and R. Boopathy. 2001. Anaerobic Degradation of Petroleum Hydrocarbons Under Mixed Electron Acceptor Conditions. Paper will be presented at the Environmental State of the State Conference-V. Oct. 25-26, 2001, Thibodaux, LA.

Zeringue, R*., R. Matherne*, and R. Boopathy. 2001. Use of Sulfate and Nitrate Reducing Bacteria for Oil Spill Clean Up. Paper will be presented at the Environmental State of the State Conference-V. Oct. 25-26, 2001, Thibodaux, LA.

Boopathy, R. and R. Martin*. 2001. Enhanced Biotransformation of Carbon Tetrachloride Under Mixed Electron Acceptor Conditions. Paper presented at the 62nd Annual Meeting of the Association of Southeastern Biologists. April 6-8, 2001. New Orleans, Louisiana.

Toups, D*. and R. Boopathy. 2000. Microbial Decomposition of Post-Harvest Sugarcane Residue. Paper presented at the Annual Meeting of the South Central Branch of the American Society for Microbiology. Nov. 10-11, 2000. Little Rock, Arkansas.

Toups, D*. and R. Boopathy. 2000. An Alternate Biological Method for the Open Air Burning of Post-Harvest Sugarcane Residue. Paper presented at the 52nd South East Regional Meeting of the American Chemical Society. Dec. 6-8, 2000. New Orleans.

Williams, K*. and R. Boopathy. 1999. Anaerobic degradation of tetryl, a common explosive. Paper presented at the Annual Meeting of the South Central Branch of the American Society for Microbiology. Oct. 29-30, 1999. New Orleans.

Refereed Journals

Boopathy, R., M. Robichaux, D. LaFont*, and M. Howell. 2002. Activity of sulfate-reducing bacteria in human periodontal pocket. **Canadian Journal of Microbiology**. 48:1099-1103.

Boopathy, R., M. Gurgas*, J. Ullian* and J.F. Manning. 1998. Metabolism of explosive compounds by sulfate-reducing bacteria. **Curr. Microbiol**. 37:127-131.

Davis, E. P*., R. Boopathy and J. Manning. 1997. Use of trinitrobenzene as a nitrogen source by *Pseudomonas vesicularis* isolated from soil. **Curr. Microbiol**. 34:192-197.

Widrig, D.L*., R. Boopathy and J. Manning. 1997. Bioremediation of TNT-contaminated soil: A laboratory study. **Environ. Toxicol. Chem**. 16:1141-1148.

Boopathy, R., D.L. Widrig* and J. Manning. 1997. In Situ bioremediation of explosives-contaminated soil: A soil column study. **Biores. Technol**. 59:169-176.

Belay, N., R. Boopathy, and G. Voskuilan*. 1997. Anaerobic transformation of furfural by *Methanococcus deltae* LH. **Appl. Environ. Microbiol**. 63:2092-2094..

Costa, V*., R. Boopathy and J. Manning. 1996. Isolation and characterization of a sulfate-reducing bacterium that removed TNT (2,4,6-trinitrotoluene) under sulfate- and nitrate-reducing conditions. **Biores. Technol**. 56:273-278.

APPENDIX C

BIOL 416
Undergraduate Research Syllabus
Spring 2007

Instructor: Aaron Pierce, Ph.D. **Office:** 218 Gouaux Hall
Phone: 493-2628 **E-mail:** aaron.pierce@nicholls.edu
Office Hours: Tuesday and Wednesday: 9am-12 and 1pm-5pm, and by appointment.

COURSE DESCRIPTION:
Research Problems is a Junior or Senior level course to be taken with a selected faculty member. The student will learn how to develop a hypothesis, design an experiment, collect and analyze data, and write a research report in a scientific journal format.

COURSE TEXT:
There is no specific text assigned for this course. The student will review scientific literature in the research area chosen and perform laboratory procedures according to the direction of a mentor professor.

PREREQUISITES FOR COURSE:
Junior or senior status in Biological Science, Natural Sciences, Science Education, or permission of the instructor is required.

COURSE GOAL:
The student will gain basic knowledge of how to develop a hypothesis, design an experiment, collect and analyze data, and write a research report in a scientific journal format.

COURSE OBJECTIVES:
In this course, the student will:
1. Formulate a hypothesis and identify how to use the scientific method in constructing an experimental design.
2. Record scientific data and maintain a database of results and daily log of protocols, observations and occurrences.
3. Apply library and computer technology to do a literature search of the research topic, and how to write a scientific review of that literature for the introduction and background of the research paper.
4. Distinguish how to use correct scientific reference protocols in the scientific research paper that will be written for the course requirements.
5. Apply technical skills in laboratory and field procedures and techniques required for the research topic chosen, and learn how to use any analytical or other scientific equipment required for the research.
6. Demonstrate to mentor professor that one is capable of accomplishing independent study.
7. Evaluate and analyze data and compose information into a scientific paper

COURSE REQUIREMENTS:
1. Biology 416 is a two-hour credit course. Students must spend an average of five contact hours per week or a **minimum of 70 total hours** for the semester working on some aspect of the research topic.
2. Students must keep a scientific data book, and maintain a journal of all aspects of the research problem. The journal must be dated and time logged at each entry.

3. Students must keep a daily time sheet to log an average of five hours of time per week, or a total of 70 hours per semester spent working on the research topic. The time sheet must be signed each week by the mentor professor working with the student.

METHOD OF EVALUATION:
Evaluation is based on:

1. Three Progress Reports turned in to **both** the mentor professor and the course instructor . **(30% total; 10% each report)** *The first Progress Report will consist of a title, abstract, five literature references, and a timetable of milestone events in the research.*
2. The signed attendance logs to document the time spent on the project. **(10%)**
3. The scientific data book, which is turned in first to the mentor professor for review and grading and then to the instructor. **(10%)**
4. The final scientific report, *which is turned in first to the mentor professor for review, editing and a grade*. The mentor professor turns in the graded report to the instructor for a final grade; course instructor will also assign grade and the average of the two grades will be used. **(50%)**
5. Grading is on a 10 point scale: 90-100=A; 80-89=B; 70-79=C; 60-69=D; <60=F.

MAKEUP PROCEDURE:
Students who do not complete the project in one semester may receive a grade of Incomplete and complete the project the following semester. Failure to complete the project during the second semester will result in a grade of F.

CHEATING POLICY:
Cheating will be swiftly dealt with according to the rules in the Nicholls State University Student Handbook. Cheating is considered the most serious transgression a university student can make against their honor, fellow students, the university, and the public.

ATTENDANCE POLICY:
Students are required to log in a minimum of five hours per week, or a total of 70 hours per semester for Biology 416 in the spring and fall semesters, and 12 hours per week (total 70 hours) in the summer semester.

COURSE TOPICS:
Multiple research topics are available each semester according to the research interests of the departmental faculty. Research topics of each of the faculty members will be turned in to the instructor at the beginning of each semester. The instructor will distribute these to the students and ask the students to select a faculty member with whom to work. Upon mutual agreement of both the student and the faculty member as ascribed to the **Mentoring Agreement** (see below), the student may begin working toward credit in this course under the mentorship of the chosen professor.

OTHER IMPORTANT INFORMATION AND FORMS
See attached forms needed for this course. Students must abide by information due dates.

- PROGRESS REPORT FORMATS
- MILESTONE CHART FOR RESEARCH EVENTS
- MENTORING AGREEMENT*
- SPECIAL REQUIREMENTS FOR EXTRAMURAL RESEARCH
- TIME SHEET*
- SCHEDULE OF DUE DATES

University Disability Policy: *"If you have a documented disability that requires assistance, you will need to register with the Office of Disability Services for coordination of your academic accommodations. The Office of Disability Services is located in Peltier Hall, Room 100-a. The phone number is (985) 448-4430. (TDD449-7002)."*

BIOL 416
PROGRESS REPORT FORMATS

The following are outlines of the required formats for progress reports.

Progress Report 1
Time period covered by this report:
Name:
Faculty Mentor:
Title:

1. Work completed in this reporting period:
   a. Milestone chart of timelines for the entire project
   b. Literature (minimum of 5 references)
   c. Results to date:
2. Problems encountered or reasons why work scheduled for this reporting period was not completed.

Progress Reports 2 and 3
Time period covered by this report:
Name:
Faculty Mentor:
Title:

1. Work completed in this reporting period:
2. Problems encountered or reasons why work scheduled for this reporting period was not completed.

FINAL REPORT FORMAT:
Name
Title
Abstract
Introduction and Background (literature review)
Materials and Methods
Results
Summary and Discussion
Literature Cited (bibliographical entries in alphabetical order)
Acknowledgments

CITATION AND REFERENCE FORMAT:

- Examples of in-text citations:
  single author: (Boudreaux 1990)
  two authors: (Jones and Smith 1998)
  more than two authors: (Doucet et al. 1999).
  multiple citations for single summary: (Boudreaux 1990, Jones and Smith 1998, Doucet et al. 1999)

•Example of bibliographical entry:

Smith, J. R., M. C. Hammer, and J. R. Ewing. 1992. Evidence for virulence in *E. coli* 0157:H7. Journal of Bacteriology 2(7):234-240.

BIOL 416
MILESTONE CHART FOR RESEARCH EVENTS

The following is a guide for mentoring professors and students to ensure satisfactory progress and completion of the research project.

- **Final Report is due by noon on Wednesday May 2, 2007.**

Suggested Sequence to follow:

Research Events	**Weeks (Spring Semester) Date at Beginning of Week**															
Week #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15
Date	16 Jan	22 Jan	29 Jan	5 Feb	12 Feb	19 Feb	26 Feb	5 Mar	12 Mar	19 Mar	26 Mar	2 Apr	9 Apr	16 Apr	23 Apr	2 May
1. Literature Survey	X	X	X	X												
2. Set up	X	X	X	X												
3. 1st Progress Report					**X**											
4. Data/Sample Collection					X	X	X	X	X	X						
5. Analysis of Samples					X	X	X	X	X	X	X					
6. 2nd Progress Report										**X**						
7. Analysis of Results											X	X				
8. 3rd Progress Report														**X**		
9. Final Report*																**X**

TIME SHEET

Must be submitted with final report and notebook upon completion of project.

Semester _____

Course Instructor _____

Faculty Mentor _____

Name _____

Project Title _____

Date	Week	Hours	Student Signature	Mentor Signature
	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
	16			
	Total*			

*A minimum of 70 hours per semester is required for course credit.

SCHEDULE OF DUE DATES

Date	**Event**
Monday, February 12	Literature Survey
Monday, February 12	First Progress Report
Monday, March 19	Second Progress Report
Friday, March 30	Last Date to Drop with "W"
Monday, April 16	Third Progress Report
Friday, December 1	Final Report, Notebook, Time Sheet

Submit each item to Biology Department mailbox of Dr. Aaron Pierce on or before 12:00 noon on due date

Notice: Late submissions will result in grade reductions.

MENTORING AGREEMENT

Must be submitted to course instructor at the beginning of semester in which course credit is desired.

Project Title: _____

FOR THE MENTORING PROFESSOR:

I agree to mentor _____ for the course BIOL 416

during the _____ semester of _____.

Faculty Signature: _____

FOR THE STUDENT:

I agree to (1) undertake the research project described above, (2) abide by the directions of the above mentoring professor, (3) obey the laboratory regulations of the mentoring professor, the department, and the university, and (4) to fulfill the requirements outlined in the course syllabus.

Student Signature: _____

SPECIAL REQUIREMENTS FOR EXTRAMURAL (OFF CAMPUS) RESEARCH

Must be submitted to course instructor at the beginning of semester
in which course credit is desired.

Students choosing to conduct research off-campus for credit in BIOL 416 must petition for this privilege from the Instructor at or before the beginning of the semester in which credit is desired. Permission to conduct such extramural research will be granted by the Instructor upon both of the following:

(a) **Letter of Agreement.** The student must solicit a letter of agreement from a supervisory researcher, on the researcher's official letterhead, to be received by the Instructor within ten class days of the university's first day of class in the semester in which credit is desired, that contains no less than the following information: (a) the agreement of the researcher to supervise the student in a research project, (b) a brief description of the research project, (c) a brief description of the specific role of the student in the research project, (d) an agreement of the researcher to abide by the student's requirements in the course, including and especially both a true and accurate accounting of the student's work time (as denoted by the supervisor's signature on the student timesheet) and surrender of the student's data notebook for inspection by the Instructor at the end of the semester.

(b) **Approval of the Project.** Following receipt of the "Letter of Agreement" described above, approval that both the research project and the student's role in the research project is in accord with the goals and objectives of BIOL 416 as described in the syllabus is at the discretion of the Instructor. Only after this approval may the student begin work in the project for credit in BIOL 416.

Once permission is obtained, the student must agree to the following requirements *in addition to all requirements described in the BIOL 416 syllabus for the current semester.*

1. **On-Campus Mentor.** The student must choose an on-campus mentor from the faculty of Biological Sciences whose job will be to interpret the student's progress and affix a final grade to the final report in accordance with the syllabus.

2. **Photo journal.** The student must submit along with other required materials, a brief journal describing his/her contribution to the research project with photographic evidence of the student performing duties on the extramural site.

I hereby understand and agree to abide by these special requirements for students conducting extramural research in the course BIOL 416.

SIGNATURE OF STUDENT _____ DATE _____

Contract Work Plan

NICHOLLS
STATE UNIVERSITY

June 4, 2007

Dr. Kerry Davidson
Deputy Comm. For Sp. Research
Louisiana Board of Regents
1202 North Third St., Suite 6-200
Baton Rouge, LA 70802

RE: Post Katrina Support Fund Initiative – Primarily Education Sub Program

Dear Dr Davidson,

The PI would like to assure the BoR that there are no other funding agencies supporting or have promised to support this, or a very similar proposal.

The following is a timeline of activities associated with this proposal each year.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Recruitment	XX	XX										
Training/Mentoring	XX	XX	XX	XX	XX			XX	XX	XX	XX	XX
Evaluation/Reporting					XX	XX	XX	XX				

The Principal Investigator hereby agrees to furnish the following services:

a. Goals and Objectives:
This proposal seeks funds to establish a Laboratory Education Experience program for Undergraduates at Nicholls State University.

The objectives of the proposed program are (i) to provide freshmen and sophomore level undergraduate students with intensive year-long laboratory instruction, (ii) mentoring in multi-disciplines of biology including environmental biology, bioremediation, costal restoration, genetics, immunology, infectious diseases, marine biology, toxicology, ecology, microbiology, ornithology, cell and molecular biology and (iii) opportunities for structured enrichment activities that include improving presentation skills. The project's aim is to involve a diverse group of students from urban environments, minorities, underrepresented groups in science, and women who have been impacted by hurricane Katrina. Each year fifteen students will participate in laboratory instruction with faculty sponsors.

b. Deliverables:

The proposed project will be operated over fiver years (July 2007-June 2012). All activities associated with this project are listed in the timeline outlined above.

c. Performance Measures:

The undergraduate laboratory experience program in Biological Sciences at Nicholls State University will be evaluated on several levels annually as well as at the end of the five year funding period. The following means to measure performance will be used. (1) Annual Self-Assessment, (2) Program Survey, (3) Student Seminars, (4) End-of-Year Survey and (5) External Evaluation.

d. Monitoring Plan:

Progress Report. The annual progress report will be submitted to BoR through the project report system. The BoR guidelines specific to this proposal on the laboratory training provided and other educational activities will be followed. The data obtained from program evaluations will be included in the annual report. All the equipment items to be acquired through this project will be tagged, inventoried and available for state inspection as early as February of each year.

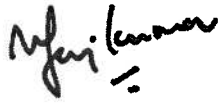
A revised budget is attached to this signed contract and the Institutional Match will be maintained in full. Due to the magnitude of this project, the PI's felt it necessary to enlist the help of four additional faculty members to enhance this project. Match has been increased overall to include these four additional faculty members.

e. Utility of Final Product:

This project will insure the increased success rate of undergraduates in Biological Sciences along with an increased skilled talent pool within the state of Louisiana making the state more attractive for high technology businesses.

This letter is being submitted by the Co-PI due to the PI Ramaraj Boopathy's absence on a Fulbright Scholarship. He will return to Nicholls State University on June 11, 2007.

Sincerely,



Rajkumar Nathaniel, PhD
Assistant Professor,
Department of Biological Sciences
222 Gouaux Hall
985-448-4684
Rajkumar.nathaniel@nicholls.edu

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

Annual Report

1. Personnel

Raj Boopathy Ph.D, Distinguished Service Professor:

Raj Boopathy served as a principle investigator for this grant. He recruited undergraduate students for research training. Raj also was in charge of all faculty mentors in guiding undergraduate students on the project. In addition to being a PI, Raj also mentored five undergraduate students in his research lab.

Rajkumar Nathaniel Ph.D, Assistant Professor:

Rajkumar Nathaniel served as a co-principle investigator. He was in charge of purchasing supplies and equipment for the grant for all faculty mentors. He also maintained travel budget for student travel to scientific conferences. He mentored four undergraduate students in his research work.

Gary LaFleur Ph.D, Associate Professor:

Gary Lafleur served as a faculty mentor for one undergraduate student for two semesters.

Earl Melancon, Ph.D., Distinguished Service Professor

Earl Melancon served as a faculty mentor for two undergraduate students for two semesters.

Marilyn Kilgen, Ph.D, Alcee Fortier Distinguished Service Professor:

Marilyn Kilgen served as a faculty mentor for two undergraduate students for two semesters.

Aaron Pierce, Ph.D, Assistant Professor:

Aaron Pierce served as a faculty mentor for one undergraduate student for two semesters.

Angie Corbin, MS, Instructor:

Angie Corbin served as a faculty mentor for two undergraduate students for two semesters.

2. Activities and Findings

Major Research and Educational Activities:

The goals of the project are to enhance one-on-one mentoring of freshmen and sophomore level undergraduate students and to increase interest in science through hands on laboratory experiences in biological sciences and thereby improving the retention of students in science.

During this funding period we recruited seventeen undergraduate students and seven faculty members volunteered their time to mentor these students in research and educational activities. The students were engaged in varieties of research projects. All students were trained in multitude of research techniques such as field biology, marine biology, plant pathogen, waste water analysis, antibiotic assay, bird survey, fish larval survey, bacterial media preparation, isolation and identification of bacteria, water quality analysis, maintaining fish hatcheries, evaluation of pathogens, bioethics, genetics, running protein gel and PCR Reaction.

Data Supporting Major Findings:

Some of the student projects are listed below:

1. Seed-Borne Recovery, Incidence, and Fungicidal Resistance fo Fusarium Sp. On *Eustoma grandiflorum*.
2. When does Human Life Begin? A Survey Study.
3. Bio-Ethanol Production from Post-Harvest Agricultural Residues.
4. In Search of c-jun Homologues in the Genome of the Red Swamp Crawfish, *Procambarus clarkii*. II
5. Informatic Analysis of Two Putative Genes Downstream of the Human c-fos Proto-Oncogene.
6. Ontoglyphology of the Blood Clotting Factors.
7. Observations on Appendicular Structure and Function of the Lovebug, *Plecia neactica*.
8. Antibiotic Resistant Bacteria in Store-bought Meat Products.
9. A Survey on the Presence of Antibiotic Bacteria in Bayou-Lafourche.
10. Sludge Volume Reduction in Shrimp Waste Water using Anaerobic Digestion Process.
11. Use of Sequencing Batch Reactor in Removing Nitrogen in Shrimp Production Wastewater.
12. Effect of Pro-biotics in Controlling a Shrimp Pathogen, *Vibrio harveyi*.
13. Effect of Organic Acids on Shrimp Pathogens.
14. A Survey of Raptors in Nicholls Farm.
15. Effect of Salinity on Oyster spats, Larave, and Survival of Oysters.
16. A Survey of Oyster Beds in Barataria Bay.
17. Methods of using Otoliths to Age Yellow Bass, *Morone mississippiensis* in the Upper Barataria Estuary.

Student Training and Workforce Development:

Students were trained in various research skills such as hands on laboratory training, microbial analysis, and evaluation of pathogens, water quality analysis, and molecular biology techniques including polymerase chain reaction, western blot, and protein gel analysis, genetics, field biology, oyster survey, biological treatment of wastewater, biotechnology, fish survey, and bird identification.

Some of the students presented their findings in regional and state level science conferences and won awards. The following students won awards:

1. Sara Shields won first prize for her oral presentation titled "Bio-Ethanol Production from Energy Cane Residues." at the 84th Annual Meeting of the Louisiana Academy of Sciences, Alexandria, LA. Feb. 27, 2010.

2. Sam Wise won second prize for his oral presentation titled "Sources of Anthropogenic Fecal Coliform Contamination in Bayou Lafourhce, Louisiana" at the 84rd Annual Meeting of the Louisiana Academy of Sciences held at Alexandria, LA in Feb. 27, 2010.

3. Cindy Sotto won first prize for her Poster presentation titled "SCC*Mec* TYPING OF CLINICAL METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* ISOLATED IN SOUTHERN LOUISIANA" at the South Central Branch American Society for Microbiology Conference held in Thibodaux, LA. November 7 – 8, 2009.

4. Lisa Breaux won second prize for her Poster presentation titled "CHARACTERIZATION OF *STAPHYLOCOCCI* AMONG NURSING STUDENTS IN LOUISIANA AND ARKANSAS" at the South Central Branch American Society for Microbiology Conference held in Thibodaux, LA. November 7 – 8, 2009.

5. Stephanie Coleman won first prize for her presentation titled "Antibiotic Resistant Bacteria in Store Bought Mat" at the Nicholls Research Week student competition. March 26th, 2010.

Community Development and Outreach Activities:

Every year Nicholls sponsors research week as a showcase of research activities to the local public. This year the event was during March 22rd to 26th and it was well attended. All the undergraduate students participated in this grant were asked to present posters of their research activities. We had seventeen posters presented by the participating students and this was our major outreach activity. This event was covered by local newspapers, Houma 10 (HTV) Television station, and university student newspaper.

Problems Encountered:

There was no significant problem encountered during the project period.

3. Contributions

The project contributed immensely to the university in the form of enhancement of STEM related activity in Biology department. The major impact of this proposal thus far is student retention in science. Most of the recruited students excelled in their course work and maintain "A" average in their grade and some of the students are planning to register in honors classes. This project also increased systematic institutionalization of the mentoring process throughout the campus in other departments. We have recruited seven faculty members to train undergraduate students in their research projects. The participating faculty members benefited through student labor in their laboratories through data collection and publication. This project widened student horizons, developed written and communication skills, built sense of collaboration and team work in many participating students. This project prepared students in better study habits, awareness about students' strength and weaknesses, development of new interests, and an increase in passion for life-long learning. This project is very popular at Nicholls State University and many students try to get into the program each semester and we have to deny some students due to lack of funding. We are maintaining "waiting list" for students to participate in this program for next year. More funding will solve this problem and it is hard to deny students that show interest in research in science.

We have first batch of students participated in this program graduating this semester. We are happy to report that two of the students got admitted to Medical school in New Orleans, four students got into phyisco-therapy program, two into Med-Tech program, and two of them are admitted to graduate school for Ph.D program.

4. Project Revision

No significant variance.

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

Annual Report

1. Personnel

Raj Boopathy Ph.D, Distinguished Service Professor:

Raj Boopathy served as a principle investigator for this grant. He recruited undergraduate students for research training. Raj also was in charge of all faculty mentors in guiding undergraduate students on the project. In addition to being a PI, Raj also mentored three undergraduate students in his research lab.

Rajkumar Nathaniel Ph.D, Assistant Professor:

Rajkumar Nathaniel served as a co-principle investigator. He was in charge of purchasing supplies and equipment for the grant for all faculty mentors. He also maintained travel budget for student travel to scientific conferences. He also mentored three undergraduate students in his research work.

Gary LaFleur Ph.D, Associate Professor:

Gary Lafleur served as a faculty mentor for one undergraduate student for two semesters.

Allyse Ferrara, Ph.D, Assistant Professor:

Allyse Ferrara served as a faculty mentor for one undergraduate student for two semesters.

Quenton Fontenot, Ph.D, Assistant Professor:

Quenton Fontenot served as a faculty mentor for one undergraduate student for two semesters.

Marilyn Kilgen, Ph.D, Alcee Fortier Distinguished Service Professor:

Marilyn Kilgen served as a faculty mentor to two undergraduate student for two semesters.

Aaron Pierce, Ph.D, Assistant Professor:

Aaron Pierce served as a faculty mentor for two undergraduate students for two semesters.

Angie Corbin, MS, Instructor:

Angie Corbin served as a faculty mentor for two undergraduate students for two semesters.

2. Activities and Findings

Major Research and Educational Activities:

The goals of the project are to enhance one-on-one mentoring of freshmen and sophomore level undergraduate students and to increase interest in science through hands on laboratory experiences in biological sciences and thereby improving the retention of students in science.

During this funding period we recruited sixteen undergraduate students and eight faculty members volunteered their time to mentor these students in research and educational activities. The students were engaged in varieties of research projects. All students were trained in multitude of research techniques such as field biology, marine biology, bird survey, fish larval survey, bacterial media preparation, isolation and identification of bacteria, water quality analysis, maintaining fish hatcheries, evaluation of pathogens, running protein gel and PCR Reaction.

Data Supporting Major Findings:

Some of the student projects are listed below:

1. Testing Specificity of a Novel PCR Method to Differentiate between *Staphylococcus aureus* and *Staphylococcus intermedius*.
2. Development of Specimen Transport and Isolation Techniques for *Vibrio* Pathogens in Biofilm Associated with Aquaculture.
3. Anti-Microbial Properties of Cajun Spices.
4. Characterization of TRPM4 in Glucagon-Secreting Cells of the Pancreas.
5. Identification and Susceptibility Patterns of the Zoonotic Pathogens, *Staphylococcus intermedius* and *Staphylococcus pseudointermedius*.
6. Colonization Rates of *Staphylococcus* species in the Community.
7. Comparison of Southeast Louisiana Frog Reproduction in Impounded versus Natural Wetlands.
8. Isolation of *Staphylococcu*s from Veterinary Personnel.
9. Genetics of Love Bug.
10. *Enterococcus* Count of Bayou Lafourche.
11. Is the Molting Hormone Involved in Regulation of Glucose Homeostasis in the Fiddler Crab, *Uca pugilator*?
12. Bio-Ethanol Production from Post-Harvest Agricultural Residues.
13. PCR Detection of Human Polyomavirus, Human *Bacteroides*, and *Methoanobrevibacter smithii* from Environmental Waters.
14. Anti-Microbial Properties of Gar Blood.
15. Isolation of Salmonella from Bayou Lafourche following Hurricane Gustav.

16. Carbonic Anhydrase Activity in the Epidermis of the Fiddler crab, *Uca pugilator*, during the Molting Cycle.

Student Training and Workforce Development:

Students were trained in various research skills such as hands on laboratory training, microbial analysis, and evaluation of pathogens, water quality analysis, and molecular biology techniques including polymerase chain reaction, western blot, and protein gel analysis, field biology, fish survey, and bird identification.

Some of the students presented their findings in regional and state level science conferences and won awards. The following students won awards:

1. Nick Walker won first prize for his oral presentation titled "Bio-Ethanol Production from Post-Harvest Agricultural Residues." at the 83rd Annual Meeting of the Louisiana Academy of Sciences, Hammond, LA. Feb. 27, 2009.

2. Melody Becnal won second prize for her oral presentation titled "Is the Molting Hormone Involved in Regulation of Glucose Homeostasis in the Fiddler Crab, *Uca pugilator*?" at the 83rd Annual Meeting of the Louisiana Academy of Sciences held at Hammond, LA in Feb. 27, 2009.

3. E.J. Raynor won third prize for his oral presentation titled " Breeding Water bird use and Hatching Success of three Colonial Seabirds on Louisiana's Barrier Islands" at the 83rd Annual Meeting of the Louisiana Academy of Sciences held at Hammond, LA in Feb. 27, 2009.

4. Kasie Leonard won the Second prize for her presentation titled "Susceptibility Patterns of Coagulase Positive *Staphylococcus* in Healthy Dogs" at the Nicholls Research Week student competition in March 2009.

Community Development and Outreach Activities:

Every year Nicholls sponsors research week as a showcase of research activities to the local public. This year the event was during March 23rd to 27th and it was well attended. All the undergraduate students participated in this grant were asked to present posters of their research activities. We had twenty posters presented by the participating students and this was our major outreach activity. This event was covered by local newspaper and university student newspaper.

Problems Encountered:

There was no significant problem encountered during the project period.

3. Contributions

The project contributed immensely to the university in the form of enhancement of STEM related activity in Biology department. The major impact of this proposal thus far is student retention in science. Most of the recruited students excelled in their course work and maintain "B" average in their grade and some of the students achieved "A" grade last semester. This project also increased systematic institutionalization of the mentoring process throughout the campus in other departments. We have recruited nine faculty members to train undergraduate students in their research projects. The participating faculty members benefited through student labor in their laboratories through data collection and publication. This project widened student horizons, developed written and communication skills, built sense of collaboration and team work in many participating students. This project prepared students in better study habits, awareness about students' strength and weaknesses, development of new interests, and an increase in passion for life-long learning. This project is very popular at Nicholls State University and many students try to get into the program each semester and we have to deny some students due to lack of funding.

4. Project Revision

No significant variance.

Annual Report

1. Personnel

Raj Boopathy Ph.D, Distinguished Service Professor:

Raj Boopathy served as a principle investigator for this grant. He recruited undergraduate students for research training. Raj also was in charge of all faculty mentors in guiding undergraduate students on the project. In addition to being a PI, Raj also mentored three undergraduate students in his research lab.

Rajkumar Nathaniel Ph.D, Assistant Professor:

Rajkumar Nathaniel served as a co-principle investigator. He was in charge of purchasing supplies and equipment for the grant for all faculty mentors. He also maintained travel budget for student travel to scientific conferences. He also mentored three undergraduate students in his research work.

Gary LaFleur Ph.D, Associate Professor:

Gary Lafleur served as a faculty mentor for one undergraduate student for two semesters.

Allyse Ferrara, Ph.D, Assistant Professor:

Allyse Ferrara served as a faculty mentor for one undergraduate student for two semesters.

Quenton Fontenot, Ph.D, Assistant Professor:

Quenton Fontenot served as a faculty mentor for one undergraduate student for two semesters.

Marilyn Kilgen, Ph.D, Alcee Fortier Distinguished Service Professor:

Marilyn Kilgen served as a faculty mentor to one undergraduate student for two semesters.

John Doucet, Ph.D, Associate Professor:

John Doucet served as a faculty mentor for two undergraduate students for two semesters.

Angie Corbin, MS, Instructor:

Angie Corbin served as a faculty mentor for two undergraduate students for two semesters.

2. Activities and Findings

Major Research and Educational Activities:

The goals of the project are to enhance one-on-one mentoring of freshmen and sophomore level undergraduate students and to increase interest in science through hands on laboratory experiences in biological sciences and thereby improving the retention of students in science.

During this funding period we recruited fifteen undergraduate students and eight faculty members volunteered their time to mentor these students in research and educational activities. The students were engaged in varieties of research projects. All students were trained in multitude of research techniques such as bacterial media preparation, isolation and identification of bacteria, water quality analysis, maintaining fish hatcheries, evaluation of pathogens, running protein gel and PCR Reaction.

Data Supporting Major Findings:

Some of the student projects are listed below:

1. Microbial Ecology of Upper Barataria Bay
2. Biological Treatment of Shrimp Aquaculture Wastewater
3. Identification of *Vibrio* pathogens in oyster and shrimp
4. Survey of Methicellin Resistant *Staph aureus* (MRSA) in pets
5. Survey of Methicellin Resistant *Staph aureus* (MRSA) in children
6. Survey of Pathogens in Circulating U.S. Dollar Bill
7. Ecology of Gar Fish in Barataria Bay
8. Laboratory Spawning of Gar Fish
9. Genetics of Craw Fish
10. Genetics of Love Bug
11. Ligno-cellulosic Ethanol Production from Sugarcane Crop Residues
12. Survey of Fecal Coliform in Bayou Lafourche

Student Training and Workforce Development:

Students were trained in various research skills such as hands on laboratory training, microbial analysis, and evaluation of pathogens, water quality analysis, and molecular biology techniques including polymerase chain reaction, western blot, and protein gel analysis.

Some of the students presented their findings in regional and state level science conferences and won awards. The following students won awards:

1. Nick Walker won first prize for his poster presentation titled "Presence of pathogenic and non-pathogenic bacteria in U.S. Dollar bill in circulation in Thibodaux, LA" at the Regional Conference of American Society for Microbiology held at Little Rock in October 2007.

2. Nick Walker also won second prize for his oral presentation titled "U.S Dollar bill serve as the common means of bacterial infection" at the Louisiana Academy of Sciences Meeting held at Natchitoches, LA in March 2008.

3. Nicole Eddlemon won third prize for her oral presentation titled " Survey of bacteria and water quality of a semi-closed aquatic ecosystem in the upper barataria estuary in south Louisiana" at the Louisiana Academy of Sciences Meeting held at Natchitoches, LA in March 2008.

4. Tessie Rachal won the first prize for her presentation titled "Prevalence of methicillin resistant *Staphylococcus aureus* in domesticated pets from southern Louisiana" at the Nicholls Research Week student competition in April 2008.

Community Development and Outreach Activities:

Every year Nicholls sponsors research week as a showcase of research activities to the local public. This year the event was during April 14th to 18th and it was well attended. All the undergraduate students participated in this grant were asked to present posters of their research activities. We had fifteen posters presented by the participating students and this was our major outreach activity. This event was covered by local newspaper and university student newspaper.

Problems Encountered:

There was no significant problem encountered during the project period.

3. Contributions

The project contributed immensely to the university in the form of enhancement of STEM related activity in Biology department. The major impact of this proposal thus far is student retention in science. All the recruited students excelled in their course work and maintain "B" average in their grade. This project also increased systematic institutionalization of the mentoring process throughout the campus in other departments. The participating faculty members benefited through student labor in their laboratories through data collection and publication. This project widened student horizons, developed written and communication skills, built sense of collaboration and team work in many participating students. This project prepared students in better study habits, awareness about students' strength and weaknesses, development of new interests, and an increase in passion for life-long learning.