

**COVER PAGE FOR TRADITIONAL AND UNDERGRADUATE ENHANCEMENT PROPOSALS
BOARD OF REGENTS SUPPORT FUND, FY 2008-09**

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 Dillard University Additional Institutions			
5. Address of Institution of Higher Education Division of the Natural Sciences and Public Health 2601 Gentilly Blvd. New Orleans, LA 70122			
6. Title of Proposed Project Intereaction of Technology and Virtual Laboratories into the Biology Curriculum at Dillard University: Impact on Attitude in Learning Biology for majors and non-majors.			
7. First-Year Support Fund Money Requested \$56039	8. Second-Year Support Fund Money Requested (if applicable) \$0	9. Proposed Duration 1 Year	
10. Category In Which Proposal Is Being Submitted <input checked="" type="checkbox"/> Biological Sciences <input type="checkbox"/> Engineering B (Industrial, Materials, Mechanical, etc.) <input type="checkbox"/> Humanities <input type="checkbox"/> Computer and Information Sciences <input type="checkbox"/> Social 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:	
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)
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Date:	Telephone Number:	Date:	Telephone Number:

BOARD OF REGENTS SUPPORT FUND ENHANCEMENT PROGRAM PROPOSALS
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PERSONNEL PAGE

Name(Last,First,MI) Broadway, Ruby L				Gender Female	
Race/Ethnicity Black-Not Hispanic				Disabled? No	
Citizen of USA			Residential Status: U.S. Citizen		
Highest Degree Ph.D.					
Institution Dillard University					
Department Biology Department					
Position in Contract Lead Principal Investigator					
Address Natural Sciences and Public Health,					
City New Orleans	State LA	Zip 70122	Phone 5048164725	Fax 5048164724	
E-Mail Address rbroadway@dillard.edu			Website/URL		

BOARD OF REGENTS SUPPORT FUND ENHANCEMENT PROGRAM PROPOSALS
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PERSONNEL PAGE

Name(Last,First,MI) Ahmed, Syed Adeel				Gender Male	
Race/Ethnicity Asian				Disabled? No	
Citizen of usa			Residential Status: U.S. Citizen		
Highest Degree Ph.D.					
Institution Dillard University					
Department Computr Science 7 Physics- Pre-Engineering					
Position in Contract Faculty					
Address Division of the Natural Sciences,					
City New Orleans	State LA	Zip 70122	Phone 8164506	Fax 8164724	
E-Mail Address asyed@dillard.edu			Website/URL		

PROJECT SUMMARY

Name of Institution (Include Branch/Campus and School or Division) Dillard University
Address (Include Department) Division of the Natural Sciences and Public Health 2601 Gentilly Blvd. New Orleans, LA 70122
Principal Investigator(s) Dr. Ruby L. Broadway and Dr. Syed Adeel Ahmed
Title of Project Integration of Technology and Virtual Labs into the Biology Curriculum at DU: Impact on Attitude in Learning Biology for non-majors and majors.
Abstract (DO NOT EXCEED 250 WORDS)* Virtual learning experiences (VLEs) possess many advantages over traditional teaching methods in skills training that offer empowerment of constructing the skills by freely exploring a VLE. However, a conflict between the free exploration and ensuring the learning tasks tackled emerges in the learning process. A strategy to balance the conflict is to employ virtual experiences to heighten the learning tasks. This project is being carried out to investigate the issues of virtual laboratories experiences to allow higher education (university based) students to practice/engage in various laboratory experiments. The aim of this project is to enhance the infrastructure by the integration of an electronic classroom for laboratory instruction in the Department of Biology through modernization with state-of-the-art computer. The specific objectives to achieve this goal are: (1) acquisition and installation of major computer equipment for faculty/student instruction during Fall 2009. Funding for this proposal will enhance the quality of higher education and promote the economy and manpower admission and retention;(2) improving the competitiveness of Dillard graduates, and hence minority groups, for research, graduate and professional school, and for state and federal skilled jobs; and (3) providing a work environment conducive to research and instruction. Equipment ordering and installation is scheduled for Summer, 2009. The envisaged infrastructure should be in use by Fall 2009. Approximately 2000 students are expected to be impacted yearly through utilization of the improved, modernized state-of-the-art electronic classroom. This project will focus on student perceptions of virtual biology labs. A formative evaluation study will be carried out.

(Form 2, rev.2006)

A. The Current Situation

a. 1 Institutional Description

Dillard University is a four-year, co-educational, liberal arts institution located in the metropolitan New Orleans area. It is accredited by the State Board of Education of Louisiana, the Southern Association of Colleges and Schools, and by the University Senate of the Methodist Church. Its nursing program is accredited by the National Nursing Accrediting Service. The Curriculum is organized under six academic divisions: Business Administration, Education, Humanities, Natural Sciences, Nursing, and Social Sciences. Dillard University grants three baccalaureate degrees; the Bachelor of Science degree in Nursing, the degree of Bachelor of Science to graduates in the Division of Natural Science, and the Bachelor of Arts degree to students graduating in other Divisions.

One of the Colleges most distinctive features is a set of extracurricular requirements that all students must satisfy to qualify for graduation. These requirements, designed to enrich the collegiate experience, include: (1) a period of living and learning in another culture; (2) participation in community service; and (3) intensive career exploration through activities such as an internship.

The University has traditionally focused its recruiting efforts on Louisiana and surrounding states. Consequently, most of our students come from that region. In the summer of 2007, a new Dean of Enrollment Management joined the University staff. Under his leadership, the University is expanding its recruiting efforts nationwide. The average composite ACT score for Dillard students entering in Fall, 2007 was 25.1. On average, Dillard's students score higher on college entrance exams than any other institution in the state.

The Departments of Biology and Chemistry, along with the Departments of Physics, Mathematics and Public Health form the Division of Natural Sciences. Dillard has a long history of success in preparing its students for entry into professional schools and that record attracts large numbers of students into our pre-professional curricula. The majority of students currently in the Division are preparing to enter professional schools in health care areas.

Dillard University is located three miles northeast of the central business district of New Orleans (Louisiana) and on one of America's most beautiful campuses. The quality of Dillard's educational program is attested to, in part, by the quality of its graduates. Based upon alumni surveys, Dillard's graduates have attained a remarkably high level of educational achievements. Over three-fourths of Dillard's graduates continue their formal education, and achieve success in graduate and professional schools. The University offers two professional programs, Nursing and Education. Many of the New Orleans Schools' principals, counselors and public school administrators are graduates of Dillard, including several assistant superintendents and a former President of the New Orleans School Board.

The continuing mission of Dillard University is to create and maintain an atmosphere

conducive to learning and growth through programs of academic excellence within the framework of the liberal arts tradition. With particular emphasis on professional and business careers, Dillard prepares its students to work, compete and function in a highly competitive, challenging, stimulating, pluralist and ever changing society. Dillard aims to produce graduates who possess a system of values, exhibiting an inner character that enables them to make sound, ethical and humanistic choices.

a.2. Rational for Project

In 2005, ago, a new President and Provost assumed leadership of the University and is in the process of leading through an extensive process of self-study and strategic planning. The primary institutional goal that emerged from this process is to strengthening of the University's science programs. Planning was initiated for a new building to house all the departments of the Division of Natural Science and Public Health. An architectural firm nationally recognized for design of academic science facilities assisted in this process. Planning is now complete and our Development Office is pursuing funding from a number of sources. In the interim, steps are being taken to improve the appearance and functionality of the current facility. Because teaching is the Division's primary function, discussions were aimed at finding better ways to communicate science to our students, It was somewhat surprising to us that all the departments of the Division, planning independently, arrived at a set of common goals. These are:

1. To implement a laboratory intensive discovery based mode of teaching,
2. To enhance the role of education as an integral component of the overall teaching process,
3. To enhance lectures by exploiting technology in the classroom, and
4. To re-evaluate the structure and content of our curricula.

Our progress toward meeting these goals is presented in Section b.2. of this proposal. In the Fall of 1996, an external team composed of faculty and administrators from liberal arts colleges with nationally recognized undergraduate science programs reviewed all the programs within the Division of Natural Sciences. A primary recommendation coincided with a growing realization among the faculty of the various departments in the Division. That realization is that coordinated planning and unified action by all the departments of the division could lead to an otherwise attainable strength and vigor.

Accordingly, the Division of Natural Sciences and Public Health initiated a series of planning retreats, leading to definition of a divisional strategic plan. Several components of that plan are germane to this proposal:

1. The division defined two focus areas based on its preexisting strengths and resources, and on considerations of the regional economy, namely biological sciences .
2. These focus areas are inherently interdisciplinary so departmental curricular structures and course content as well as equipment inventories will be developed with a view toward enhancing the divisional effort rather than through independent action.

a.3. Impact on Existing Resources

This proposal seeks funding for equipment to teach an intensive, discovery-based virtual laboratory in biological sciences to majors and non-majors. This laboratory course is one of the central elements in a larger plan of curricular modification designed to enhance learning in all biological science programs at Dillard University.

B.THE ENHANCEMENT PLAN

b.1. Plan of Proposed Project

The areas of online instruction and web-based learning initiatives have grown tremendously over the past two decades, though there are certain areas within which a paucity of research on effectiveness and learning outcomes remains. One of these areas is the use of virtual biology laboratories in the science classroom. Research findings support the use of virtual laboratories for providing engaged, active learning experiences in physics education and use of website-based simulations in the online biology classroom, but there are few studies that examine the use of virtual laboratory simulations in face-to-face (F2F) or online postsecondary biology courses. The current study is an exploratory beginning of a research agenda to address this gap.

Research supports the use of hands-on, minds-on, active instructional strategies over passive, lecture-based instructional methods for improved student learning outcomes in science education. One way of creating an active learning environment is to use multiple modes of instruction. Research has shown that meaningful learning can occur when connections are made between information stored in visual and auditory working memory systems. Additionally, reaching today's students can be a challenge when using primarily lecture-based instructional methods. Today's youth are visuo-spatially intelligent and talented and may need to experience instruction that is visual and that requires active participation. The virtual lab experience combines visual and auditory modalities and requires students to be actively involved.

It is essential that educational researchers study the virtual biology lab experience to determine if evidence exists to support the use of this tool to increase levels of active, engaged learning and overall achievement in science. This issue is especially stimulating for the online science classroom due to the inherent learning challenges in the virtual environment, one of which involves developing and maintaining active student engagement in course activities.

There exists a large body of literature on instructional approaches to distance and online learning, with strong support for creating an active, engaged learning environment to enhance student learning. Instructional materials can engage and motivate students when they are user-friendly, interactive, and problem-oriented. It has also been asserted that the distance education environment is fertile ground for developing new instructional practices, and further, that distance education may be able to extend learning in ways that traditional, face-to-face education cannot. The use of virtual laboratories in non-majors biology courses is one relatively new instructional practice that may help to create the

engaged and active learning experience that is supported by the literature. This practice may also extend learning for students when specialized biology materials are not affordable or are deemed undesirable for actual use.

Though the aforementioned studies present a focused effort to inform instructional approaches that facilitate a more active and engaged learning experience, there is an insufficiency of research that focuses specifically on the effectiveness of the use of virtual biology laboratories in the college setting. A focused research program is needed to determine if these tools are indeed effective in moving students toward a deeper understanding of basic biology concepts and the overall nature of science.

STUDY OVERVIEW

This exploratory study is the first step in a research agenda that is focused on investigating the effectiveness of virtual biology laboratories. The long-term goal of the agenda is to eventually add to the literature in terms of how well virtual biology laboratories, whether used in the online environment or as supplements in face-to-face (F2F) setting, could provide a comparable learning experience. Though the literature is growing, there remains a need for more research on virtual laboratories specifically in biology courses.

The purpose of this exploratory work is to investigate student perceptions of their experiences completing several virtual biology laboratories during the Biology course for non-majors in which they were enrolled. In an effort to elicit student responses that reflected a more accurate depiction of student perceptions of the virtual laboratories, it was important that students compared their experiences with both face-to-face (F2F) and virtual labs. The students will complete both F2F and virtual labs, so they were able to compare their experiences.

Our ultimate goal is to eventually examine effectiveness of virtual labs as an instructional tool, the purpose here is to first glean student perceptions of the tool from an evaluative perspective. It is hoped that findings from this research would provide information to use during instructional improvement as well as add to the literature in this area. The purpose of this study is to investigate student perceptions of virtual biology labs used in introductory biology courses. As such, this study addressed the following research questions:

- ◆ How do students perceive virtual laboratories in terms of effectively helping them to understand biology concepts and the general nature of science?
- ◆ How do students perceive face-to-face laboratories in terms of effectively helping them to understand biology concepts and the general nature of science?
- ◆ How do students perceive both types of laboratories in terms of enjoyment?
- ◆ Which instructional factors are perceived to make either type of laboratory most effective and why?

In the Sciences, understanding complex concepts and principles is increasingly crucial. Students' learning success depends upon them comprehending complicated theory and

mastering laboratory experimental skills. To understand complex concepts and principles, students need to be able to study the innate relationships of phenomena and recognize critical points. Laboratory experiments provide the most effective way to simplify and to clarify the comprehension of any complex scientific theory. Unfortunately, there are limitations in real life for students carrying out a laboratory experiment such as time schedule, experimental equipment and using toxic materials.

Virtual Reality (VR) could support the construction of the type of learning environments students need to develop this understanding. VR may have the potential to provide viable learning environments. VR has been now investigated to create highly advanced learning and skill training environments. It may make important concepts and relationships more salient and memorable, help students build more accurate mental models by engaging them in learning activities. In virtual learning environments, the students become part of a phenomenon and experience it directly. The students play a role in such virtual environments. The objects in the virtual environments react and move either in response to users' actions or to illustrate motion or their innate behavior. VR could deepen what the students learn by providing different and complementary insights. VR, as a vehicle for building powerful and compelling simulated environments, allows the students to interact with the virtual world without the usual constraints of the physical world. VR is appealing because it can make for a highly intuitive interface for accessing and organizing information.

VR-based applications could provide students with flexible navigation and interaction with the virtual learning environments as in real life. However, a potential dilemma in the promotion of experiential learning emerges. If students are allowed free exploration of these VLEs, how can it be ensured that the target learning objectives are achieved? How can it be ensured that students carry out the necessary activities that will allow the construction of knowledge through their experiences if they are free to carry out some activities and ignore others? Empowerment in the form of free exploration to construct knowledge through interaction with realistic objects and activities should be tempered by the introduction of some form of control (educational strategies) to ensure that the necessary lessons are learned. One of the strategies is to employ virtual tutoring agents to heighten the important activities. Introducing virtual tutoring agents reduces the flexibility for the students to interact with the VLEs. However, it is necessary to ensure the learning tasks to be tackled.

BACKGROUND AND SIGNIFICANCE OF THE STUDY AND THE PROBLEM:

It has been shown that there is a relationship among students' perceptions, attitudes, and preconceived notions in biology which ultimately affect achievement. Attitude toward science has become an important concept for a number of reasons:

1. To fulfill one's basic psychological needs, such as the need to know and the need to succeed.
2. To influence future behaviors, such as a student's interest in working on a science project at home or in visiting a science museum

3. May be viewed as a learned, positive or negative feeling about science that serves as a convenient summary of a wide variety of beliefs about science.
4. Importantly, because it permits the prediction of science related behavior.

The problem undertaken is to examine the perceptions, attitudes, and preconceived notions about biology held by non-science students enrolled in biology classes.

In relation to the major problem, one sub-problem will be investigated: determining the effectiveness of the integration of technology by way of virtual tutoring, concept-mapping and virtual labs used as instructional tools in improving non-science majors' attitudes toward biology.

Agent-based software introduces a new paradigm for instruction, learning and training in the use of computer aided learning packages. The virtual agents are proposed as a personal butler or assistant. They act autonomously on behalf of themselves or their users, are co-operative in process, convey information to the users, and perform tasks that meet user's goals. In software terms, virtual agents are described as electronic "butlers," performing tasks, such as assisting in learning process), and training user's skills. From the computing viewpoint, these agents are computer programs that simulate a human relationship by doing something that another person could otherwise do for the students. The virtual agents in a three-dimensional (3D) virtual environment could be classified into the following categories in terms of their exhibited authentic behaviors.

Atmosphere agents : an agent that simply lends to the local color. For example, in an urban simulation there may be a street magician, a street vendor, a street sweeper; in a museum simulation there may be a visitor wandering the exhibits or vendors selling popcorn.

Infrastructure agents : an agent who contributes in some way to the learning process. For example, the agents may be a banker, an employee, and an advertising consultant in an urban simulation. They may be a guide, or an instructor in a museum.

Tutoring agents : an agent that monitors learners' movements, and visits learners to give advice in the form of expert stories and cases, or in some other ways to assist learners. These will represent expertise or past experience of other learners.

Virtual agents are built into tutoring systems to respond to the needs of educational and training programmers. The role of the tutoring agents in virtual learning environments emphasizes the interactions and communication between students and these agents as an expert, tutor and assistant. In an agent-based virtual learning experience (VLE), tutoring agents serve as educators, which introduce concepts and principles, promote an instructional paradigm, and provide help to students. Their ultimate purpose is to communicate with students in order to efficiently fulfill their respective tutoring functions as the educational mission of the system.

Tutoring agents can play several valuable roles in a 3D virtual environment. Since

students often fail to recognize that their actions are inappropriate, tutoring agents can intervene with appropriate advice. At other times, the students may lack sufficient knowledge to proceed or face an unfamiliar situation. The students could in this case benefit from a tutoring agent that answers the questions or demonstrates a procedure, performance, or a task.

To facilitate the assignment of tutoring agents to pedagogical tasks in a learning session, the multiple-agents' concept promotes the idea of designing tutoring agents in learning environments to achieve different pedagogical goals; such as delivering expertise, motivating students, providing procedural tutorials, assessing success and failure within their particular sub-topics, and remedying student performance.

There are two hypotheses that stimulated this interest: (1.) College students' perceptions, attitudes and preconceived notions about biology will indicate that science majors have a positive attitude, while non-science majors have a more negative attitude toward the general biology course and (2) the use of concept-mapping and virtual labs as instructional tools will result in a more positive attitude by students enrolled in general biology classes.

DEFINITION OF TERMS

Science major refers to those students majoring in any of the natural sciences, physical sciences, mathematics, engineering, or information technology.

Non-science major refers those student pursuing an undergraduate field of study, outside the natural and physical sciences, engineering, and information technology.

Attitude is defined as “a predisposition to respond positively or negatively to things, people, places, events, or ideas.”

Concept map is “a graphical representation where nodes (points or vertices) represent concepts, and links (arcs or lines) represent the relationships between concepts.”

Virtual lab is defined as “ a computer simulation which enables essential functions of laboratory experiments to be carried out on a computer.”

Tegrity is defined as “an application for recording class lecture and demonstration and can also be used in virtual laboratory demonstrations.

Perception is the act of becoming aware of something via the senses; a way of conceiving something

Preconceived notions refer to opinions formed beforehand and without adequate evidence.

Inspiration® is a software “tool for visual thinking, outlining, and communicating ideas. Inspiration provides an integrated outlining environment for developing ideas into written documents and diagrams. ”

Misconceptions, are naïve understandings that are so ingrained that traditional teaching is not sufficient to correct them.

EXPERIMENTAL PLAN

In this study, we will use both closed- and open-ended items survey, to collect data to answer the previous and below questions and explore issues related to perceived effectiveness of the virtual science laboratories used in the biology courses for non-majors.

The experimental plan is also designed to seek answers to the following two additionally research questions.

1. Is there a difference in the attitude toward biology of science majors and non-science majors enrolled in general biology classes?
2. Are concept mapping and virtual labs effective instructional strategies (learning tools) for improving science majors' and non-science majors' attitudes toward biology?

COURSE CONTENT

The introductory Biology course will have three sections for non-majors conducted primarily via power-point, and discussion-type except for laboratory experiences. In total, there were 18 laboratory experiences for the semester. Students met face-to-face (F2F) for one hour and fifteen minutes class sessions and 14 lab experiences over the course of these sessions. Ten (10) of the fourteen (14) laboratories will be virtual experiences that students completed independently.

The F2F laboratories will consist of primarily reading text and viewing and labeling images. They will also be required to answer questions. Some labs will require students to collect data from each other and analyze the data. There will also be two “wet” labs on chemical digestion of macromolecules (i.e., carbohydrates, fats, and proteins), urinalysis, fetal pig dissection, and microscope use.

The virtual laboratories involved a series of pointing and clicking to manipulate virtual lab equipment. The program produced quantitative data for students to analyze. For the analysis, students answered questions, which were submitted as the laboratory assignment. For example, the Virtual Pathology: The Microscope addresses the question; How are blood smears used to diagnose diseases. This virtual lab on microscope contained virtual slides with virtual blood cells. Students were required to select and diagnose a case based on information given about a patient. Other virtual lab topics will be animal biology, plant biology, ecology, scientific method, community ecology circulation: blood pressure, muscle stimulation, gene splicing, biotechnology, Knocking Genes and dissection of the fetal pig.

CONCEPT MAPPING SOFTWARE

Concept mapping activities involved the use of Inspiration Software®, which is a commercially developed software. (Note: It is our hope that the company will grant permission to use the software in this research and will also provided samples for all students who participated in the concept mapping activity.) **Appendix 1A,B**

PARTICIPANTS

The participants will enroll in the non-majors introductory biology course. We will send out an e-mail invitation for survey participation to all students enrolled. Respondents' ages will range from 18-55 years. The groups will be also ethnically diverse; consisting of African-American, Caucasian, International (European) and Asian students if possible. The participants who are not Biology majors are studying in a variety of disciplines (i.e., social science, humanities/languages, business, and education).

This study will consist of (X) non-science majors who were enrolled in “Biological Sciences,” the course for non-science majors at the University. Participants in the study will be, for the most part, college freshmen, who ranged in age from 16 to 40 years of age.

DESCRIPTION OF THE MATERIALS

THE SURVEY INSTRUMENT

The Survey instrument will be a self-designed instrument that is patterned and designed similar to the Biology Attitude Survey by (Russell & Hollander, 1975). The instrument will be validated by tenured faculty members of Psychological and Testing services at Dillard. It will be pilot-tested on students at the University. (SEE APPENDIX)

Instrument Validation

A Survey will be administered to five independent biology classes at the University and later to two independent biology classes at another university in the local community. The Survey will also be reviewed by five biology professors.

Analysis and Interpretation of Results

The researcher will record and report the frequencies and percentages and then analyzed the data using non-parametric statistics. Chi square will used to determine if there existed a significant difference between the attitudinal distributions of science and non-science majors. Chi square will also be used to determine if students' use of concept maps and virtual labs were independent of their attitudes towards the biology course.

Data Collection

We will collect survey data via FreeOnlineSurveys.com, an online survey creation and

delivery tool. The link to the online survey will be presented to students via email and through a link in the Announcements section on the course blackboard website. The survey will consist of seven demographics items (i.e., ethnicity, major, age range, number of online classes taken, and number/type of labs taken), 16 Likert-type items (scaled Strongly Agree, Agree, Somewhat Agree, Somewhat Disagree, Disagree, Strongly Disagree) that focused on student perceptions of effectiveness of the virtual laboratories and the F2F laboratories in terms of increasing their general understanding of the nature of science and the concepts covered in the virtual laboratory. Below are sample items from the survey:

In addition to the demographics and Likert-type items, there will also be three open-ended items that will allow for qualitative answers about the effectiveness of the virtual and F2F laboratories.

Focus Group Interviews

A supplemental phase in which informal focus group interviews will be conducted to provide further insight into the origins of students' attitudes toward biology.

Each focus group interview will consist of 8 students; two from each of the four identifiable groups. The interviews will last ~20 minutes. In total, there will be three interviews, all conducted at the end of the semester. An interview guide will be developed to insure that basically the same information will be obtained from each person.

The instructional/teaching strategies topic will address what students remember about their high school science instruction, including the most important materials and techniques.

Cognitive demands will be explored through responses to the ambiguity, difficulty, abstractness, and relevance of the academic tasks.

One main point or theme will be constructed from the answers students give most often to the question, "What would you do if you were the science teacher of this course?"

SUMMARY

The review of literature strongly suggests that students' perceptions of science appear to have an affect on their participation and attitude in science as a subject, thus impacting their performance in science classes.

Concept mapping and Virtual Labs can be very good visual aids for biology instruction and, if used, can ultimately help students overcome their negative perceptions about biology and, as a result, change their attitudes.

CONCLUSIONS

Based on the findings from the pre- and post-survey, as well as comments during the focus group interviews, the following conclusions will be addressed.

1. Do science majors have a more positive attitude towards biology than non-science majors at the beginning of the semester and at the end of the semester?
2. Should concept mapping and virtual labs activities be implemented in a single course, or should they be activities of several instructors, across the curricula in various departments. In other words, for technology to be effective, it should be undertaken by the students and instructors in more than one course.
3. Should concept mapping software, as well as virtual labs, should be available for students to use on a voluntary basis.
4. Should classes for science majors and non-science majors be designed to actively involve students in both lectures and laboratories, as means of improving attitudes toward biology and interest in the sciences.

Finally, activities, such as concept mapping and virtual labs, if implemented should allow students to develop, and appreciate the value, of meta-cognitive strategies, which are also desirable for helping them to become life-long learners. Further, in the context of long-term professional development, the use of concept maps and virtual laboratories will give instructors a new perspective on methods for enhancing transfer of understanding of concepts to their students.

b.2. Evidence of Potential to Achieve Recognized Eminence

As departments in a predominately undergraduate liberal arts university, we cannot realistically aspire to a national reputation as a site of high research productivity, but we can and do aspire to be recognized as a source of students readily prepared to enter graduate study or the workplace. We are convinced that the foundations for that reputation are already established and that its realization is within our reach. The most critical component of an academic unit's quest for improvement is support from the institution's administration. Previously, stated the Board of Trustees, President and Provost are all committed to development of nationally recognized science programs. That commitment has been clearly demonstrated through a number of specific actions: (1) the decision to make a new science building the University's highest capital improvement priority, and (2) locating funds to acquire new equipment and to match proposals.

While teaching is the primary responsibility of the faculty, we feel a continued engagement with our disciplines is essential to competent teaching. Establishing and maintaining a quality educational program in at undergraduate institution presents problems unique from those encountered in a large university. Teaching loads are higher and the institution has difficulty in providing the supporting infrastructure of electronics technicians and glassworkers. While these difficulties are real, they are not

insurmountable. Perhaps the major impediment to quality education in small undergraduate schools is their relatively small scale.

The departments of the Division of Natural Sciences and Public Health have enjoyed considerable success in securing funding to bring their interdisciplinary vision of discovery teaching and enhanced undergraduate research participation to fruition.

b3. Impact on Curriculum and Instruction

Basically, our plan is to refocus and intensify the program for Biology majors. The key component of this plan is to introduce virtual laboratory(ies) in the first semester of the second year for the major. All of the upper-level, biology courses will build on this experience. We are convinced that science is best learned by doing science, so an intensive laboratory is critical to its success.

In addition to serving this laboratory in biological science, many of the requested items will be extensively used to enhance laboratory teaching in a number of other courses. The requested electronic classroom will be used most extensively as it will serve as the main teaching instruments for all departments in the Division. We plan to use the electronic classroom in General Biology (majors and non-majors), Genetics, and Cell and Molecular Biology.

b.4 Impact on Quality of Students

As mentioned previously, under the leadership of the Dean of Enrollment Management, the College is embarking on an ambitious program of aggressively recruiting students from across the nation. An intense discovery-based program of scientific education built around well equipped laboratories will certainly be a positive factor in attracting good students to our campus. While an intensive curriculum and well-equipped laboratories are major recruiting factors, we believe the major impact of the curricular changes presented in this proposal will be in student retention. An institution of higher learning can present itself quite favorably in recruiting efforts and draw students to its campus. In order to retain those students, reality must match expectations. We believe good students will persist in an institution when they feel intellectually challenged and sense they are making substantial progress toward their educational goals. The curricular changes presented in this proposal are designed to accomplish both.

b.5. Impact on Faculty Development

Work in the departments of the Division of Natural Science and Public Health toward the goals presented near the beginning of Section b.2. of this proposal has already yielded substantial dividends in faculty development and we are convinced that further efforts will continue this process. Graduate education and establishment of research programs, of necessity, force specialization. Undergraduate teaching, on the other hand, requires breadth and depth. The conception, design, and testing of discovery experiments have

forced us to dynamically re-engage areas of our disciplines not dealt with since graduate school. As we toil with the task of designing experiments that illuminate concepts far from our areas of expertise, we are learning and thus becoming better teachers. In addition to enhancing our classroom and laboratory instruction, we see undergraduate research participation as a vital component in the overall process of science education. We believe the discovery orientation of the laboratory presented in this proposal will foster student enthusiasm for participation. Further, the breadth of experience provided by the proposed laboratory will give students skills that will allow them to rapidly become productive workers in the biological sciences.

C. EQUIPMENT

Based on current enrollments in Biology (majors and non-majors) we estimate 250-300 students will enroll each year. Enrollment in lab sections will be restricted to 24 and multiple sections.

The 25 Desktop computers & monitors with installed and wireless connections. **\$4,225.00**

LCD Projector **\$500.00**

The 9 Flip Top Access workstations with storage racks **\$681.00**

The two (2) Adjustable Hi-Tech workstations__**\$700.00**

The 25 contoured High-Back chairs **\$2,225.00**

The two (2) Phaser 6250 DX Color Laser printers **\$9,360.00**

It can be documented that each item of the above listed equipment plays a very vital role in the implementation of this state-of-the-art computer laboratory. If funds are provided to purchase the above equipment, the Computer laboratory will be able to carry out all multimedia and technology based applications for research, presentations, and learning.

This equipment is requested will be used specifically by the program director, staff and students. At this present time, there is no desk top computers available to support the program. The University has committed to installation and maintenance of all requested equipment.

c.2. Equipment on Hand for Project .

At the present there are no computers nor computer lab in the Biology Department.

c.3. Equipment Housing and Maintenance

The Computer Laboratory will be located in Stern Hall and will be maintained by a Computer technician (to be hired), computer science majors who have applied for word study and the Principal Investigator.

d. Faculty and Staff Expertise

This proposal seeks funding for equipment essential for an electronic classroom to teach virtual laboratory experience. Dr. Ruby L. Broadway will serve as Principle Investigator for the project. Dr. Broadway has been a productive and active member of the Dillard University faculty since 1983. Her graduate training was in Molecular Biology and Developmental Biochemistry. As a member of the Dillard family, she has served as mentor and program director for over ten years to Dillard University MARC and MBRS programs. She is the Program Director for the Dillard University Saturday Science Academy, a position she has held for fifteen years. She is also Principal Investigator and Director for the Project: Young Scholars Environmental Studies Institute, funded by the Board of Regents, 2003, Co-Principal Investigator to Project Title: Enhancement of Biochemical Instruction and Research with Dr. Reginald Stanton, funded by the Board of Regents, 2002 and Co-Principal Investigator to the Project Title: Enhancing the Instrumental Analysis Laboratory for Instruction and Research with Dr. Sonja Caston funded by the Board of Regents, 2008. Dr. Broadway will be responsible for administering the grant. She will have the responsibility of reporting to the Board of Regents in the programmatic and fiscal management of the grant. The Program Director will use the electronic class room to teach and conduct several virtual laboratories exercises. She will also oversee and maintain the electronic classroom. Dr. Broadway is trained in molecular biology and is thus fully qualified to develop and supervise that component of the laboratory experience.

While responsibility for development and conduct of the grant falls primarily on the Principal Investigator, its implementation is a high priority for the entire Division of the Natural Sciences and Public Health. Additionally, the entire faculty in the Division will thus use and implement to the project.

Dr. Syed Adeel Ahmed is an Assistant Professor of Biology at Dillard University. He is a young (seven years) professor at Dillard University. Dr. Aheed received his Ph.D. in Engineering and Applied Sciences from the University of New Orleans in 2006. Dr. Ahmed is a DU-LAMP mentor, ranked #1 as a Math Simulator at University of New Orleans and is a Microsoft Certified Professional. He has experiences in teaching, reforming courses, and research. His research experience includes: Polarization Optics, and Virtual Reality, and Computer Networking. He also teaches Physical Sciences and Electric Engineering courses. Currently, he is working on a two publication entitled Usability studies with Virtual and Traditional Computer Aided Designed Environments and Coupling of Light to Silicon Detectors Using Frustrated Total Internal Reflection (FTIR).

E. Economic and/or Cultural Development and Impact

e.1. Relationships With Industrial/Institutional Sponsors

With the growing concern of long term scientific issues facing the world, mathematician, engineers and scientist are in demand. In addition, there is a heightened emphasis on

collaborative activities with academia and community organizations. This project will be instrumental in establishing new relationships and partnerships with public and private sectors that need to identify and develop relations with institutions responsible for training our future scientists. Students can participate in internships and volunteer in various mathematics, engineering and/or science areas. This will increase skills needed for professional education. It is speculated that after they complete their education, they will seek employment at institutions where previous relationships were developed.

e.2. Promotion of Economic Development and/or Cultural Resources

This project will further serve Dillard University and the state of Louisiana because researchers with adequate training can improve and enhance scientific issues for the city and the state. Dillard University will be able to attract high quality students and excellent educators and researchers. These students, educators, and scientists will promote the economic development of the region by residing in the state and contributing to the tax base. Finally, the scientific community needs to be a true representation of the society in terms of diversity. Dillard University's mission is to produce highly qualified students for the nation, workforce, and educational institutions. Well-trained students have an enormous impact on the prestige of an institution, which will again positively affect New Orleans and Louisiana.

Investigators actively recruit our students into their classrooms and laboratories based instruction and commonly acknowledge their contributions through co-authorship on publications. The enhanced virtual laboratory training described in this proposal will make our students even more valuable to the New Orleans and surrounding region's growing emphasis on biotechnology.

a.3. Impact on Existing Resources

This proposal seeks funding for equipment to teach an intensive, discovery-based virtual laboratory in biological science. This electronic class room laboratory course is one of the central elements in a larger plan of curricular modification designed to enhance learning in all the biology program of study at Dillard University.

The requested equipment items will supplement those already on hand and others to be obtained with funds from our HBC-UP grant.

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and consultants and collaborators. Begin with the principal investigator/program director. Photocopy this page for each person.

Name **Dr. Syed Adeel Ahmed**Position Title Assistant **Professor of Computer Science & Physics Pre-Engineering**

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

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Osmania University, 1997 Hyderabad, India		B.S. Degree	Electronics & Communication Engineering
University of New Orleans, 2001 Louisiana, U.S.A		M.S. Degree	Electrical Engineering
University of New Orleans, 2007 Louisiana, U.S.A		M.S. Degree	Engineering Management
University of New Orleans, 2007 Louisiana, U.S.A		Ph.D. Degree	Engineering & Applied Sciences

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

Membership

Department

◆ Advisor - DOS Computer Science Club & Education

Division

◆ Faculty Search Committee - Natural Science

Honors and Award

- ◆ Ranked#1 in Business Strategy Game (BSG) Simulation (U.N.O)
- ◆ DU-LAMP tutoring service award 2002-2004

Current Position and Activities

- Assistant Professor, Dillard University, Computer Science & Physics Pre Engineering, 2001-Present
- Adjunct Professor, Southern University of New Orleans, Physics, 2006-Present
- Adjunct Professor, Tulane University, Computer Science, 2008-Present
- Member of the Southern Association for the Accreditation of Colleges and Universities, 2001 - Present

Colleges and Universities Visited:

◆ HBCU Conference, Fayetteville, University of Arkansas Feb.14-18, 2004

◆ Minority serving institutions research partnership conference 2008 at Hilton Hotel (May12-14) New Orleans L.A.

◆ NSF/NASA conference Feb. 20-24, 2007 in Washington D.C

◆ Network Security Management workshop at Tulane University (Dec 7th 2007).

◆ Blackboard & Tegrity workshops at Dillard University (April 2008).

◆ Electronic Publishing Conference at University of Toronto, Canada (June 23-27, 2008).

Currently Active Support

- ◆ **State of Louisiana Board of Regents Support Fund (2004)
under the Multi-Disciplinary, Multi-Institution Enhancement Program
(Virtual Reality Enhancement for New Orleans Area Universities) \$50,000**
- ◆ **State of Louisiana Board of Regents Support Fund for Enhancement of**

Computational Chemical Engineering. \$50,000 (2003)

PRESENTATIONS:

◆Efficient mobility management for vertical Handoff (U.N.O)
access networks (U.N.O) ◆Seamless handover in terrestrial radio
airline tickets (U.N.O) ◆Analysis of the problem of Overbooking for
Shipyard) ◆Virtual Reality for Ship Building (Avondale
(Avondale Shipyard) ◆Hand Gesture Recognition (Avondale Shipyard)
◆Perceptual User Interface (PUI) vs. GUI
Networking (U.N.O) ◆Business Strategy Game Simulation (U.N.O)
◆Polarization optics, Lasers, Fiber Optics,

◆Usability Studies with Virtual & Traditional
Computer Aided Design Environments, PhD Dissertation,
December 2006.

◆Coupling of light to silicon detectors using
frustrated total internal reflection (FTIR): Theory
and application, M.S. Thesis, December 2001.

CURRENT AND PENDING SUPPORT

(From ALL sources, including Board of Regents Support Fund)

The following information MUST be provided for each investigator and other senior personnel.
Use additional sheets as necessary.

NAME OF INVESTIGATOR: Dr. Ruby Broadway

Status of Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future

Contract Number/Proposal Title:

Source of Support: Borad of Regents Research

Award Amount (or Annual Rate): \$180.0000 Period Covered: 3 years

Location of Activity: Dillard University – Stern Hall

Person-Months or % of Effort Committed to the Project: Cal Yr 75 Acad 100 Summ

Status of Support: ☐ Current ☐ Pending ☐ Submission Planned in 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: ☐ Current ☐ Pending ☐ Submission Planned in 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: ☐ Current ☐ Pending ☐ Submission Planned in 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 2008-09**

Budget Pages

Year 1:

	Support Fund Money Requested	Institutional Match ¹	Private/Other Match ²
A. Equipment ³	\$47690	\$	\$
B. Software	\$6349	\$	\$
C. Supplies	\$2000	\$	\$
D. Shipping/handling	\$	\$	\$
E. Installation	\$	\$	\$
F. Personnel training	\$	\$	\$
G. Other	\$	\$	\$
H. Indirect costs	Not allowed	\$	\$
I. Maintenance	Strongly discouraged	\$	\$
J. Total costs (A-I)	\$56039	\$0	\$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	\$47690	\$0	\$0
B. Software	\$6349	\$0	\$0
C. Supplies	\$2000	\$0	\$0
D. Shipping/handling	\$0	\$0	\$0
E. Installation	\$0	\$0	\$0
F. Personnel training	\$0	\$0	\$0
G. Other	\$0	\$0	\$0
H. Indirect costs	Not allowed	\$0	\$0
I. Maintenance	Strongly discouraged	\$0	\$0
J. Total costs (A-I)	\$56039	\$0	\$0

Budget Justification and Budget Narrative

Justification for each item is as follows:

Equipment

The 25 Desktop computers & monitors with installed and wireless connections are absolutely needed to accommodate instructors that have training in Blackboard, Inspiration, MarcoPofo, and other multimedia learning in the classroom. **\$34,225.00**

LCD Projector **\$500.00**

The 9 Flip Top Access workstations with storage racks are needed to accommodate enough workstations in the available space. **\$680.00**

The two (2) Adjustable Hi-Tech workstations are needed to accommodate our faculty, staff: and students with special needs/disabilities. **\$700.00**

The 25 contoured High-Back chairs are ergonomically designed for lumbar support and are required for those persons who have disabilities. **\$2,225.00**

The two (2) Phaser 6250 DX Color Laser printers are needed to produce high-quality, permanent documents and to accommodate faculty, staff, and students actively engaged in research and presenting. **\$9,360.00**

It can be documented that each item of the above listed equipment plays a very vital role in the implementation of this state-of-the-art computer laboratory. If funds are provided to purchase the above equipment, the Computer laboratory will be able to carry out all multimedia and technology based applications for research, presentations, and learning.

Software 6349.00

A total of **\$4349.00** is requested for supplies

The successful utilization of the above listed equipment is dependent on the availability of the software.

Inspiration enables students to brainstorm and explore relationships among concepts through both visual diagramming and outlining. This software is also designated to work with Braille systems. Students can work individually or in small groups to develop "maps" of related concepts they have studied or to organize ideas prior to writing. The

technology makes possible moving seamlessly between verbal and visual modes (left and right brain?) and instant revision.

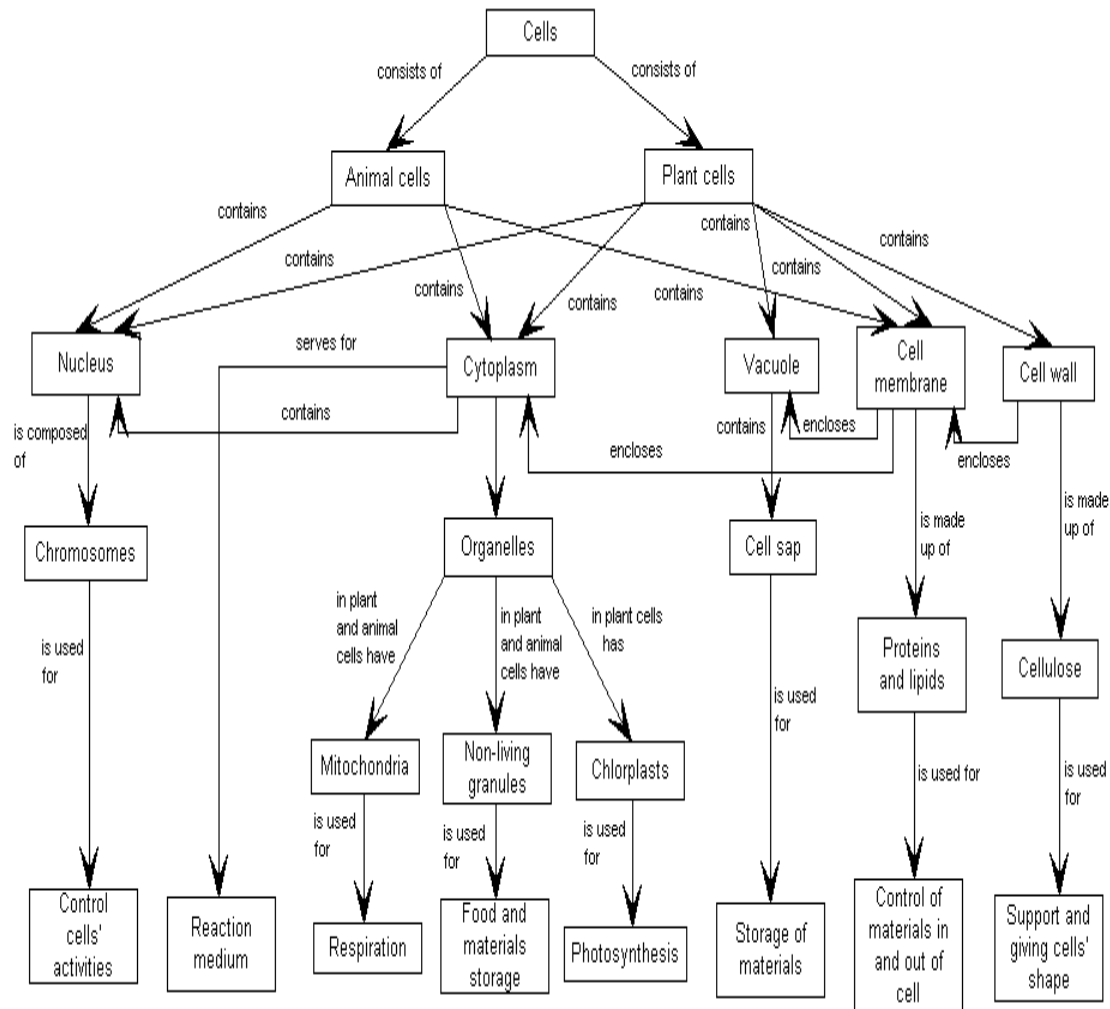
Biology Labs on-line Full series are virtual labs that will allow science majors, non-science majors, and students to participate and perform virtual labs such as fetal pig dissections and genetics populations of fruit flies. **\$1,000.00**

A.D .AM software (Animated Dissection of Anatomy for Medicine) is a simulated human being with all anatomical structures from skin to bone. Students can explore various facets of human anatomy by simulated dissection, learning how structures relate to one another. **\$1,000.00**

SUPPLIES

A total of **\$2,000.00** is requested for supplies to purchase the necessary wiring, hubs, routers, and other computer accessories.

SAMPLE CONCEPT MAP



On the following page is a module of a virtual (fetal) pig dissection (VP available at http://www.whitman.edu/offices_departments/biology/vpd). This is an ongoing website that includes study guides and quizzes on the following: anatomical references, sexing your pig, digestive system, excretory system, circulatory system, reproductive system, respiratory system, and nervous system. This website was created for the sole basis of having alternatives to actual dissections and as review materials prior to exams.

