COVER SHEET AND UNIVERSITY ENDORSEMENT

A. PROJECT SUMMARY

As a result of the use of Self-Study Preparatory Videos (SSPVs) produced with infrastructure developed using funds from the Dreyfus Foundation and Louisiana State University (LSU), we will expand and deepen the educational experience of undergraduate students participating in analytical chemistry laboratories at LSU through consistent, high quality education with high-technology instrumentation. In addition, the impact of the SSPVs on undergraduate chemistry education will be broadened by their utilization on neighboring Louisiana university campuses that do not have access to high-tech instrumentation.

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C. PROJECT DESCRIPTION

Goals and Objectives

The immediate goal of the project at hand is development and evaluation of a specialized educational tool that will be one of several in the "toolbox" used for instruction in laboratories that utilize high-tech equipment and instrumentation. Specifically, the educational tool to be developed here will become integral to the complete education of undergraduate students in the use and role of analytical instrumentation in the chemical laboratory. In addition, the project described here will influence the training of doctoral students (teaching assistants) in the Department of Chemistry. Ultimately, the project described here will lead to similarly fashioned educational video tools that can be used to educate undergraduate science students at Louisiana State University (LSU) and other Louisiana Universities about cutting-edge instrumentation and its role in their specific area of science.

The final outcome of the project will be the dissemination of carefully trained scientists—with high-technology skills—to career paths in the public and the private sector. Such scientists are in great demand throughout the United States and around the world. This demand is even greater in the State of Louisiana, where are located over 260 chemical facilities, many government laboratories and universities, and satellite offices for instrumentation companies. For example with the chemical industry in Louisiana, over 30,000 people are employed directly and over 235,000 indirectly, leading to the influx of $7.2 billion/year to the State ($0.75 billion/year in state and local taxes); the number of jobs associated with the chemical industry is expected to rise by almost 30,000 within the next 6 years. Indeed, the education/training of students in high-tech areas and their employment at high-tech facilities is one of the three goals of the *Louisiana Vision 20/20 Plan* established by the Louisiana Department of Economic Development.[1]

Through funds provided by the Dreyfus Foundation and Louisiana State University, we will achieve our immediate goal through successful achievement of the following objectives:

- Development and production of Self-Study Preparatory Videos (SSPVs) that are internet accessible and/or in portable format ("instructional video discs" or IVDs)
- Implementation of the SSPVs in analytical chemistry laboratories that educate 350+ science students per year on the Louisiana State University campus
- Evaluation of the efficacy of the SSPVs in the instruction of students in the analytical laboratories at LSU

- Sharing of the SSPVs with neighboring Louisiana universities that do not have access to cutting-edge analytical instrumentation
- Dissemination of the outcomes of the study to faculty and students in the sciences at Louisiana State University and other universities, as well as the public, through symposia at national and local chemical society meetings, publications in chemical education journals, websites at LSU and the Louisiana Chemical Association, and LSU and Baton Rouge[2] newspapers.

Background and Significance

Analytical chemistry in the 21st century, whether it be in the research, service, or teaching laboratory, will be an area of the sciences that relies upon the use of cutting-edge instrumentation, instrumentation whose use will "spill over" into other sciences and engineering. This utilization of new analytical instruments is quite evident of late in the biological and environmental sciences, particularly in the subdisciplines that target genome, proteome, environmental and toxicology research. At the same time, knowledge gained in these health/environmental-related research areas through the use of new instrumentation has made more successful the research undertaken by analytical chemists. As a result, it is now becoming more difficult to identify the scientific "label" (chemist, molecular biologist, environmental engineer, etc.) of the participants in a given research or service laboratory. This blurring of borders between scientific disciplines is something that is being embraced by research and service laboratory scientists. Thus, to be competitive, undergraduate science students must have the proper training to be selected for participation in such environments.

Elementary and secondary science education is currently in the process of reform as advocated by such documents as Benchmarks for Science Literacy[3] and the National Science Education Standards.[4] Students entering the university frequently expect that their education at this level will be a natural extension of what they have previously experienced. The National Science Education Standards state,[4] "Conducting scientific inquiry requires that students have easy, equitable, and frequent opportunity to use a wide range of equipment, materials, supplies, and other resources for experimentation and direct investigation of phenomena." At the undergraduate level, this means that students should have access to the types of equipment that they may reasonably expect to use when they graduate, whether they pursue careers in the public or private sector. In addition, the students must be allowed to explore the use of this equipment at a level that challenges the student and provides results that the student can interpret and use. Unfortunately, for many undergraduate students enrolled in chemistry courses, the lack of the necessary university resources for high-quality, consistent instruction concerning the theory *and* practice of high-tech instrumentation does not allow student access to the state-of-the-art equipment that they can expect to use upon graduation.

Studies indicate that laboratory activities can "promote inquiry, intellectual development, mastery of problem-solving skills, and manipulative skills that can lead to the formation of concepts in science".[5] Yet the mere fact that several investigators have questioned whether laboratory courses are a waste of time leads one to the conclusion that the science laboratory frequently does not live up to its promise.[6] When students have limited access to state-of-the-art technology, meaningful concept development is impeded. A method whereby students can be trained in both the theory and methodology of complex scientific instrumentation that emphasizes the individual learner is needed. *The Self-Study Preparatory Video (SSPV) technology proposed here is one teaching tool that can benefit both students who need training on the theory and use of complex instruments before handling the instruments and those students who require knowledge of current instrumental techniques but have no access to the requisite instrumentation*.

Chemistry as a discipline integrates mathematical thinking, visual learning, and kinesthetic skills. This is an ideal discipline in which to integrate computer technology so as to enhance learning. Gammon[7] lists six important types of software used in chemical education: tutorial software and lecture aids, laboratory simulation, laboratory data acquisition/analysis, modeling and data manipulation, instrument simulation/instruction, and computer/videodisc databases. Many well-designed chemistry tutorial programs are currently available. Similarly, several excellent data acquisition packages are now commercially available; among these are the IBM Personal Science Lab Vernier software (Vernier Software, Portland, OR), PSL (IBM Corporation, Armok, NY) and LabWorks (SCI Technologies, Inc., Bozeman, MT). Most undergraduates have access to excellent spreadsheets, which have traditionally been the workhorse of modeling and data manipulation, and several interactive computer/videodisc databases such as SpectraBook I & II are now available. What many undergraduate students lack is access to state-of-the-art chemical instrumentation that is frequently only found in large research institutions and industrial and governmental research facilities, or if they are lucky enough to be at such an institution, they suffer from not having the opportunity to obtain the requisite training for use of high-tech instrumentation. Interactive, "portable" videos may offer such students the opportunity to be educated, in a thorough manner, about the practical use and theory behind the use of such instrumentation. These videos must be broad in scope, transportable, and editable to suit the needs of the given environment.

The advantages of the proposed SSPVs (internet server-based or compact disc-based) over traditional instructional video tapes are several. First, high quality videos can be produced and edited more readily than video tapes with only minimal "up-front" training of the videographers. Because the SSPVs can be so easily edited, the course instructor can choose specific examples most useful to his or her students in an apparently seamless presentation. Thus, a general introduction to use of a given instrumental technique can be followed by one or more specific examples. Because the individual segments of the SSPVs can be indexed and accessed similar to scene selection in DVD movies (in a non-linear search format), the student can quickly navigate to desired sections of the SSPV. In addition, the ability to have SSPV segments containing voice and text descriptions of the up-close images of the "inside" of instruments will help battle the "black box" syndrome often times found among students. Finally, due to recent advances in commercially available video-compression software, the specific SSPVs may be distributed on CD (30-40 min of video per CD) or readily viewed over the internet from a server for on- or off-campus use. See http://www.chem.lsu.edu/htdocs/people/rlmccarley/mccarley/camd.html for an example of a video compressed using this software (2 min video = 15 Mb); PLEASE USE INTERNET EXPLORER 5.0 OR LATER TO PROPERLY VIEW THE TEST VIDEO. Thus, the material available on a given topic can be encyclopedic in scope; such technology far supercedes what could be done using standard videotape technology.

Current Environment at LSU

Few university chemistry departments offer sophomore and junior undergraduate science majors the opportunity to experience teaching labs where they have the opportunity to experience hands-on use of high-tech instruments. The quantitative chemical analysis laboratory at LSU was not too long ago a traditional wet chemistry course, but within the past few years, both the "quant" lecture and laboratory have moved toward a hybrid wet chemistry/instrumental education process. This change came about so as to meet the needs of the highly diverse group of students that matriculate through our analytical laboratories. In addition, the type of equipment that was available to our senior-level chemistry majors in our instrumental analysis laboratory was becoming less and less high-tech when compared to what LSU graduates found in industry and graduate school. Finally, little was being done with the use of internet-based methods for instruction.

Through the efforts of several faculty at LSU, an analytical chemistry laboratory is being established that will offer hands-on use of high-tech instrumentation to sophomore- through senior-level students. The individual laboratory courses are Analytical Chemistry 2002 and Instrumental Analysis 4553. The students taking the two analytical chemistry courses are majors in biological science, chemistry, physics, environmental engineering, biochemistry, and geology numbering greater than 350 per year. Through extramural and state funds of more than $300,000 acquired over the past year and a half, we are currently outfitting this laboratory with top-of-the-line instrumentation. Once in place, the laboratory will contain the following: two capillary electrophoresis units, two high-resolution Fourier-transform infrared spectrometers, three high performance liquid chromatographs, four gas chromatographs with electron-capture and flame-ionization detection, three atomic absorption spectrometers, four ultra-fast scanning ultraviolet-visible spectrometers, a gas chromatograph/mass spectrometer, and a fluorometer.

The laboratory educational modules (lab experiments), LEMs, to be performed in the two analytical laboratory courses are directed at our clients' major areas of study. Using capillary electrophoresis (CE) as an example, we are developing LEMs that demonstrate the use of this cutting-edge instrumentation in the detection/identification of toxic metal ions in complex media (environmental samples), and the separation/identification of biopolymers (DNA from restriction fragment digestions). In addition, we will demonstrate the role that micromachining plays in the miniaturization of CE equipment by having our instrumental analysis students make use of miniaturized CE devices ("chips") constructed at LSU's Center for Advanced Microstructures and Devices (CAMD).[8] Similarly, LEMs that focus on the role instrumentation plays in a variety of scientific disciplines are being developed. Some of these include gas chromatography/mass spectrometry (pesticide analysis), ultra-violet/visible and fluorescence spectroscopies (drug binding), liquid chromatography (evaluation of antioxidants in wine), and infrared spectroscopy (atmospheric reactions).

In addition, the instructors have also developed and instituted an internet-based submission/grading system for quizzes and laboratory reports.[9-12] Laboratory students are able to determine instantly if their data are within an acceptable range or if experiments need to be repeated (without penalty by using the "second-chance" grading philosophy developed at LSU[12]) during that lab period before moving on to other portions of the LEM. This environment prevents "wasted lab time" if only a portion of an LEM must be repeated and emphasizes the importance of proper technique in the laboratory. Thus, we are currently developing the infrastructure to thoroughly and properly train students in this high-tech laboratory environment, but need an additional tool to complete the picture.

SSPVs and Their Role in the Analytical Laboratory Courses

Eight Self-Study Preparatory Videos will be prepared for the quantitative analysis laboratory and six SSPVs for the instrumental analysis laboratory. The SSPVs will be broken up into "core" video/audio segments that cover the general theory and practical issues for a given type of instrument and "periphery" video/audio segments that demonstrate proper use and implementation of a given instrument for a particular application (experiment at hand). Key points, including safety issues, will be clearly delineated through the use of text-over video segments throughout the SSPVs. Due to the non-linear search and indexing capabilities of the SSPVs, it will be easy for students to review sections for further reinforcement; the clarity of these points will then be evaluated through on-line quizzes before entering the laboratory and using the equipment.

Initial efforts will focus on the production of the core segments for three of the SSPVs due to the fact that a good fraction of these can be used to make SSPVs for both the upper-level and lower-level laboratory courses. Experienced users of similar equipment and novices will be shown the segments and a preliminary review conducted so that enhancements to the core videos can be made. At this point, the remaining portions of the SSPVs for both courses will be completed. Test subject evaluations will be performed and adjustments made. Then the remaining SSPVs will be targeted. Of the 14 SSPVs to be made, 11 of those will be based on equipment in the analytical laboratories and 3 will focus on instruments that are not available to our LSU students in the analytical laboratory. Our plans are to make an SSPV on X-ray powder diffraction as it applies to assessing the crystallinity of nano-particulate magnetic materials, another on Fourier-transform Raman spectroscopy (FT-Raman) for applications in macromolecular chemistry, and a third focusing on matrix-assisted laser-desorption mass spectrometry (MALDI-MS) applied to nucleic acids and proteins. Professor Julia Chan has agreed to the use of her X-ray powder diffractometer; Dr. Felicia Graves, who is employed at Dow Chemical in nearby

Plaquemine, LA, will help with the FT-Raman video (equipment at Dow); and Dr. Tracy Donovan McCarley, Mass Spectrometry Facility Manager at LSU, will assist with the MALDI-MS video.

Weekly meetings between the faculty (McCarley, Lyon, Reese) and the student videographers will ensure that videos with the desired qualities are produced in an efficient fashion. The instructors will be able to place in the videos and share with the teaching assistants their 40+ years of lab/class room teaching experience with analytical chemistry, as well as their experience with multimedia and internet-based educational tools. During these meetings and others, the students and faculty will also be able to interact with Dr. Stryjewski in order to obtain valuable information on proper techniques of videography for scientific applications.

Copyrighted material will not be targeted for use during the development of the SSPVs. However, if it is in the best interest of the videographers or student customers, we will obtain permission from the original copyright owners to make use of the materials. The copyright for the various SSPVs will be held by LSU but will not be used for profit.

The SSPVs will be available to students in two forms; both forms are portable and will meet the needs of all students. We will place the SSPVs, arranged by instrument type, on a server (requested here) so that students can log into the server and view/download the videos. In addition, the SSPVs will be available to students on CDs (instructional video discs-IVDs) through both the LSU library system (reserve check out) and the LSU Department of Chemistry (purchase for a nominal fee to cover the costs of the recording media). The IVDs can be viewed on one of over 1000 personal computers available to undergraduates on the LSU campus; in addition, all dormitory rooms at LSU are ethernet-ready (100 Mb/sec) for students who have a personal computer.

Once students in a given laboratory section have viewed the SSPV for a particular experiment, they will log into our chemistry laboratory website and take a pre-lab quiz automatically generated and then graded making use of a database program already in place.[9,10] Students successful with the pre-lab quiz will then print out their graded quiz, which will also have the daily password for the computer controlling the instrument over which they were examined, and they will then be ready to begin their experiment. The unsuccessful student will be allowed to take a "second-chance" quiz;[11,12] the key points the students missed on the original quiz will be highlighted on the hardcopy of the graded quiz so that the student can review the SSPV and correct their deficiencies. Once the student has reviewed the SSPV, they can then take the second-chance quiz and advance into the laboratory.

In addition to the use of SSPVs at LSU, we will provide access to the SSPVs on our server to students at Nicholls State University in Thibodeaux, LA (NSU), University of Louisiana at Lafayette (ULL), and the Nursing School at Our Lady of the Lake Medical Center in Baton Rouge (OLOTL). The students at these schools either have limited or no access to any cutting-edge instrumentation. Those that do have limited access to instruments will utilize our internet-based grading system so that we may determine the effects of the SSPVs on their students. We already have existing relationships with faculty at NSU (Prof. Mike Janusa), ULL (Prof. Bob Braun), and OLOTL. Many of the faculty, such as Prof. Mike Janusa at NSU (http://chem.nich.edu), already utilize internet-based submission/grading of assignments and are committed to this project.

Assessment of Project

Effectiveness of the SSPVs will be measured using several methods. Each LEM should be complete and in use before the SSPVs are developed. Thus, laboratory data and scores obtained from students who did not have access to the SSPVs will be collected. These data will be compared with that from students in subsequent courses who used the SSPVs. Because the internet-based lab report submission programs currently in use in the analytical courses[10] readily enable collection of demographic data over the internet, generalizability studies of both sets of classes will be performed. Statistical comparisons of groups of students who made use of the "second chance"[11,12] option and those who did not require it will serve as another indicator of the effectiveness of the SSPVs. Finally, student surveys will provide both qualitative and quantitative data regarding student perceptions of the SSPVs.

The ability of mass communication technology to impact learning in science has been the subject of many studies since radio was the dominant medium in the 1950's. Many of these studies are reviewed by Weller,[13] who notes that the results are decidedly mixed. Weller describes many of the pitfalls associated with studies comparing one instructional medium to another, and emphasizes that when comparing one medium to another, it is important that only the media investigated can be different. However, in educational settings, it is frequently difficult to control other factors.

Leonard found no significant differences in scores between a group of introductory biology students who used videodisc technology to study two units on respiration and biogeography and those who did not.[14] Similar results were obtained by Billings and Cobb in their study of upper-division nursing students studying the auscultation of heart sounds.[15] In contrast, Levin found significant differences in scores of female seventh grade students who used videodisc technology in seven lessons on earthquakes.[16] And Vitale and Romance found that embedding a commercial interactive videodisc within classical coursework was significantly more effective than coursework alone in remediating deficiencies in an elementary science methods course.[17] Perhaps the most compelling study indicating the effectiveness of videodisk technology in enhancing learning was an in-depth quantititative study by Bunderson et al. that studied the learning of DNA structure and function and protein synthesis at both Brigham Young University and Brookhaven Community College.[18] These investigators found that videodisk technology significantly enhanced learning when compared with lecture alone with an effect size of 0.57 (improvement by 0.57 standard deviation).[18]

In evaluating the effects of the SSPV technology on learning in a state-of-the-art analytical chemistry laboratory, we feel that we have created the ideal environment in which to control extraneous factors and assure that the predominant effect studied is that of the SSPVs themselves. By its very nature, analytical chemistry is a quantitative discipline. Collection of number is grist for the analytical chemist's mill, and evaluation of students is commonly done by the numbers that they generate. At this university, we have developed a set of programs that allow students to submit both their raw data and calculations via the internet.[10] These data are placed into a spreadsheet and processed. Students' raw data compositions of chemical unknowns are compared to both their calculated values and the 'true' values. A large course enrollment combined with a large number of chemical parameters gives these investigators access to a database that would be difficult to achieve in any other manner. Access to multiple sections and the use of SSPV technology in successive semesters offers the opportunity to minimize differences in learning caused by effects other than the SSPVs. Access to student records gives the opportunity to use ANCOVA (statistical test) to control for effects such as age, sex, race, and ability as determined by grade point average.

More enlightening than quantitative studies of student learning may be qualitative analysis of students' perceptions of their own learning. Internet technology greatly facilitates this type of analysis. We propose to develop a questionnaire consisting of a series of both quantitative (Likert-scale) and open-ended questions for students in our analytical chemistry laboratories who have had access to our SSPVs regarding their own perceptions of their learning. Likert-scale type questions can be analyzed using classical statistical techniques. Student answers to the open-ended questions will be submitted to us as text files and analyzed by successive unitization and categorization using the technique of Lincoln and Guba.[19]

Outcomes from Project/Long-Term Impact of Project

Such a route for pre-laboratory preparation will allow the student to learn the required information in a rigorous but fair manner, lead to higher student confidence concerning the use of cutting-edge equipment, provide more time for the instructor and teaching assistants to spend on the global education process of the laboratory, and decrease the number of costly operator errors. The pre-laboratory education/evaluation system described here will also yield additional time for the students to learn more about how the instrumentation they are using interfaces with the scientific area being investigated (molecular biology, atmospheric chemistry, geology, etc.). Finally, upon graduating from

LSU, the students will be more competitive in their career paths as a result of being properly trained in the use of high-tech analytical equipment.

Roughly 700 students will be exposed to the SSPV program in analytical chemistry at LSU over the period of the grant. Of those 700 or so students, 400 will be female, 100 will be African American, 70 will be chemistry majors, 100 will be agriculture majors, and 500 will be biology majors. Thus, the diversity within this group will be large, and so will be the careers they pursue. However, they will have two things in common—extensive experience with high-technology instrumentation and outstanding career opportunities.

This project should lead to significant developments in chemistry and other science laboratories in the College of Basic Sciences at LSU. The need for instrumentation and the requisite high quality, consistent training associated with such equipment will continue to grow in organic, general, physical, and materials chemistry laboratories. Thus, the SSPVs developed here should lead naturally to the use of training videos in all of our laboratories at LSU that educate ~2500 students per year. It is easy to envision the use of such instructional videos in physics, geology, biology, and engineering laboratories—courses that require significant pre-laboratory training. Although not an "end-all" in the laboratory education process, the proposed instructional video program will have a tremendous impact on the way students at LSU view their laboratory training and their future career paths involving laboratory instrumentation, whether that be in an academic, industrial, national, or service laboratory.

From a raw economics point of view, the cost per student over the two-year period will be approximately $150, or an amount less than the annual LSU Technology Fee charged to all LSU students. This investment is small when one considers that the average salary of an employee of one of the high-tech businesses in Louisiana, namely chemistry, is $55,000 per year. It is also small considering that the majority of our chemistry majors are now going on to graduate schools such as Berkeley, Michigan, Florida, North Carolina, and Purdue. Finally, the investment will not be restricted to chemistry or the sciences at LSU, we will also be introducing this technology to other colleges and universities within the State, which will propel those students and their careers.

Dissemination of Outcomes from Project

In addition to the traditional routes to dissemination such as publication in chemical education journals and presentation of papers at national meetings, we will institute a three-point plan to "publicize" this project. First, we will create opportunities for student and local newspaper reports, similar to what has been done for our summer research programs in chemistry.[2] This will create grass-roots support for such endeavors and help foster future projects, as well as educate the public about how high-tech education affects them and their families. Second, we will work with Dr. Lyon's contacts at Louisiana Public Broadcasting to produce a "science and technology concentrate report" that will air over the 6 LPB stations that reach over 300,000 Louisianans per week. Finally, we and our co-collaborators at our neighboring institutions will give presentations on the project to local sections of the American Chemical Society to demonstrate the value of such programs to their future employees.

Strategies for Project Continuation

Our long-term plan is establishment of a digital recording studio that focuses on science education. The main expenses for this type of project will be associated with staff funding. Occasional needs for supplies and new equipment can be met through University avenues in the early stages. The Department of Chemistry has a large commitment to this project and will attempt to continue this commitment when funds are available. In order to establish a steady funding base, we will submit a proposal to the Louisiana Board of Regents in the fall of 2001 for the salary of two teaching assistants for three years starting in the summer of 2003. Matching money would be provided by the University in the form of supplies and equipment. In addition, matching funds may be obtained from Dow Chemical; Dow has played a very active role ($16,000 in funding) in establishing the instrument-intensive analytical labs that we are now building.

D. INSTITUTIONAL CHARACTERISTICS/RESOURCES

The qualifications of the principal investigators (PIs) are such that initiation, implementation, and evaluation of the SSPV program in the analytical laboratory courses will be highly successful. Two of the PIs (Reese and Lyon) have been extensively involved in internet-based, automatically graded homework and laboratory reports.[9-12] The other PI (McCarley) was one of the first at LSU to utilize internet-based teaching methods in analytical chemistry, has received training for the production and recording of videos on CDs from Dr. Stryjewski, and has used novel teaching methods in both analytical lectures and laboratories. Dr. Lyon has a Ph.D. in science education, a proven track record in the design, implementation, and evaluation of new teaching methods in lecture and laboratory courses, and an intimate relationship with our local Louisiana Public Broadcasting affiliate. Dr. Reese has a long-standing involvement with our local chemical industry and was instrumental in obtaining funds for equipment purchases in the analytical laboratories.

LSU is a Carnegie I Research Institution and the Flagship of the LSU system. The Department of Chemistry at LSU has an outstanding undergraduate program, and the graduate program is ranked in the top 65 of all departments in the US (National Research Council, 1995). The Department is composed of 27 tenured or tenure-track faculty with annual extramural research funding of greater than \$4.5 M (2nd at LSU). Our graduate population (120 total students) is highly diverse, being composed of roughly 40% female, 35% African American (one of the largest populations in any Ph.D. chemistry program in the US), and 30% foreign Ph.D. students. The faculty has won numerous teaching and research awards (see http://www.chem.lsu.edu/web/faculty.html) and several members hold endowed chairs.

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F. BUDGET JUSTIFICATION

Item	**Cost Each**	**Number of Items**	**Total Cost**
	Total Project Costs		*$108,531*
LSU Direct Cost Contributions:			
Teaching Assistant Salary	$20,000	2	$40,000
Professional Videographer	$4,000	1	$4,000
Sony Digital Video Camcorder	$2,699	1	$2,699
	Total LSU Matching Funds		*$46,699*
	Total Direct Cost Request to Dreyfus Foundation		**$61,832**

Equipment. (See page 1 for details) The project will require the purchase of two computer workstations capable of producing and recording the SSPVs; prices are from Dell Computer, our state contract computer vendor. The computers will each have 512Mb RAM, a CD recorder, 800MHz PIII processor, service contract, 10Gb hard drive for program storage, high memory video and sound cards, and a network card. In order to make the transfer and editing of digital video and sound highly efficient, SCSI arrays of hard drives (ultra-fast video data storage unit) will be connected to the two workstations. In addition, the necessary digital capture board (input from devices) and the associated software will be needed for each workstation. Funds are also requested for purchase of one digital video camera with various video/audio inputs/outputs. It will also be necessary to copy and back up digital video tapes; thus, funds for one digital video recorder/player are requested. Two balanced microphones will be required for digital recording of sound. We also request funds for a centralized server that will house the SSPVs and be used to handle the automatically generated/graded pre-laboratory quizzes and "second chance" quizzes; due to the expected future internet traffic associated with this project both on and off campus, a two-processor server is necessary. Various items associated with equipment training (books, CDs) and equipment supplies (digital video tapes, headphones, sound devices, camera tripods, halogen light sources) will be needed, but are not considered permanent equipment (value < $200).

Personnel. In order to quickly gain the proper insight necessary to record, transfer to computer, edit, and "save" moving images and sound, followed by production of a final product, we will formally interact with a professional videographer, Dr. Wieslaw Stryjewski. He has already advised us on the intricacies of the digital video production process, and has assisted in the selection of the equipment delineated above. His company, Singular Solutions Group, has extensive experience with digital video productions used for equipment instruction. He has agreed to consult with us at a rate of $50/hour for a total of 10 days over the two-year period. Collectively, we estimate that 80 hours consulting over two years will be appropriate to aid us in the production of the videos described here. As an added benefit, Dr. Stryjewski works part time on the LSU campus in the same building that houses the Department of Chemistry, which will (and already has) facilitate(d) interactions between him and our video production team.

Due to the amount of effort that will be needed for timely production of the videos, it is necessary that we have two teaching assistants who can carry out the recording of video/audio segments and subsequently produce the final products. It is important to note that the role of the teaching assistants will be more than just videographer—the doctoral students will become adept at understanding the fundamentals of presenting information to a wide variety of students using many presentation formats, a key to future educators, particularly those in the sciences. The two teaching assistants will work full time on this project (20 hours/week) and will work closely with Dr. Stryjewski at the onset in order to quickly become adept at the entire digital video production process. In addition, it is important that continuity in the knowledge base of the day-to-day operations of the program be maintained. Our plan is to employ two students who have a great interest in this project, one more senior than the other. This differential in position within the graduate program for the two doctoral students is to ensure continuity of the project; our plans are to involve a “newer” doctoral student in the program near the time that the original more senior student will be leaving our program at LSU.

G. BIOGRAPHICAL SKETCH OF PROJECT DIRECTOR

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(225) 388-3239
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Group Web Site: http://www.chem.lsu.edu/htdocs/people/rlmccarley/mccarley/rlm.html

FIELD OF SPECIALIZATION

Analytical Chemistry

EDUCATION

THE UNIVERSITY OF TEXAS, Austin, Texas
NSF Postdoctoral Fellow in Chemistry, October 1990-July 1992
Director of Research: Allen J. Bard

THE UNIVERSITY OF NORTH CAROLINA, Chapel Hill, North Carolina
Doctor of Philosophy in Analytical Chemistry, July 1990
Research Advisor: Royce W. Murray

LAKE FOREST COLLEGE, Lake Forest, Illinois
Bachelor of Arts in Chemistry with Honors, *summa cum laude*, May 1986
Research Advisor: William B. Martin

PROFESSIONAL HISTORY

August 1998–present	Associate Professor of Chemistry LOUISIANA STATE UNIVERSITY
July 1992-August 1998	Assistant Professor of Chemistry LOUISIANA STATE UNIVERSITY

HONORS/AWARDS

LSU College of Basic Sciences Faculty Research Award, 1998
Society for Analytical Chemists of Pittsburgh Award, 1993
National Science Foundation Postdoctoral Fellow in Chemistry, 1991-1992
The American Chemical Society Analytical Division Summer Fellowship, 1990
The Electrochemical Society Summer Energy Fellowship, 1989
Department of Education Fellowship, University of North Carolina, 1989
The North Carolina-American Chemical Society Centennial Scholarship, 1989
The Charles N. Reilley-Upjohn Award in Analytical Chemistry, 1987
Phi Beta Kappa, Sigma Xi, Phi Sigma Iota

GRANTS AWARDED FOR TEACHING RESOURCES

Louisiana Education Quality Support Fund, *Integration of Environmental and Life Science Applications into the Undergraduate Analytical Chemistry Laborotory*
LEQSF99-00-ENH-TR-14, 1999-2000, $61,000; PI, co-PIs are Lyon and Reese.

Louisiana State University Technology Fee, *Augmenting the Undergraduate Analytical Chemistry Laboratories at LSU*, 5/2000-present, $154,000; PI, co-PIs are Lyon and Reese.

H. LETTER OF COST MATCHING

August 24, 2000

Robert L. Lichter, Ph.D.
The Camille and Henry Dreyfus Foundation
555 Madison Avenue
New York, New York 10022
(212) 753-1760
admin@dreyfus.org

RE: Proposal by McCarley et al.

Dear Dr. Lichter:

I am very pleased to write this letter of support for the proposal to your organization from Professor Robin McCarley, Dr. Ron Reese and Dr. Gary Lyon. The idea of having the facilities in the Department of Chemistry at LSU to produce educational training videos for our laboratories is one that I fully endorse. Due to the efforts of faculty like McCarley, Lyon and Reese, our department has seen in the past two years a tremendous influx of funds for the purchase of up-to-date and cutting-edge equipment/instrumentation in our undergraduate laboratories.

Now that the laboratories are beginning to benefit from the implementation of the new equipment, a challenge is arising concerning careful and competent *individualized* instruction associated with the instrumentation. That is to say, we are identifying needs amongst our student "customers" that vary greatly due to the diversity in their training. In addition, it is clear that the methods employed by doctoral students and faculty in the laboratory education process which involves new technologies must be more than those which can be acted out on paper and the chalkboard. This challenge in instruction within the laboratory environment is not and will not be limited to analytical chemistry; thus, the model that the three investigators propose in their application to your organization will be successful for any area of chemistry, and should be readily adaptable to chemical engineering, molecular biology, computer science, or physics, for example. In addition, the ideas and methodologies behind the SSPVs can be used to educate prospective users of high-technology equipment at universities that may not have the resources for such equipment.

In order to support this project and make it successful, the Department of Chemistry will provide matching funds for the proposal in the amount of $46, 699. These funds will be used to support a teaching assistant on the proposed project for two years, the purchase of a digital video camcorder, and the salary of the consulting videographer.

If I may be of any help during the review process, please do not hesitate to contact me at the coordinates below.

Sincerely,

Brian J. Hales

Chair, and Professor of Chemistry
(225) 388-3361
brian.hales@chem.lsu.edu