STRATEGIC PLAN
FOR HIGHER EDUCATION'S PORTION OF THE
LOUISIANA EDUCATION QUALITY SUPPORT FUND
1988

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I. OVERVIEW AND INTRODUCTION

In September 1986, the Louisiana Constitution was amended to place the bulk of the proceeds from the State's share of Federal revenues from offshore oil and gas development into a permanent trust fund for education called the "Louisiana Education Quality Trust Fund." The amendment provides for placing 75 percent of the investment revenues from the permanent trust fund into a separate Louisiana Education Quality Support Fund (LEQSF) for use in enhancing education at all levels within the State.

The amendment further provides that the State treasurer "shall disburse not more that 50 percent of the moneys in the Support Fund, as that money is appropriated by the legislature and allocated by the Board of Regents for any or all of the following higher educational purposes to enhance economic development."[1]

- o The carefully defined research efforts of public and private universities in Louisiana;
- o The endowment of chairs for eminent scholars;
- o The enhancement of the quality of academic, research or agricultural departments or units within a university;
- o The recruitment of superior graduate students.

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[1]Act 1020, Regular Session, 1985.

The funds available to higher education each year are appropriated by the Legislature to the Board of Regents, which then allocates the moneys to these four programs.

The Board of Regents has the authority and responsibility to distribute the funds among the categories as it deems appropriate and to determine the targeted areas of basic and applied research and academic disciplines to be supported. Accordingly, the Board of Regents requested the LEQSF Planning Committee to draft a long-range plan to guide the Board in making these decisions. The plan relies heavily on the findings reported in Louisiana Higher Education and Economic Development: Prosperity Through Academic Excellence, a "White Paper" prepared in 1987 by The Louisiana Stimulus for Excellence in Research Committee (LaSER) at the request of the Louisiana Education Quality Support Fund Advisory Committee.[2]

This paper addresses four specific issues:

- The manner in which the enhancement of higher education research and instructional programs can most effectively promote economic development;
- The short-term and long-range priorities for the enhancement of programs, research, and economic development;
- The manner in which the four mandated LEQSF programs should be interrelated in pursuing the general objectives of enhancing instructional programs and research and promoting economic development;
- The manner in which the constituent units involved in the LEQSF

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[2]This report will subsequently be referred to as "White Paper."

(Board of Regents, its advisory committees, the individual campuses, consultants, and other entities) can best work together according to a comprehensive schedule.

Background research to develop the plan included:

- o Reviewing published materials on national trends in higher education and economic development and on guidelines for establishing such programs;
- o Contacting administrative staff of national organizations that previously had conducted studies of higher education and economic development to discuss trends in this area and to identify model programs;
- o Interviewing administrative staff in "model" state economic development programs and reviewing their published materials to determine what types of activities had been implemented and which were successful. Written documentation from/about these and other states was also reviewed.
- o Reviewing literature related to higher education and economic development in Louisiana, the South, and the region;
- o Surveying key groups in Louisiana from all parties involved in the economic development/higher education policy process, including representatives from education at all levels, key government agencies, the legislative and executive branches of state government, major business associations, key business/industrial firms, and economic development organizations.

A more complete description of the sources of background information is included in Appendix A.

II. STATEMENT OF THE PROBLEM AND RECOMMENDED GOALS

In order to attain the goal of increased economic diversity and competitiveness, Louisiana must improve the infrastructure supporting commercial enterprises that utilize and promote advanced technologies as well as traditional resources. Louisiana must also strengthen its educational system to provide the most intensive and comprehensive education possible, addressing both science and engineering education on the one hand, and the humanities and arts on the other. Recent analyses have repeatedly shown that the growth industries of today are directly dependent on technological innovations and a well-educated and adaptable workforce.[3]

The cornerstone of the technological infrastructure is education. Without a high quality educational system at all levels--elementary, secondary, vocational/technical, undergraduate, and graduate--neither the nation, the South, nor Louisiana will be able to support sustained economic growth.[4] Numerous studies of education and economic development at the national level, in other states, and in Louisiana amply demonstrate that higher education plays a crucial role in educating all our citizens in the

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[3] See reports of the Southern Technology Council; Southern Growth Policies Board, 1987.

[4] As stated by the Southern Growth Policies Board in its report Halfway Home and a Long Way to Go:
"Tomorrow's jobs will change: from rural to urban settings, from old manufacturing methods to technological services, from low to high skill, from local to international competition. This increasing complexity means that every link in the chain of education from pre-school through graduate programs will be under strain as the South struggles to raise the standard of living by raising everyone's standard of thinking. . . . higher education will need to produce and keep current a new generation of scholars, scientists, engineers, business and government leaders."

fundamental values of our civilization and in nurturing, developing, and attracting technologically advanced industries.

Recognizing the limits of funds available for educational initiatives, the LEQSF should further the following long- and short-term priorities:

- **Long-term priority: The overriding and long-term priority should be to enhance literacy and, ultimately, to improve education at all levels and in all respects so that Louisiana will be competitive in the modern world.**
- **Short-term priorities: Concurrent with advancing the long-term priority of improving education at all levels, the LEQSF should further economic development in the State by pursuing six short-term goals.** These goals, which should be given the highest priority for initial LEQSF investments, are described below. They focus on two main issues--development of an educated and skilled citizenry and the fostering of basic and applied research.

GOAL #1: Develop and maintain international excellence and a competitive position in basic research, especially in those science, engineering, humanities, and arts disciplines critical to the State's economy.

There is a strong feeling that the State has failed to support, either philosophically or financially, basic research efforts in its universities. The respondents, in a survey of over 700 Louisiana scientists and engineers in research-oriented universities, concluded that inadequate support translated into difficulties in recruitment and retention of superior researchers, insufficient resources and time for research as opposed to teaching, and inadequate equipment and funds for maintenance. These results are consistent with

findings in national surveys regarding barriers to research competitiveness.[5]

GOAL #2: Provide state-of-the-art equipment and facilities for research and training, especially for scientific and engineering studies, but also to include other disciplines as funds permit.

A survey of barriers to competitive research in Louisiana identified the lack of modern research equipment and a system to maintain and replace equipment as key barriers.[6] This is consistent with several national assessments of the problem of university research equipment that have found the instrumentation capabilities of universities slipping ever behind that considered state-of-the-art by industry. Several efforts are underway at the federal level to increase support for research equipment. Since federal awards in this area are largely competitive, the institutions already most successful on the national scene will receive most of the support. In addition, many equipment grants programs require significant matching funds from the institutions. The current fiscal austerity facing institutions of higher education in Louisiana makes it difficult to meet matching fund requirements for Federal equipment grants. Although there are some new and well-designed facilities that have become available or will be available to the Louisiana research community, all of these facilities are facing problems in

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[5] In Drew's national survey of 1985, the following barriers are identified: institutional attitude and commitment, time available for research, lack of access to research facilities, overemphasis on applied research, and inexperienced grantsmanship. Drew also discussed a predisposition of national granting agencies to favor applications from prestigious institutions.

[6] See "White Paper."

assembling sufficient state-of-the-art instrumentation for the research laboratories.[7]

GOAL #3: Form close ties among government, higher education, business and industry in order to transfer the results of basic and applied research, as well as to enhance the capability to conduct such research.

Louisiana universities have undertaken a variety of activities to serve area industries. Most institutions provide technical consulting services, access to research equipment and personnel, and retraining of displaced workers. In a survey of Louisiana university leaders, almost all the campus presidents observed that it was essential to provide more services to area businesses.[8]

GOAL #4: Create a pool of technically trained entrepreneurs--specially scientists and engineers--to help develop a more entrepreneurial mindset in the State.

Diversification of a state's overall economy by using the results of university research to develop new technologies and encouraging new company formation and expansion of existing small firms was mentioned repeatedly in our literature review as necessary for sustained economic growth. Of necessity, a large pool of entrepreneurs--persons willing to organize and assume the risks of a business or enterprise--are required if a state is to meet this objective of economic development/growth.

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[7]Examples include the Engineering Building at the University of New Orleans; the Louisiana Universities Marine Center; the Pennington Biomedical Research Center; new buildings for Agronomy, Forestry, Wildlife and Fisheries, and Geology at Louisiana State University; the New Iberia Research Center and new computer facilities at the University of Southwestern Louisiana; and the Boggs Center for Energy and Biotechnology at Tulane University.

[8]See "White Paper."

Louisiana lacks a strong tradition of technology transfer and entrepreneurial development.[9] A number of small firms have developed over the years in connection with the State's oil and gas industry and several small firms have been initiated recently in the area of biotechnology. As a whole, however, the State has not developed a large pool of entrepreneurial talent upon which to draw as it attempts to diversify its economic base.

GOAL #5: Educate students at both undergraduate and graduate levels in order to prepare large numbers of highly skilled and liberally educated citizens, particularly scientists and engineers.

Among the most significant barriers to attracting new industry in Louisiana is the lack of a well-educated workforce. For example, Louisiana's preparation of graduates in science and engineering fields lags behind the per capita average both for the nation and for the South as a whole. Well-trained scientists and engineers are essential to a sound economic future. Recent studies have shown that a liberal education is also important in the development of flexible and capable managers and entrepreneurial leaders. A study conducted by AT&T in 1985 discovered that while only "21 percent of the engineering graduates and 32 percent of the business graduates had reached at least the top levels of middle management, 45 percent of the humanities and social science majors had reached this level."[10] Liberal arts majors comprised 60 percent of the two highest levels of corporate management.

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[9] See studies by Vaughan (1983) and Daniels (1983).

[10] See Keim (1985) and Useem (1985).

GOAL #6: Develop an intensive program in scientific and cultural literacy on the undergraduate level for all students, and especially develop teacher education programs to produce highly skilled science, mathematics, English, and foreign language teachers.

It is essential that a high quality, comprehensive, general education in both science and the humanities be implemented as soon as possible so that there will be a progressive movement toward general educational and economic improvement. Virtually every national study of education in the U.S. in recent years has stressed the need for solid grounding in science, mathematics, English, history, and foreign languages.[11] The development of proficiencies in both the sciences and the humanities is crucial to the development of Louisiana, and intensive teacher education in these areas is the best possible means of effecting how these subjects are taught. Research and development of curricular frameworks for K-12 are necessary and must be developed in cooperation with the State Department of Education and our institutions of higher learning.

Scientific education and literacy, including both basic and cultural literacy, are at the heart of an effective general education, and inadequacies in general education constitute a fundamental economic problem in the State. A high-quality educational system will be absolutely critical in order to attract new businesses and corporate headquarters to Louisiana.

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[11]These include the recent Carnegie Report urging the need to shift teacher education from the pedagogy to the fundamental texts of specific disciplines, William Bennet's To Reclaim a Legacy, Lynn Cheney's report, American Memory, E. D. Hirsch's Cultural Literacy, Allen Bloom's The Closing of the American Mind, and Diane Ravitch and Chester Finn's What Do Our Seventeen-Year Olds Know.

In developing programs that will assist Louisiana in meeting these six goals, eight guiding principles are suggested below. These principles are based on a consensus of individuals involved with such programs in other states who were surveyed by the LaSER Committee and on a review of individual programs and national literature. Underlying these principles is the fact that the programs of almost every state focus on the importance of advanced technology in promoting economic development.

- Each state must carefully analyze its own economic, educational, and social/political characteristics and create a program tailored to its unique circumstances. It is extremely difficult to transfer sucessful programs from one state to another, as witnessed by the empty research parks and incubators around the country.
- A state should build on its economic strengths. The emphasis should be primarily on utilizing the state's raw materials and resources, and promoting and developing its existing business and industry. Attracting business from other states should be only a secondary focus.
- A state should build on its educational strengths and be continually aware of the need to develop new strengths in response to economic realities.
- Economic development is a long-term problem; there are no quick fixes. Many states believe their programs will have no significant payback for 15 to 20 years.
- While establishing economic development goals and priorities is the responsibility of state government, actual distribution of funding to achieve these goals must be de-politicized through a

peer-based merit review process.

- o Significant gain in a state's economic development requires close collaboration and cooperation among all parties. Included within this parameter is the need for collaboration/ cooperation among the state's educational institutions.
- o No state has sufficient funds to fully finance the activities needed to attain economic development goals, so state funds must be used to leverage greater federal and industrial funding.
- o Higher education/economic development funds must be carefully targeted to accomplish significant progress.

III. TARGETING QUALITY SUPPORT FUND INVESTMENTS

Several studies undertaken in Louisiana provide a helpful background for targeting LEQSF dollars.[12] Attention should be focused on those areas of traditional economic strength that must be bolstered, emerging technologies that have potential in Louisiana, and the pervasive issues of human and environmental resources. These target areas are summarized below, organized by economic sector.

Target Area # 1: Oil and Gas Production

This has been and will be a mainstay in Louisiana's economy. Research and training are needed to maintain the critical role of this industry by identifying deep hydrocarbon resources; improving recovery by developing infill drilling techniques, secondary and tertiary recovery methods; advancing production technology; constructing and maintaining production, field, reservoir, and

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[12] See Daniels (1983), Vaughan (1983), and Richardson (1982) and the LaSER Committee's survey of Louisiana campus heads and scientists and industry representatives.

recovery techniques data bases; and alleviating environmental hazards.

Target Area #2: Chemicals and Materials

The commodity and specialty chemical industry is another mainstay that must be supported. In addition, Louisiana needs to strategically move forward in selected areas of new materials development and manufacture, including coatings, catalysts, and plastics. Opportunities in microelectronics, ceramics, fiber optics, and composite materials should also be pursued. Advanced materials research is an area where Louisiana's university programs are not presently viable, but because of the importance of the field in technological innovation, this is a key priority area.

Target Area #3: Information and Control Systems

Louisiana cannot afford to be left behind in this age of automated information systems; these systems are critical to all other economic sectors and to environmental and human resources. Areas such as communications technology, parallel and distributed algorithms, languages and architectures, artificial intelligence, robotics, and intelligent design and manufacturing systems must be selectively pursued based on strengths and opportunities.

Target Area #4: Biotechnology

Biotechnology was one of two areas of investment which Roger Vaughan suggested as meriting high priority in terms of Louisiana's economic future. Building as it does on the biological sciences and other basic scientific and engineering disciplines, this "new biology" offers great potential for development in almost every area of business, medicine, agriculture, fisheries, and related fields. Due to the State's historic association with agriculture and the oil

and gas and petrochemical industries, Louisiana has the beginnings of a base in biotechnology. However, much greater emphasis must be placed on the biological sciences if Louisiana is to take advantage of this emerging technological field.

Target Area #5: Agriculture and Forestry

Along with oil and gas, agriculture and forestry are other areas that are of profound importance to Louisiana's economy. The highest possible technology must be utilized to improve the productivity and develop the agribusiness sector. Additionally, special technology must be infused into small farm operations to enhance their survival. Genetic manipulation of plant and animal reproduction, growth and development processes, and other biotechnological approaches promise to enhance the competitive production and utilization of agricultural commodities. Systems management potential must be used to assure effective use of resources.

Climate, soil, and transportation make forestry a staple of the Louisiana economy. Research should be conducted on innovative uses not only of traditional forest products but of all sources of basic cellulose and on new applications in fabrication and packaging including glues and other binding agents.

Target Area #6: Aquatic Resources

The abundance of water in the streams and coastal areas of Louisiana makes the State a leader in fisheries production, both commercial and recreational. Yet the full potential of the State's water and biological resources has not yet been realized. Opportunities exist to harvest presently under-utilized species, to greatly expand aquaculture and mariculture, and to reap more economic benefits from this production. Realizing these opportunities will

depend on the development of efficient management techniques, by adding value in the form of primary and secondary processing, and by developing market niches and products to cater to those niches. The management of the water resources upon which fisheries production and other important elements of the Louisiana economy depend also needs increased attention and innovation.

Water transportation is a fundamental factor of Louisiana life, yet its economic assets have been dissipated by aggressive competition from the ports of Miami, Houston, and Mobile, and the development of air and truck freight lines. Higher education must lead business and industry to find new ways to utilize the natural assets of ocean ports and their connections to inland waterways, rail lines, highways, and airports.

Target Area #7: Health Care

The economic impact of health care is very large, yet Louisiana has seen its status as a regional medical center decline. Rapid expansion of the health care industry in Houston, for example, has provided some buffer from the effects of depression in the oil and gas industry. As a state that attracts an increasing percentage of the retired population, medical services become an even larger factor in the state's economy. The academic underpinnings of Louisiana as a regional medical research, training, and service center need strengthening, especially in areas such as cancer and dietary research, medical toxicology, and geriatrics.

Target Area #8: Tourism

Tourism is one of Louisiana's few growth industries. Improved marketing and management, coupled with creation of a more attractive public image of Louisiana and its cultural heritage, promise

accelerated growth in the tourist industry. Tourism is based heavily on the preservation and presentation of Louisiana culture and heritage. There is a need to strengthen training and stimulate creativity in our academic community in the arts and humanities, including emphasis in cultural anthropology and folklife.

Target Area #9: Environmental Resources

Louisiana must ensure environmental conditions that protect the health and interest of its citizens while promoting economic growth and prosperity. A proper environment is of prime importance for:

- o Maintaining health standards of high quality;
- o Influencing the relocation of industries;
- o Ensuring the efficiency and economic viability of industrial operations, and;
- o Avoiding a deterioration of resources that exact a huge cost from society.

The loss of coastal habitats, for example, will drastically reduce future fisheries, waterfowl, and furbearer production. The development of new and more efficient techniques for dealing with wastes, deterioration of water quality, and the loss of coastal wetlands is of critical importance to the State's economic well-being.

Target Area #10: Internationalization of Louisiana Business

With Louisiana functioning as part of national and world economies, business and industry need international perspectives. The State needs to re-develop and exploit its distinctive close association with Latin America. Traditional relations with European business should be broadened and, perhaps even more important, the State needs to innovatively nurture connections with Asia and Africa.

Business people and industrial leaders need language skills and intercultural sensitivities.

IV. ACADEMIC DISCIPLINES WHICH MUST ACHIEVE EXCELLENCE

In order to support economic development in these critical target areas, certain academic disciplines must achieve excellence. Some disciplines must be supported because they have a direct impact on technological and economic development; others because they are critically important to the education of scientists, engineers, and entrepreneurs. While all disciplines are eligible for LEQSF funding, the implementation schedules reflect the primary targets of support from the LEQSF. The major categories of disciplines are: Natural Sciences (Biological, Physical, Computational, Earth/Environment); Engineering; Social Sciences; Humanities and Arts; Education; and Business. A complete taxonomy of all the disciplines included in these major categories is provided in Appendix D.

V. PROGRAM RECOMMENDATIONS

With modest adjustments and fine tuning, the LEQSF could become one of the nation's model programs for higher education/economic development.[13]

A. RESEARCH EFFORTS COMPONENT

1. Research Subprogram A: Basic Research Competitiveness

Leveraging LEQSF dollars through continued, consistent levels of funding for grants will assist Louisiana scientists and engineers in the early stages of their research careers

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[13] See "White Paper" for a detailed discussion of programs of other states and the results of a survey of Louisiana university presidents concerning the ways that higher education could contribute to economic development. A brief summary of programs and studies is in Appendix C.

to become more competitive in acquiring federal research and development dollars. It is extremely difficult to predict from year to year what will be the emerging technologies at the cutting edge of basic research. Further, enhancement of basic research in most scientific or engineering fields will have an impact on at least one and, typically, several of Louisiana's major economic and resource areas: oil and gas; chemical and materials; information and control systems; biotechnology; agriculture/forestry; aquatic resources; health care; tourism; environmental resources, and internationalization of Louisiana business. Hence, the major portion of the basic research funds should be reserved for all scientific and engineering fields, including social sciences as defined by NSF, agriculture, and health and medical services.

The merit review of LEQSF grant proposals by outstanding scientists, engineers, and scholars from outside Louisiana, who themselves typically receive significant levels of Federal funding, has proven an effective way to depoliticize the review/award process. Merit reviews should be continued. Since the reviews focus on the ability of researchers in the early stages of their careers to become nationally competitive within a specific period, the Support Fund will build on educational strength and lead toward national eminence.

For Research Subprogram A, the following table indicates those disciplines in which proposals were accepted and funded during 1987 and 1988, as well as those disciplines in which

proposals may be submitted for funding consideration during 1989-98. These disciplines are considered important for the State's long-term economic development as well as educational advancement. Although each discipline was eligible for funding during the first two years, limitations on funding and the pressure of a large number of proposals suggested the need to make most disciplines eligible on a staggered basis. Beginning in 1990, only two disciplines which are accorded a high priority for economic development (biological and earth/environmental sciences) are targeted for funding annually. Because it is extremely difficult to predict from year to year what will be the emerging technologies at the cutting edge of basic research, the Board of Regents may consider expanding the range of disciplines eligible for competition in a given year.

RESEARCH SUBPROGRAM A*	Award Year											
	87	88	89	90	91	92	93	94	95	96	97	98
Natural Sciences--Physical												
Chemistry	x	x	x	x			x	x			x	x
Physics & Astronomy	x	x	x		x	x			x	x		
Natural Sciences--Computational												
Computer & Information	x	x		x			x	x			x	x
Mathematics	x	x			x	x			x	x		
Natural Sciences--Earth/ Environmental Sciences	x	x	x	x	x	x	x	x	x	x	x	x
Natural Sciences--Biological												
Agriculture	x	x	x		x	x			x	x		
Biological	x	x	x	x	x	x	x	x	x	x	x	x
Health & Medical	x	x	x	x			x	x			x	x
Engineering												
Engineering A	x	x	x		x	x			x	x		
Engineering B	x	x	x	x			x	x			x	x
Social Sciences	x	x			x	x			x	x		
Number of Disciplines	11	11	8	6	7	7	6	6	7	7	6	6

*See Appendix D for a listing of those disciplines which are included in these larger groupings.

2. Research Subprogram B: Applied Research/Industrial Ties

University/industry collaborative research grants should be provided to enhance the competitiveness of Louisiana companies and industry. While a solid basic research infrastructure is necessary for economic progress, it is not sufficient. The research capability of colleges and universities must be made available to and utilized by business to enhance competitiveness.

Programs to leverage LEQSF dollars will be used to foster closer university/industry collaborative efforts. By careful industrial targeting and the use of eminent out-of-state reviewers, the proposal review/award process will be depoliticized to assure that funds are invested in projects that build on Louisiana's academic and economic strengths and opportunities. Each year the LEQSF Planning Committee will work with industrial representatives and state agencies to identify that year's targets of opportunity.

For Research Subprogram B, the following table indicates the target areas that were eligible for funding during award years 1987 and 1988 and those recommended for funding eligibility during 1989-98. Beginning in 1990, three target areas which are accorded a high priority for economic development (chemical and materials, biotechnology, and oil and gas production) are targeted for funding annually. The others are eligible on a staggered basis. Under exceptional circumstances, the Board of Regents may consider additional target areas in a given year.

RESEARCH SUBPROGRAM B	Award Year											
	87	88	89	90	91	92	93	94	95	96	97	98
Oil & Gas Production	x	x	x	x	x	x	x	x	x	x	x	x
Chemical & Materials	x	x	x	x	x	x	x	x	x	x	x	x
Information/Control Systems	x	x	x		x	x			x	x		
Biotechnology	x	x	x	x	x	x	x	x	x	x	x	x
Agriculture	x	x	x		x	x			x	x		
Aquatic Resources	x	x	x	x			x	x			x	x
Health Care	x	x	x	x			x	x			x	x
Tourism					x	x			x	x		
Environmental Resources	x	x	x		x	x			x	x		
Internationaliz. of Bus.	x	x		x			x	x			x	x
Research on Literacy and Selected Educational Issues*		x		x	x			x	x			x
Number of Target Areas	9	10	8	7	8	7	6	7	8	7	6	7

*The Board of Regents will determine the issues and funding level prior to the issuance of the RFP in a given year.

B. DEPARTMENT AND UNIT ENHANCEMENT COMPONENT

Program 1. Instructional Enhancement

Departmental grants should be given to Louisiana institutions of higher education to enhance instructional efforts in ways that will increase, at both undergraduate and graduate levels, the quality and quantity of scientists; engineers; science, mathematics, English, and foreign language teachers; and scientific and engineering entrepreneurs.

Grants may be used to support instructional improvement programs, curriculum revision projects, instructional equipment and instrumentation including computing equipment, collaborative projects between business schools and science/engineering departments, collaborative projects between universities and colleges, or any other activity likely to enhance a department's ability to recruit, develop, and retain individuals in the targeted groups.

The LEQSF shall promote the creation and funding of interdisciplinary and interinstitutional centers/institutes. Priority should be given where there is potential for regional or national eminence.

Proposals will be solicited and reviewed by outstanding scientists, engineers, science and engineering administrators, scholars from other representative disciplines, representatives of industry; projects involving education departments or business schools will be reviewed by scholars from these disciplines. Reviewers will have national reputations and will be from outside Louisiana.

Each year the LEQSF Planning Committee will work with representatives of the Board of Elementary and Secondary Education to coordinate plans for enhancing educational programs for science, mathematics, foreign language, and English teachers.

Program 2: Research Resources

Grants should be available for critical research resources, including state-of-the-art equipment and instrumentation and library resource materials. The primary target of the program should be science and engineering departments. The purpose of this program should be to enhance the ability of the departments to increase their competitiveness in acquiring Federal and/or industrial research funds. Projects involving collaboration between departments and colleges within university and between two or more universities in Louisiana will be strongly encouraged. The LEQSF Planning Committee should try to specify each year

potential areas for cooperation, such as networking of libraries.

Program 3. Inter-Institutional Program Enhancement

Consideration should be given to dedicating a small amount of funds to increase inter-institutional cooperation among departments by:

- o Providing matching funds to support joint institutional colloquia to be presented by outstanding scientists and engineers; and
- o Providing summer fellowships for faculty to conduct research at another Louisiana institution during the summer.

The LEQSF Planning Committee will identify areas for possible funding.

The following table indicates disciplines that were eligible for funding consideration during award years 1987 and 1988, as well as disciplines recommended for funding eligibility during award years 1989-98. All disciplines are eligible on a staggered basis. Some are eligible more frequently because of their importance to economic development.

DEPARTMENT ENHANCEMENT*	Award Year											
	87	88	89	90	91	92	93	94	95	96	97	98
Natural Sciences--Physical												
Chemistry				x			x			x		
Physics & Astronomy				x			x			x		
Natural Sciences--Computational												
Computer & Information	x	x			x			x			x	
Mathematics				x			x			x		
Natural Sciences--Earth/ Environmental Sciences			x			x			x			x
Natural Sciences--Biological												
Agriculture		x	x			x			x			x
Biological		x	x		x			x			x	
Health & Medical		x	x			x			x			x
Engineering												
Engineering A	x		x			x			x			x
Engineering B	x		x		x			x			x	
Business				x			x			x		
Social Sciences					x			x			x	
Education				x			x			x		
Arts						x			x			x
Humanities					x			x			x	
Number of Disciplines	3	4	6	5	5	5	5	5	5	5	5	5

*See Appendix D for a listing of those disciplines which are included in these larger groupings.

C. GRADUATE FELLOWS COMPONENT

The goals of the Graduate Fellows Component are (1) to elevate to higher levels of performance departments or units which have attained, or which show clear promise of attaining, regional, national, or international standards of eminence; and (2) to elevate to higher levels of performance departments or units which have promoted, or which show clear promise of promoting, economic development of the State.

Graduate stipends or fellowships should be available to recruit outstanding graduate students in all disciplines critical to Louisiana's economy, especially science, engineering, and business disciplines.

Although priority will be given to proposals for doctoral study, master's programs in areas critical to the State should also be considered.

Proposals should be merit-reviewed using outstanding scientists, engineers, and scholars in academia and/or industry from outside of Louisiana.

The following table indicates disciplines that were eligible for funding consideration in 1987 and 1988, as well as those disciplines recommended for funding eligibility during 1989-98. All disciplines are eligible on a staggered basis. Some are eligible more frequently because of their importance to economic development.

GRADUATE RECRUITMENT*	Solicitation Year											
	87	88	89	90	91	92	93	94	95	96	97	98
Natural Sciences--Physical												
Chemistry	x	x	x	x	x	x	x	x	x	x	x	x
Physics & Astronomy	x	x	x	x	x	x	x	x	x	x	x	x
Natural Sciences--Computational												
Computer & Information	x	x	x				x	x	x			
Mathematics	x	x	x				x	x	x			
Natural Sciences--Earth/ Environmental Sciences	x	x	x	x	x	x	x	x	x	x	x	x
Natural Sciences--Biological												
Agriculture	x	x	x				x	x	x			
Biological	x	x	x	x	x	x	x	x	x	x	x	x
Health & Medical	x	x	x				x	x	x			
Engineering	x	x	x	x	x	x	x	x	x	x	x	x
Business	x	x	x				x	x	x			
Social Sciences				x	x	x				x	x	x
Education	x	x	x				x	x	x			
Arts				x	x	x				x	x	x
Humanities				x	x	x				x	x	x
Number of Disciplines	11	11	11	8	8	8	11	11	11	8	8	8

*See Appendix D for a listing of those disciplines which are included in these larger groupings.

D. ENDOWED CHAIRS COMPONENT

The goal of the Endowed Chairs component over the long-term is to assist colleges and universities in attracting eminent scholars and we believe that this program will indeed make a significant contribution to the enhancement of the overall infrastructure of higher education in Louisiana. The program is already highly leveraged by its requirement of a 3:2 private-sector match. The size of industrial and private contributions required assures that funds will be spent in areas perceived by the donor as meeting important public needs.

VI. ADMINISTRATION AND COORDINATION OF QUALITY SUPPORT FUND PROGRAMS

In building toward excellence, the LEQSF should build on strength. Every Louisiana institution of higher education--large and small, graduate and undergraduate, public and independent, predominantly black or predominantly white--should be encouraged to carefully study itself in light of its mission, to identify its strongest programs, and to develop plans to build them into excellent programs. All proposed projects should continue to be reviewed for merit using outstanding individuals in relevant fields from outside Louisiana.

Additionally, the LEQSF Planning Committee will undertake the following activities:

- o Provide an annual review of the LEQSF programs, in response to ongoing evaluations, and update the Strategic Plan on a regular basis;
- o Review and comment on draft RFPs, reviewer guidelines, criteria and analysis forms developed by the Board of Regents, prior to their distribution, whenever time permits;

- Work with Board of Regents' staff to organize industrial task forces and use the input of these task forces to suggest revisions in program goals and targets;
- Continue to seek large grants from the Federal government, industry, and national foundations to supplement LEQSF moneys, and;
- Promote inter-institutional cooperation and collaboration among Louisiana colleges and universities, as well as with elementary, secondary, and vocational-technical schools.

APPENDIX A
DESCRIPTION OF PLANNING ACTIVITIES

I. LOUISIANA SPECIFIC

A. MATERIALS REVIEWED RELATIVE TO HIGHER EDUCATION AND ECONOMIC DEVELOPMENT IN LOUISIANA

- LaSER Louisiana Stimulus for Excellence in Research: The Louisiana Response to the National Science Foundation's Experimental Program to Stimulate Competitive Research. Louisiana Board of Regents, March 1986.

- Excellence in the Eighties: The Master Plan for Higher Education in Louisiana. Louisiana Board of Regents, April 1984.

- "Policy for Administration of Funds Received from the Louisiana Education Quality Support Fund", Louisiana Board of Regents, October 1986.

- Institutional Structures for Louisiana's Economic Growth and Development. Gulf South Research Institute, September 1983.

- A Technology Program for Louisiana. Gulf South Research Institute, December 1984.

- A Technology Program for Louisiana: Background Papers. Gulf South Research Institute, April 1985.

- Louisiana's Economic Development: An Annotated Bibliography January 1970 - June 1982. Gulf South Research Institute, September 1982.

- 1985 PAR Conference: The Ingredients of Economic Development. Public Affairs Research Council, March 1985.

- Louisiana Economic Development: Policy, Programs and Process. Beldon Daniels, Counsel for Community Development, Inc., June 1983. (Submitted to The Joint Commerce Committee of the Louisiana State Legislature.)

- An Economic Development Strategy for the State of Louisiana: Final Report. Roger J. Vaughan, The Gallatin Institute, July 1983. (Submitted to the Louisiana State Senate and House.)

- The Report of the 1986 Commission on the Future of the South: Halfway Home and a Long Way to Go. Southern Growth Policies Board, 1986.

- "Education and Southeastern Economic Growth", Economic Review Special Issue, November 1984.
- An Annotated Bibliography of Selected Studies and Reports Relative to Louisiana's Tax, Fiscal and Economic Development Situation. Prepared for the Joint Legislative Committee on Louisiana Economic Strategies, January 1987.
- Tax Policy for Economic Development: Louisiana's Expenditure Policy; Future Policy Directions. Governor's Economic Development Commission, November 13, 1985. (Report to Governor Edwin W. Edwards.)
- State Economic Policy and Program Coordination. Governor's Economic Recovery Council, February 9, 1987. (Report to Governor Edwin W. Edwards, Louisiana House of Representatives, and Louisiana Senate.)
- Planning documents of individual colleges and universities within the State of Louisiana.
- Proposals submitted to the Board of Regents during the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR).
- Proposals submitted to the Board of Regents for the 1986-87 Education Quality Support Fund allocations.

B. INDIVIDUALS/AGENCIES CONTACTED FOR INPUT AND REVIEW OF DRAFT REPORT AND AS PARTICIPANTS IN INSTATE SURVEY

- Louisiana Stimulus for Excellence in Research (LaSER) Planning Committee
- Outstanding Scientists and Engineers in Louisiana
- University and College Presidents
- Key Business Associations
- Top 50 Private Employers in Louisiana
- Louisiana Department of Commerce
- Governor's Economic Recovery Council
- Local Economic Development Entities within Louisiana
- Louisiana State Arts Council
- Louisiana Endowment for the Humanities

- Louisiana Small Business Equity Corporation
- Louisiana Minority Business Development Authority
- Board of Elementary and Secondary Education
- Selected Federal/Private Research Laboratories
- Louisiana Congressional Delegation

II. NATIONALLY

A. EXISTING MATERIALS REVIEWED REGARDING HIGHER EDUCATION AND ECONOMIC DEVELOPMENT TRENDS NATIONALLY

A number of existing materials compiled by national and/or regional organizations and associations involved in higher education and economic development were reviewed in devising the original methodology for preparation of the white paper.

- Forging Links for a Productive Economy: Partnerships Among Government, Business and Education. The Council of State Governments, 1984.
- The Higher Education-Economic Development Connection: Emerging Roles for Public Colleges and Universities in a Changing Economy. American Association of State Colleges and Universities, 1986.
- Issues in Higher Education and Economic Development. American Association of State Colleges and Universities, 1986.
- To Secure the Blessings of Liberty. Report of the National Commission on the Role and Future of State Colleges and Universities. American Association of State Colleges and Universities, November 1986.
- The Second Term: A Report to President Reagan from the Business-Higher Education Forum. Business-Higher Education Forum, 1985.
- Science and Technology in the Sunbelt: Federal Policy, Jobs and Competitiveness Fact Book. The Sunbelt Institute and The Southern Technology Council of the Southern Growth Policies Board, 1987.
- The Report of the Committee on Technology and Innovation. Commission on the Future of the South, Southern Growth Policies Board, 1986.

B. INDIVIDUALS/AGENCIES CONTACTED FOR BACKGROUND INFORMATION, REVIEW OF PROPOSED PLAN, AND REVIEW OF DRAFT REPORT

From information obtained by literature review (particularly Appendix A and B of the AASCU report Emerging Roles), representative national associations and organizations were identified for input into our proposed project plan. Seven national organizations (as indicated by asterisks below) were contacted, first by telephone and then in writing, for suggested model programs to include in our project and for suggested materials to be reviewed. These organizations provided invaluable assistance, in terms of identifying and describing models for possible inclusion, in terms of suggesting particular areas of concentration for the project, and in terms of final draft review of the report itself.

- American Association of State Colleges and Universities *
  Helen Roberts, Director, Office of Community Development and Public Service [NOTE: During the course of our project, Ms. Roberts left AASCU, and her duties were assumed by Ms. Evelyn Hively.]
- National Academy of Sciences (Government, University and Industry Roundtable)
- Business-Higher Education Forum *
  Judy Irwin, Assistant Director
- National Governor's Association *
  Marianne Clarke, Economic Development Section
- Council of State Governments *
  Frank Hersman, Director of Research and State Services
- Carnegie Forum on Education and the Economy *
  Marc Tucker, Executive Director
- Southern Growth Policies Board
- National Conference of State Legislatures
- National Association of State Universities and Land Grant Colleges *
  Nevin Brown, Assistant Director Special Programs
- American Assocation of Community and Junior Colleges *
  James McKenney, Associate Director Keep America Working Project
- Industrial Propects who considered Louisiana as a Potential Location, but Ultimately Located Elsewhere (This group was ultimately not contacted, due to inability to identify specific contact personnel within firms)

III. MODEL ECONOMIC DEVELOPMENT PROGRAMS CONTACTED

Individuals representing twelve state programs were identified as a result of the initial telephone conversations with national organizations and/or by telephone contact with state information offices. These identified contacts were requested to review our proposed project plan and schedule, and to provide us with information regarding additional national materials or model programs that might merit consideration during our project. At the same time, they were asked to provide any available documentation which would enable us to understand the operations of their programs. In the interests of time, members of the study committee then contacted these individuals by telephone for feedback on the study design and suggested additional models. At the same time, a general verbal overview of the model program and any particular problem areas encountered in its establishment was solicited. Written documentation subsequently was received from ten of the states contacted. Additional material describing the programs of other states also was supplied by Regents' staff engaged in a similar, shorter-term study for a legislative body. (For a description of particular programs, see Appendix B)

California	Ms. Suzanne H. Ness, Director Legislative and Public Affairs California Postsecondary Education Commission 1020 Twelfth Street, 2nd Floor Sacramento, CA 95814	(916) 322-0145
Florida	Dr. Israel Tribble, Director McKnight Programs of Higher Education 201 E. Kennedy Blvd., Suite 1510 Tampa, FL 33602	(813) 221-2772
Kentucky	Ms. M. Joanne Lang, Deputy Executive Director for Policy & Planning Kentucky Council of Higher Education U. S. 127 South 1050 W. Frankfort Office Complex Frankfort, KY 40601	(502) 564-7980
Illinois	Mr. Norm Peterson, Director Governor's Commission on Science and Technology Department of Commerce 100 W. Randolph, Suite 3-400 Chicago, IL 60601	(312) 917-3982
Michigan	Dr. Jamie Kenworthy Manager of Research and Technology Programs Michigan Strategic Fund Post Office Box 30234 Lansing, MI 48909	(517) 373-7550

Mississippi	Dr. George Carter Associate Executive Director Board of Trustees for State Institutions of Higher Learning Post Office Box 2336 Jackson, MS 39225-2336	(601) 982-6611
New Jersey	Edward Cohen, Executive Director New Jersey Commission of Science and Technology 122 W. State Street CN832 Trenton, NJ 08625	(609) 633-2740
New York	Mr. William Horne, Manager University Industry Relations New York Science and Technology Foundation 99 Washington Avenue, Suite 1730 Albany, NY 12210	(518) 473-9744 (518) 474-4349
Ohio	Ms. Christine Meehan, Program Analyst Technological Innovations Thomas Alva Edison Program 65 E. State Street, Suite 200 Columbus, OH 43266-0330	(614) 466-3086
Pennsylvania	F. Roger Tellesen, Executive Director Ben Franklin Partnership Department of Commerce 463 Forum Building Harrisburg, PA 17120	(717) 787-4147
South Carolina	Dr. Frank Kinard, Associate Director Academic Affairs South Carolina Commission on Higher Education 1333 Main Street, Suite 650 Columbia, SC 29201	(803) 253-6260
Texas	Dr. Jane Armstrong Vice President for Program Development Houston Area Research Center 2202 Timberloch Place, Suite 200 The Woodlands, TX 77380	(713) 363-7907 (713) 367-1348
	Dr. Jurgen Schmandt, Director The Woodlands Center for Growth Studies Houston Area Research Center 2202 Timberloch Place, Suite 200 The Woodlands, TX 77380	(512)471-4962 (713) 367-1348

PROJECT PROCESS

After receipt of the comments from the national organizations and the model programs, the white paper project plan was revised for circulation among various groups within the state. Ultimately, any fully effective approach to economic development must involve all relevant parties - education at all levels, key government agencies, the legislative and executive branches of state government, major business associations, key business/industrial firms, and economic development organizations - throughout the policy development process. While the Quality Support Fund deals only with one component of the economic development umbrella, we believed it important to obtain the opinions of all key components. Hence, we identified various individuals representing all of these areas, and requested their feedback on our proposed project plan. At the same time, we developed survey documents for each key group - industry leaders, state agencies, private and federal research facilities, college and university presidents, outstanding scientists, and economic development organizations statewide - to obtain their opinions on the research priority needs of the state, and the preferred interactions that could be utilized to enhance the state's ability to promote economic development through higher education.

A total of 241 questionnaires were distributed statewide to these groups. Of these questionnaires, some 96 (40%) were completed and returned in time for inclusion in the white paper report.

Once the white paper reached a final draft form, it was recirculated to representatives of these same groups - national organizations, out of state model programs, instate colleges and university presidents, state agencies and economic development groups - for review and comment. The final paper, as submitted by LaSER to the Research and Development Advisory Committee, the Louisiana Education Quality Support Fund Advisory Committee, and the Board of Regents, takes these comments into consideration as much as was possible.

APPENDIX B
SUMMARY OF SELECTED STATES' PROGRAMS

CALIFORNIA: The basic applied effort has been a program called MICRO (Microelectronics Innovation and Computer Research Program) which was founded in 1981 to support the state's homegrown microelectronics industry. Open to University of California campuses only, it has two main components: one involving research projects and assistantships, and one involving fellowships to students in specific fields. MICRO is jointly funded by state and industry, with industry commitment needed up front at two times the state level.

California also has the prototype research park, established in 1951 by Stanford University, that developed into what is now Silicon Valley with 80 companies on 660 acres.

FLORIDA: Florida has embarked on a number of programs over the last several years to promote economic development through enhanced linkages to higher education. In fact, in 1986 the Florida Education and Industry Coalition compiled a Guide to Programs in Florida Which Link Higher Education with Economic Development. This guide briefly describes some 37 programs or entities that encourage such linkages in five areas: state level policy and planning; regional cooperative consortia and councils; information management and coordination mechanisms; training programs; and business assistance and industrial development. Of particular interest are the Florida Graduate Scholars Fund, which provides scholarships to full-time graduate students in particular fields (as identified by the Florida High Technology and Industry Council); the Trust Fund for Postsecondary Cooperation, which is designed to fund competitive linkage projects including local consortia/institutional arrangements, faculty/staff networks, cooperative faculty from industry programs, or other apprenticeship or cooperative training of students; and the McKnight Programs in Higher Education, which are designed to improve the recruitment and retention of minority students throughout the educational process in Florida.

MICHIGAN: Michigan has developed various programs funded in a variety of ways: Some provide up front state appropriations; some involve investment of state retirement funds for venture capital pool financing; and some are funded through the Michigan Strategic Fund, which is a specialized quasi-public funding source that receives direct appropriations and also has bond selling capacity.

The Michigan State Research Fund is a competitive grant program that provides funds to colleges and universities for grant research. In order to participate, the college/university must have cooperative funding from a business or other private source for the research project.

Michigan has also created a number of technical centers or institutes with seed money from the state and partial sponsorship from industries. Four of these centers have been initially financed out of the Michigan Strategic Fund. These centers are separate from the state's university system, although each is located close to a university campus. Initial funding from the Michigan Strategic Fund for the Centers lasts for only a short period; the local industrial base is responsible eventually for the operations, funding, and management of the Centers.

The Department of Commerce is extremely prominent in its involvement in this area in Michigan, in terms of funding, determination of research priority areas, compilation of database for use by industry, and providing funding for incubators and other technical assistance efforts. There has been a strong push in Michigan to keep the university administration/boards out of the economic development process. This is because there is some feeling that the tendency of universities and their boards is to bias decisions towards their own educational missions. Because the programs in Michigan focus strongly on economic development, there is a strong feeling that the university structure should be separate from the economic development arm, in order to counterbalance the educational bias.

NEW JERSEY: New Jersey has also taken a multi-angle approach to the higher education/economic development connection, although most efforts have been channeled through the Science and Technology Foundation. There is a slightly different approach, in that the emphasis has been primarily on capital improvements and infrastructure creation to improve educational efforts in economic areas.

One mechanism by which the state is accomplishing this objective is providing facilities and equipment funding to several advanced technology centers, to which industry must pay an annual participation fee in order to use. The state is also providing equipment and facilities funding to the state's community colleges and other public and private colleges, in addition to the ATC's.

New Jersey is also in the fourth year of five competitive grant programs to provide supplemental funding to the normal appropriations process. Two of these programs go to provide undergraduate equipment needs; there will be a new program in 1987 to improve programs in computer literacy.

The state also provides Innovations Partnership Grants for graduate research in various areas; in order to participate, the academic institution must have company matching funds up front. The state is also creating endowed chairs, fellowships, and graduate assistantships in areas of particular interest to the state. Some of these mechanisms are being funded through individual institutions' receipt of Challenge Grants from particular industries or companies. There are also research park efforts underway.

NEW YORK: There are six multi-level programs operational via the State Science and Technology Foundation; again, these programs are admin-

istered separately from the state's normal higher education funding and administration process.

The NYSSTF provides research and development grants to academic institutions and not-for-profit laboratories in the state; each must have supplemental funding (in the form of money, equipment, staffing) from companies or other institutions involved before grants can be awarded. NYSSTF also operates a program for small business that provides a state match to Federal Small Business grants.

The sites of the state's seven Centers of Advanced Technology were selected by the NYSSTF based on the prior academic excellence of the individual institution involved and on the institutional willingness to work with industry. Before a CAT can be funded or created, the applying institution must have private sector matching funds in hand.

The state also provides grants to regional councils for networking to increase technological development; these grants must be matched by private sector monies prior to award. There is also a program of competitive fellowships for teacher certification in shortage areas; these areas are determined by the State Department of Education. Fellowships provide funding for room, board and tuition for both one- and two-year programs, full or part-time.

Finally, the state also provides venture capital funds.

OHIO: Ohio is the home of the Thomas Alva Edison Program, which is a multi-level program operating out of the State Department of Development. This program has functions through various components, all of which are interrelated and which operate separately from the state's educational system.

There are three main components of the Edison Program: The Seed Development Fund provides state funds for matching with private sector support, to fund feasibility tests of new products, services, or systems. The Applied Technology Centers program funds the creation of centers in specific areas at universities, and requires corporate sponsors for individual research efforts. Edison Incubators provide basic services (accounting, secretarial services, management advice, space, overhead, etc.) to small new businesses for a limited period. Each Incubator is managed by a local academic and business partnership.

The state also operates several other programs, which are separate from the Edison Program, but which complement its activities. The Eminent Scholars program provides state funds for match with private money to create endowed chairs at $1 million each; to date, the program has funded nine such chairs, and has plan to fund nine additional chairs. Research Challenge Grants provide a partial state match to externally raised funding for basic research at institutions. Each institution is able to independently select the topics/projects to be funded with these funds; however, the private match must be in hand prior to any award. The state also operates two venture capital mechanisms: one is

a grant program for small/medium firms, and the other uses state pension funds to invest in Ohio firms either directly or indirectly.

PENNSYLVANIA: A number of programs are active in the state to encourage technology improvements and economic development of the state. The best known of these programs is the Ben Franklin Partnership, which operates out of the state's Department of Commerce.

The Ben Franklin Partnership (BFP) is a collaborative effort of education, business, labor and government that is relatively recent. Begun with an initial $1 million seed fund, the Partnership has six separate components, most of which require at private source match of at least 50 percent. The Challenge Grant for Technical Innovation provides support to research and development efforts, entrepreneurial assistance efforts, and education, training and retraining of workers. Firms are encouraged to join the Partnership, through an investment of money or services (or both); partners may then negotiate a project with one or more university. If the university certifies the technical merit of the project, it may proceed as a collaborative effort. Members of the Partnership receive not only university expertise for their projects, but also may share in the results of previous projects in related areas (via access to information); universities receive supplemental funding for necessary equipment, facilities, and/or staff, as well as "real world" problem solving exposure for both faculty and students.

The Small Business Research Seed Grants provide funds to small businesses engaged in research in specific areas, while the Small Business Incubator Loans (require a 3:1 private match) provide funds to establish new business incubator facilities. Seed Capital Challenge Grants may be used to set up privately managed regional seed venture funds, for making money available for new high risk small ventures. Such grants require a three to one private investor match before the state will release funds. Economic Revitalization Tax Credits provide up to $25 million for qualified investments in high technology or research and development areas.

The final Partnership program involves the establishment of four regional Advanced Technology Centers. Each of these centers is affiliated with a major research university, but represents a local consortium of colleges, the university, private firms and economic development organizations. Each center specializes in one or more specific research area, and there are 123 colleges and more than 1700 firms participating in the Partnership.

In 1982, the state identified specific fields that held promise for job creation. The primary focus has been to apply technologies through commercialization of new products or services and to enhance existing, traditional industries of the state. The Ben Franklin Partnership programs are consistent with this focus. Other state programs that complement the Partnership in achieving economic development are the Research Inventory Project, which provides firms with a database of the research capacity of the state in its private or higher educational

institutions and PENNTAP, which is a smaller program of technological assistance to industry and small business. The Inventory may be access via a catalog distributed by the state Department of Commerce, or on-line at participating local universities/Commerce offices. PENNTAP is patterned roughly after the Agricultural Extension Service, and provides specifically tailored information to aid firms in solving particular technological problems. In addition, PENNTAP hosts group seminars in order to rapidly and widely distribute applications of particular technologies among the state's industries and companies.

SOUTH CAROLINA: Since its passage in 1984, South Carolina's Educational Improvement Act has received national attention as an educational reform plan for public school systems (grades K-12). Funding for these reforms has come from a 1 percent increase in the state sales tax, and state leaders feel that improvements in the elementary and secondary schools will have a significant impact on future economic development within the state.

Following passage of the Act, the South Carolina Commission on Higher Education (SCCHE) determined that a detailed examination of the state's public higher educational system would also be in order, and an external consulting firm was retained to conduct such a study. The results - including 22 recommendations for change - were published in early 1986. The SCCHE then appointed six task forces to further examine the implications of these recommendations. The task forces completed their studies by mid-fall 1986, and their recommendations were presented to the Commission in early November.

From these recommendations, staff suggestions, and college representative comments, the SCCHE compiled a report (released in January 1987) detailing a new initiative aimed at the preparation, admission and retention of students; the improvement of instruction and research, and the recognition of excellence in each; and the strengthening of planning and quality assessment for accountability. Through this initiative, South Carolina is determined to bring its public higher education system to the cutting edge of excellence.

Of particular interest to Louisiana's Quality Support Fund efforts are the two South Carolina programs aimed at achieving excellence in research for economic development. The first involves a one-time legislative appropriation of $2.9 million to provide matching funds for establishment of endowed professorships at the state's senior public colleges and universities. This fund is expected to endow some 38 chairs at the state's public institutions of higher education. The second program will involve annual appropriations to a Research Incentive Fund aimed at establishing and expanding research programs at public colleges and universities that are related explicitly and directly to continued economic development of the state. This program is designed to operate through both an incentive grants component and a matching funds component addressing predetermined priority areas related to economic development in the state. Neither component may be used for capital improvements, and both require a significant

institutional match from external sources (only identified federal contracts or grants or private sources may be used as match).

At the time of our review, neither of these programs were operational. Due to South Carolina's current fiscal constraints, representatives from the Commission on Higher Education were unsure of the ability to secure necessary funding during the current fiscal year for institution of these programs.

TEXAS: The Texas Advanced Technology Research Program provided $35 million during the 1985-87 biennium for research projects at state universities. These grants were awarded on a competitive basis, through a program administered by the Texas College and University System Coordinating Board. Under the legislation establishing the program, medical schools were ineligible to compete for funding of projects, and a limit was placed on the total amount of grant funding which could be awarded to schools in the University of Texas/A&M systems.

One of the criteria for funding was that research projects must hold promise of economic benefit to Texas. While there was no specific match requirement, the existence of match potential was an indirect part of the funding decision, since the institution and/or researcher was judged on the past record of achievement in the field; capacity to collaborate with business, industry and government and attract money to the project; and whether or not the research field was significant to the institutional mission. The following target areas were established for this grant program: aerospace, agriculture, biotechnology, chemistry and physics, energy studies, microelectronics and telecommunications, and materials sciences.

SOURCE: State Initiatives to Promote Technological Innovation and Economic Growth. Maryland State Board for Higher Education, June 1986, and individual program descriptions.

APPENDIX C

REVIEW OF PROGRAM ACTIVITIES AND STRUCTURES

A. BACKGROUND -- PROGRAMS OF OTHER STATES

A review of the activities and structures of other states' higher education/economic development programs by the LaSER Committee provided considerable "food for thought" but no definitive guidance. Most states are looking toward advanced technology as a means of reviving old industry, creating new business, and providing jobs; the resulting state programs for technology development are remarkably diverse. As of 1985, over 200 state programs were operational nationwide relative to creating new business and reviving old industries, and approximately 20 states have created special programs with goals similar to those of the LEQSF.

Through these various programs, higher education/economic development funds are used to support the following types of higher education activities:

- Graduate Fellowships
- Endowed Chairs
- Equipment and Facilities Improvements
- Centers of Excellence
- Programs to Enhance Competitiveness of Scientists
- Incubator Facilities Establishment

The wide range of programs that has been developed further emphasizes the necessity of tailoring programs to the specific needs and environment of the state. Some states have created special, independent policy development and coordinating bodies - separate from their normal higher education administrative entities - to administer and/or monitor all aspects of the state's economic development/higher education-related programs; New York, New Jersey, Pennsylvania, and Michigan are good examples of states that have adopted this approach. Others have created separate bodies to administer specific portions of these programs, although in such cases, the states have taken steps to ensure that all efforts remain coordinated. Maryland, Ohio, Illinois, and Georgia are good examples of this type of administrative approach.

Most states reviewed had some type of grant program for providing funds to universities for specific research projects and many states have established grant programs involving industry-related research projects in which industry provides significant cost sharing. This combination allows states to focus their resources on specific targets and to leverage funds against other available resources. Most programs distribute funds through a request-for-proposals process involving merit review. This type of independent evaluation of proposals reduces the possibilities of political interference in the award process.

The diversity of programs reviewed in the national survey makes it difficult to recommend which ones might best serve as models for Louisiana. However, several states have developed programs that are consistently referred to as "models" for anyone interested in developing a higher education-economic development connection. Pennsylvania's Ben Franklin Partnership - which is a collaborative effort of education, business, and labor - has achieved a great deal of favorable attention recently. The program is administered through the State's Department of Commerce and has six separate components, most of which require a significant match by private sources: Challenge grants for technical innovation; small business research seed grants; small business incubator loans; seed capital challenge grants; advanced technology centers; and economic revitalization tax credits. The Ben Franklin Partnership encompasses all of the basic thrusts of economic development/higher education programs within its single policy/coordinating body. Ohio's Thomas Alva Edison Program is also consistently mentioned as an important model for economic development/higher education initiatives. Maryland and Massachusetts have created a number of programs that are independently administered, but that are linked in terms of their focus on educational enhancement to promote economic development. Michigan has developed a strongly coordinated, comprehensive program of educational enhancement aimed specifically at economic development, which is administered by an entity completely separate from the state's higher education administrative body.

A more complete summary of the specific programs operational in other states is provided in Appendix B. In considering these program structures for possible use in Louisiana, it is important to note that most of these programs were established within the past five years and none has been systematically evaluated.

B. LOUISIANA SURVEYS

In the survey of Louisiana university presidents, the campus heads suggested a variety of ways that higher education could contribute to economic development. Some of these activities such as providing stable financial support to institutions, reducing teaching loads, forward funding of capital outlay projects, elimination of policy/legal barriers to faculty participation in business, and the establishment of incubators are not appropriate for direct support under the Quality Support Fund. Some of the economic development activities proposed were directly related to current LEQSF activities, such as funding basic/applied research, establishing endowed chairs, and providing funds for equipment.

Other possible higher education/economic development activities mentioned were: develop bases of academic excellence, develop centers of excellence in specific fields/research areas, and

provide support for economic development projects and programs. Most presidents also mentioned increased federal funding of higher education, including research, as being important to economic development and almost all stressed the importance of university/industry partnerships.

The responses of outstanding scientists were similar to those of campus presidents in almost all respects. However, two areas of difference were apparent. First, outstanding scientists placed more emphasis on the importance of improving faculty salaries and scientific facilities. In addition, the importance of recruiting outstanding college students and training them to become science/math teachers was also noted. Industries responded to the survey by specifying the additional services that they needed and ways in which higher education could promote economic development. Responses reflected broad human resource development concerns, such as producing more liberally educated students and development of competent leaders. Improving the quality of education was emphasized through requests for implementation of strong degree requirements and more stringent educational standards, provision of good physical facilities, obtaining the best faculty, and developing centers of excellence. The total system, it was said, should be directed toward improvement, with resources focused on strong programs and with weak programs eliminated. A need was expressed for additional courses and seminars for business, as well as for curricula tailored to the needs of Louisiana's predominant industries. The importance of developing a strong science and technology base was addressed by several companies who also noted a need for training of engineers and for increased research activities, especially in areas related to Louisiana-specific industrial problems and areas of potential technological development.

The importance of creating a liaison between higher education and elementary/secondary education was noted. Industry respondents also identified areas in which they could contribute to higher education through grants, equipment donation/sharing, cooperative research and development efforts, faculty/student summer employment opportunities, and student internships.

APPENDIX D

TAXONOMY OF DISCIPLINES USED IN THE LOUISIANA EDUCATION QUALITY SUPPORT FUND PROGRAMS

NATURAL SCIENCES - BIOLOGICAL

Agriculture
- 0101 Agricultural Economics
- 0102 Agricultural Production
- 0103 Agricultural Sciences
- 0104 Agronomy
- 0105 Animal Sciences
- 0106 Fishery Sciences
- 0107 Food Sciences
- 0108 Forestry and Related Sciences
- 0109 Horticulture
- 0110 Resource Management
- 0111 Parks and Recreation Management
- 0112 Plant Sciences (Except Agronomy, see 0104)
- 0113 Renewable Natural Resources
- 0114 Soil Sciences
- 0115 Wildlife Management
- 0199 Agriculture - Other

Biological Sciences
- 0201 Anatomy
- 0202 Biochemistry/Biophysics
- 0203 Biology
- 0204 Biometry
- 0205 Botany
- 0206 Cell and Molecular Biology
- 0207 Ecology
- 0208 Embryology
- 0209 Entomology and Parasitology
- 0210 Genetics
- 0211 Marine Biology
- 0212 Microbiology
- 0213 Neurosciences
- 0214 Nutrition
- 0215 Pathology
- 0216 Pharmacology
- 0217 Physiology
- 0218 Radiobiology
- 0219 Toxicology
- 0220 Zoology
- 0299 Biological Sciences - Other

NATURAL SCIENCES - BIOLOGICAL (CONTINUED)

Health and Medical Sciences
- 0601 Allied Health
- 0602 Audiology and Speech Pathology
- 0603 Chiropractic
- 0604 Dental Sciences
- 0605 Environmental Health
- 0606 Epidemiology
- 0607 Health Science Administration
- 0608 Immunology
- 0609 Medical Sciences
- 0610 Nursing
- 0611 Optometry
- 0612 Osteopathic Medicine
- 0613 Pharmaceutical Sciences
- 0614 Podiatry
- 0615 Pre-Medicine
- 0616 Public Health
- 0617 Veterinary Science
- 0699 Health and Medical Sciences - Other

NATURAL SCIENCES - PHYSICAL

Chemistry
- 0301 Chemistry, General
- 0302 Analytical Chemistry
- 0303 Inorganic Chemistry
- 0304 Organic Chemistry
- 0305 Pharmaceutical Chemistry
- 0306 Physical Chemistry
- 0399 Chemistry - Other

Physics and Astronomy
- 0801 Astronomy
- 0802 Astrophysics
- 0803 Atomic/Molecular Physics
- 0804 Nuclear Physics
- 0805 Optics
- 0806 Planetary Science
- 0807 Solid State Physics
- 0899 Physics and Astronomy - Other

NATURAL SCIENCES - COMPUTATIONAL

Computer and Information Sciences
- 0401 Computer Programming
- 0402 Computer Sciences
- 0403 Data Processing
- 0404 Information Sciences
- 0405 Microcomputer Applications
- 0406 Systems Analysis
- 0499 Computer Sciences - Other

Mathematical Sciences
- 0701 Actuarial Sciences
- 0702 Applied Mathematics
- 0703 Mathematics
- 0704 Probability and Statistics
- 0799 Mathematical Sciences - Other

NATURAL SCIENCES - EARTH/ENVIRONMENTAL

Earth, Atmospheric, and Marine Sciences
- 0501 Atmospheric Sciences
- 0502 Environmental Sciences
- 0503 Geochemistry
- 0504 Geology
- 0505 Geophysics and Seismology
- 0506 Paleontology
- 0507 Meteorology
- 0508 Oceanography
- 0599 Earth, Atmospheric, and Marine Sciences - Other
- 4403 Environmental Design
- 4405 Landscape Architecture

ENGINEERING - A

Engineering - Chemical
- 1001 Chemical Engineering
- 1002 Pulp and Paper Production
- 1003 Wood Science
- 1099 Chemical Engineering - Other

Engineering - Civil
- 1101 Architectural Engineering
- 1102 Civil Engineering
- 1103 Environmental/Sanitary Engr.
- 1199 Civil Engineering - Other

ENGINEERING - A (CONTINUED)

Engineering - Electrical and Electronics
- 1201 Computer Engineering
- 1202 Communications Engineering
- 1203 Electrical Engineering
- 1204 Electronics Engineering
- 1299 Electrical and Electronics Engineering - Other

ENGINEERING - B

Engineering - Industrial
- 1301 Industrial Engineering
- 1302 Operations Research
- 1399 Industrial Engineering - Other

Engineering - Materials
- 1401 Ceramic Engineering
- 1402 Materials Engineering
- 1403 Materials Science
- 1404 Metallurgical Engineering
- 1499 Materials Engineering - Other

Engineering - Mechanical
- 1501 Engineering Mechanics
- 1502 Mechanical Engineering
- 1599 Mechanical Engineering - Other

Engineering - Other
- 1601 Aerospace Engineering
- 1602 Agricultural Engineering
- 1603 Biomedical Engineering
- 1604 Engineering Physics
- 1605 Engineering Science
- 1606 Geological Engineering
- 1607 Mining Engineering
- 1608 Naval Architecture and Marine Engineering
- 1609 Nuclear Engineering
- 1610 Ocean Engineering
- 1611 Petroleum Engineering
- 1612 Systems Engineering
- 1613 Textile Engineering
- 1699 Engineering - Other

SOCIAL SCIENCES

Anthropology and Archaeology
- 1701 Anthropology
- 1702 Archaeology

Economics
- 1801 Economics
- 1802 Econometrics

Law (5102)

Political Science
- 1901 International Relations
- 1902 Political Science and Government
- 1903 Public Policy Studies
- 1999 Political Science - Other

Psychology
- 2001 Clinical Psychology
- 2002 Cognitive Psychology
- 2003 Community Psychology
- 2004 Comparative Psychology
- 2005 Counseling Psychology
- 2006 Developmental Psychology
- 2007 Experimental Psychology
- 2008 Industrial and Organizational Psychology
- 2009 Personality Psychology
- 2010 Physiological Psychology
- 2011 Psycholinguistics
- 2012 Psychometrics
- 2013 Psychopharmacology
- 2014 Quantitative Psychology
- 2015 Social Psychology
- 2099 Psychology - Other

Sociology and Social Work
- 2101 Demography
- 2102 Sociology
- 5001 Social Work

Social Sciences - Other
- 2201 Area Studies
- 2202 Criminal Justice/Criminology
- 2203 Geography
- 2204 Public Affairs and 4801 Public Administration
- 2205 Urban Studies and 4406 Urban Design
- 2299 Social Sciences - Other
- 4401 Architecture
- 4402 City and Regional Planning
- 4404 Interior Design
- 5101 Interdisciplinary Programs

SOCIAL SCIENCES (CONTINUED)

Communications
- 4501 Advertising
- 4502 Communications Research
- 4503 Journalism and Mass Communication
- 4504 Public Relations
- 4505 Radio, TV and Film
- 4506 Speech Communication
- 4599 Communications - Other

Home Economics
- 4601 Consumer Economics
- 4602 Family Relations
- 4699 Home Economics - Other

Library and Archival Sciences
- 4701 Library Science
- 4702 Archival Science

HUMANITIES AND ARTS

Arts - History, Theory, and Criticism
- 2301 Art History and Criticism
- 2302 Music History, Musicology, and Theory
- 2399 Arts - History, Theory, and Criticism - Other

Arts - Performance and Studio
- 2401 Art
- 2402 Dance
- 2403 Drama/Theatre Arts
- 2404 Music
- 2405 Design
- 2406 Fine Arts
- 2499 Arts - Performance and Studio - Other

English Language and Literature
- 2501 English Language and Literature
- 2502 American Language and Literature
- 2503 Creative Writing
- 2599 English Language and Literature - Other

HUMANITIES AND ARTS (CONTINUED)

Foreign Language and Literature
- 2601 Asiatic Languages
- 2602 Foreign Literature
- 2603 French
- 2604 Germanic Languages
- 2605 Italian
- 2606 Russian
- 2607 Semitic Languages
- 2608 Spanish
- 2699 Foreign Languages - Other

History
- 2701 American History
- 2702 European History
- 2703 History of Science
- 2799 History - Other

Philosophy
- 2801 All Philosophy Fields

Humanities and Arts - Other
- 2901 Classics
- 2902 Comparative Language and Literature
- 2903 Linguistics
- 2904 Religious Studies; 4901 Religion; and 4902 Theology
- 2999 Humanities and Arts - Other
- 5101 Interdisciplinary Programs

EDUCATION

Education - Administration
- 3001 Educational Administration
- 3002 Educational Supervision

Education - Curriculum and Instruction
- 3101 Curriculum and Instruction

Education - Early Childhood
- 3201 Early Childhood Education

Education - Elementary
- 3301 Elementary Education
- 3302 Elementary-level Teaching Fields

EDUCATION (CONTINUED)

Education - Evaluation and Research
- 3401 Educational Statistics and Research
- 3402 Educational Testing Evaluation and Measurement
- 3403 Educational Psychology
- 3404 Elementary and Secondary Research
- 3405 Higher Education Research

Education - Higher
- 3501 Educational Policy
- 3502 Higher Education

Education - Secondary
- 3601 Secondary Education
- 3602 Secondary Level Teaching Fields

Education - Special
- 3701 Education of the Gifted
- 3702 Education of the Handicapped
- 3703 Education of Special Learning Disabilities
- 3704 Remedial Education
- 3799 Other Special Education Fields

Education - Student Counseling and Personnel Services
- 3801 Personnel Services
- 3802 Student Counseling

Education - Other
- 3901 Adult and Continuing Education
- 3902 Bilingual/Crosscultural Education
- 3903 Educational Media
- 3904 Junior High/Middle School Education
- 3905 Pre-Elementary Education
- 3906 Social Foundations
- 3907 Teaching English as a Second Language/Foreign Language
- 3999 Other Education Fields

BUSINESS

Accounting
- 4001 Accounting
- 4002 Taxation

Banking and Finance
- 4101 Commercial Banking
- 4102 Finance
- 4103 Investments and Securities

Business, Administration and Management
- 4201 Business Administration and Management
- 4202 Human Resource Development
- 4203 Institutional Management
- 4204 Labor/Industrial Relations
- 4205 Management Science
- 4206 Organizational Behavior
- 4207 Personnel Management
- 4299 Business Management - Other

Business - Other
- 4301 Business Economics
- 4302 International Business Management
- 4303 Management Information Systems
- 4304 Marketing and Distribution
- 4305 Marketing Management and Research
- 4399 Business Fields - Other

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