

**COVER PAGE FOR TRADITIONAL AND UNDERGRADUATE ENHANCEMENT PROPOSALS
BOARD OF REGENTS SUPPORT FUND, FY 2009-10**

1. This Proposal Involves: <input checked="" type="checkbox"/> One Institution <input type="checkbox"/> More Than One Institution		2. Enhancement Subprogram: <input type="checkbox"/> TRADITIONAL ENH Program (Includes all multidisciplinary proposals) <input checked="" type="checkbox"/> UNDERGRADUATE ENH Program	
3. This Proposal Is: <input checked="" type="checkbox"/> Primarily an Equipment Request <input type="checkbox"/> Not Primarily an Equipment Request			
4. Name(s) of Submitting Institution(s) of Higher Education Louisiana State University And A&M College - Shreveport Additional Institutions			
5. Address of Institution of Higher Education Allied Health Program, One University Place Shreveport, LA 71115			
6. Title of Proposed Project UNDERGRADUATE ALLIED HEALTH PHYSIOLOGY LABORATORY COMPUTER, SIMULATION, AND INSTRUMENTATION ENHANCEMENT			
7. First-Year Support Fund Money Requested \$15083	8. Second-Year Support Fund Money Requested (if applicable) \$0	9. Proposed Duration 1 Year	
10. Category In Which Proposal Is Being Submitted <input type="checkbox"/> Arts <input type="checkbox"/> Earth/Environmental Sciences <input type="checkbox"/> Engineering A <input type="checkbox"/> Agricultural Sciences <input checked="" type="checkbox"/> Health & Medical Sciences <input type="checkbox"/> Special Multidisciplinary (See Section III.B.2.c of the RFP.) NOTE: If you check this category, you must also check at least one other eligible discipline.)		11. Taxonomy Numbers: 0601 Allied Health 0217 Physiology 0615 Premedical 0699 Health & Medical Sciences, other	
12. This Proposal Is a: <input checked="" type="checkbox"/> New Request <input type="checkbox"/> Request for Continuation of a Previously-Funded Support Fund Project Previous contract number:			
<small>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) <u>Grants for Research and Education in Science and Engineering</u>, NSF Grant Proposals Guide (GPG), NSF 03-2, effective 10/1/02, and (b) 45CFR 620, Subpart F (Requirements for a Drug-Free Workplace).</small>			
Name (type or print)	Dept./Telephone No.	Degree/Year	Signature
Lead PI			
Campus Head or Authorized Institutional Representative	Dean		Authorized Fiscal Agent
Name/Title/email: (type or print)	Name/Title/email: (type or print)		Name/Title/email: (type or print)
Signature:	Signature:		Signature:
Date:	Telephone Number:	Date:	Telephone Number:
Date:	Telephone Number:	Date:	Telephone Number:

BOARD OF REGENTS SUPPORT FUND ENHANCEMENT PROGRAM PROPOSALS
FY 2009-10
PERSONNEL PAGE

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PROJECT SUMMARY

Name of Institution

Louisiana State University in Shreveport

Address

Allied Health Program, Department of Biological Sciences, One University Place,
Shreveport, LA 71115

Principal Investigator(s): **Dr. Terry S. LeGrand**

Title of Project: **Undergraduate Allied Health Physiology Laboratory Computer, Simulation, and Instrumentation Enhancement**

Louisiana State University Shreveport (LSUS) proposes this project to enhance the Allied Health Physiology Lab. Human Physiology is one of the first courses Allied Health students are required to complete. The overall goal is to enhance the allied health program at LSUS by creating a more learner-friendly atmosphere for students and facilitate a more cost-effective responsible laboratory for Human Physiology education and training. Specific objectives are: 1) to enrich the experience of students in allied health and health/medical-related fields at LSUS through the acquisition of computers, interactive laboratory simulation software, and related instrumentation to upgrade physiology lab student workstations regularly used to train 70 allied health students per academic semester; and 2) to enhance the quality and effectiveness of allied health faculty teaching and student receptiveness in physiology through the incorporation of additional physiology sensors and computer interfaces for human data acquisition for human physiology instruction and training.

The project will provide upgraded student computer stations, simulation software, and data acquisition sensors for active learning by inquiry. The new resources will provide a cost-efficient mechanism by which allied health students can explore and reinforce their knowledge/skills in physiology. Many physiology lab activities are currently performed using our existing LoggerPro computer interfaces and associated data acquisition sensors. Additional interfaces and new data acquisition sensors will allow two students to work at each computer station, rather than three or four as sometimes occurs. Student learning will be improved, thus enhancing the quality of educational preparation for careers in allied health.

NARRATIVE:

Undergraduate Allied Health Physiology Laboratory Computer, Simulation, and Instrumentation Enhancement

1. THE CURRENT SITUATION

a. Institutional Description

Louisiana State University in Shreveport (LSUS) is the only senior public university located in Shreveport, Louisiana's third largest metropolitan area and the regional medical/health care center of the surrounding Ark-La-Tex region. Established in 1967 and awarding B.S. degrees since 1975, the campus currently serves 4,700 regular students and 2,000 non-credit students per year. Since 1990, minority enrollment has grown rapidly and minority students now comprise about 34% of our regular students. Over 40% of our students are low income. We serve a primarily urban population of students who are generally the first in their families to attend college. Approximately 80% of our students remain in the metro area after graduation for employment and career development. When LSUS was founded in 1967, it was only a 2-year institution. The State did not plan for LSUS to attain 4-year status until the turn of the century. However, given our location as the first public institution of higher education in the State's third largest metro area, demand was such that 4-year status was granted in 1974. The first Masters-level program began in 1978. LSUS also offers several joint graduate programs with LSUS Health Sciences Center in Shreveport.

The Pre-Allied Health Program at LSUS currently enrolls nearly 300 students. The program components include Pre-Cardiopulmonary Science, Pre-Physical Therapy, Pre-Occupational Therapy, Pre-Radiologic Technology, Pre-Nursing, Pre-Pharmacy, Pre-Optometry, Pre-Dental Hygiene, Pre-Physicians Assistant, and Pre-Clinical Laboratory Science. Due to demand in our service area, a BS degree program in Community Health and a masters degree program in Public Health have recently been established. ***Human Physiology is one of the first courses students in Allied Health are required to successfully complete toward their education.*** More than 200 pre-medical, pre-dental, and pre-veterinary students also participate in this course in preparation for their post-graduate aspirations. At least eight full-time faculty members prepare allied health and pre-professional students. Each year, more than half of the students admitted to the LSU Health Sciences Center in Shreveport (LSUHSCS) School of Allied Health (which accepts students from across the nation) are from the LSUS undergraduate pipeline. More than 20 LSUS students are admitted to M.D. programs each year. The acceptance rate for LSUS students into post-graduate programs has ranged between 85-90%, and the institution has been recognized by the Howard Hughes Medical Institute for this success. LSUS curricula emphasize the importance of science as a process with relevant active learning laboratory exercises. With funding from BORSF in 2007, the Human Anatomy labs for allied health majors added new muscle, skeleton, and other anatomy models, as well as virtual cadaver dissection software. This equipment has revitalized the anatomy lab for the allied health students in a way that fulfills the unique preparatory needs of their professions. Physiology Lab computer, simulation and instrumentation enhancement will revitalize Physiology lab instruction and student learning in a similar fashion.

b. Rationale for the Project

National Need: Demand for qualified personnel in allied health, wellness and related fields is growing at a much faster rate than general job growth. The U. S. Dept. of Labor has projected a 24.8% increase, (compared to a 14.6% increase for all jobs) over a 10 year period.

Local/Regional Need: Louisiana Department of Labor occupational employment projection data indicate a regional need that tracks the national need for personnel. Regional/local considerations also include socioeconomic considerations: (1) our region has a relatively higher proportion of low-income families (25% below poverty level) than the nation; and (2) the depressed regional economy negatively impacts the financial ability of potential trainees, training institutions and public agencies. This project will help increase the supply of trained personnel in Louisiana and in the Ark-La-Tex area. According to the Louisiana Dept. of Labor, our primary service region in Northwest Louisiana will experience 30.9% growth in demand for these occupations over the next decade.

LSUS Program Needs: The pre-allied health program at LSUS seeks to provide its students with state-of-the-art educational computers and physiology software for active learning by inquiry, and to update, supplement and replace current resources that have lost their use with age. For example, after years of student usage, our existing computers are less and less able to accommodate newer programs that require significant processor speed and memory to run the graphics component of the software. Frequently, the old computers break down and are unable to be used until LSUS Computing Services technicians can repair them. When some of the computers are not working, three or four students must share a computer, and this crowding at a computer station reduces the learning opportunity for all students. Using computerized laboratory simulations is a new approach that seeks to follow a trend in educational settings across the nation by alleviating dependency on laboratory animals to elucidate cellular pathways and enzyme activity. The accuracy of the computerized versions of a variety of laboratory protocols enables students to participate realistically in virtual experiments that could otherwise not be conducted in a typical undergraduate physiology laboratory. By utilizing computers and computer simulations to perform a number of time-consuming and complex experiments, the cost of housing and maintaining lab animals and repeatedly purchasing reagents and other consumable supplies will be mitigated. Furthermore, purchasing additional data acquisition hardware for use with the computers in the lab will enable more students to effectively participate in non-virtual data collection as well. The equipment and software requested in this proposal will provide a cost-efficient mechanism by which allied health students can explore and reinforce their understanding and background in physiology. Should this proposal be fully funded, the current and future needs of allied health students in physiology are ensured.

Student Benefits and Interests: By using laboratory simulations in addition to hands-on data acquisition, allied health students would be learning the physiological principles directly relevant to their career fields. It is commonplace for allied health students to question the use of laboratory animals for experimentation. Their typical remark is, "I am going to work on people, not animals!" This initially negative attitude is eventually alleviated when they realize that the cellular mechanisms and organ systems of animals is comparable to that of a human. However, without an approved animal care facility and a significant investment of capital to properly equip

a lab with instrumentation and supplies to perform sophisticated experiments using laboratory animals, learning from appropriate animal models is impossible. By employing simulated laboratory experiments for about half of the experiments and live data acquisition for the remainder of the experiments performed in the physiology lab, allied health student performance will be enhanced because they will recognize human physiology as directly relevant to their studies, thus enhancing the quality of educational preparation for careers in allied health.

The number of students, from across the life science plans of study at LSUS, is evidence of the volume of interests and needs for allied health students at LSUS.

Health/Medical Related Majors (2009)

Allied Health/Pre-Medical/Biology/Biochemistry	697
Community Health/Wellness/Kinesiology	134
Undergraduate, Other	<u>83</u>
Undergraduate Subtotal	914
Graduate: LSUS & LSUHSC coop. programs	<u>37</u>
Total	951

Proposal: *This project will provide data collection interfaces and probes, computers and interactive physiology computer programs to enrich the educational experience of allied health students and students majoring in related fields that include physiology instruction.*

c. Impact on Existing Resources

Should this proposal be funded, the impact will be felt throughout the allied health program and extend to other programs requiring human physiology courses (community health, biology education, health and physical education) at LSUS. The allied health students will be more receptive to laboratory instruction that includes both state-of-the-art laboratory computer simulations and live data collection. Improved receptivity will lead to improved student effort, and ultimately student success. Faculty will have less preparatory time for these labs, providing more flexibility for meeting with students and enhancing instructional and assessment techniques. This Physiology lab equipment enhancement project will complement the recent Anatomy lab upgrade.

The physiology teaching laboratory contains existing equipment that includes 11 Dell computers (8 are old and unreliable and in need of replacement as requested in this proposal) and LoggerPro software and data acquisition sensors. The addition of the proposed computers, the latest lab simulation software, and additional data acquisition equipment would supplement, complement, and upgrade the existing resources to ensure a positive learning atmosphere for allied health students.

2. THE ENHANCEMENT PLAN

a. Goals and objectives:

The overall goal of this project is to enhance the allied health program at LSUS by creating a more learner-friendly atmosphere for students and facilitate a more cost-effective responsible laboratory for Human Physiology education and training.

More specific objectives are as follows:

- 1) to enrich the experience of students in allied health and health/medical-related fields at LSUS through the acquisition of computers, interactive laboratory simulation software, and related instrumentation to upgrade physiology lab student workstations regularly used to train approximately 70 allied health students per academic semester.
- 2) to enhance the quality and effectiveness of allied health faculty teaching and student receptiveness in physiology through the incorporation of additional physiology sensors and computer interfaces for human data acquisition for human physiology instruction and training.

b. Work Plan of Proposed Project

Project Design:

This Human Physiology enhancement project builds upon the success of our 2007 BORSF-supported Human Anatomy Lab upgrade which added new muscle, skeleton, and other anatomy models, as well as virtual cadaver dissection software. This equipment has revitalized the anatomy lab for the allied health students in a way that fulfills the unique preparatory needs of their professions. The current computer, simulation, and instrumentation enhancement project will revitalize Physiology lab instruction and student learning in a similar fashion.

The large numbers of allied health students enrolled at LSUS are currently a significant stressor on our current laboratory equipment. Many of the computers currently in use are old and unreliable, and the simulation software provided personally by the instructor is out-of-date and difficult to use. Furthermore, reliable computers are needed to allow no more than two students to work together at a single station. When three or more students work at one computer station, as occurs when one or more of the old computers does not work, two students usually do the experiment, and the additional students end up just observing. The addition of reliable computers, data acquisition hardware, and interactive physiology laboratory software to the allied health program's physiology lab will enrich our courses significantly. Instructional systems such as this allow *all* students to actively investigate the physiologic pathways of the human body through interactive learning. The project is designed to upgrade the lab and emphasize an experimental approach to teaching physiology. Many of the exercises provided via the new simulation program will help students develop their clinical knowledge of physiology,

plus help them gain an appreciation for the clinical techniques as would be needed by students studying allied health and related health/medical oriented fields.

The addition of the new resources to the allied health program will provide valuable assets for non-allied health courses such as intro to biology, to our new undergraduate degree program in Community Health, to our new Public Health program graduate program, and to public outreach. The new resources will also provide low-cost, useful tools for presentation in teacher institutes and public health education programs.

Personnel: The PI will supervise all equipment and software acquisition, schedule training sessions and demonstrations, and maintain records for determining the project's effectiveness. LSUS sciences faculty receive significant grant funding (for a primarily undergraduate institution) and are experienced in maintaining budgets and schedules. The Department chair will assist with coordinating usage by other faculty. The PI has direct experience utilizing educational software and designing curricula; she will train other faculty as well as students to use the new resources properly and responsibly.

Benefits/Effectiveness of Simulations for Allied Health/Medical Education:

Animal welfare considerations and IACUC (Institutional Animal Care & Use Committee) regulations are continuing to make the use of live animals in educational settings more difficult. This has led to the increasing availability and use of simulations to demonstrate biological principles. Research on the beneficial use of simulations for allied health and medical education is provided by several recent studies. (King, 2003; Blake & Scanlon, 2007; Rosen et al, 2009; Thomas & Milligan, 2004; Windschitl & Andre, 1998.) The non-dollar trade-off between use of laboratory animals and computerized laboratory simulations is as follows: Use of animals in laboratory experimentation introduces necessary variation as would be seen in the human population, but requires the cost of acquisition and care of the animals to be used in the lab. While laboratory simulations are programmed to include significant variability, the variability is not infinite. However, actual laboratory data have been programmed into the software, thus beginning students are able to experience "real" results without the disadvantage of making costly mistakes that have the potential to negatively alter the experimental outcome. Understanding this trade-off is essential to realizing the impact this decision would have on the quality of student preparation at LSUS. This trade-off demonstrates that quality would not decrease by using some laboratory simulations instead of lab animals. The use of simulations would instead prepare students in a different way. Compared to experimentation using laboratory animals, students employing simulations would still gain a fundamental understanding of human physiology, and the cost-effectiveness is a significant factor. This change in curriculum may actually better prepare students for advanced laboratory experimentation in later, more advanced courses by allowing the student to learn more material and develop a stronger interest. Students' interest normally drives the need to know more and the desire to ask questions, leading to even more active learning. This change in laboratory approach can improve the quality of student learning and the overall educational experience for allied health students.

Students Benefiting from Project Implementation:

Over 70 allied health students per semester will benefit from this project to upgrade the Physiology Lab by adding the proposed new equipment and software. This number includes

students in the following allied health programs which require courses in human physiology: Pre-Occupational Therapy, Pre-Physical Therapy, Pre-Cardiopulmonary Science, Pre-Physicians Assistant, Pre-Dental Hygiene, Pre-Nursing, and Pre-Pharmacy. Additional students are required to take human physiology as part of the curricula in Community Health, Biology Education, and Health/Physical Education.

Evaluation: See Section 2.g.

Dissemination:

Project dissemination will be both internal and external. Within LSUS, project results will be disseminated to other faculty, staff and students via LSUS Office of Information Services emails, monthly science faculty meetings, etc. External dissemination mechanisms include presentations, publications, conferences, professional networking, news releases, LSUS websites. Dissemination of information to colleagues is facilitated via faculty participation several national professional associations. Ongoing collaboration with LSUHSCS, area community colleges and K-12 schools will broaden dissemination and outreach to help attract more area youth to allied health careers. Faculty/scholarly networks will be utilized to support dissemination of project results and share experiences of successful educational approaches. LSUS maintains several pertinent educational outreach programs that assist with local dissemination to area school students and teachers. Associate Dean of Sciences Dalton Gossett is PI on a \$406,000 Post-Katrina Support Fund Initiative grant for the Shreveport/Bossier SciNet project, a collaboration with area high schools that uses information technology resources to develop interdisciplinary enhancements in life science curricula at the Freshman/Sophomore and high school levels. LSUS maintains an active dual-enrollment program with area high schools and several K-12 outreach efforts, such as LaPrep, a nationally recognized math/science enrichment program held each summer on the LSUS campus to encourage precollege minority students to consider careers and pursue degrees in the sciences. Dissemination via such outreach efforts will assist in attracting youth from diverse backgrounds to allied health education paths and careers.

Project Schedule: The program will initiate purchases of the proposed equipment and software as soon as possible. July 2010 through June 2011 would be the project duration. The initial phase will involve equipment/software acquisition and set up. Equipment will be purchased via state contract when possible, and software will be purchased via university pricing. The final phase will involve full utilization of the teaching resources in the physiology courses at LSUS.

PROJECT COMPONENT/ACTIVITY	J	A	S	O	N	D	J	F	M	A	M	J
Finalize grant contract; Purchase & set up new equipment and software in the Physiology Lab	X	X										
Conduct enhanced Physiology courses in the Physiology Lab for Fall Semester		X	X	X	X	X						
Conduct enhanced courses in the Physiology Lab for Spring Semester							X	X	X	X	X	
Analyze effects of the new resources on student learning in the Physiology Lab											X	X
Prepare/submit project reports to BORSF												X

c. Evidence of Potential to Achieve Recognized Eminence

Student Success: Each year, more than half of the students admitted to the LSU Health Sciences Center in Shreveport (LSUHSCS) School of Allied Health (which accepts students from across the nation) are from the LSUS undergraduate pipeline. More than 20 LSUS students are admitted to M.D. programs each year. The acceptance rate for LSUS students into post-graduate programs has ranged between 85-90%, and the institution has been recognized by the Howard Hughes Medical Institute for this success.

The project will help increase LSUS's level of regional eminence commensurate with our status as a primarily undergraduate institution. Faculty involved in interdisciplinary efforts are among our most active in scholarly activity and publication. This project will support increased eminence in Education, Research, and Community Service:

Education: LSUS is the youngest public baccalaureate degree-granting institution in Louisiana. Yet in the Gourman Report, which ranks institutions based on academic quality, LSUS ranks third in the State behind only LSU-Baton Rouge and Tulane, both well-funded doctoral-level institutions. The LSUS College of Sciences has taken the lead in applying innovations in science education reform to its degree programs. Guided inquiry laboratory work is now a major part of science courses. Science faculty have developed a three-course sequence of integrated science lecture and laboratory courses based solely on inquiry pedagogy; these courses serve as the science foundation sequence for elementary education majors. Teacher preparation has been the focus of several grants to science faculty who have conducted annual summer workshops to train almost 600 teachers in the guided inquiry approach to science teaching. Such programs held on the LSUS campus are part of a statewide effort designed to bring about systemic change in the way science is taught in Louisiana schools. We have hosted two NSF Young Scholars programs in which high school science students participated in faculty-led research.

Research: LSUS is a partner in the Louisiana Biomedical Research Infrastructure Network (LBRIN) which is led by LSU A&M and funded by NIH. LBRIN has existed for several years and has recently been renewed by NIH, providing LSUS \$300,000/year for another five years to continue its cooperative biomedical research/education efforts. LSUS's undergraduate research program is well into a transition from the original strictly teaching mission to a balance of instruction and research. In recognition, the NSF awarded the College of Sciences an Academic Research Infrastructure (ARI) grant of \$1.47 million (largest NSF-ARI award ever awarded in Louisiana). Faculty are active in research and seriously involve students in their projects. During the past five years 300 students have participated in faculty-led research projects, and LSUS has been officially recognized by the Board of Regents for excellence in involving undergraduates in research. In addition to NIH-LBRIN funding, recent research grants received by the faculty teaching Allied Health courses include: \$101,000 NSF-RUI, \$165,000 Governors Biotechnology Initiative Grant, and \$400,000 in state research grants.

Community Service: The faculty is very active in outreach programs designed to foster science-related activities. LaPrep, a summer enrichment program for minority and women school students has won national acclaim as a "model program" from the U.S. Department of Education and the U.S. Department of Energy. [For his work with LaPrep, LSUS's Dr. Carlos Spaht was

awarded a 2000 NSF Presidential Award for Excellence in Mentoring (the only such award in Louisiana).] Science faculty assisted in the establishment of SciPort, a "hands-on" science museum and serve on the board. Science faculty leadership in outreach activities includes participation in groups such as the American Medical Association, Louisiana Academy of Sciences, Science Olympiad, Society of Wildlife Diseases, the Alpha Epsilon Delta (AED) Pre-medical honor society, Biology club, Minority Association of Pre-professional students (MAPS), and the American Veterinary Medical Association.

d. Impact on Curriculum and Instruction

The faculty at LSUS recognize that in the future, computer linked audio-visual instruction will be critical to the development of an improved learning environment. Since our teaching laboratories are open for student access throughout the working day, the proposed physiology software will be available for student study and review without the necessity of a staff member being present. The pre-allied health classes are held in two lecture halls and eight teaching laboratories, the latter being connected by a large central stockroom/research area. The laboratory block is interconnected with a peripheral corridor, enabling students to move freely and easily among all laboratories. The benefit of this is that when, for example, an anatomy class is being taught in the anatomy laboratory and an adjacent laboratory is unoccupied, the computers in those rooms will be available for allied health students to study physiology software. The use of laboratory simulations will enable students to repeat certain experiments without incurring additional cost for supplies and animals. Over 70 allied health students per semester will benefit from this project to upgrade the Physiology Lab by adding the proposed new equipment and software. This number includes students in the following allied health programs which require courses in human physiology: Pre-Occupational Therapy, Pre-Physical Therapy, Pre-Cardiopulmonary Science, Pre-Physicians Assistant, Pre-Dental Hygiene, Pre-Nursing, and Pre-Pharmacy. Additional students are required to take human physiology as part of the curricula in Community Health, Biology Education, and Health/Physical Education.

Primary courses impacted will be: Human Physiology – 280 and Human Physiology Laboratory – 280L. These complementary courses (4 credits total) focus on the elements of human physiology, a study of the controls and functions of the various organ systems. The lab course includes experiments designed to give a basic understanding of the human organ systems by using physiographs, treadmill exercise, and demonstrations of physiological responses. Additional courses impacted include the following, also taught in the Physiology Lab: Microbiology Lab (320L) and General Physiology Lab (387L).

The requested simulation software (PhysioEx 8.0 for Human Physiology) is a physiology laboratory simulation program with 11 modules containing 79 physiology lab simulations that may be used to substitute for wet labs. This allows students to repeat labs as often as they like, perform experiments without harming live animals, and conduct experiments that may be difficult to perform in a wet lab environment due to time, cost, or safety concerns. The program also includes seven videos that show students how to relate their simulation to a real wet lab experience. The software is accompanied by step-by-step worksheets specifically written for second semester human physiology students. Key topics include: Cell Transport Mechanisms & Permeability, Skeletal Muscle Physiology, Neurophysiology of Nerve Impulses, Endocrine System Physiology, Cardiovascular Dynamics, Frog Cardiovascular Physiology, Respiratory

System Mechanics, Chemical and Physical Processes of Digestion, Renal System Physiology, Acid/Base Balance, Blood Analysis, Histology Atlas.

e. Impact on Quality of Students

By using state-of-the-art computers, instruments, and software, allied health students would be learning the physiological pathways directly relevant to their career fields. By offering modern computers, lab simulations, and data acquisition equipment designed specifically for enhanced student learning, this project will increase our ability to attract the best and brightest from area high schools and is expected to boost recruitment, especially of women and minorities, for allied health careers. Allied health students will continue to gain valuable training in physiology. We believe that the enthusiasm generated by encouraging allied health students to participate actively in their own learning experiences by designing physiology laboratory activities that involve state-of-the-art, award-winning programs and modern data collection instruments will translate into an increase in the quality and number of allied health students.

f. Impact on Faculty Development

The project will directly improve the quality and effectiveness of instruction in human physiology. The proposed enhancement of resources and instructional methods in the physiology laboratory will improve student learning and enthusiasm similar to what we have observed in the allied health human anatomy course which was enhanced via a BORSF grant in 2006/07. Such student enthusiasm is contagious and rubs off on the faculty, making the instructor's experience in the classroom much more enjoyable. There is no doubt that the equipment and software provided by this project will also affect changes in other curricula in accordance with its successful transition. Modern computers, software, and instruments will enhance the faculty members' ability to teach both lower and upper level allied health laboratories and have an immediate morale-boosting effect. In its evaluation of the faculty teaching of allied health students at LSUS, the Board of Regents Regional Program Review team stated: "The caliber of the faculty at LSU-Shreveport is very high. All are meeting the triad of teaching, research, and service in various ways. Considering their heavy teaching load, the Committee commends the faculty for active role in research, especially where it has involved undergraduates. A successful project will encourage others in the department and college to design additional projects to seek external funding. The new resources will also provide low-cost, useful tools for faculty to use in presentations for teacher institutes and public health education programs.

g. Performance measures

Evaluation: Quantitative and qualitative measures will be used to document project effectiveness, with specific benchmarks to be achieved by the end of the grant (one year). Short-term benchmarks include: By the end of the grant project and the end of the academic year, (1) At least 150 students will have received hands-on experiences utilizing the new equipment, with at least 75% indicating a positive experience in the end-of-course student satisfaction survey; (2) Faculty teaching allied health courses will be regularly utilizing the new resources in class. For assessing longer-term effectiveness, several types of information will be collected. Records of students matriculated, professional placement, and allied health student learning will be maintained. **Performance Reports:** The PI will submit project reports in accordance with the BORSF timetable and format: Final Project report; Final Expenditures Report. All publications, presentations, etc. that result from this work will cite BORSF support and the contract number.

3. EQUIPMENT:

a. Equipment Request:

The allied health program at LSUS requests funds for state-of-the-art computers, data acquisition instrumentation, and physiology laboratory software for active learning by inquiry, and to update, supplement and replace current resources that have lost their use with age. The new approach seeks to follow a trend across the nation, by alleviating dependency on laboratory animals through life-like laboratory computer simulations. The addition of simulations to supplement actual data collection on human subjects (the students themselves) will not sacrifice learning about human physiology, but will allow the students to continue their success in obtaining entry to programs. The equipment and software requested in this proposal will provide a cost-efficient mechanism by which allied health students can explore and reinforce their understanding and background in anatomy. [See budget narrative for itemized justifications, etc.]

Eight Dell desktop computers with monitors	\$7,992
CD-ROM multi-user license of PhysioEx 8.0 for Human Physiology	500
Three LabPro Interfaces	660
Thirteen Vernier 25-g Accelerometers	1,196
Three Vernier Hand-Grip Heart Rate Monitors	357
Three Vernier Hand Dynamometers	297
Three Vernier Surface Temperature Sensors	69
Three Vernier Blood Pressure Sensors	315
Three Vernier EKG Sensors	441
Five packages of EKG electrodes	60
Three Vernier Spirometers	597
Three boxes of disposable bacterial filters	90
Thirteen Vernier Oxygen (O ₂) Gas Sensors	2,444
Thirteen CO ₂ to O ₂ Tees	65
TOTAL AMOUNT REQUESTED	\$15,083

(See justification in budget narrative for explanations.)

b. Equipment on Hand: The physiology teaching laboratory contains existing equipment that includes 11 Dell computers (8 of them are old and unreliable and in need of replacement as requested in this proposal) and LoggerPro software and data acquisition sensors. The addition of upgraded student computers (to be used with existing usable student units), up-to-date lab simulations, and additional data acquisition equipment would supplement, complement, and upgrade the existing resources to ensure a positive learning atmosphere for allied health students.

c. Equipment Housing and Maintenance: Equipment will be housed in Room SC230 where physiology is taught. Software will be installed on existing and new computers (if this proposal is funded) in SC230 and the computer lab for allied health student use. These same computers will be used to run the requested interactive physiology lab simulations as well as live data acquisition. Adequate maintenance, repair and technical advice is available to us from the LSUS technical personnel who have considerable experience. Safety and security procedures are already in place to protect the equipment, faculty, staff, and allied health students.

4. FACULTY AND STAFF EXPERTISE

Project Investigator (PI):

Dr. Terry LeGrand (PhD in Cellular Physiology, LSU Health Sciences Center in Shreveport, School of Graduate Studies, and BS in Cardiopulmonary Science, LSU Health Sciences Center in Shreveport, School of Allied Health Professions) teaches Human Anatomy, Human Physiology, and General Physiology at LSUS. As the former Director of the Allied Health Department at the University of Texas Health Science Center at San Antonio, Dr. LeGrand has extensive experience in Allied Health education and program development. Her professional expertise in these disciplines will enable efficient and effective curricular implementation of the enhancements. Dr. LeGrand is actively engaged in undergraduate curricular reform and enhancing student achievement in Allied Health pre-professional programs at LSUS. As PI and project director, she will be responsible for equipment acquisition, installation, training, and reporting project results to BORSF.

Other Key Faculty:

Dr. Tara Williams-Hart (PhD, LSU Health Sciences Center in Shreveport and BS from Spellman College) specializes in biochemistry and molecular biology and has a broad background in Medical Education. She serves as faculty advisor to the Minority Association of Pre-Medical Students and teaches several allied health related courses such as introductory genetics. Her guidance, derived from her education at the medical school will provide a valuable resource in designing this curriculum. She currently participates in collaborative research with colleagues at LSUHSCS. As a minority female scientist, she provides a significant role model for students at our institution.

Dr. Dalton Gossett (PhD, Texas A&M) Department Chair and Associate Dean of Sciences will be responsible for institutional resource allocation.

Dr. Larry Anderson (PhD, University of Illinois at Chicago), Dean, will be responsible for overall academic oversight.

Other Personnel:

Cassandra Johnson (BS, Wiley College) Assistant Director of Accounting Services, will work directly with the PI to set up the grants account, monitor the line item budget, and prepare financial reports to BORSF. LSUS Computing Services technicians will assist with installation and set up of the new equipment and software in the lab. Staff from other LSUS divisions will assist as necessary, including staff from the Office of Institutional Effectiveness and the Office of Sponsored Research.

5. ECONOMIC AND/OR CULTURAL DEVELOPMENT IMPACT

a. Relationships with Industrial/Institutional Sponsors

LSUS, a primarily undergraduate university, maintains a close partnership and several joint degree programs with LSU Health Sciences Center in Shreveport (LSUHSCS), a professional/graduate institution which includes management of the regional public hospital and a variety of public clinics. [LSUHSC operates the Charity Hospital System and provides public clinical and outreach services to low-income patients/clients in Louisiana.] Together, LSUS and LSUHSCS form one of only two public comprehensive health/medical professional education centers in Louisiana. The two partners' faculties have a history of cooperation including such activities as serving as adjunct faculty for each other, organizing and co-sponsoring conferences, conducting and presenting research together, partnering on grant applications, sharing equipment, and developing research/training institutes together.

Coordination with other agencies such as area Willis-Knighton Health System, Schumpert Medical Center, VA Hospital, other area hospitals/clinics, La. Department of Health & Hospitals, La. Rehabilitation Services, Biomedical Research Institute, non-profit and private service providers, assisted living centers, and other agencies is ongoing. LSUS also works with local public schools to develop, expand and improve opportunities for students seeking careers in health, medical and related fields. For example, our faculty work cooperatively with Booker T. Washington High School's Health Careers Magnet Program. LSUS also maintains cooperative efforts with community colleges through articulation agreements with Southern University in Shreveport, Bossier Parish Community College, Texarkana Junior College (Texarkana, AR), and Panola Junior College (Panola, TX). Many corporate sponsors support scholarships, internships, faculty research, and program improvements that benefit the Allied Health Program. An example of such a relationship is a \$16,900 grant from the Biomedical Research Foundation of Northwest Louisiana to acquire additional analytical equipment for use in our programs. Willis-Knighton Health System and the Dawson Foundation have donated over \$400,000 for scholarships to encourage minority and low-income students to attend LSUS. This project will help LSUS maintain and enhance such relationships.

b. Promotion of Economic Development and/or Cultural Resources

With the educational experiences made possible by the proposed equipment and software acquisitions, LSUS graduates will become an even more important regional resource. Shreveport is the state's second largest medical center, consequently there is a strong demand for increased proficiency of our graduates to help diversify and strengthen the economy of the Ark-La-Tex. The Shreveport-Bossier City metropolitan area is characterized by a growing population with developing industry and trade services. Expansion of the Biomedical Research Foundation, BASF Pharmaceuticals, and other major corporations in Shreveport is increasing the population and thus the demand for allied health graduates. Allied Health, along with other programs with the College of Sciences, a significant impact on economic development in the area.

LSUS is a partner in the Louisiana Biomedical Research Infrastructure Network (LBRIN) which is led by LSU A&M and funded by National Institute of Health/National Center for Research

Resources (NIH/NCRR). LBRIN has existed for several years and has recently been renewed by NIH, providing LSUS \$300,000/year for another five years to continue its cooperative biomedical research/education efforts that have clear economic development potential. This anatomy equipment enhancement project will improve instruction and student learning in the lower level courses that form part of the pipeline necessary for human resource development and economic growth in Louisiana's important biomedical sector.

The Biomedical Research Foundation is working with the state Department of Economic Development to promote further development in Shreveport. LSUS has established ties to several Shreveport area firms involved in allied health, including pharmaceutical companies and firms purveying allied health services. Among these are: Kinzie & Payne Biomedical, Morris Dickson Pharmaceuticals, Natural Solution, Olin, Orthoevolution, Ortho-Med, Red River Pharma, Sage Pharmaceuticals, and SteriFx. Several of these companies are located in Shreveport's Inter-Tech Science Park near the \$10 million wet lab funded by the state.

The LSU System's Shreveport research facilities and the Biomedical Research Institute form the core of a growing biomedical cluster in Shreveport. Inter-Tech Science Park, designed as a partnership of business, government, education and medical institutions is projected (over the next 25 years) to add at least 6,000 jobs with a \$225 million annual payroll and has already attracted several companies to Shreveport. LSUS's allied health training efforts are a key asset in expanding the potential of the existing Shreveport biomedical cluster. Many of these companies will need staff with allied health training. The region is already developing as a leader in health care facilities and research, and there is a strong need for more personnel with allied health training. The rapid development of the Biomedical Research Institute and the Inter-Tech Science Park adjacent to LSUHSCS signals the need for an even greater number of technical staff with training in allied health in the future.

According to the U.S. Department of Labor, of the 30 fastest growing occupations from for the current decade, 17 are health-related. Healthcare practitioners and technical occupations and healthcare support occupations have a combined growth rate of 27.9% and are projected to add 2.7 million jobs. Nearly 3 out of 4 new jobs for workers in these occupations should be in the health services industry (non-government). Rapid growth among health-related occupations reflects an aging population that requires more health care, a wealthier population that can afford better health care, and advances in medical technology that permit an increasing number of health problems to be treated more aggressively. Much of the increase is in occupations requiring a bachelors degree or higher. Mean earnings for such occupations is at least double the mean for all wage and salary workers. In the long run, Allied Health Program enhancement at LSUS will clearly contribute to workforce preparedness, quality of life, and economic development in Louisiana.

6. ADDITIONAL FUNDING SOURCES:

LSUS has committed over \$19,000 in institutional matching funds (detailed in the budget) to support the purchase of related equipment, supplies, and other items related to the project. BORSF-supported physiology laboratory enhancement will increase our potential to secure additional funding from private sources as well as from Federal sources for Allied Health Program improvements.

Selected References:

- Blake, C. and Scanlon, E., Reconsidering simulations in science education at a distance: features of effective use, *Journal of Computer Assisted Learning*, 23:6, 491-502, 2007.
- King, P. Simulations vs. use of live animals in biology labs, *Bulletin of the South Carolina Academy of Science*, Annual, 2003.
- Rosen, K., McBride, J. and Drake, R. The use of simulation in medical education to enhance students' understanding of basic sciences, *Medical Teacher*, 31:9, 842-846, 2009.
- Thomas, R.C. and Milligan, C.D. (2004). Putting Teachers in the Loop: Tools for Creating and Customising Simulations. *Journal of Interactive Media in Education (Designing and Developing for the Disciplines Special Issue)*, 2004 (15).
- Windschitl, M. and Andre, T. Using computer simulations to enhance conceptual change: The roles of constructivist instruction and student epistemological beliefs, *Journal of Research in Science Teaching*, 35:2, 145-160, 1998.

PREVIOUS BORSF AWARDS:

Dr. Terry LeGrand was CoPI on a \$26,899 BORSF grant in 2006-07 for Anatomy Laboratory Enhancement for Allied Health Students. This grant provided anatomically precise replicas of human anatomy, which have enhanced instruction and student learning in the LSUS Allied Health Program. The current proposal complements the previous grant by upgrading computer and data acquisition capabilities for Allied Health students in the physiology lab, as well as adding a simulated laboratory component.

BIOGRAPHICAL SKETCH			
<u>NAME/ADDRESS</u>		<u>POSITION TITLE</u>	
TERRY S. LEGRAND		Instructor, Allied Health Program and Department of Biological Sciences	
<u>EDUCATION</u>			
INSTITUTION	DEGREE	YR	FIELD OF STUDY
LSU Health Sciences Center: School of Allied Health Professions	BS	1992	Cardiopulmonary Science
LSU Health Sciences Center: School of Allied Health Professions	PhD	1997	Cellular Physiology

PROFESSIONAL EXPERIENCE:

Louisiana State University in Shreveport

2006 – Present Instructor, Department of Biological Sciences, and Allied Health Program

University of Texas Health Science Center at San Antonio

2004-2005 Associate Professor and Chair, Department of Respiratory Care

2003-2004 Associate Professor and Director of Clinical Education, Department of Respiratory Care

1997-2003 Assistant Professor and Director of Clinical Education, Department of
Respiratory Care

Louisiana State University Health Sciences Center, Shreveport, LA

1994-1997 Lecturer, Department of Molecular and Cellular Physiology

PUBLICATIONS/PRESENTATIONS:

Shelledy, D. C., **LeGrand, T. S.**, Gardner, D. D., Peters, J. I. A Randomized, Controlled Study to Evaluate the Role of an In-Home Asthma Disease Management Program Provided by Respiratory Therapists in Improving Outcomes and Reducing Cost of Care. *J Asthma*, 46:2, 194-201, 2009.

Shelledy, D. C., McCormick, S. R., **LeGrand, T. S.**, Cardenas, J, Peters, J. I. The effect of a pediatric asthma management program provided by respiratory therapists on patient outcomes and cost. *Heart and Lung: the Journal of Acute and Critical Care*, 34 (6): 423-428, 2005.

LeGrand, T. S. Graduate Degree Education Programs: Organization, Structure, and Curriculum. In *Respiratory Care Clinics of North America*. Eds. LeGrand, T. S. and Vines, D. L. 11:417-424, 2005.

Shelledy, D. C., **LeGrand, T. S.**, and Peters, J. I. An Assessment of the Appropriateness of Respiratory Care Delivered at a 450-bed Acute Care Veterans Affairs Hospital. *Respiratory Care*, 49 (8):907-916, 2004.

LeGrand, T. S. Congestive Heart Failure with Pulmonary Edema. In *Critical Thinking in Respiratory Care*. Eds. S. Mishoe and M. Welch. McGraw-Hill Publishing Co. pp. 497-517, 2002.

LeGrand, T. S. and T. Y. Aw. Intestinal Absorption and Metabolism of Peroxidized Lipids. In *Intestinal Lipid Metabolism*. Eds. C. Mansbach, P. Tso, and A. Kuksis. Kluwer Academic/Plenum Publishers, pp. 351-366, 2001.

- Peters, J. I., Shelledy, D. C., Jones, A. P., Lawson, R. W., Davis, C. P., and **LeGrand, T. S.** A Randomized, Placebo-controlled Study to Evaluate the Role of Salmeterol in the In-hospital Management of Asthma, *Chest*, 118(2):313-20, 2000.
- LeGrand, T. S.**, Hickman, E., Tabor, J., and Shelledy, D. C. Lethal arrhythmia recognition among graduating baccalaureate degree respiratory care and nursing students, *Respiratory Care*, 44(10):1285 (abstract), 1999.
- LeGrand, T. S.**, Aw, T. Y. Chronic hypoxia alters utilization of glucose during GSH-dependent detoxication in rat small intestine. *American Journal of Physiology - Gastrointestinal and Liver Physiology*. 37: G376-G384, 1998.
- LeGrand, T. S.**, Aw, T. Y. Chronic hypoxia, glutathione-dependent detoxication, and metabolic instability in rat small intestine. *American Journal of Physiology - Gastrointestinal and Liver Physiology*. 35: G328-G334, 1997.
- LeGrand, T. S.**, Aw, T. Y. Electrophoresis. In *Biomedical Instrumentation: Tools for Understanding Life*. Eds. J. H. Wandersee, D. R. Wissing, and C. T. Lange. National Association of Biology Teachers, pp. 1-18, 1996.
- LeGrand, T. S.**, Aw, T. Y. Electrophoresis. In *Biomedical Instrumentation: Tools for Understanding Life*. Eds. J. H. Wandersee, D. R. Wissing, and C. T. Lange. National Association of Biology Teachers, pp. 1-18, 1996.
- LeGrand, T. S.**, Aw, T. Y. Chronic hypoxia and glutathione-dependent detoxication in rat small intestine. *American Journal of Physiology - Gastrointestinal and Liver Physiology*. 33: G725-G729, 1996.

RELATED PROFESSIONAL ACTIVITIES:

Berneice Castella Allied Health Endowed Chair in Aging Research

Berneice Castella Allied Health Endowed Chair in Geriatric Science

Title: "A Randomized, Controlled Study to Evaluate the Effect of a Disease Management Program on Physical Functioning, Quality of Life, and Cost of Care for Elderly Patients with Chronic Respiratory Disease"

Period: 2003-2005

U. S. Department of Health and Human Services Grant

Title: "Asthma in a Decentralized Patient Population: Is Traditional Disease Management Enough? A Randomized, Controlled Trial Comparing Traditional Healthcare Delivery to Two Systems of Disease Management for a Decentralized Population of Patients in South Texas"

Period: 2003-2005

American Association for Respiratory Care Grant

Title: "A Randomized, Controlled Study to Evaluate the Role of an In-Home Asthma Disease Management Program Provided by Respiratory Therapists in Improving Outcomes and Reducing the Cost of Care"

Period: 1999-2004

CURRENT AND PENDING SUPPORT
(From ALL sources, including Board of Regents Support Fund)

The following information **MUST** be provided for each investigator. Use additional sheets as necessary.

NAME OF INVESTIGATOR: Dr. Terry S. LeGrand
Status of Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission planned for Near Future Contract Number/Proposal Title: Undergraduate Allied Health Physiology Laboratory Computer, Simulation, and Instrumentation Enhancement (PI) Source of Support: BORSF Award Amount (or Annual Rate): \$15,083 Period Covered: 7/01/10 – 6/30/11 Location of Activity: LSUS Person-Months or % of Effort Committed to the Project: ____ Cal Yr __10__ Acad ____ Summ
Status of Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission planned for Near Future Contract Number/Proposal Title: Virtual Case Studies for Pre-Health Science Students (CoPI); Joint project with Northwestern State University. Source of Support: BORSF Award Amount (or Annual Rate): \$57,595 (LSUS share) Period Covered: 7/01/10– 6/30/11 Location of Activity: LSUS Person-Months or % of Effort Committed to the Project: __5__ Cal Yr ____ Acad ____ Summ
Status of Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission planned for Near Future Contract Number/Proposal Title: Source of Support: Award Amount (or Annual Rate): Period Covered: Location of Activity: Person-Months or % of Effort Committed to the Project: ____ Cal Yr ____ Acad ____ Summ
Status of Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission planned for Near Future Contract Number/Proposal Title: Source of Support: Award Amount (or Annual Rate): Period Covered: Location of Activity: Person-Months or % of Effort Committed to the Project: ____ Cal Yr ____ Acad ____ Summ

**BOARD OF REGENTS SUPPORT FUND
TRADITIONAL AND UNDERGRADUATE ENHANCEMENT, FY 2009-10**

Budget Pages

Year 1:

	Support Fund Money Requested	Institutional Match ¹	Private/Other Match ²
A. Equipment ³	\$14583	\$3000	\$
B. Software	\$500	\$300	\$
C. Supplies	\$	\$500	\$
D. Shipping/handling	\$	\$	\$
E. Installation	\$	\$1000	\$
F. Personnel training	\$	\$	\$
G. Other	\$	\$9000	\$
H. Indirect costs	Not allowed	\$4510	\$
I. Maintenance	Strongly discouraged	\$1000	\$
J. Total costs (A-I)	\$15083	\$19310	\$0

Year 2(Only if the proposed duration is 2 years):

	Support Fund Money Requested	Institutional Match ¹	Private/Other Match ²
A. Equipment ³	\$	\$	\$
B. Software	\$	\$	\$
C. Supplies	\$	\$	\$
D. Shipping/handling	\$	\$	\$
E. Installation	\$	\$	\$
F. Personnel training	\$	\$	\$
G. Other	\$	\$	\$
H. Indirect costs	Not allowed	\$	\$
I. Maintenance	Strongly discouraged	\$	\$
J. Total costs (A-I)	\$0	\$0	\$0

1 Stipulate whether in-cash or in-kind. The Board strongly encourages the sharing of costs for proposed projects. Applicants and institutional officials should note, however, that the employing institution will be required to honor the commitments made in the original proposal before any awards are made. Discounts for equipment purchases are not allowable as institutional match.

2 The budget page(s) must reflect and the budget justification pages must explain any external funds that are claimed in the proposal. External funds and their expenditure must be accounted for in the same manner as Support Fund money and institutional match.

3 Equipment. If applicable, itemize and describe briefly the proposed equipment and its intended use in the project. Include the name, model number, and manufacturer(s).

**BOARD OF REGENTS SUPPORT FUND
TRADITIONAL AND UNDERGRADUATE ENHANCEMENT, FY 2008-09
Budget Pages**

Composite Budget Page:

	Total Support Fund Money Requested	Total Institutional Match ¹	Total Private/Other Match ²
A. Equipment ³	\$14583	\$3000	\$0
B. Software	\$500	\$300	\$0
C. Supplies	\$0	\$500	\$0
D. Shipping/handling	\$0	\$0	\$0
E. Installation	\$0	\$1000	\$0
F. Personnel training	\$0	\$0	\$0
G. Other	\$0	\$9000	\$0
H. Indirect costs	Not allowed	\$4510	\$0
I. Maintenance	Strongly discouraged	\$1000	\$0
J. Total costs (A-I)	\$15083	\$19310	\$0

Budget Justification

ITEM	DETAILS	Cost
EQUIPMENT:		
Student computers: Dell Desktop Computers	State standard desktop with monitor; OptiPlex 760 desktop base standard PSU, genuine Windows Vista Business Downgrade, XP Professional SPE, E. These will be used with the 3 existing usable student units, for a total of 11 student workstations in the lab.	8 @ \$999 = \$7992
LabPro Computer interfaces	These allow computers to be interfaced with the LoggerPro data acquisition software and sensors. Adding 3 units will bring the lab total to 13. [We need totals of 13 interfaces & sensors that work with them because we need to have two extras on hand in case an interface or sensor breaks down. It would be inefficient to have an exact number of sensors & interfaces for the 11 computers, because if something breaks, it means a whole computer station will be unusable.]	3 @ \$220 = \$660
Vernier 25-g accelerometers	Sensor used with the LabPro computer interface to study motion in a number of live physiology experiments	13 @ \$92 = \$1196
Vernier hand-grip heart rate monitors	Sensor used with the LabPro computer interface to determine a subject's heart rate while mobile or stationary (brings total to 13)	3 @ \$119 = \$357
Vernier hand dynamometers	Sensor is used with the LabPro computer interface to measure grip strength and to perform muscle fatigue (brings total to 13)	3 @ \$99 = \$297
Vernier surface temperature sensors	Sensor is used with the LabPro computer interface to determine skin temperature or exhaled air temperature (brings total to 13)	3 @ \$23 = \$69
Vernier blood pressure sensors	Sensor is used with the LabPro computer interface to measure human blood pressure (brings total to 13)	3 @ \$105 = \$315
Vernier EKG sensors	Sensor is used with LabPro computer interface to measure electrical signals produced during muscle contractions (brings total to 13)	3 @ \$147 = \$441
Vernier EKG electrodes	Electrodes to be used with Vernier EKG sensors	5 @ \$12 = \$60
Vernier spirometers	Sensor is used with the LabPro computer interface to measure air flow and lung volume (brings total to 13)	3 @ \$199 = \$597
Bacterial filters	This device is used with the Vernier spirometer to prevent bacterial contamination when more than 1 student uses the spirometer	3 boxes @ \$30 = \$90
Vernier oxygen gas sensors	Sensor is used with the LabPro computer interface to determine oxygen concentration in air	13 @ \$188 = \$2444
CO2 to O2 Tees	This device is used with the Vernier oxygen gas sensor	13 @ \$5 = \$65
Subtotal Equipment		\$14,583
SOFTWARE:		
PhysioEx 8.0 for Human Physiology	Multi-user license for state-of-the-art physiology laboratory simulation program; allows students to perform sophisticated experiments virtually	1 @ \$500
TOTAL REQUEST		\$15,083

MATCHING SUPPORT

LSUS will provide an institutional match as follows:

CATEGORY	Institutional Match
Equipment related to the project	\$3,000 cash
Software	\$300 cash
Supplies, from regular dept. budget	\$500 cash
Installation by LSUS technicians @ \$25/hr. x 40 hrs.	\$1,000 in kind
Faculty time to conduct project @ \$50/hr. (incl. fringe) X 180 hrs.	\$9,000 in-kind
Maintenance by LSUS technicians @ \$25/hr. x 40 hrs.	\$1,000 in-kind
Indirect Cost: 41% of personnel (Installation technicians, faculty & maintenance staff time) (US Dept. of Health & Human Services Negotiated Rate)	\$4,510 in-kind
TOTAL MATCHING SUPPORT	\$19,310

NOTE: All faculty/staff salaries, purchasing, etc. will be in accordance with LSUS and State policies/procedures. LSUS assures the Board of Regents that no full-time LSUS personnel will receive in excess of 100% of their regular salaries, either from BORSF funding or from matching support. Any and all compensation of LSUS personnel involved in the project will be in accordance with state guidelines and requirements.