ANNUAL REPORT OF EFFECTIVENESS

ACADEMIC YEAR 2001-2002

DEPARTMENT OF BIOLOGICAL SCIENCES
COLLEGE OF ARTS AND SCIENCES
DELTA STATE UNIVERSITY

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August 1, 2002
MISSION STATEMENT

The mission of the Department of Biological Sciences is to provide quality instruction in biology, environmental science, and biology education in a manner that will help develop biologically literate, educated professionals. The Department seeks to develop the technical competence and the broad intellectual foundation needed to understand the implications of human influence on all of life and to make informed decisions on biological and ecological questions. The Department also endeavors to meet the general educational needs of the University; to contribute new knowledge in biology, environmental science, and biology education; and to serve the needs of educators, other professionals, and communities within the service area.

VISION STATEMENT

We aspire to be known throughout the region, state, and beyond as a center of excellence in undergraduate biology education. It is our goal to improve to the point that we are held as the standard against which other schools benchmark their programs. To achieve this, we will promote the philosophy that highly technical and dynamic programs in the biological sciences must have priority support status and we will focus our creativity, energy, and resources to achieving that end. We must develop and maintain sophisticated curricula that embrace current technologies, pedagogical styles, and contents that are geared to meet the changing demands of our constituents. Our recent and on-going revision of the biology, pre-health, and environmental science programs to incorporate new demands in those fields are testimony to our resolve to provide up-to-date educational opportunities. Likewise, we desire to expand and enhance our science education program through continued development of the Center for Science and Environmental Education (CSEE). Our vision is for the CSEE to be known as the premier program in the state and region, both for its excellent degree programs and for its formative impact and service in leading and supporting revolutionary development of strong K-12 science education programs in school systems throughout the Delta region. And last, we plan to increase emphasis on research activities that will benefit students and faculty from educational and professional development perspectives.

We envision the department building upon its role as a campus leader in developing and enhancing the university goal of strengthening community outreach. Plans are being made to reform the biological science curriculum to bring more emphasis on civic responsibility and community engagement through experiential and service learning. Continuing education and other post-graduate educational opportunities will be expanded in response to interests and needs expressed by the community. Two major avenues for achieving this part of our vision are (1) our leadership in development of a campus arboretum, gardens, museum, and associated programs for the campus community, school groups, and the lay public and (2) our development of the CSEE outreach programs for the general public.

Finally, we see that external funding will be a much more important component of our resource base in the future. We will continue to aggressively increase our efforts in development activities and, with university support, we will increase grant writing to support departmental programs and demands for resources. We will work toward greatly expanding our endowment to assist in ensuring an adequate and sustainable resource base for our future.

OVERVIEW OF RECOMMENDATIONS AND REQUESTS FOR 2002-2003

The department offers the following recommendations and requests in response to existing demands to meet our vision of excellence in undergraduate education. Additionally, we have been asked to place greater emphasis on engagement in terms of community outreach. We have expanded our efforts to secure external funding through increased involvement in development activities and in grant writing. These new
pressures are redefining the traditional roles of faculty at Delta State University and specifically those in the Department of Biological Sciences. The central administration has been willing to alleviate some existing pressures that we might attempt to develop and meet these new goals. It has not been possible to achieve desired levels of success relative to these new pressures because of lack of significant institutional investment to facilitate the effort required by faculty and the department. The following recommendations and requests summarize the attention that needs to be given to the department if we are to continue meeting “both” existing and new goals:

- Enhance support of the department so that it may attain the goal of becoming truly excellent and a standard against which other university biology departments are measured. Expand the departmental budget to assure adequate laboratory instructional equipment, field experiences, and other program needs and resources.

II. Redefine the “12-hour full load” to include provision of release time for individual faculty to pursue scholarly activity, community and university service functions, and support of student research. Provide this incentive to departmental faculty who desire to embrace the institution’s expanded emphasis on research, grant writing and development activities, community engagement and service, and other outreach functions.

III. Demonstrate by action the philosophy that highly technological and dynamic programs in the biological sciences must receive priority support status to assure that program demands are met and maintained.

- Endorse the CSEE as the science education outreach function of the university and the recommendation to umbrella all science education programs under the CSEE for the benefit of the University, Delta science teachers, their schools, and their students.

- Upgrade Malcolm McEwen’s present faculty position in science education to a 12-month coordinator position to provide educational opportunities that match the summer training demands of in-service science educators.

- Create a new faculty position in zoology to share responsibilities of existing faculty, allowing them to be active in scholarly activities, grant writing, and community service.

- Provide funding mechanisms dedicated to acquisition, maintenance, and replacement of equipment, technology, and other programmatic needs on an “as necessary” basis. Establish a line item budget category to provide this resource to the sciences.

- Provide additional funding to support departmental activities in alumni/foundation solicitation and student recruiting efforts.

- Create “new” instructional space to adequately and appropriately house the department.

- Provide up-to-date classroom and laboratory instructional technology and specialized computing needs to enhance instructional creativity of faculty.
PERSONNEL

Changes in Current Positions

- It is requested that Dr. Malcolm McEwen's current 9-month faculty position be upgraded to a 12-month coordinator of science education position and director of CSEE.

Justification: This change of status will assure a dependable and sustainable base at DSU allowing us to develop much needed summer programs that appropriately meet educational and professional development demands of in-service science educators and school districts. Those constituents need DSU to provide meaningful, quality science education support workshops, continuing education programs, student science camps, and academic offerings on a dependable basis during the summer rather than on a piece-meal, hit-or-miss basis. Continuity needs to be assured in order for any effective program to be maintained. This position upgrade would provide Dr. McEwen the opportunity to direct his talents to requisite organizational and grant-writing efforts that will facilitate development of a higher quality science education program at DSU. We must act to meet the existing unmet demands of the regional and statewide science education community as well as the current function of training new science educators. This position change is viewed as critical to implement envisioned programs of the CSEE that will incorporate extensive summer programs as well as school-term programs. This will greatly facilitate President Potter's initiative to increase civic responsibility and community engagement.

IV. We request permission to fill the vacant position in Botany/Plant Taxonomy.

Justification: Dr. Robert Stewart retired at the close of the Spring Semester 2002. His position was frozen due to budgetary limitations. Failure to fill this position has compromised the integrity of our departmental degrees and majors.

V. Dr. Nina Baghai-Riding was promoted to Associate Professor.

VI. Dr. Keith Hughes was promoted to Associate Professor.

VII. Ms. Shawn Thomas is scheduled to complete all requirements for the Ph.D. during fall semester 2002. A dual contract has been issued which will promote her from instructor to Assistant Professor upon completion of all degree requirements.

New Positions

- The request for a second full-time position in science education remains intact.

Justification: Ms. Janice Strickland was employed as part-time Instructor in Science Education and Coordinator of Science Education Programs for CSEE for the 2002-2003 academic session. This position was created in response to our standing request for a second full-time faculty position to support the expanding Biology Education program. This faculty position was needed to alleviate the enormous and over burdened workload of Dr. Malcolm McEwen in administering the B.S.E. in Biological Sciences major and the M.S.N.S. graduate program in education. This position facilitates much needed curriculum expansion, in-service science teacher professional development, and school support functions of the science education program at DSU. The position alleviates pressing needs and facilitates continued
development of the Center for Science and Environmental Education (CSEE). Many of these functions have been precluded or significantly limited due to lack of sufficient science education personnel. Current work loads and community demands needing to be embraced have exceeded Dr. McEwen's capacity. The part-time position should be viewed as a temporary resolution of the pressing problem.

- The request for a second faculty position in zoology remains intact.

**Justification:** This position will provide relief necessary to facilitate the present faculty in writing grants, in developing scholarly and service activities, in developing student research programs, and will provide for the department to schedule adequate sections and diversity of zoology courses. A zoologist previously filled the position now occupied by Jira Katembe which was redefined for cell biology and plant-oriented biotechnology. That change was necessary to meet the growing need for curriculum development in biotechnology. The loss of that faculty position in zoology, coupled with the loss of the previous MAMP director, Mr. Michael Smith, who taught essentially halftime in biology put extra pressure on remaining zoology faculty. The reduction in appropriate zoology personnel has resulted in our inability to offer several courses and restricts release time for existing faculty to write grants or be involved in scholarly activities and community service activities. This position is needed to redistribute the zoology load and thus permit current faculty to embrace the demands for increased scholarly activity and community engagement.

**2001-2002 MAJOR DEPARTMENTAL GOALS:**

The Department of Biological Sciences is attendant to the mission of the University and its goals. Current departmental goals stem from a commitment to achieving the University mission. They address the specific University goals listed below:

- Review and update undergraduate and graduate programs to adequately address basic skills, knowledge, and competencies necessary for students to be properly prepared in their chosen fields, to complete licensure requirements, enter the work force, and/or continue advanced study in graduate or professional school.

- Accommodate non-traditional students and the general public by offering a comprehensive program of continuing education, including off-campus classes, independent study courses, non-credit courses, conferences, and workshops.

- Optimize the effective use of technology in support of the education process.

- Enhance educational experiences at all levels by encouraging student and faculty research and other creative work.

- Improve the use of instructional technologies.

- Refine and coordinate more effectively community and economic development activities.

- Support interdisciplinary centers that contribute to our regional mission.

- Beautify the campus.
• Review academic programs for currency in curriculum, pedagogy, instructional technology use and mission-relatedness.

• Strengthen experiential learning activities.

• Pursue federal and private funding.

• Seek ways to enhance student life on campus.

GOAL 1. The department will provide adequate space, equipment, and resources so that students have the opportunity to develop research and technological skills required for success in their future employment or professional or graduate training. The department will have a strong commitment to attract high quality students by maintaining facilities that keep pace with current developments in technology.

Justification Relative to University Goals

The department is expected to maintain currency and appropriateness of its programs by adequately addressing basic skills, knowledge, and competencies in undergraduate and graduate programs. We are expected to optimize and improve the use of instructional technology. We are challenged to do more to encourage research and creative activities and to increase experiential and service-learning components in our programs.

Assessment Plan for Goal 1

Standing departmental committees on curriculum, renovation, and equipment along with individual faculty will continually examine our facilities, resources, and programs relative to good practice standards in science education and professional employment requirements. Areas in need of development will be identified and recommendations for improvement made. Records of recommendations, requests, and acquisitions relative to appropriate space, equipment, and resources and their use in enhancement of research opportunities will be used to assess success in meeting this goal. Assessment will also be based on examination of course syllabi that relate the incorporation of research and technological skill-building experiences.

Assessment Results for Goal 1

Records of committee actions are present in departmental files for the past several years. Those recommendations and historical data were used in producing an inclusive assessment report to the department and administration entitled Program and Resource Needs of the Department of Biological Sciences, Delta State University, dated January 21, 2000. The findings of that report and subsequent recommendations have called for the instructional and research facilities housed in Caylor Hall to be modernized and for out-of-date equipment to be replaced. We have also documented the need for additional new space to provide students with an environment that exposes them to the latest in scientific instrumentation and computing facilities for learning skills they will need in their future careers. Recommended improvements at that time relative to this goal were:

II. replace aging microscopes in the general botany laboratory
III. purchase specimen preparation equipment needed to make the existing scanning electron microscope (SEM) fully functional
IV. renovate former photographic darkrooms into student research facilities
V. modernize instrumentation for ecology and plant physiology laboratories
VI. provide adequate computer facilities in a local computer lab to facilitate technology integration into classroom and laboratory experiences.

Few of the above requests have been satisfied. They remain valid results of the departmental assessment. Funding was made available at close of the 1998-1999 budget year to purchase five microscopes for the botany laboratory (20 were needed).

In the annual report for 2001-2002, requests consistent with this general goal included the following specific funding/improvement requests:

VII. $1,125 for installation of Internet drops in 15 classrooms and laboratories. This will provide access for real-time web-based activities to all instructors and their students in all courses. Instructors are now prevented from using this new instructional technology and integrating it into their pedagogy because there is no web access in their teaching venues. This request is made as an emergency to relieve faculty frustration and rapidly facilitate integration of the Internet into their courses.

OUTCOME: This request was not met. It remains an active request.

VIII. $13,000 for two SmartCart portable video projection systems with projectors and laptop computers. This will allow flexibility in pedagogy and provide relief for faculty members who want to use web, power point presentations, and other instructional technologies in the classroom. It will also support guest lecturers who want to use power point and other technologies in their seminars. It will provide us with the technology to make appropriate presentations at off-campus venues. We currently have no such technology available at our disposal. These units will have stand-alone applicability and will also be utilized with the Internet drops requested above so that all classrooms and laboratories will have Internet access available.

OUTCOME: This request was not met. As an alternative, two portable digital video projectors were purchased with science endowment funds to partially meet this departmental need. It remains an active request, as further improvement in capability is needed.

• $17,000 is needed for the geology/environmental science laboratory for purchase of petrigraphic polarizing microscopes, storage cabinets, and basic earth science supplies including maps, charts, models, and mineral, rock, and fossil specimens. This request supports all majors. Our new offerings in the very popular areas of geology and earth sciences are rapidly exceeding our ability to meet the student demand. The courses need this further enhancement.

OUTCOME: No additional funding was received to meet this request. One petrigraphic polarizing microscope was purchased with science endowment funds to partially meet this departmental need. Some laboratory specimens were purchased using the departmental commodity budget. This request remains active, as continued development of holdings in this area is required to develop the program to an appropriate level.

• $18,000 is requested to purchase 15 compound microscopes @ $1200 each for the botany laboratory. These scopes are needed to update the laboratory by replacing aged, worn out, broken, and irreparable 34-37 year-old scopes that were salvaged from general biology and zoology about seven years ago. Five new scopes were purchased for the botany laboratory two years ago. This purchase would complete this replacement project and bring the equipment up to par.
OUTCOME: This request was not met. It remains an active request.

Improvements Made Toward Reaching Goal 1

Upon evaluating the department's improvements in facilities and equipment as detailed above, it is clear that little progress has been made relative to achieving measurable progress towards satisfying the needs that have been established under this important goal.

Future Plans Relative to Goal 1

The instructional and research facilities housed in Caylor Hall still need significant modernization to facilitate incorporation of current instructional technology, instrumentation, and evolving pedagogy. Out-of-date equipment must be replaced and additional space must be provided to assure our students an appropriate modern environment, programs, and facilities that expose them to the latest in scientific instrumentation and computing facilities for learning the skills required for their future careers.

Goal 1 remains a valid and critical goal that reiterates the ongoing need for constant improvement of department facilities and programs in order to keep abreast of changing standards and meet the university and departmental missions. The specific requests for improvements as stated above remain valid for 2002-2003. Departmental personnel will continue to seek outside funding through foundation and grant-writing activities to supplement the central budget allocations in achieving elements of this goal.

GOAL 2. Students will work with “cutting edge” middle school and high school textbooks, multi-media resources, and supplementary curriculum materials, e.g., science, technology, and society materials, during their course work in the biology education degree program.

Justification Relative to University Goals

The department is expected to maintain appropriateness of its programs by adequately addressing basic skills, knowledge, and competencies in undergraduate and graduate programs relative to current demands. Instructional technology and instructional resources are developing at an accelerated pace. To meet the University goal of “improving the use of instructional technologies” in our biology education degree program it is mandatory that our students have access to and instruction concerning “cutting edge” curriculum materials, computer software, scientific probeware, and multi-media resources. Many of these items are already available and being used in precollege classrooms in the Delta. In this respect, some precollege science classrooms are better equipped than our biology education training facility here at DSU. Activities associated with the CSEE should assist us in closing this gap but additional support is needed from the University.

Assessment Plan for Goal 2

Should the budget requirement associated with this request be approved, by the end of the 2001-2002 academic year we plan to procure the necessary curriculum materials, software, and multi-media resources necessary to upgrade some of the critical elements of our biology education program. These resources will be used primarily in two courses: CUR 493 - “Teaching the Sciences” and BIO 435/535 - “Methods and Materials in the Biological Sciences”. Students will
construct lesson plans based on use of these new resources and then micro-teach those lessons to other students in the classes.

Assessment Results for Goal 2

Assessment yielded the following request: $5,000 is needed for academic year 2001-2002. This request was not met. It remains an active request.

Improvements Made Toward Reaching Goal 2

A few pieces of instructional software have been obtained through the Center for Teaching and Learning associated with the DSU College of Education. Several CBL 2 units and graphing calculators have been obtained through the Institute for Effective Teaching Practices, an entity managed jointly by DSU and Mississippi Valley State University. Unfortunately, DSU does not own the necessary probeware that must be used with the CBL 2 units and graphing calculators.

Future Plans Relative to Goal 2

The University must make a commitment to adequately support its biology education degree program with resources at a level commensurate with the needs of the program. NCATE expects that students pursuing teacher education degree programs will have access to appropriate resources and technology so that they will be familiar with the use of these materials when they participate in field experiences, complete their student teaching semester, and become first-year teachers.

GOAL 3. The department will continue to reform its curriculum and pedagogy to establish and maintain alliance with national standards for scientific literacy. We will incorporate increased experiential and service-learning activities focused on development of civic responsibility and community involvement.

Justification Relative to University Goals

The department is expected to maintain currency and appropriateness of its programs by adequately addressing basic skills, knowledge, and competencies in undergraduate and graduate programs. We are expected to optimize and improve the use of instructional technology. We are challenged to increase efforts to encourage research and creative activities and promote development of civic responsibility by increasing experiential and service-learning components in our programs.

Assessment Plan for Goal 3

Activities focused at meeting this goal will be assessed by documented changes in course descriptions, syllabi, and programs of study. Other activities that address this goal will be monitored and documented, for example, the outcome of participation in the SENCER project.

Assessment Results for Goal 3

Review of various national standards relative to developing science literacy in majors and non-majors and participation in the SENCER project have resulted in definition of a need to critically examine our programs relative to specific skills and content being taught as well as the pedagogy being employed. It was determined that we should develop and institute a departmental-wide method to evaluate our programs against published national standards for
competency and literacy. It was anticipated that such an on-going assessment would identify areas of omission/weakness and otherwise define needed improvements. It would also provide a mechanism for quantitative evaluation of student and program outcomes.

Improvements Made Toward Reaching Goal 3

Participation in the SENCER project prompted us to target revision of our approach to educating non-majors. It was determined that non-majors should be segregated from majors by developing more appropriate course options. We revised BIO 110 — “Biology and Human Concerns” to reflect SENCER ideals of civic engagement and responsibility and existing national standards for general science literacy. Pedagogy has been modified to include more emphasis on learning cycles, inquiry, and discovery-based learning. We increased the number of BIO 110 sections offered annually from one to three to accommodate the initial transition. This shift of non-majors into a course designed specifically to address their needs will also facilitate reformation of the existing BIO 100 — “Principles of Biology” course to better fit the demands of the biology major. At this time, the non-majors course is well into its reformation as documented in changing syllabi. The major course has not been modified at this time, as it awaits more critical evaluation of needs.

The SENCER ideals of civic engagement and responsibility have also been adopted in other appropriate major courses. Examples are the inclusion of service project requirements in "Introduction to Environmental Science", "General Zoology", "Parasitology", and "Developmental Biology". These are documented in course syllabi.

As a result of recent NCATE accreditation, CUR 493 — “Teaching the Sciences” was increased from a 3 to 4 hour credit to respond to the requirement to include more field experiences in the BSE in Biology Education major.

It was determined that laboratory components should be added to BIO 300 — “Cell Biology” and BIO 328 — “Genetics” in order to incorporate sufficient skill development and to reform the traditional pedagogy of lecture-only in those courses. Techniques associated with laboratory exercises will enhance skill development, critical thinking, and retention of content in our students.

We have made limited improvement in increasing appropriate use of technology in the classroom and in our pedagogy due to acute lack of funding. Acquisition of two digital video projectors enabled three professors to redesign their teaching styles to include use of internet-based assignments, power-point presentations, CD technology, etc. However, most hardware for these developments has been personally provided by those professors rather than by departmental or university budgets. Two courses, BIO 419/519 — “Biostatistics” and BIO 440/640 — “Evolution and Systematics” have been revised to be largely on-line/CD-based courses using WebCT.

Future Plans Relative to Goal 3

Experience with reforming the BIO 110 course for non-majors has demonstrated a need to increase its number of sections. Five sections will be available in fall 2002. We also plan to develop a second non-majors course to complement BIO 110 because the issues-based approach provides sufficient material. BIO 110 will focus on basic concepts in biology as related to human issues such as biodiversity, environment, bioethics, human genetics,
population, sociobiology, and plant and food production. The second course will address more in-depth concerns related to nutrition, health, disease, and medical issues. We hope to offer the second course in spring 2003. This finalizes the needed segregation of non-majors from majors.

We plan to acquire CBL Probeware systems to establish technological investigative laboratories for freshman level biology laboratories as we initiate necessary science curriculum reform. This equipment is central and critical in our plans for appropriate science reform of the BIO 100 course for majors. The estimated cost for outfitting the freshman laboratory is $30,000. Until this equipment is acquired, significant reform of the major sequence cannot occur. We anticipate funding this acquisition through a combination of grant, endowment, and university sources.

Enhancement of faculty capabilities by involving appropriate technology in their pedagogy will be promoted by acquiring requisite hardware as funding permits and through funding of faculty development experiences.

There are substantial general needs to acquire, update, and/or replace dedicated instrumentation and laboratory materials to facilitate reform and appropriateness of our programs. We will continue this process as funding allows.

We will seek needed renovation of our existing building and new classroom, teaching laboratory, and research laboratory spaces to facilitate reform of our curriculum. The current physical plant is archaic and inadequate in design and size to accommodate the changes that have been identified as desirable.

GOAL 4. The department will upgrade its programs and abilities in the area of cell biology and biotechnology through curriculum revision, dedication of resources, and strengthened collaboration with the Department of Physical Sciences.

Justification Relative to University Goals

The department is expected to maintain currency and appropriateness of its programs by adequately addressing basic skills, content, and competencies in undergraduate and graduate programs. We are expected to optimize and improve the use of instructional technology. We are challenged to do more to encourage research and creative activities and to increase experiential components in our programs.

Assessment Plan for Goal 4

Evidence used to measure the success in meeting this goal will be the documentation (catalog descriptions and course syllabi) relative to re-description of existing courses and descriptions of new courses to include meaningful laboratory exercises designed to integrate biotechnology into the curriculum. Also, implementation of these revised courses will testify to the success of this goal. Student opinions and course evaluations will also document progress in meeting this goal. Expenditures relative to instrumentation and supply acquisition relative to this goal will serve as evidence for assessment. Documentation of interaction with representatives of the Physical Sciences Department relative to this goal, such as joint proposal efforts and implementation strategies will serve as additional evidence for assessment.
Assessment Results for Goal 4

We identified fundamental courses in the biology sequence where biotechnology should be integrated to be BIO 100 – “Principles of Biology”, BIO 300 – “Cell Biology”, BIO 442/642 – “DNA Science/Biotechnology”. Other courses where its inclusion is desirable are BIO 317 – “Microbiology”, BIO 328 – “Genetics”, BIO 427/527 – “Immunology”, and CHE 440 – “Biochemistry”. Other courses exist where fundamental biotechnology techniques are transferable and applicable. Examination of course descriptions and syllabi demonstrated that with exception of the formal DNA Science/Biotechnology course, students receive inadequate exposure and training in biotechnology. BIO 100, 300, 317, 328, 427/527, and CHE 440 should be targeted for course revision to include appropriate exposure and training in basic and/or advanced biotechnological techniques as determined to be consistent with individual course and program goals.

Improvements Made Toward Reaching Goal 4

A proposal submitted jointly by the Biological Sciences and Physical sciences departments to ChemFirst, Inc. requesting funds for purchase of biotechnology equipment in support of this goal was not funded. However, funding was secured through the DSU Foundation to acquire a new refrigeration unit and freezer unit to enhance the holdings in the biotechnology laboratory. Joint departmental funds were expended to secure additional supplies for the biotechnology course and to repair non-functional dedicated equipment.

In conjunction with the Physical Sciences Department, we have identified the improvement of biotechnology holdings and program development as a joint priority. It is identified as a priority need in the Foundation’s new Wing & Roots Campaign for Delta State. We have established a funding drive to provide for an endowed professorship in biotechnology that will be a joint appointment between departments. The position will compliment existing faculty positions and will provide for leadership in developing interdisciplinary academic and research opportunities for faculty and students.

The department became affiliated with the new Mississippi Functional Genomics Network. Two faculty members have submitted a research proposal to that organization which, if funded, will provide funding for acquisition of biotechnology equipment and materials and will incorporate student research experience into our curriculum.

The commitment was made to add laboratory components to the “Cell Biology” and “Genetics” courses beginning in fall 2002. Considerable portions of our existing commodity budget will be used to outfit those courses. However, there are no departmental budget funds to supply desired equipment.

Future Plans Relative to Goal 4

We plan to seek funding from NSF through its CCLI program to fund laboratory equipment and instrumentation to meet the requirements for expansion of biotechnological investigations in the suite of courses mentioned above. Additional grant and other funding opportunities will be explored. We request that our central administration build an equipment line item into future budgets to provide for routine acquisition, replacement, and repair of necessary equipment to adequately support the sciences.
GOAL 5. The department plans to develop a campus nature center, gardens, and artoreturn for teaching functions and for utilization in campus and community outreach functions.

Justification Relative to University Goals

One requirement of the department is to address the needs of non-traditional students and the general public. Activities of the department in community outreach projects through its own initiatives as well as participation with various centers are thus appropriate. In working to develop the Delta Nature Center and Gardens the department is mounting a major initiative designed to meet these university goals, as well as enhancing student life on campus, seeking external funding, and providing opportunities to strengthen experiential learning activities for our major and non-major students.

Assessment Plan for Goal 5

Review of documentation related to production of conceptual designs, working plans, foundation development activities, and grant writing activities will help in assessing our success in meeting this long-term goal.

Assessment Results for Goal 5

Work on this goal is in initial stages and has progressed slowly. The overall conceptual design is sufficiently developed to allow Foundation consultants to develop the project as a major goal of the new Wings & Roots Campaign for Delta State. The Foundation is in initial stages of developing campaign strategy for this project. Funds need to be raised to initiate refinement of the concept and to develop working plans. Grant writing activities will require refinement of concepts and some development of working plans before grant proposals can be written in support of this project.

Improvements Made Toward Reaching Goal 5

Conceptual architectural renderings have been generated for inclusion in Foundation promotional materials. Departmental faculty members have worked with Foundation representatives and others to identify and construct an initial list of donors for contact and solicitation of funds.

Future Plans Relative to Goal 5

We will increase the pace of work in identifying potential donors for contact by foundation representatives. Upon securing sufficient initial funding, we will work with architects to refine conceptual plans and develop working plans for initial construction.

GOAL 6. The department will work to expand the operations of the Center for Science and Environmental Education (CSEE) to incorporate both community service and university academic program components. The CSEE will work to meet the resource, professional development, and other educational support needs of Delta school districts, science teachers, and their students and to provide for continuing science education experiences for the broader community. The CSEE will also develop experiential learning activities for departmental science education majors, thereby becoming an active force in our undergraduate and graduate professional education programs.
Justification

The University has identified as one of its goals to “strengthen the cooperative relationships with business, industry, community groups, government, and other educational institutions.” Additionally, in the 2000-2001 University Goals Statement there is a commitment to “support interdisciplinary centers that contribute to our regional mission.” Through its emphasis on development of a comprehensive support structure for pre-college science education in the Mississippi Delta, the CSEE is assisting the University in meeting these goals by establishing partnerships with many of these entities. During the 2001-2002 academic year the CSEE proposes to continue to build partnerships and implement programs that will bridge the gap between the college classroom and the working world for students interested in careers in science education.

Assessment Plan for Goal 6

The CSEE will carefully track utilization of the programs and services that it offers during the 2001-2002 academic year. Another area that will be addressed is the quality of programs offered by the CSEE. Questionnaires will be used extensively to collect this type of information from individuals participating in CSEE programming.

Assessment Results for Goal 6

Assessment results for Goal 6 will be addressed from two perspectives—programmatic and organizational.

Programmatic: The CSEE conducted 14 precollege teacher workshops during the 2001-2002 academic year. Two of the workshops dealt with wetland ecology while 12 focused on instructional units associated with the Great Explorations in Math and Science (GEMS) program. (The CSEE became a national network training site for the GEMS program in June 2001.) The wetland ecology workshops provided K-12 instructors with opportunities to become familiar with innovative approaches for dealing with environmental issues in the classroom while GEMS workshops helped K-8 teachers develop an understanding of hands-on science instructional materials that meet the National Science Education Standards. Approximately 125 Delta area teachers were impacted by these workshops with numerous teachers attending multiple workshops. Results of the analysis of workshop evaluation data indicate that the teachers perceived the workshops to be relevant to their needs and efficiently implemented with excellent instruction.

Organizational: It was determined during conceptual development of the CSEE, that its functionality would be enhanced by establishing it as a separate organization with a discrete budget separate from the department. In the departmental annual report for 2001-2002, recommendations consistent with this general goal included the following specific funding/improvement requests:

- For budgetary purposes, it was requested that the CSEE be identified as an organization separate from the Department of Biological Sciences. Creation of this new organization label and its attendant “org” number in the budget would make tracking of CSEE income and expenses easier. Granting signatory authority over CSEE funds to the Director of the CSEE would facilitate handling of budgetary paperwork.

OUTCOME: This request was met.
As a recently established organization, the CSEE was not previously included in the university budget. The university provided land and buildings at the Merigold site for development of the CSEE. Additionally, cost of utilities (electricity, water, and gas services) at the Merigold site has been absorbed by the university. In addition to continuing use of property, buildings, and utilities, we requested university budgetary support during the 2001-2002 academic year to cover certain expenses associated with day-to-day operation of the CSEE.

OUTCOME: This request was met with a separate budget allocation of $5,000.

Improvements Made Toward Reaching Goal 6

Goal 6 is an on-going goal. We continued our efforts to expand the impact of CSEE and its programming on stakeholders in the Delta through an emphasizing development of a mechanism to insure its sustainability into the future.

The two organizational sub-goals associated with Goal 6 were met during the 2001-2002. We solicit increased financial support of the CSEE by the university as economic conditions permit.

Future Plans Relative to Goal 6

As the CSEE programs continue to develop facilities at the Merigold site the university needs to address three critical areas:

- The property and buildings in Merigold are currently either uninsured or underinsured. Refurbishment of these buildings and then stocking them with scientific equipment and supplies represents a significant outlay of cash that could not be recovered should catastrophe strike. We request that the university review insurance coverage for buildings and building contents at the Merigold site and establish/increase the coverage to realistic levels.

- There is inadequate security at the Merigold site since a security fence does not currently surround portions of the property. We now have a significant investment in trees to protect along with the equipment contained in the metal building. The soon to be refurbished greenhouse represents another investment that needs to be protected. We request that the university complete the perimeter fence so that it surrounds the entire property. This enclosure will double as a safety fence to prevent school children participating in CSEE activities from nearing the adjacent highway.

- A maintenance plan needs to be established for the Merigold property. With exterior painting and structural modifications soon to be completed on the metal building, we need to maintain that investment. The maintenance plan also needs to include a systematic schedule for mowing and lawn maintenance. We request that the university supply the labor to complete the work through its physical plant services as it would for any maintenance project.

DEGREE PROGRAM EVALUATION

The department offers four degree/major programs:

- BS: Biology
- BS: Environmental Science
- BSE: Biology Education
- MSNS: Biological Sciences
As each program has its foundation in the biological sciences, it is obvious that majors in each program will be expected to meet certain common expectations based on commonality in the fundamentals of science and biology knowledge, skills, and practice. They are thus expected to achieve certain common outcomes. Simultaneously, each specific program is tailored to address specific requirements attentive to the requirements of diverse professional opportunities. For example, secondary teachers in biology will have specific outcomes that must be met to graduate and receive certification in order to gain employment in that capacity. Those outcomes have been addressed in the NCATE accreditation report and are reviewed below.

RESULTS OF NCATE ACCREDITATION SELF-STUDY

The BSE in Biology was recently assessed during the university-wide NCATE accreditation self-study. For purposes of this annual report, a summary review of the NCATE self-study and outcomes is used here.

Assessment Plan for Biology Education, BSE

The National Council for Accreditation of Teacher Education (NCATE) requires that each institution seeking re-accreditation of its teacher education programs conduct a self-study of its professional education unit, i.e., the College of Education, and associated degree programs that may be offered by departments within other colleges on campus. Results of the most recent NCATE self-study completed by DSU were presented to the accrediting agency during the spring of 2000. As part of the review process NCATE has identified “learned societies” which are responsible for examining degree programs within specific areas. The science education (biology education and chemistry education) portion of the DSU self-study was examined by a committee formed by the National Science Teachers Association (NSTA).

Assessment Results for Biology Education, BSE

When summarizing its review of the DSU science education program self-study report, the NSTA committee included these comments: “The undergraduate secondary science program at Delta State University is recommended by the NSTA for national recognition. The content preparation is strong and well designed, addresses the applications in teaching and is sufficiently specific about the requirements and assessments in the professional program. The report deals with disciplinary preparation and pedagogical preparation”. Results of the university-wide self-study process coupled with an on-site visit by an NCATE examining team during fall 2001 led the examining team to recommend that the teacher education programs at DSU be issued continuing accreditation. Subsequently, NCATE voted to accept the team’s recommendation.

The NSTA committee reviewed the DSU science education program self-study report in terms of how well the program addressed ten standards. Those standards included content, nature of science, inquiry, context of science, skills of teaching, curriculum, social context, assessment, environment for learning, and professional practice. According to the examining committee, all standards were met with the exception of the one dealing with assessment. After perusal of a rejoinder prepared by the DSU science education program in which additional information was furnished concerning how the program addresses assessment issues with preservice science teachers, the committee agreed that the program met the standard. Consequently, NSTA and NCATE recognize that the DSU program meets all ten process standards established for preservice science education programs.

Improvements Made as a Result of Assessment

The focus of teacher education program evaluation by NCATE is changing. For the fall 2000 review, the assessment of DSU programming emphasized experiences that prepared preservice teachers for the
profession rather than on performance data generated by the preservice teachers. In fact, performance data was neither expected nor required. Subsequent NCATE assessments must include performance data. Consequently, all DSU teacher education programs, including the science education program, must submit performance assessment data indicating that all standards continue to be met in the next review in five years for a continuing accreditation recommendation to be issued by the appropriate learned society. The NSTA committee reviewing the DSU science education program during fall 2000 emphasized this requirement several times in its report concerning our program. Based on this requirement, we have begun to develop a plan for collecting performance assessment data from preservice science teachers at key points during their preparation program.

The science education program self-study helped us identify several areas where the program can be strengthened and brought more fully in line with national trends in science education. These action items are:

VIII. (1) provide genuine inquiry experiences for students enrolled in the program.
IX. (2) incorporate more performance based assessment techniques in science content courses,
X. (3) create more opportunities for students in science methods courses to develop and microteach thematic lessons which integrate various science disciplines, and
XI. (4) develop a mechanism by which preservice science teachers obtain more field experience and a greater variety of field experiences with secondary school students earlier in their programs of study.

We have already made some progress in addressing these action items. Concerning items 1 and 2 we have examined our biology education curriculum and made modifications in major course requirements which we feel will ultimately have a positive effect as we move toward inclusion of more inquiry experiences and more performance based assessment techniques in the curriculum. Specifically, BIO 100 - "Principles of Biology" has become a course designed exclusively for biology department majors rather than a combined majors/non-majors course. The laboratory component of this four-semester hour course will be redesigned to include more inquiry opportunities. BIO 300 - "Cell Biology" and BIO 328 - "Genetics" have been redesigned to include laboratory components. Credit for each course has increased from three semester hours to four semester hours. Modifications to BIO 300 and 328 were implemented beginning with the fall semester 2002. Concerning items 3 and 4 we have examined our CUR 493 - "Teaching the Sciences" and our BIO 435 - "Methods and Materials in the Biological Sciences" courses to determine the best placement for additional field experiences for our biology education majors prior to student teaching. This assessment led to addition of a laboratory/field experiences component in CUR 493 during the fall semester 2002. Credit for this course has increased from three semester hours to four semester hours. The laboratory/field experiences component will emphasize interdisciplinary teaching techniques along with preparation, microteaching, and revision of science lessons. Revised science lessons will be taught to students in classes of cooperating teachers in the Cleveland public schools.

Future Plans for Biology Education, BSE.

Significant progress in being made and will continue to be made to insure that the science education program at DSU continues to utilize cutting-edge instructional practices that reflect national standards for preparation of science teachers. We solicit the university's continued support as we seek financial and human resources to make these changes sustainable.

**STUDENT OUTCOMES FOR 2001 – 2002:**

**Student Outcome 1.** All students/majors will acquire a broad knowledge of the fundamental principles, concepts, and skills attendant to biological literacy. They will be able to demonstrate linkage between concepts and demonstrate higher order thinking skills such as application of skills and concepts in creative and critical thinking, problem solving, quantitative reasoning, experimental design, data analysis, etc. This
student outcome applies to each degree program in the department with appropriate emphasis assigned to
discipline specific areas of uniqueness, for example, acquisition of appropriate teaching skills by biology
education majors and acquisition of knowledge and skills associated with dedicated instrumentation by
environmental science majors.

Assessment Plan for Student Outcome 1

Acceptable performance in course work and progression through the respective major sequence
will testify to acquisition of requisite biological literacy and performance ability. The department
enforces a provisional admission policy that requires a student to earn a grade of “C” or better in
each of the freshman sequence of four inorganic chemistry and three biology courses before
gaining full admission to the program. Full admission status is required before enrollment in
upper division courses in biology. Likewise, a grade less than “C” in required upper level core or
elective coursework in biology is deemed unsatisfactory performance and cannot be used towards
meeting major requirements. This policy requires that a student demonstrate minimal acceptable
performance in each course applied towards the degree. In-course evaluation of a student’s
content and skill acquisition along with the ability to appropriately, creatively, and critically apply
that knowledge to the solution of relevant problems, is therefore an integral component that is
continually assessed in determining the level of success in achieving this student outcome.

Graduating students take a departmental senior exit exam administered during their final semester.
Test items have been constructed by the faculty to represent a cross-section of the basic knowledge
needed by students completing a major in the department. Test results are summarized by subject
area in order to allow general assessment of strengths and weaknesses. Graduating students should
be able to achieve acceptable scores on the departmental senior exit exam administered during
their final semester.

A portfolio of example work collected from such key courses as “Biostatistics”, “Evolution and
Systematics”, “Readings in Biology”, “Ecology”, and others is created for each undergraduate
student. Materials included in the portfolio are used to examine collective student proficiency in
areas key to biological disciplines. Deposited materials typically include samples of writing, data
analysis, and evidence of knowledge of fundamental principles and concepts. The portfolio of
acceptable example work created for each student is considered reflective of the student’s
proficiency in these key areas.

Assessment Results for Student Outcome 1

The “C” or better non-progression policy instituted in fall 1996 has achieved a desired effect in
departmental programs and student outcome. Its enforcement by the department as a whole and by
individual faculty in in-course student assessment has resulted in redirection of students into other
majors who were unable to make satisfactory progress in requisite freshman biology and chemistry
coursework. It has also served to motivate other students to achieve more satisfactory results in
order to continue in departmental programs after gaining full admission status.

Examination of past senior exit exams indicated some areas of concern. Recent graduates taking
the senior exit exam performed less than satisfactorily in the areas of plant and animal diversity,
animal anatomy and physiology, and evolution, but did perform satisfactorily in ecology and
principles of systematics. Many students continue to depend on rote memory rather than
developing a working knowledge and proficiency of skills. There is concern that the exam as
designed does not appropriately evaluate comprehensive knowledge. It has little value in
evaluating hands-on skill acquisition.

We continue to maintain student portfolios but are not certain of their validity in student outcome evaluation or in program evaluation. They demonstrate acceptable work by the students but fail to give a comprehensive picture of a student's knowledge and ability.

**Improvement Made Toward Reaching Student Outcome 1**

As a result of the "C" or better non-progression policy, the average student now enters upper division courses with better skills and more-developed fundamental knowledge than prior to implementation of this policy. This makes the average student better prepared to meet the challenges of upper level courses and has improved performance at that level. Instructors continue to report that many students are poorly prepared or marginal in their abilities to perform adequately on writing, quantitative reasoning, and analytical assignments.

We have modified some items on the senior exit exam in an effort to improve the exam. We continue to refine the test to be more representative and comprehensive. Because the exam is departmentally designed, we are unable to compare our graduates to students at other schools. We had hoped to incorporate a national exam, at least in part, to provide this type of evaluation but have not been able to do so. Such a standard would allow comparison of our students to those in similar biology programs at similar institutions.

Portfolio review generally demonstrates that our students experience difficulty with writing and quantitative reasoning. Their analytical skills often appear under-developed.

These results demonstrate a need for the faculty to continually review both the departmental curriculum and pedagogy in an effort to develop programs that will best prepare our majors for the professional roles they seek. While we continue to modify degree requirements to meet demands, we also continue to modify pedagogy where appropriate.

**Future Plans Relative to Student Outcome 1**

The faculty believes that the key to improving student outcomes lies in the relationship between learning styles of students, pedagogy, and course design and sequence. It has been and continues to be the department’s goal to offer the best possible experience to our majors.

We believe that our program needs a more thorough examination than that provided by the assessment plan outlined above in order to improve substantially in this regard. The first step in this process will be to inventory what we do now, how we do it, and in which course(s) it is done. This inventory will be evaluated in relation to what we expect students to know and be able to do. With that in mind, the department is planning an in-depth inventory of what skills and content are taught in which courses in our programs. To benchmark this effort, we will use recently available national standards for evaluating biological literacy and effectiveness of programs in biology. This assessment will then be used to identify weaknesses and strengths in expectations, content and skills exposure, and appropriateness of pedagogy. We can then propose changes to modify our instructional program for greater effectiveness.

**Student Outcome 2.** Students will demonstrate competency in the use of computer technology for word processing, spreadsheet use, and data analysis relative to appropriate applications in their biological disciplines. They will demonstrate competency in the application and use of dedicated field and laboratory
scientific equipment and instrumentation appropriate to their respective majors. This student outcome applies to all degree programs in the department.

**Assessment Plan for Student Outcome 2**

Departmental curriculum design requires that majors take several biology courses requiring computer use in which they will be expected to demonstrate mastery of basic computer skills for biological applications. Applications include analysis of data obtained in laboratory exercises, simulations of biological phenomena, use of statistical methods, utilization of Internet web sites for information resources and research. To facilitate computer knowledge, incoming majors will be advised, but not required, to complete CIS 205 — “Microcomputer Applications” early in their careers. Several required or elective courses likewise require demonstration of ability to appropriately utilize sophisticated equipment and dedicated instrumentation which in many cases involve interfacing with computer technology. Assessment of the student use and mastery of applications and technology will be by faculty in-class evaluation of student performance relative to assignments and objectives included in course syllabi. Therefore, assessment will be continuous by instructors of record. Satisfactory performance relative to this student outcome requires that the student earn a grade of “C” or better in order to apply the course to degree requirements for the major.

University records documenting existence of appropriate equipment, instrumentation, and computing facilities or similar available computing stations within the Caylor-Walters complex will serve to assess the student accessibility part of this outcome.

**Assessment Results for Student Outcome 2**

Renovation of the Caylor/Walters complex to include improved access to computing technology and dedicated laboratory equipment and instrumentation has been intended for several years, however such renovation has not occurred. Without renovation, which prioritizes satisfaction of this deficiency, it has been impossible to make significant progress towards improvement and resolution of technological needs. This has led to inadequate improvement towards optimizing our ability to meet this student outcome.

Present departmental computing technology holdings available for student use are woefully inadequate. There are no reasonably modern computers with graphic access to the Internet available for student use. A handful of older and mostly obsolete models are available, but these have limited use as they lack the power to run the software required for today’s scientific applications. Although computer labs are available at other sites on campus, they lack adequate specialized scientific software, and the laboratory assistants do not have sufficient expertise in scientific applications to assist our students. Also, it should be noted that typical computer labs in the classic sense neither address most of our student needs nor do they model computing in the science laboratory where real-time experimentation is being done and analyzed simultaneously. There has been a common misconception by ITS and responsible administration that a traditional computer laboratory will address this problem.

A plan to routinely acquire and replace sophisticated laboratory and field testing instrumentation and equipment needed to fully meet this student outcome is lacking. There is no equipment line item in the departmental budget designed to address this critical need. Significant attention needs to be given to addressing this inadequacy.
Improvement Made Toward Reaching Student Outcome 2

Today, most advanced biology courses require use of computers. Many courses require use of sophisticated field or laboratory equipment and instrumentation. Where appropriate to course content, a large number of our biology courses have increased the number of assignments that require students to use computer technology and/or sophisticated equipment and instrumentation. These assignments include student analysis of experimental results, writing scientific reports, communication with professors and other students via e-mail, and gathering information for research projects from the Internet. Our faculty document student use of equipment, instrumentation, and computer facilities in their courses. They also assess development of student skills with technology as a part of overall student mastery of course requirements. Records of student work involving equipment, instrumentation, and computer facilities are now included in student portfolios, which demonstrates achievement in this student outcome.

The conversion of Walters 260 into a GIS/remote sensing laboratory will extend our capabilities in that limited area when it becomes fully operative. New courses are being added to offer that dimension to our major programs. This will help to provide training and knowledge in an area that is being called for by potential employers. Existing departmental courses will be able to incorporate GIS/remote sensing exercises, making them more current and complete. It is anticipated that the laboratory will be usable in fall 2002.

Little improvement of existing departmental laboratory equipment and instrumentation has been made during the last few years due to the statewide and university budget crisis.

Future Plans Relative to Student Outcome 2

To improve on this student outcome, specialized computing facility is needed “within” science laboratories. An evaluation of this need has been performed and reported to the Dean of the College of Arts and Sciences for inclusion in the campus instructional technology initiative. Access to computing facilities, necessary software applications, and equipment and instrumentation must be targeted for improvement, whether this comes as a component of building renovation or as a priority retrofit project in itself.

The department will continue to increase requirements for student technology use and skill development in biology courses as required to meet science literacy and employment opportunity guidelines. There will be increasing demands for student demonstration of mastery of basic computer skills, mastery of dedicated laboratory and field instrumentation, and their applications in biological situations.

As stated above for Student Outcome 1, we believe our ability to improve in Student Outcome 2 will be facilitated by a thorough inventory of what we do now in the way of technology content and skill development, how we teach it, and in which course(s) it is taught. Such an inventory will be evaluated in relation to what we expect students to know and be able to do when they complete a given course and when they complete a major program. With that in mind, the department will include aspects associated with Student Outcome 2 in its in-depth inventory of what skills and content are taught in which courses in our programs. We will benchmark this effort against recently available national standards for evaluating biological literacy and effectiveness of programs in biology. This assessment will then be used to more thoroughly identify weaknesses
and strengths in our technological holdings and its application in our pedagogy. We can then
defend and justify proposed changes to increase and modernize our technology for greater
effectiveness in meeting Student Outcome 2.