Assessments in Support of Graduate Education and Research

East Carolina University

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Preface

Our assessments of both East Carolina University's doctoral programs and the institutional climate and infrastructure that support them are based on certain premises related to the contemporary practice of doctoral education at research universities in the United States. The purposes of this preface are to clarify the perspectives from which we conducted our work in order to establish a context for the evaluative comments that follow and to articulate our sense of what constitutes a competitive doctoral program.

As we have written elsewhere,[1] the overwhelming reality for public higher education in this decade—despite the temporary relief experienced by many public universities in the last two years—is budget inadequacy. It is tempting to think that budget crisis is cyclical and that more prosperous times always return, but we think that the economic reality for most states is that greater portions of shrinking revenue bases need to be earmarked for the care of aging populations, civil security, and other matters deemed more pressing than higher education. More important, the rhetoric emanating from both state and federal government indicates a fundamental shift in values: higher education is seen increasingly as a good for the individual rather than as a societal good. For government officials, regardless of party affiliation, it is beginning to stand to reason that the cost of an individual good should be shouldered primarily by the individual. From any vantage point now conceivable, many of the recent cuts to higher education are permanent. This economic scenario has many important implications for public research universities, the most important of which is that they need to develop a capacity for self-funding—down to the level of the individual faculty member, wherever possible.[2]

Related closely to budget inadequacy is the cost structure of research doctoral programs. Competitive programs require the presence of senior faculty with active and prominent research agendas, which in turn requires higher salaries and—increasingly frequently—very large start-up packages. Competitive programs also require top-notch Ph.D. students who are competent to participate in faculty research programs. Though we would all like to believe that students choose a doctoral program based on their projected major professor, the reality is that most students now opt for the program that provides the highest assistantship stipend. Competitive stipends and benefits are becoming significantly more costly to universities, particularly in those fields in which ECU is poised to make a difference. Add to these the cost of state-of-the-art facilities and equipment, student professional travel, and the like, and it is clear that research doctoral programs are enterprises of significant expense.

How do we reconcile the expense of these enterprises with the reality of shrinking state support for public higher education? On the faculty level, we assume that the appropriate plan of action is to increase the grantworthiness of research and to pursue grant opportunities vigorously. Given the now long-standing patterns of the federal agencies in awarding research grants, we place great emphasis on collaborative research projects

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[1] Michael Ditchkofsky, "Editor's Introduction to a Special Issue on Financing Higher Education," *Journal for Higher Education Strategists* 1 (Winter 2004): 341-343.

[2] We acknowledge that self-funding is more possible for faculty in the sciences, engineering, and some of the social sciences than it is for faculty in the humanities. Nevertheless, in four years of performing doctoral program assessments at research universities, we have encountered only two programs in the humanities that have no external funding at all. Of course, grant awards in the humanities are significantly lower than they are for the other disciplines; and they frequently carry no possibility of indirect cost recovery.

conducted by multidisciplinary teams of faculty and students.[3] On an institutional level, we stress the need for strong strategic choices that create centers of excellence—areas with a critical mass of research-active faculty and students supported by deliberative institutional financial investment. Because of the budgetary realities of most public universities, it is—to us—clear that strategic choices will include placing some programs in a position of lesser emphasis. More than any other factor, we believe it is the drive to be comprehensive—that is, the desire to be uniformly excellent in every possible discipline and sub-discipline—that increases the operating costs of institutions. In our view, the attempt to be comprehensive results in mediocrity, since there is no area resourced sufficiently to make a difference.

Our assessments also take into account developments in the academic disciplines. It is obvious that disciplines develop over long periods of time. Otherwise, for example, chemists would still be discussing phlogiston. In the past three decades or so, however, we have witnessed rapid and radical shifts in the scope, content, and epistemological orientations of many of the arts and sciences—so that scholars practicing those disciplines today ought to be doing work of a decidedly different nature from the work they were doing 30 years ago.[4] We assume that doctoral programs should also develop over time; and to us, the development of viable doctoral programs is closely aligned with the development of their disciplines. We reject the notion that faculty are "stewards of their disciplines," as the Carnegie Foundation for the Advancement of Teaching phrases it; and we tend, therefore, to be critical of programs that are overly concerned with preserving traditional practices and techniques or with exploring questions of decreasing relevance to the constituents which the program serves.

For us, the primary strategic purpose of a research doctoral program is to help shape its discipline, and we, therefore, define competitiveness as the ability of a program to impact its field. For this reason, all of our analyses are based on comparison of ECU programs with similar programs at other universities. We have no interest in comparing programs within an institution to one another. This practice of external comparison is part of an increasingly more prevalent practice in higher education to embrace performance metrics in order to monitor and foster improvement and in order to be accountable to various constituents—taxpayers, legislators, boards, etc.

As we explain in our discussion of methodology below, we assessed ECU's doctoral programs against the specific performance standards embodied in the institutional benchmark group for this project. More generally, however, we evaluated ECU programs from the perspective of emerging national standards on doctoral education and research, as represented by the consensus of the communities of graduate deans and research officers and the findings of studies on the doctoral degree, such as the University of Washington's Re-Envisioning the Ph.D. Project, that have been conducted over the last decade or so by numerous academic agencies. We did *not* see our task as the assessment of faculty priorities. Hence, we avoid questions about how much emphasis should be given to teaching versus research or to undergraduate education versus graduate. Our intention has been to discuss ECU doctoral

[3] Correspondingly, we are critical of administrative structures and budgeting processes that prevent such collaboration.

[4] The field of bioinformatics is a perfect example of the rapid shifts we have been discussing. Approximately 20 years ago, the field didn't exist. By the early to mid-1990s, many research universities were offering doctoral programs in the field. Today, there are very few bioinformatics programs left—precisely because they have changed into something else: computational biology, functional genomics, etc.

programs against the background of doctoral programs generally so that faculty and administrators can then make informed decisions about what their priorities ought to be.

A final note: Except in certain instances below where our intentions are clear, we do not mean to suggest in a negative assessment that the situation we have found is the fault of individual faculty or departments. As we have indicated during our visits to campus, we believe that state budgeting practices and program approval processes in North Carolina have placed ECU as an institution at a decided disadvantage; and we acknowledge that what it means to be a faculty member now is in many ways radically different from what it was when most faculty now practicing chose to enter the professoriate. As we have also indicated below, the most pressing issue facing the institution is that there is currently no viable financial basis for doctoral education, and the responsibility for this situation clearly rests with previous University leadership, which encouraged the development of doctoral programs without a sufficient understanding of their costs. Despite this, we consider fiscal prudence to be the responsibility of both administrators and faculty, and we have suggested below a methodology for both strategic planning and strategic budgeting that we believe will improve the current situation of financial instability.

Introduction and Methodology

In March 2006, the Vice Chancellor for Research and Graduate Studies at East Carolina University contracted Yardley Research Group to conduct a strategic assessment of the University's doctoral programs, in order both to benchmark them against cognate programs in the University's institutional peer group and to introduce to the faculty the plan for the National Research Councils' national assessment of research doctoral programs. The specific purposes of this analysis are to:

- define the competitiveness of each participating program in relation to a cohort of institutions selected by the University and identify steps to increase program competitiveness;
- suggest long-term strategic priorities that strengthen, realign for development purposes, or otherwise improve prospects for graduate study and research at ECU;
- estimate enrollment capacity for doctoral and master's programs; and
- propose possible new graduate programs for the University that are both marketable and feasible.

The methodology we used to complete the doctoral assessments evaluates a program's own sense of its strategic direction and competitive position in light of comparative data on similar programs at peer institutions. While in practice the various stages of the methodology overlap one another, it is convenient to think of the work as taking place in distinct phases.

- *Phase I—Interviews*: During the week of April 2, 2006, Yardley Research Group personnel[5] conducted on-campus interviews with directors of graduate study of the doctoral programs participating in the study, as well as the relevant department chairs. At the same time, we also interviewed faculty representing proposed doctoral programs in various stages of development. Faculty interviews related to existing programs focused on enrollment trends and analytics, recruiting activities, the programs' own sense of their competitive strengths and weaknesses, especially related to academic research, and strategic initiatives to improve program standing.

  Faculty interviews for proposed programs mirrored the process and criteria by which the University of North Carolina system evaluates new degree proposals, and sought to relate the proposed program to institutional mission and strategies, explored how existing resources could contribute to program development and how gaps could be addressed. In addition, we explored faculty research interests and scholarly achievements, infrastructure requirements, including library holdings, market demand for the program, plans for competitive indicators such as stipends, and plans for the ongoing assessment of the program.

  For background purposes and in order to discover institutional strategic intent, we also interviewed the Deans of each of the participating colleges and some of the University's senior administrators, including the Chancellor, the Provost, the Vice Chancellor for Research and Graduate Studies, and others.[6]

[5] CEO Michael Ditchkofsky and Vice President Louise Williamson. Senior Consultant Nancy Diamond had a scheduling conflict for the visit but joined us in our analysis.
[6] Questionnaires for each of these interviews are included in Appendix A: Interview Protocols.

- *Phase II—Selection of Institutional Cohort*: In collaboration with the Vice Chancellor for Research and Graduate Studies (VCR), we selected a cohort of ten institutions for comparative purposes. To select the group, we worked with several lists—ECU's newly developed list of peer institutions, the 2006 Carnegie Classifications, and two lists based on queries we conducted on data from the Integrated Post-Secondary Education Data System (IPEDS) of the U.S. Department of Education.[7]

  The first query identified institutions that, for the most recent three-year period for which data was available, spent within 20% of ECU's instructional expenditures. The second query identified institutions that spent within 20% of ECU's research expenditures. We chose the final list of comparator institutions with a view to establishing aspirational benchmarks for the University. As we will discuss in more detail below, it was impossible to find within the cohort an adequate number of cognates for some programs. In those cases, we went outside the initial group of 10 benchmarks, giving preference to institutions in the official ECU peer group.[8]

- *Phase III—Selection of Program Cognates*: Once we selected the comparative cohort, we then reviewed catalog copy and other published descriptive information in order to choose benchmark programs for each ECU doctoral program participating in the project. In choosing, we paid particular attention to credentials offered, program curricula, and faculty research. This allowed us to compare programs that, whatever their official names, were similar in content and strategic intent.[9]

- *Phase IV—Productivity Comparisons*: We assessed each program on the basis of productivity indicators that we anticipate will be used by the NRC in its upcoming assessment of doctoral programs.[10] These data are divided into the following groups:

  - Data related to program size, including the current number of FTE faculty[11], the average doctoral enrollment for the previous three years, and the resulting doctoral-student-to-faculty ratio
  - Data related to students, including in all cases the number of doctoral degrees conferred in the five year period from AY 2000-01 through 2004-05.

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[7] Results of these queries are provided in Appendix B: Instructional and Research Peers.
[8] The final list of benchmarks for the project, usually referred to below as the "comparative cohort," includes Florida International University, Northern Illinois University, Ohio University, Old Dominion University, University of Missouri Kansas City, University of North Dakota, University of South Carolina, University of Wisconsin Milwaukee, Virginia Commonwealth University, and Wright State University. As we have already indicated, we were often compelled to go outside this cohort in order to find program cognates. Institutions used most frequently for these cases include Florida State University and the University at Buffalo, though in all, 42 additional universities figured into the study.
[9] A list of comparator programs is available in Appendix C: Taxonomy of Program Cognates.
[10] This data is summarized in Appendix D: Comparative Program Data. We detail the sources of data fully in Appendix D, but for the most part, the source of data is the universities' office of institutional research.
[11] In all cases, we asked for the number of FTE faculty who are either designated as graduate faculty or who are currently active in training doctoral students. (We did not count non-graduate faculty or non-tenure-system faculty.) The universities' calculation of FTE are derived from the varying teaching load requirements of each university and, in those cases where joint appointments are possible, the percentage of faculty time devoted to specific doctoral programs. Formulae for calculating FTE differ from institution to institution.

(Figures for 2005-06 were, for the most part, not available at the time of data collection.) For many programs, we also include average GRE scores, though institutions were inconsistent in the way that they record scores. Some institutions record verbal and quantitative scores; others record only the total score. For verbal, quantitative, and total scores, we use a three-year average (AY 2002-03 through 2004-05). For analytical writing scores, we use a two-year average (AY 2004-05 and 2005-06), since using earlier years would require us to convert from the test's old method of scoring.

- Data related to faculty and research, including total average annual research awards[12] for the period AY 2000-01 through AY 2004-05 and papers published and citations received in periodical publications for the same period.
- Data related to program competitive quality and practices, including net assignable square footage of research space, degree of tuition remission, the customary duration of the graduate stipend, the average amount of the stipends, the degree of subsidization of student and dependent health insurance, and the average time-to-degree for the five-year period from AY 2000-01 through 2004-05.

We will detail the methodologies for assessing enrollment capacity and determining new program marketability and feasibility in later sections of this document. Before turning to the assessments of the doctoral programs themselves, we want to delineate some general observations that became apparent during the course of the study and that cut across specific programs.

[12] We prefer awards rather than expenditures, since awards are the best indicator of current research prowess.

Assessment of Existing and Proposed New Doctoral Programs

General Observations and Recommendations

We begin by noting that East Carolina University is in an exciting time of transition as an institution and that, not surprisingly, such transition is being mirrored in particular programs which, after an apparent period of stagnation, are moving in the right direction. A new central administration is bringing vitality to the institution, engaging faculty and staff for the first time in integrated strategic planning, which features a budget planning process that above all values transparency. During our time on campus, we saw no shortage of excellent and innovative ideas, particularly in health-related areas, and we believe that the institution is evolving a world-class academic medical center that is on the verge of particular distinction in several areas of research that are important both generally and to the region in which the University resides.

Many of these transitions, obviously, are reflected in the University's doctoral programs; but we are concerned that the historical development of those programs is problematic in several senses, and that, from the point of view of a highly functional research university, they exist in a context of cultural, structural, and infrastructural deficiencies that require significant institutional change and in a climate of bureaucratic impedance that is hostile to the conduct of doctoral education and research, particularly in the biomedical sciences.

Of the University's 17 existing doctoral programs (excluding the consortium degree in technology management), a significant percentage have been launched within the last 10 years—six programs were begun in 2001 or later, another five were started between 1996 and 2000, and six were founded prior to 1995. Under a previous central administration, in fact, the University pursued an aggressive campaign of doctoral program development in order to earn the greater per-student allocation that the state provides for doctoral students. Our concern is that the University appears to have developed these programs without an adequate understanding generally of how much doctoral programs cost to run and specifically that the per-student allocation from the state is not enough to support a doctoral student.

It is not simply a question of student support, however. One program—Health Psychology—though it launched officially last year, was at the time of our visit considering not accepting students for the 2006-07 academic year because the department lacked faculty who could supervise a doctoral dissertation. At least one other program—Medical Family Therapy—launched not only with insufficient qualified faculty, but with inadequate funds for student support and a lack of both the clinical and research space needed to support the program. Our sense is that the University embarked upon program development with neither an adequate understanding of start-up costs nor a reasonable assessment of barriers to entry—to the extent that those barriers, in several cases, continue to exist even after the launch of the program. In at least one case, though we think that the program is a wonderful idea and that its research output is sorely needed in the region, we wonder if the University will decide that it can afford both the start-up costs to operate the program competitively and the ongoing investment required to support the faculty vision of community engagement.

Moreover, the choice of some programs for development strikes us as odd and, in several cases, constitutes a high risk for the University. In an effort, perhaps, to avoid the objection during the state approval process of duplicating programs, faculty settled upon a kind of development by synecdoche, substituting a narrow sub-specialization for the field itself—so that ECU has bioenergetics rather than exercise and nutrition sciences, medical family therapy instead of marriage and family therapy, and technical and professional discourse rather than English or communication. This kind of development has several consequences.

During the course of our practice, we have encountered several programs of this type, in which a faculty orientation is institutionalized as curriculum and becomes the entire program. Even though the research or epistemological orientation of the faculty is a principal selling feature and—frequently—a strength of the program, its expression as curriculum ultimately means that the program never finds an audience, since students fear that what appears to be overly narrow specialization will limit their employment prospects. Hence, most students opt for Exercise Science rather than Bioenergetics, for example.

We think that this problem will be especially acute at ECU for another reason. In many instances, faculty choice of program shape or focus has placed the ECU program in a uniquely uncompetitive position. As we indicated in our discussion above of the methodology for this study, the odd shape or configuration of programs at ECU forced us to search outside the comparative cohort for similar programs. Frequently, we found cognates only at some of the country's foremost research universities—to find Medical Physics, we had to look to Purdue, UCLA, Minnesota, and Wisconsin; to find Health Psychology, we turned to Duke, Stony Brook, and Florida; and to find Medical Family Therapy, or the closest match to it, we had to go to some of the country's foremost land-grant institutions: Iowa State, Michigan State, Purdue, and Minnesota.

Such choices will obviously lend a negative cast to these particular program assessments, but the more important point is that when looking for programs in Medical Physics, for example, prospective students will be comparing the ECU program with those at the institutions cited above—and there they will find faculties more than twice as large as the one at ECU, research earnings—and consequent student research opportunities—nearly 20 times larger than those at ECU; and faculty publication records that dwarf ECU's by 15 or more times. We project, as a result, that the ECU programs will struggle mightily with enrollment targets and will be forced to take students of a caliber that will neither raise program research profiles nor result in distinguished post-degree placements. In some of these cases, we are dealing with program choices that could very well be pioneering for their fields, but we think pioneering a new discipline is a very high-risk financial strategy for ECU. Our sense is that faculty choices are more likely the result of particular cultural issues which the University will need to address if it is to move forward in a way that makes financial sense.

The national reality of decreasing state support for higher education and the concomitant increase of self-supporting activities from faculty have not yet gained currency among many faculty at ECU. As we spoke to faculty and administrators during our campus visit, it became clear that there was little sense—outside the central administration—that programs are responsible for supporting their own graduate students. We use the word "graduate" deliberately, for many programs state frankly that it is the state's—and hence, the Graduate School's—responsibility to provide support even for master's students.[13]

In fact, there appears to be little agreement that research is among the primary functions of faculty. This is, perhaps, connected with the University's double legacy as a teacher training institution and a community-based (that is, non-research) medical school. We observed a frequent tendency in faculty speech, in curriculum design, and even in strategic discussion with the deans, to separate research from other legitimate endeavors. Too many programs, for example, feature separate research and clinical tracks; and some faculty tend to believe there needs to be a choice between "traditional" research and community engagement. More than anything else, the University needs to navigate a cultural shift in which faculty come to

[13] We have, in fact, never encountered anywhere such a complete absence of the notion that one of the principal roles of master's programs is to generate tuition revenue.

believe that externally funded research is among their primary job responsibilities and that their doctoral students need to be trained and funded out of that same research.

In many instances, the University is faced with a chicken-and-egg dilemma in initiating this shift. Some of the deans admit candidly that faculty in their colleges are "nowhere" with active research programs and insist that, consequently, they need research assistantships from the Graduate School and other financial resources from the VCR in order to seed faculty research. Some seed funding is inevitable, but we would feel more comfortable with this notion if all the deans were to approach this question as the Dean of the College of Technology and Computer Science does—that internal funding is an investment that must be returned to the University within a particular period of time and that internal funding provided by any mechanism is tied to expectations of particular levels of research and other productivity. We think it is also important that the University move quickly to hire a permanent advancement and development staff.

To be fair, there are several serious infrastructural issues that need to be addressed at least simultaneously with the launching of a research culture. The first is that the teaching load for doctoral faculty needs to be reduced—probably to 2-2, based on our experience elsewhere. Second, the University needs to set up a system of metrics and annual unit reports that encourage activities important to a research university. During our data collection for this study, we had the opportunity to consult the academic unit report system developed by the Office of Institutional Planning and Research. This system appears to be operating well and certainly tracks many of the required elements—faculty publications, etc.—but has several important deficiencies.

First, it is not sufficiently integrated into whatever system is used by the Office of Sponsored Programs to track grant proposals, awards, and expenditures. Second, at least some of the reporting that feeds the system is either voluntary or inadequately enforced.[14] The more serious issue, however—and this is an issue with the Sponsored Programs system as well—is in the way the system defines "academic unit." For the most part, tracking happens at the level of departments—so that it is difficult, for example, to track research awards at the level of an interdisciplinary doctoral program.[15] It is not our intention to call attention to system deficiencies per se but to point to the need to begin tracking performance measures in a way that is more conducive to the conduct of doctoral education and research. We recommend the development of a system that defines "unit" as the individual faculty member.[16] In such a system, various codes can be assigned flexibly so that the University can track cost, revenue, and other kinds of productivity however it desires. For example, an individual faculty member can be coded so that (s)he is a member of a program, a department, a college, an overarching research initiative such as obesity care, or any other larger group of faculty which the University is using to accomplish some strategic purpose. Such a system would foster the development of a culture in which a primary job function of faculty is to conduct

[14] We encountered an incident in which a department had not entered all of its faculty publications into the appropriate database for annual review purposes, and the University administrator with whom we discussed this indicated that the failure to observe this required practice is fairly routine.

[15] To obtain research awards attributable to the Coastal Resource Management program, for example, at least four people had to discuss the question over a period of several days, and the discussion included territorial tensions.

[16] We do not mean by this the re-development of technical systems but the re-definition of terms in the current system, with "individual faculty member" replacing, for example, "department" as the definition of unit.

funded research that supports both University strategic initiatives and individual doctoral students, in which individual job performance and institutional progress toward strategic initiatives are measured, and in which resources can be strategically aligned.[17]

We think that infrastructural issues are not the cause of an insufficient research culture; they simply confound it. Because the comparative cohort for this study is so fragmented (for the reasons we have discussed), we were unable to benchmark specifically the percentage of grant proposals that result in funding. Our experience in the field, however, indicates that the conversion rate at ECU is unusually low, and the kind of analysis we are performing here is unable to indicate why. It could be simply that faculty require professional training in terms of proposal development, which is easily provided. It is probable, especially in the newer programs, that the funding agencies simply do not see a level of research activity in the institution to give them a sufficient comfort level; but it is also possible that faculty research is not yet grant-worthy in itself, which is a more serious cultural issue that needs to be addressed in several ways.

First, we think it is important that the University jump-start its research program by hiring senior faculty leadership in the areas it deems most important. Second, a significant portion of seed money for research should be reserved for senior hires, with the stated expectation that faculty who receive start-up funds need to return that investment within a particular period of time and need to generate consistently several times their annual salary and other costs after that.[18] Third, it should be a routine part of periodic program reviews for visitors to review grant proposals and comment on their effectiveness. Naturally, we assume that visitors should be distinguished and productive scholars in their fields.[19]

It is not surprising that the University's infrastructure for research development is itself in need of development, since the University's research mission is, after all, relatively new. We think, however, that the advancement of the University's research culture is impeded by two principal factors, one of which is an *over-development* of infrastructure, in several senses.[20] We have already noted that systems and reports tend to track by department, and this is no accident: the department itself looms large in the ECU collective consciousness, so to speak, since the department is the chief entity through which resources are allocated. Our direct experience during this study is that alternative structures, such as institutes, function in precisely the same way—as channels for resources; and because of this, they are less effective in doing what they do at other research universities: bringing faculty together from the various resource channels so that they can pursue a particular research agenda or accomplish some other strategic purpose.

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[17] If this system could be integrated into the budget planning process, it would help to at least examine many issues. Many faculty complained to us, for example, that they have no real incentive to conduct research. We are unable to judge the legitimacy of this complaint, but the kind of system we have described would enable the University to examine, for example, indirect cost allocation on a number of levels so that it could be benchmarked against standard practice in the field.

[18] This is becoming standard practice in many universities.

[19] Many faculty lamented that too few of their proposals are funded, though in several cases noted below, we think the issue is that their pipeline is too small—that is, they are not submitting enough proposals. It is curious to us, however, that most faculty seem genuinely mystified about why their proposals go unfunded. Is it possible that it is not routine procedure for faculty to see reviewers' comments? We think it is important for the VCR to conduct a review of recent proposals to see if anything can be learned.

[20] The other factor is legacy.

It is our observation that there is an over-abundance of "resource channels" at ECU. There is certainly significant repetition at the program level. There is a proposed program, for example, in Health Intervention Science, a growing strength of the University. Our point, however, is that the content of this program will overlap significantly with both the program in Bioenergetics and the program in Rehabilitation Counseling and Administration—three programs, each with its own administrative infrastructure. This kind of overlap is repeated at higher levels: a college of health and human performance which overlaps significantly in scope with a college of allied health sciences; and, for that matter, there are four separate colleges that relate to human health. While we are not making recommendations related to the specific programs and colleges mentioned here, we do need to raise the possibility that in order to develop the infrastructure it needs for doctoral education and research, the University may need to eliminate some of the redundant infrastructure it currently has.

This is not simply a question of efficient administration. This is a fundamental anomaly the University will need to solve: in order to avoid duplication of existing programs in North Carolina and to pursue a doctoral and research agenda with a restricted budget, the University will need to develop *inter-departmental* doctoral programs that serve as a vehicle for interdisciplinary research—this in an institution that is currently focused on administrative units and is preoccupied with a host of *factors of separation*—departmental resources, budget, faculty organization, assigned space—none of which is conducive to interdisciplinary research. In a very real way, establishing a viable culture of faculty research means changing the whole way the University assigns credit, allocates resources, and administers rewards and penalties. To do this, ECU will need to focus the entire institution on *factors of integration*, and it is quite possible that one of the means to do this will be to eliminate internal redundancy—to say nothing of artificial barriers.

We need to address another kind of over-development of infrastructure that is impeding the advancement of the University's research culture. In nearly every one of the 42 interviews we conducted on campus, we heard alarming reports of a bureaucracy spun out of control—to the extent that major initiatives negotiated at the decanal level and approved at the vice chancellor level are brought to a complete halt by relatively junior-level employees—usually on the grounds that they violate some policy or procedure imposed by the state of North Carolina. The "Code"—and all its variations by college and type of employee—hovers over virtually everything the University attempts to do, from large strategic initiatives to ordinary mundane tasks, sapping significant time, energy, and political will that could be devoted elsewhere.[21]

On several occasions both during and after our visit to campus, we spoke to various faculty and other personnel about some possibility we had conceived—only to be told that the Code would make it impossible to pursue such an action. We have not read the Code in all of its iterations; but we have read significant parts of it—those parts that purportedly nullified our ideas—and we believe that the source of bureaucratic obstacles to strategic initiatives at ECU is local interpretation of state requirements—and not the requirements themselves. We think it crucial for the health of the institution that the Chancellor order an external audit of all policies and procedures related to accounting, hiring, and executing contracts. The audit should extend down to employees at the lowest level; and the auditors should adopt as standard procedure that they demand to see the precise relevant policy or regulation every time they are told that something must or must not be done in a particular way because of state requirements.

[21] We cannot overestimate the seriousness of this issue. Discussion of it took up nearly 60% of the total time we spent with deans and senior administrators at the University.

Part of the theme we have been developing is that a large part of the cultural shift that needs to take place at ECU relates to the University budget, which played second fiddle in our interviews only to bureaucracy. In general, those on the East Campus prefer to have the budget scenario of those of the West Campus, who prefer to have the scenario of those on the East Campus. Everyone complains that the budget is baroque and impenetrable. We know that current senior administrators are going a long way to make the budget process transparent and we are not in a position to judge whether it is over-complicated, but it is clear that faculty are preoccupied with budget—in an unhealthy way. Perhaps because resources are scarce, there is a tendency to engage in hoarding and empire building, as we have already indicated: "Something must be paid for out of the university budget, not out of the department's."; "It is important for this program that it have its own dedicated space that no one else uses."; "This money is attached to this administrative entity and cannot be attributed elsewhere, even for analytical purposes."

The part of the budget we have seen—that part related to graduate student financial support—was largely determined in the past by legacy. We will discuss this more fully when we turn to the Graduate School, but the point we wish to make here is that in discussing assistantship support with programs, we discovered that there is a frequently occurring practice in which, apparently feeling that the Graduate School is not providing adequate support, deans will take funds allocated for something else (usually faculty lines that have not been filled) and use them to fund assistantships. This practice troubles us for several reasons.

The one relevant to this discussion is that this is a sign that spending is primarily operational rather than strategic. In order to move forward on a strategic research agenda, we think the University will need to set aside significant funds to build strategic areas and then will need to be sure that those funds are in fact spent on those areas. Perhaps the most difficult part of the cultural shift is that there will need to be more centralized control of spending than that to which faculty and administrators are currently accustomed, but we see this as crucial. In our opinion, it is characteristic of a viable research culture that funds are allocated strategically and then spent as budgeted on the purposes for which they were allocated. It is also our opinion that "cushions" or reserves should be restricted to senior administrators. This assumes, of course, that there is a consensus among deans and senior administrators about institutional strategic priorities.[22]

Given the problematic history of doctoral program development, including the failure to plan for significant start-up costs, as well as faculty assumptions about graduate student support and the factors of both legacy budgeting and operational spending, our principal concern for East Carolina University is that there is not currently a rational and viable financial basis for doctoral education. Therefore, we think it is urgent that the University develop a comprehensive enrollment management plan that will govern in detail operational and strategic spending for the next five years and that will lay the groundwork for spending for the five years beyond that. Such a plan should be grounded in the long-term strategic priorities of the University and should be informed by explicit polices that express the consensus of the deans and senior administrators about acceptable levels of spending and non-financial values in particular areas. The plan should include the following elements:

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[22] The other reason that we are troubled by operational spending in this area is equally important: our general experience is that when graduate assistantships are administered outside the Graduate School, the balance between the pressure to cover instruction and the need to provide meaningful professional experiences that contribute to a student's doctoral education is often jeopardized.

- an accurate accounting of existing and potential income for particular academic units, including state per-student allocations, actual tuition revenues, external research grants (probably expressed as indirect cost allocations), income from service contracts and clinical trials, student fees, and income generated through University or College Advancement, and endowment-generated income (if applicable)
- an accurate accounting of actual and projected operational and strategic expenses, including salaries and benefits for tenure-system faculty, fixed-term instructors and adjunct professors, graduate assistants, technical and research staff, and clerical staff; competitive tuition support for GAs; competitive start-up packages for new faculty; physical infrastructure; equipment maintenance; and marketing
- the resulting Income/Expense (I/E) ratios. (It is important to note that acceptable I/E ratios (whether positive, negative, or zero) are governed by institutional policy. The University may decide that the non-financial value associated with a particular unit is high enough to warrant a negative or zero I/E ratio. Strategic budgeting assumes that I/E ratios differ by unit and change over time.)
- operational assumptions and strategic goals of the unit plotted out over time, but these must always be expressed in terms of their effect on the I/E ratio.

It is probable, given the state budgeting process, that income will need to be expressed in part by student credit hours (SCH). We think it will be helpful to plot out SCH for both major students and non-major students by unit, since an accurate picture of service instruction may alter the way the University charges units for general allocation. We assume that both the institutional budget and the enrollment management plan will reflect institutional strategic intent.

Before turning our attention to the Graduate School itself, we have a final point on cultural issues. A number of the faculty with whom we met speculated whether the University (and hence, the region) could become a more modest version of the research triangle that dominates the state economy. We think this is the wrong question to ask because it indicates adherence to a particular model of higher education that will not likely be possible for ECU: the large comprehensive research university in which excellence is derived partly from faculty size and partly from contributing, through original research and by preparing the future professoriate, to the development of the traditional academic disciplines. Adherence to that model has extensive implications that effect virtually everything in the University—especially faculty hiring. In that model, the operating principle is to hire one or two faculty in every possible area in a field—both in order to be comprehensive and in order to cover instructional needs—with the consequence that no single area achieves critical mass.

ECU will never be the University of North Carolina at Chapel Hill or NC State or Duke University. This does not mean that excellence is impossible for ECU. In fact, we think it possible in the near term for ECU to become internationally recognized for its metabolic research, especially in terms of the treatment of obesity and diabetes, and for its work in rural medicine generally. The University has achieved this precisely because it developed (by plan or otherwise) research foci that are crucial for improving the quality of life in its particular region, and we think that this is the key to distinction for ECU: to build concentrated research excellence in areas that have immediate regional impact and to focus intently on those areas.

The necessary by-product of intense focus is that other areas are held necessarily in a kind of receivership, especially if they have not yet developed the ability for self-support through grants or service contracts. We think that this, along with more centralized control of the budget, will be the most difficult part of the University's cultural shift since, as we have

already discussed, the University currently has a culture focused on rigid separation of units. For ECU, the achievement of critical mass will be achieved through interdisciplinary collaborations, joint hirings, and other mechanisms that support interdisciplinary research focus. It will not be achieved by building comprehensive departments.

An ironic result, we think, of adherence to the ideal of the comprehensive department and its concomitant resistance of collaboration is that the practice of the disciplines themselves becomes outdated. We believe this to be a serious issue for ECU, especially in the Brody School of Medicine, where concern for the erosion of traditional disciplines has had the unintended consequence of outdating faculty approaches to biomedical science. It is possible that this factor plays an important role in the University's generally low award to proposal ratio.[23]

One of the key strategies for increasing the research culture at ECU is to increase the functionality of the Graduate School itself, which has suffered from a lack of strategic direction under prolonged interim leadership.[24] The Council of Graduate Schools has laid down ten broad functions of graduate schools[25]; but of greatest relevance here is that graduate schools play a central role in coordinating the development and ongoing evaluation of programs and in recruiting, admitting, and monitoring the progress of graduate students toward their degrees. The current Graduate School is active primarily in terms of students, though not strategically so, and so far as we can tell, it has had little role in the ongoing development of programs. From our point of view, a strong graduate school would play the central role in the coordination of proposals for interdisciplinary training grants—the award of which would be a major step forward for ECU.

In terms of students, we are concerned, first of all, that the pool of applicants to doctoral programs is quantitatively and qualitatively inadequate—most programs have acceptance rates of 50% or more and, for the most part, incoming GRE scores are not higher than the 50th percentile. The Graduate School needs to develop a plan consisting of centralized—that is, Graduate School initiated—actions and program activities that will increase the quality of incoming students over time. Part of the plan should be to improve the timeliness of the admission cycle. Currently, admission offers with assistantships are made too late in the spring for the University to attract the best possible students. Similarly, the Graduate School needs to address the question of graduate student health insurance, which is currently offered only to students in the Brody School of Medicine. Our sense is that, in order to be competitive at all, institutions need to subsidize health insurance for students by at least 50%, though many graduate schools routinely offer full subsidies for both students and dependents; and we expect that the minimum level of competitiveness will increase as time goes by.[26]

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[23] We observe a curious dichotomy in this regard. By instinct, faculty who have developed doctoral programs have created programs that, in terms of content, do in fact cross the traditional disciplinary boundaries. Except for those areas in which the practice of a discipline is outdated, resistance to collaboration is administrative, not scholarly.

[24] Since our visit to campus, the Vice Chancellor for Research has hired a new Graduate Dean, and we expect this will make a major difference for the University.

[25] in Daniel Denecke, Ed., *Organization and Administration of Graduate Education*. Washington, DC: Council of Graduate Schools, 2004.

[26] We are not, however, advocating full subsidies for students and their dependents, which several programs felt should be the case, since their doctoral students tend to be adults. In our view, graduate stipends and health insurance are not meant to support families, and we don't believe that ECU needs to go this far to be competitive.

Under interim leadership, the Graduate School developed a number of uncompetitive practices related to graduate student funding. As far as we can tell, the allocation of GA funds has been determined by legacy and is appropriate to an institutional academic profile and levels of state funding that are far in the past. The most recent figures we have available to us indicate that 68% of assistantship funds are spent on master's students, with only 15% of funds available to doctoral students. (An additional 15% of funds are spent on "other" students,[27] apparently including, at one point, certificate students. This is a profile not worthy of a research university and needs to be changed. While we recognize that certain programs in the liberal arts and sciences have heavy service instruction loads that need to be satisfied by non-tenure system faculty, we think that the priority for funding should be doctoral students first and then academic master's students.[28] As we have already indicated, master's students in professional programs, such as business, education, communication, etc., should be expected to pay tuition, either full or discounted as a means to attract students, since this is standard practice nearly everywhere.

In our view, the task force on the funding of graduate education chaired by Associate Vice Chancellor Paul Gemperline had made an excellent beginning in sorting out ECU funding practices, and we want to endorse and carry further the committee's recommendations made in its report of October 25, 2004. Specifically, we believe that the Graduate School's practice of offering administrative assistantships—in which students are paid to perform clerical work in various department offices—should be abolished, since clerical work does nothing to contribute to the student's educational experience or professional development, which is the principal purpose of a graduate assistantship. For the reason discussed above (on page 12) and because it also jeopardizes the balance between the education and professional development of students and the workforce needs of departments, we recommend that various deans' practice of using lapsed salary funds for additional graduate assistantships be avoided. The experience of the field is that students perform better and benefit more when their assistantships are administered by the Graduate School.

We also recommend that the Graduate School pay much more attention than it has in the past to the question of professional development. First, it needs to develop and implement professional development programs for students—in such areas as pedagogy theory and practice, grant writing, job searching, etc. Second, we think there is a strong need for both orientation and ongoing professional development of graduate program directors so that the University can be certain that their activities and the advice they give to students conform to best practices in the field.[29]

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[27] It is an established practice in many units to hire graduate students from other programs with unit funds as part-time hourly assistants. Categorizing these kinds of expenditures as graduate assistantships for accounting purposes confuses the role of institutional support for graduate education and makes it difficult to track true expenditures for graduate education.

[28] It is not clear to us if the University is making adequate use of fixed-term instructors, but these should certainly be part of the picture. At minimum, fixed term instructorships can be used as a tenure-system faculty recruiting tool. More than one program indicated that it had lost candidates because the University could not accommodate their spouses in any way. In any case, we think this should be part of the discussion for strategically reallocating graduate assistantships.

[29] We published, in our now-defunct periodical, *The Journal for Higher Education Strategists*, a paper on this issue by Suzanne Ortega, former Vice Provost for Graduate and Advanced Studies at the University of Missouri Columbia and now Dean of the Graduate School at the University of Washington. We have included a copy as Appendix E of this document.

As we believe the new senior administrative team understands, we think program development is also crucial if the University is to increase its stature as a research institution. What needs to be accomplished principally is the building of second and third areas of research prowess in order to attract additional external funding and to back up the existing strength in health sciences. However, we believe that this new development should take place in an economic context different from past development. We think that in the new context, the University should assume that programming will be supported first by external grants (primarily from NIH) and second by tuition income from professional master's programs, including distance-delivered professional master's programs, and finally (and of significantly less priority), state allocations.

As we have already indicated, we think that the future for ECU lies in developing concentrated research excellence in areas that have immediate regional impact. The final section of this document—on new program development—will discuss in detail how potential ECU programs could relate to existing economic clusters in eastern North Carolina, but as we foresaw, there is not currently a critical mass of any particular kind of employer in the region, and consequently, we think it needs to be ECU's role to *initiate* economic development rather than simply to respond to initiatives already taking place in the region. This will be a significant change for the University: past program development was driven by some combination of faculty strength, interest, and readiness; future program development needs to be driven by regional economic imperatives. For this reason, we think it would be helpful for the University to hire an economic development officer, reporting to the Vice Chancellor for Research, whose principal functions are to be in constant contact with the existing regional industrial base, to suggest avenues for program development based upon regional contact, and, working with interested parties in the region, to assess and build the feasibility of new economic development.

For this reason, we also think that technology transfer will be especially important for ECU, though we think the University needs to adopt a model of technology transfer that goes beyond faculty and student discovery and incubates basic services businesses that are essential to quality of life in the region.[30] Why couldn't business faculty and students, for example, begin start-ups that increase employment and services in logistics and manufacturing? In turn, that kind of technology transfer could also be integrated into programming, so that students might earn academic credit for the businesses they incubate. Our sense is that the fundamental task of the Division of Research and Graduate Studies is the alignment of research, programming, and technology transfer.

Ph.D. program development—when it happens[31]—should take place in an additional context. Obviously, the primary purpose of Ph.D. programs is to prepare future faculty and, as such, post-degree placement should be on a national basis; but we also think it important that the University develop some mechanism for keeping some students in the region in order to build the intellectual and cultural capital that is the necessary foundation for a thriving service economy. This could be, perhaps, a partnership with AmeriCorps or some other organization

[30] We understand that the University has experienced some success in the area of medical technology transfer, though it is not clear if that success has been integrated into doctoral programming.

[31] We think the University's priority should be the development of professional master's programs.

that helps finance a student's education in return for a period of community service in the region, which might then become a loyalty to the region.[32]

A third context for doctoral program development should be an attempt to bridge some of the gap between ECU's current assets and those of other institutions that have successfully made the transition to a major research university. We have already indicated one of those gaps, but it bears repeating: there needs to be a cadre of professional master's programs for which students pay tuition. The second gap is a lack of doctoral programming in the arts and sciences, which appears to be crucial in providing the intellectual foundation for a research university. We are not advocating comprehensive programming in the arts and sciences, but as a beginning, Technical and Professional Discourse could be transformed into English, and Biomedical Physics could be transformed into Physics. The Dean of the Harriot College indicates that there is some readiness in other areas; and so long as these could also be justified as contributing to the quality of life in the region, we think the University should explore these.[33]

Apart from several programs in arts and sciences, we think that, in light of the economic cluster analysis given below and the University's own emerging research strengths, Ph.D. development should be confined to contemporary biomedical sciences—versus broader health sciences and with emphasis on the molecular biosciences—and, where feasible, to state-defined emerging and potential economic clusters, especially pharmaceuticals. Professional master's and doctoral programs[34] should focus on teacher training and renewal of the public schools and on state-defined existing economic clusters, all of which are related to manufacturing. There is another industrial category which we think will be of strategic importance to ECU, but we will take this up below in our discussion of economic clusters.

Finally, we think that graduate program development at ECU will need to take account of distance delivery. Apart from a handful of programs in Education and a few other areas, online and off-site education at ECU are imbedded in otherwise traditionally delivered programs. We think it will be important to develop a cadre of online professional master's programs that can be marketed nationally and used as a source of tuition revenues.[35] Distance delivery, in our view, is not an overarching remedy, however, since the model of distance education which ECU has adopted and which makes ECU's distance education distinctive—the provision of online student support services—makes distance delivery more

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[32] It is also possible that at least some Ph.D. programs could be developed as joint programs with other institutions in the state, since this would defray at least some of the cost of maintaining the program. It could be, for example, that ECU would provide some instruction and a practical internship—consisting of regional service—as part of a Ph.D. program, additional parts of which could be offered elsewhere in the state.

[33] We did look at the development of doctoral programs at both UNC Greensboro and North Carolina A&T. UNC Greensboro probably is the right model for ECU, since it has programming in the basic arts and sciences, as well as more "applied" degrees. We think it important that ECU regard NC A&T as a partner institution with which to develop joint programs.

[34] By professional doctorates, we mean doctoral programs without the nomenclature "Ph.D.," such as the Ed.D. and the DTS.

[35] We heard repeatedly from faculty that people living in the region had to be supported through assistantships because they are too poor to afford tuition. While we don't believe this to be entirely true, national marketing would certainly produce a pool of qualified and paying students.

expensive than it otherwise might be. It is possible that some of the cost associated with distance learning could be defrayed.

Doctoral Program Assessments

School of Allied Health Sciences

Communication Sciences and Disorders

The doctoral program in Communication Sciences and Disorders appears to be well thought through in terms of curriculum, though we don't understand the imposition on students in a Ph.D. program of a choice between research and clinical tracks, and is evidently well-taught. Faculty in the program seem very ambitious for both themselves and the program, and give serious consideration to both student publications and professional development activities.

The faculty's sense of itself, however, appears to be based on data that are very different from the official institutional data we have, which is mixed in terms of program performance indicators.[36] There is no faulting the program in terms of size, since it has by far one of the smallest faculties in the comparative cohort for this study. With eight faculty, it is well below the mean cohort faculty size of 15.2 and trails behind every program except for the one at the University of North Dakota. Despite this, its doctoral enrollment of 17.7 students is significantly above the mean enrollment for the comparative group and, in fact, is larger than that of all but three of the comparator programs. As a result, its doctoral-student-to-faculty ratio of 2.21 students per faculty is the highest in the cohort and substantially above the mean ratio of 0.9 students per faculty.

We are not certain, however, that the quality of current doctoral students is as good as it should be, since the three-year average combined GRE score is below the mean for the comparative group—is, in fact, the lowest, in the cohort. The problem is with the GRE verbal score, which is nearly 50 points lower than the other verbal scores in the cohort. The program's average quantitative score is well above the others.

We are less certain of the program's productivity in degree production, since the official IPR figure for degrees conferred over the period of the study is eight, though faculty reported during our assessment interview that they had granted 11 degrees. Protocol dictates that we accept the IPR figure, in which the program—as a function of small faculty size—is slightly below the cohort mean of 9.9 degrees. On a per-faculty basis, however, and even using the IPR figure, faculty are highly productive, producing one degree per faculty versus the cohort mean of 0.6 degrees per faculty.

In terms of performance indicators related to research, unfortunately, there is no ambiguity. As a program, Communication Sciences and Disorders at ECU is more than $200,000 below the mean for the cohort for average annual research income, and this pattern holds true on a per-faculty basis. On average, cohort faculty each earn approximately $34,000 per year in external grants; ECU faculty, on average, earn $28,000 per year. The publication record is similarly undistinguished. On an overall basis, the ECU faculty published approximately 900 fewer papers than the mean number for the comparative group, though such a large discrepancy is a function of faculty size. Individual faculty are closer to the group mean, publishing 69.9 papers versus 79.7 papers for the average faculty member in the cohort. The citation record is more definitive: individual ECU faculty received, on average, 262 citations

[36] This is illustrative of the infrastructural issues we discussed above in the general section of this document. Part of establishing a research culture in which performance indicators are tracked is developing common definitions of various data elements in order to be certain that both administrators and faculty are on the same page in the discussion of indicators. We think that the Office of Institutional Planning and Research should take the lead in developing these common definitions.

during the five-year period of the study, while the average faculty member in the cohort received 534 citations.

The program's competitive indicators are mixed. Because the program is in the health sciences, its health insurance benefits for students are fully competitive with the comparative group. We are concerned, however, that students do not routinely receive full remission of tuition; and the doctoral stipend, at $12,000, is significantly below the cohort mean. In our view, the stipend should be $15,000. It is not clear to us if program faculty include support for doctoral students in their grant proposals, but it is certain that some of its benchmark programs do.[37] This is part of the solution here; though in the interim, we think the program could afford to accept fewer doctoral students in order to increase the amount of the stipend. The average time to the doctorate of 5.4 years is fully competitive for the group and slightly shorter than the group mean of 5.5 years.

Physical Therapy

The doctoral program in Physical Therapy is new—too new to have yet produced any DPTs—and, as a result, is difficult to assess. Perhaps as a result of the youth of the program, faculty research efforts are also new, and the program exhibits the chicken-and-egg syndrome that we discussed above in the general section of this document. During our assessment interview, program faculty expressed their strong conviction that in order to jump-start faculty research programs, they will need the support of either the Graduate School or the University Vice Chancellor for Research in providing funding for graduate research assistantships.

As we indicated above, it is possible that some internal funding will be inevitable, though in our experience, it is rare that graduate schools provide research assistantships to programs. If faculty hiring is on the docket for this program, we suggest that hires be at the senior level in order to attract faculty who can both transfer external grants to the University and provide faculty leadership in developing research proposals.

Unfortunately, and also as a result of the youth of the program, performance indicators related to size, enrollment productivity, research prowess, and competitiveness are uniformly poor in relation to the other programs in the comparative cohort. In terms of program size, the faculty of eight professors is small relative to the cohort mean of 11 faculty per program. This is not, however, the smallest program in the group. It is roughly the same size as the ones at Old Dominion and the University of South Carolina, and it is slightly larger than the program at the University of North Dakota.

Given small faculty size, its enrollment of 32 doctoral students is less than half the mean enrollment for the cohort—80.6 students. Likewise, the doctoral-student-to-faculty ratio is also half the size of the group mean—4.0 students per faculty in the ECU program versus the mean ratio of 8.1 students per faculty. Its ratio is, however, roughly equal to those at Buffalo and South Carolina—both established programs—and is better than that of Ohio University, another new program. It is highly possible that ECU doctoral enrollment is, at this point, limited by the number of students it can place in clinical practica, since program faculty complained—rightly—about the cumbersomeness of the bureaucratic procedures regulating the signing of contracts for clinical sites. We have already discussed this issue above in the

[37] We have recently finished a doctoral program assessment for the University of South Carolina and have, in the past, benchmarked against the University of Pittsburgh. Including tuition and stipend support on grant proposals is routine in these institutions.

general section of this document, and recommended that the University order an audit of some of its administrative procedures, especially those related to the signing of contracts. The program has set a target enrollment of 90 students and is well on its way to achieving that target, which would place it well above enrollment productivity in the cohort.

At this point, it appears that the program is attracting and admitting students of an appropriate level of quality. The three-year average GRE verbal score is precisely equal to the mean verbal score for the cohort, and the average quantitative score of 621 is well above the cohort mean of 562. Since initiating the doctoral program, the department has begun to require Analytical Writing scores for admission. We think this behooves the program, since the consensus in the field is that this is as good an indicator as any of potential student success.

As we have already stated, research performance indicators are very unfavorable, and suggest that this is the program's most serious competitive weakness. Average annual research earnings for physical therapy programs in the cohort are approximately $171,000; the ECU program's earnings are approximately $13,000. On a per-faculty basis, average research earnings for the cohort are roughly $16,000; ECU's faculty earn, on average, $1700. The individual faculty publication record is better, though not good: ECU faculty published 50 papers from AY 2000-01 through AY 2004-05; the average faculty member in the comparative group published 57 papers. On average, individual faculty in the cohort received 396 citations; ECU faculty received 253.

Competitive indicators are also weak. Program faculty report that the Dean of the College is funding health insurance for those students in the program. IPR indicates otherwise. Since this is a professional—rather than a research—doctorate, we are hard pressed to understand why faculty and students have the expectation of assistantship funding at all, but every program in the cohort does provide some funding—at least to some students. That said, the ECU program provides the lowest stipend in the comparative group. It is currently $7500, but to be really competitive in this cohort, it should probably be about $10,500. Our understanding is that assistantship funding is provided primarily through the Dean of the College, who is using lapsed salary funds, but we think this money would be better spent in hiring senior research-active faculty.

Rehabilitation Counseling and Administration

The doctoral program in Rehabilitation Counseling and Administration is also too new to have yet produced any doctoral recipients or to have developed a nationally competitive faculty research program. As such, it is difficult to assess, though we have seen some oddities in the initial program development that we think it would be best to correct at the start.

Program leadership is very ambitious and would like to develop the program to the point that it can compete effectively with the one at the University of Wisconsin-Madison. At the moment, the practical face of this ambition is the program's desire to train, in about equal measure, both clinical administrators and future faculty.

Though we admire and want to encourage this degree of ambition, we think, given the performance indicators we will discuss in detail below, that it is premature and places an undue strain on the program to operate both professional and academic tracks at this point. We believe the program would be best served at the start to focus on producing clinical administrators and to delay the preparation of future faculty until it has had an opportunity to develop its own research profile.

In turning to performance indicators, we begin by noting that this is a very small program, with an FTE faculty count (eight) that is less than half the size of the mean number of faculty for the comparative cohort (18). As a result of this and of relative youth, the program is dramatically under-enrolled in terms of the comparative group, with a doctoral enrollment of six students (0.75 students per faculty) versus a mean enrollment of 37.2 (or two students per faculty) for the cohort.

The program's students appear to be of a high caliber, however. Three-year average GRE scores in both the verbal and quantitative sections of the test are above the means for the cohort—on the verbal test, ECU averages 515 versus the cohort mean of 505; and on the quantitative test, ECU averages 560 versus the cohort mean of 520. Assuming normal attention to mentoring and the monitoring of student progress, these scores bode well for good degree production and time to degree—that is, if the small faculty can keep up with the demands that doctoral students will place on its time.

The program's performance indicators for research are a serious issue. Given the size of the faculty, we would expect the program to fare poorly on overall average annual research income—and it does, earning approximately $113,000 versus a mean for the cohort of $1.9 million. The problem continues if we examine research earnings on a per-capita basis, however. On average, individual faculty in the cohort earn approximately $152,000 per year; ECU faculty earn $14,000 per year.

The faculty also under-performs in terms of publications. Because of anomalies in the ISI database, we are fairly certain that we have over-counted ECU publications over the five-year period for the study. Even at that, program faculty appear to have published 20 papers over the period of the study (four per year) against a cohort mean of 30 papers per faculty (5 per year.) Our deeper concern is that the director of the program is currently projecting publication standards for tenure (1.5 papers per year, on average) that are not adequate for a viable doctoral program. (We think that five to six papers per year are necessary.) Similarly, the director proposes a tenure standard of submitting two to three grant proposals per year, whereas we believe the standard should be that faculty will actually receive a minimum of $100,000 in funding through the actual award of at least one grant during the period of assistant professorship.

Competitive indicators for the program are much better. Full tuition remission is both competitive and necessary, and the doctoral student stipend of $15,000 significantly exceeds the mean stipend for the cohort of $10,950. In fact, we think that, so long as the stipend is not provided out of faculty grants, the amount could safely be reduced and the remainder reallocated to other programs where lack of a competitive stipend is an issue.

Thomas Harriot College of Arts and Sciences

Biomedical Physics

The doctoral program in Biomedical Physics is particularly difficult to assess for several reasons. The most important is that the specialized choice of biomedical physics—rather than Physics—for the doctoral program makes it necessary for us to compare the ECU program with far more established programs at some of the country's foremost universities: Purdue, UCLA, Minnesota, and Wisconsin. Having such institutions in the comparative cohort makes it especially difficult to scale the standard in a way that is fair to the ECU program, a relative newcomer to the field.

For a faculty of its size, the research interests of the department appear scattered. The program provided a schematic of faculty research interests that confirms this impression, indicating no more than a few faculty working in any single area. Faculty are, however, approaching critical mass in two areas: ionizing radiation and theory and computation in biological and medical physics. This schematic, in our view, evidences that the department faculty is not optimally configured to pursue a competitive research agenda, for precisely the reason discussed above in the general section of this document. Faculty hires, over time, have been designed primarily with a view to covering undergraduate instruction, representing as many subfields of the discipline as possible, with the result that critical mass for research strength is unachieved in any single area. New program leadership is taking a different approach to faculty hiring aimed at building research strength related to biological physics, and we concur with this newer approach.

From our point of view, however, the category "biological and medical physics" is too broad to be useful in determining a hiring strategy. The predominance of the category in the faculty schematic indicates that the program's approach to its discipline is state-of-the-art and moving in the right direction. As program faculty retire and the department embarks on hiring, we think it should give specific emphasis to structural biophysics or to those areas of physics that interact with molecular and structural biology. This can be accomplished in part by departmental hiring, but we think it is crucial that the hiring plan of this department be well aligned with the hiring plans of Biology and Chemistry and with several departments in the Brody School of Medicine. The program's choice as an aspirational peer of Structural and Computational Biophysics at Wake Forest University is further evidence that the program is developing in line with the development of its discipline.[38] The problem is not with the program's direction, but with lack of critical mass in specific research areas. The report the department provided of funded grants and contracts from 2000 through 2006 speaks directly to the problem of research fragmentation we have been discussing. It appears that, apart from the work of Professors Tolburen, Sutherland, and Lu, the grants the department is getting are very small and distributed to single investigators; and it is very difficult to develop a competitive research profile at these levels of funding. It appears, however, that this pattern may be changing. A group of five co-investigators received a large grant in 2004, with a member of the Chemistry department serving as principal investigator. We hope that this pattern will persist.

[38] The choice as a peer of the Physics department at Northeastern University is puzzling to us, however. This is a department we know well for several reasons, and in our opinion, its departmental structure of faculty divided into theoretical and experimental high energy physics and condensed matter is highly dated. At the time we examined the program, it was resisting the efforts of University administrators to develop a biological focus.

The program's placement profile is mixed, though with recent placements at Vanderbilt and the University of Michigan, we are encouraged. We expect that this profile can only improve as the faculty builds its research profile.

To turn to specific performance indicators, we begin with an observation we have been implying throughout this discussion. In terms of size, the faculty is small—at 20 faculty, it is considerably below the mean cohort faculty size of 26.6—though the department at Virginia Commonwealth is roughly the same size and the one at Purdue is significantly smaller. Overall doctoral enrollment is also small, reflecting faculty size, but the doctoral-student-to-faculty ratio of 0.9 students per faculty is precisely at the cohort mean. Program faculty at Wisconsin are handling roughly two students per faculty, and we think this would be an achievable enrollment goal for the ECU program to set.

The quality of doctoral students appears to be reasonably good, though thanks to a three-year average GRE verbal score, the combined average score for the program is one of the lowest in the cohort. (The average quantitative score is the highest in the cohort.) We think that the program is mature enough to command better quality students and recommend that it establish a minimum GRE combined score of 1250 for admission. Requiring the analytical writing score may also offset the effect of low verbal scores. Doctoral production is significantly below average on both program and per-faculty bases, but we assume this is a function of the relative youth of the program.

Research performance indicators are the program's weak spot, though this is also reflective of the unusually prestigious comparator programs that the choice of biomedical physics necessitated. Average annual research earnings for the cohort are $5.2 million (or $178,000 per faculty); research earnings for the ECU program are $537,000 per year (or $27,000 per faculty). The publication record continues this trend, with ECU faculty each publishing only 16% of the mean number of papers for the cohort. On average, ECU faculty receive only 11% of the citations of the mean per-faculty citations for the comparative group. These figures unquestionably reflect the fragmented research profile we have discussed.

Program competitive indicators are excellent. Full tuition remission and a stipend of $21,500 are fully competitive for the cohort, as is the provision of full health insurance. The program's time to the doctorate is quite good, shorter than the average time to degree for the cohort by slightly more than half a year.

Health Psychology

The new doctoral program in Health Psychology illustrates the phenomenon we discussed above in the general section of this document, in which the University launched new doctoral programs without a real understanding of the barriers to entry for the fields—to the extent that those barriers continue to exist even after the program was approved by the state. As a result of this situation, the director of the program was considering, at the time of our visit, delaying the admission of the first cohort of students until the 2007-08 academic year, which would give the program time to build itself to the appropriate level of qualification before commencing operations. This was to include the hiring of five faculty who are qualified to direct the dissertations of students in the field. We are unaware if this delay was actually implemented, but the situation has caused us to treat the program in Health Psychology as a proposed program rather than an existing one.

Lack of qualified faculty to direct dissertations is not the only challenge the program needs to overcome. There is currently no budget to support doctoral students, nor are the final details of the program's clinical site network ironed out with either the Medical School or the clinical

sites themselves. At the moment, there is also no curriculum focused on health psychology but a clinical psychology curriculum that offers a few courses in health-related topics.

In any event, in order to launch successfully, the program will require start-up money for new faculty, seed money to initiate the research programs of the existing faculty, and a faculty professional development program in writing grant proposals. In order to offset these costs, and assuming that faculty searches are still ongoing, we recommend that the department confine itself—to the extent possible—to hiring only senior faculty who can transfer external grants with them to ECU.

Despite these considerable obstacles in launching the program, our feeling is that a doctoral degree in this area fits in very well with ECU's overall emphasis on rural health and medicine, the University's overarching foci on obesity and diabetes, and the institution's regional service mission. The program director seems competent and well aware of what he needs to do to build a quality program.

Prior to deciding to treat Health Psychology as a proposed rather than an existing program, we did collect performance indicator data from a number of institutions in the comparative cohort.[39] This data now serves as a set of standards which the new program will need to emulate, though this is not an unproblematic task. Health Psychology itself is an important, though new, academic discipline; consequently, there are only a handful of such doctoral programs in the country—and, unfortunately for ECU, they are housed at some of the nation's most prestigious and wealthy institutions: Duke; Rutgers; UCSD and San Diego State University, which together offer a joint program; Stony Brook, and Florida. The program director and appropriate administrators will need to decide how to scale appropriately expectations for the ECU program; though ultimately, the program will need to compete effectively with the field.

The mean faculty size in Health Psychology for the comparative cohort is 24.9. Ironically, ECU's current faculty is significantly larger at 32, but most of these are clinical psychologists who lack the appropriate degree of research activity in health psychology. Average doctoral enrollment in the cohort is 30 students or 1.5 doctoral students per faculty, and the average combined GRE score is 1237, including a significantly higher verbal score (617) than ECU programs are currently accustomed to getting.

By far, the greatest challenge will be for the program to increase its research prowess. Mean per-faculty average annual research earnings are $201,000; current earnings for ECU faculty are $2600 per year. The mean five-year publication figure on a program level is 1906 papers (or 136 papers per faculty); the current ECU figure is 504 (or 16 per faculty).

Competitive standards are also steep. The standard doctoral student financial support package includes full remission of tuition and fees, and a stipend of $17,377, though several programs in the comparative group have stipends of $20,000 or above, and we expect this will be the standard to meet.

Technical and Professional Discourse

We have some ambivalence about the form of the doctoral program in Technical and Professional Discourse. Though it appears to be well-formulated in terms of curriculum and we believe it to be state-of-the-art for its discipline—in fact, we think it is an early example of

[39] These data are now presented in Appendix D: Comparative Program Data.

what Rhetoric and Composition programs will become over the next decade or so—we think, as we discussed above in the general section of this document, that the University is in greater need of broader doctoral programming in the arts and sciences to achieve the research stature that it desires.[40]

On the positive side, we see evidence of research leadership among some of the faculty in the program and we endorse completely the program identity that is described on the program's web site and in its promotional and other materials provided to us by faculty. We think the program's assumption that it will be training people for jobs both inside and outside academia is naïve, however; and, in our opinion, it would be best if the program accepts the fact that, with rare exception, it will be training the next generation of scholars and faculty in English and cultural studies.

In terms of size, the program boasts the single largest faculty in the comparative cohort—literally double the mean faculty size for the group. Given this, we are puzzled by the remarks of some of the program's early reviewers that the program's enrollment goals are too ambitious—especially since, on both a program and a per-faculty basis, the program is significantly under-enrolled. A faculty of roughly the same size at Texas Tech has a doctoral enrollment of 32, while the ECU program enrolls merely 10 doctoral students. A program of about half the size at Michigan Tech enrolls 36 doctoral students, as do programs at the University of Minnesota and Ohio University, even though they have significantly smaller faculties. Perhaps current enrollment is a function of the program's youth, but we see no reason that, over time, the program shouldn't be enrolling two doctoral students per faculty member, which is about standard for the field.[41]

The program is not yet old enough to have produced doctoral degrees. Since time to degree is a serious issue in this discipline, however, we recommend that the program take early steps to ensure reasonable time to degree, including the monitoring of timely curricular milestones, energetic and frequent mentoring of students writing dissertations, and especially, the elimination of a master's degree as a requirement for admission to the program, since this can only serve to lengthen time to the doctorate from the bachelor's degree.

Research performance indicators for the program are not favorable. English is not a field that typically attracts significant external funding, particularly of the kind that generates indirect cost allocations, but we have rarely encountered an English program that has no external funding. That said, external funding for this program is the fourth-lowest in the comparative group, ahead of only the program at Michigan Tech—a program which we know

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[40] We suppose that in some sense, the question is moot, however, since it was probably necessary for the sake of program approval not to submit to the state a proposal for an ordinary doctoral program in English.

[41] One of the reasons for under-enrollment at this point may be lack of appropriate financial support for students. In fact, a serious weakness of the program is that some of its students are required, for the sake of financial support, to work outside their field in some other department. We assume this issue is complicated by the fact that the department provides teaching assistantships to a large number of master's students in order to cover instruction in freshman composition; but all the evidence in the field suggests that it is both less expensive and more effective to have these courses covered by fixed term instructors—and we emphatically reject the notion that the use of such instructors compromises the quality of the undergraduate program. One effect of adopting this solution would be to increase the amount of assistantship funds available for Ph.D. students.

well and which has an insufficient faculty research orientation—and the programs at Clemson University and Virginia Commonwealth University, both of which are new.

Journal publishing is also less significant in English than it is in many other fields, but the ECU program published 75 fewer papers during the period of this study than the mean number of papers published for the group—astounding since it has the largest faculty in the cohort. The per-faculty publication record is more telling, however. On average, faculty members in the comparative cohort each published 15 papers over the period of the study. ECU faculty each published approximately four papers over the same period. We would have liked to see the number of books published by faculty in each of the comparative programs in the cohort. Unfortunately, these data are not available.[42]

Competitive indicators for the program are also unfavorable. The doctoral stipend of $14,000 is slightly below the mean stipend for the cohort, but not significantly so. From our point of view, the more serious issue is lack of full tuition remission for some students.

[42] There is a new company in the market that compiles such data, but our experience in using their information for two other client institutions for which we have performed doctoral assessments is that it is not yet ready for sale—primarily because the company assumed that it could use web crawlers to collect program and faculty names. In our experience, the average graduate program web site is three years out of date. Though the company made an attempt to verify web data through graduate deans, it had only a 25% response rate to its inquiries.

College of Education

Curriculum and Instruction

The Ph.D. program in Curriculum and Instruction is in the proposal stage, and as part of this project, we examined the supporting documentation that C&I faculty have thus far prepared. In our view, this documentation evidences the confusion between professional and academic, clinical and research that is common to many ECU doctoral programs.

Given the existence of other Curriculum and Instruction doctoral programs in the state, we do not believe that this program will be approved as it is currently conceived, for several reasons. It is a major question to us, given the current state of resources at the University, whether the ECU program can simultaneously address both the professional education needs of curriculum specialists and policy personnel in the region and state and the shortage of college faculty in special education, reading and literacy, and elementary education. If the ECU program were to address the shortage in higher education personnel, we think it could only do so at the expense of the College of Education's mission to regional schools.

The department further believes that it can attract an audience of both potential college professors and regional classroom teachers; but in the first place, the knowledge base, research skills, and curricular specializations of teachers at these levels are vastly different—different enough, at any rate, to be unsupportable by a single program with limited faculty. Besides, it is almost the universal experience of colleges of education that students who pursue doctoral degrees do so specifically because they intend not to remain in the classroom, and the doctorate is perceived as a stepping stone into school and district administration.

We think the program would be much better re-conceived as a professional doctorate (Ed.D.) aimed primarily at regional teachers and other school personnel whose ambition is to work in public policy or in district curriculum administration.

Educational Leadership

We are ambivalent about the doctoral program in Educational Leadership, primarily because it is very ambitious and designed to be rigorous, which we want to encourage; but its high degree of ambition has lead it to over-reach itself significantly, and has produced a situation that program faculty describe as "near crisis," in which a large number of students are reaching the dissertation phase of their work and there are not enough faculty to supervise adequately that number of dissertations.

We believe that this "near crisis" is the result of two fundamental flaws in the design of the program. The first is a common practice among the various fields of education, and that is the tendency, in the face of criticism from much of the rest of the academy about lack of rigor in educational programs, to introduce overly-stringent research requirements and research methodological courses, into what are essentially professional programs. According to the former Dean of the College of Education, the original intent of this program was to engage in problem-centered research rooted in regional schools for the purpose of training district superintendents. Program faculty have instead sought to integrate research requirements into every part of the program and, at the time of our visit, were considering the development of a four-course sequence in research methodology. We do not support these efforts, and we wonder why the current requirement of a dissertation cannot be replaced with a capstone research project based on field research in the schools.

The second design flaw is the program's introduction of a specialization track in higher education, the audience for which appears to be educators whose career ambition is to join the Education faculty at ECU. Faculty reported to us that in a document prepared for University of North Carolina President Erskine Bowles, ECU administrators expressed the belief that this track is "expendable." We concur with this assessment, in part because there is no shortage of such program offerings in the state and in part because it dilutes significantly the program's mission focus on regional schools. If this track is to continue, we recommend that its stated purpose be specifically the preparation of state and regional community college leaders and not university faculty. This change should have the effect of realigning the program's enrollment and kind of students with its original mission.[43]

None of this is to say that the program's faculty is not highly productive. In fact, the program's performance indicators evidence that it is over-productive in many areas, and as we have already stated, this has created the "near crisis" condition in which too few relatively research-inactive faculty are supervising too many research-oriented dissertations.

To turn to performance indicators, we note that, on paper at least, the faculty of 14, approximately half of which are fixed-term instructors rather than tenure system faculty, is not small. It is slightly above the comparative cohort mean of 13.1 faculty and significantly larger than the faculties at Old Dominion, Nevada Reno, and Virginia Commonwealth. However, the program is, as faculty indicated, dramatically over-enrolled, with 130 doctoral students (or 9.3 students per faculty)—the largest enrollment in the cohort with the exception of the program at Virginia Commonwealth which, with a faculty of 9.5, enrolls 133 students (or 14 students per faculty). Mean enrollment for the comparative group is 71.6 (or 5.3 per faculty), and given this, we wonder of what quality student research can be when faculty supervisors are so overburdened. It is not clear to us from this analysis how many of these students pay their own tuition or have it covered by their districts; and so we are unsure of the financial implications for the institution if the program were to introduce planned enrollment decreases. In any case, if these students are supported from state funds, enrollment should certainly decrease—and as soon as possible. If not, then this enrollment decrease will need to be taken into account in the University's long-range comprehensive enrollment management plan, discussed above (on pp. 13-14).

Relative to the rest of the cohort, the program's students appear to be quite good, with higher three-year average GRE scores than any other program in the group. Whether higher scores are relevant to school practitioners or the higher education track, it is impossible to say; but if they are appropriate to the higher ed track, we feel the program has some room to allow scores to drop as part of the change in its enrollment profile.

Not surprisingly, and apart from Virginia Commonwealth and the University of South Carolina, both of which are larger programs, the ECU program has the highest degree production record in the cohort, both overall (45 degrees versus the cohort mean of 31.4) and per-faculty (3.2 versus the mean of 2.3). The questions are how long faculty can hold up under this burden and the research quality of students' dissertations.

The program's adopted over-emphasis on traditional research would not be so troublesome to us were it not for the program's relatively poor performance on faculty research and

[43] We also think that there is a particular danger in any program hiring a disproportionate number of its faculty from among its own alumni. This is especially true for East Carolina, where the insular nature of the community has helped to create many of the issues we have addressed above in the general section of this document.

scholarship indicators. In virtually every category, ECU indicators are well below the mean indicators for the comparative group. Mean average annual research awards for the cohort are $178,579; ECU's average research earnings—despite having the third-largest faculty in the cohort—are $102,649. Average per-faculty earnings for the cohort are $11,717 per year; ECU faculty earn $7,332 per year. While the mean number of papers published for the cohort are 24 over a five-year period, the ECU program published 14 papers; and on a per-faculty basis, ECU faculty published one paper against a cohort mean of 1.8 papers per faculty. During the same five-year period, ECU received 11 citations (one per faculty) against a cohort mean of 19.8 citations (or 1.5 citations per faculty). Clearly, this is not a research profile that can support the completion of numerous research-oriented dissertations.

We do not believe, by and large, that students in professional doctoral programs should be supported on assistantships, though some are in every program in the comparative group. In that context, we note that the ECU program's doctoral stipend of $10,000 is almost competitive with the field. The cohort mean stipend is $10,638. Several programs in the cohort (Louisville, Nevada Reno, and Virginia Commonwealth) offer full tuition remission. The ECU program does not, though given our bias about student support in professional doctorates, we do not see this as an issue. Average program time to degree is too long by slightly more than half a year, though this is not surprising given the context of over-enrollment and over-production.

College of Health and Human Performance

Bioenergetics

Of all the programs we are evaluating at East Carolina, the doctoral program in Bioenergetics is one of two that are the most difficult to assess, in part because it is a pioneer in its field. In the entire country, we were able to find only one other program that is an exact cognate for this one—the program in Human Bioenergetics at Ball State University—and two others that match fairly closely—the program in Movement Sciences at Florida State and the new program in Human Movement Sciences at Old Dominion.

The remainder of the programs in the comparative cohort are as close as we can come to the scope and content of the ECU program, but they run the gamut from traditional Exercise Science to Exercise Physiology tracks within larger biological and biomedical sciences programs.[44] In this latter case, it was impossible to collect comparative data at the level of the track, since universities rarely track data at a level below departments, let alone for tracks within programs.[45] Nevertheless, despite a significant concern we have for both the scope and the name of the program, we believe the program is doing quite well and could be improved if it were to exist within a wider academic context.

To touch first upon our concern, we return to the discussion we began above in the general section of this document. The program in Bioenergetics is an illustration of what we have called elsewhere development by synecdoche,[46] that is, development of a narrow sub-field as an entire program, perhaps in an attempt to avoid the charge of program duplication that frequently arises in the state approval process for new programs. In our experience, programs of this type frequently have trouble finding an audience, in part because students searching for programs by their common name frequently miss programs with unique or unusual names, and in part because students who do find the program fear that their career options will be limited because of the overspecialization that the subfield represents.

In the case of this particular program, faculty reported that they were unable to meet their minimum expectations for enrollment. It is far too early to tell—especially in the absence of a rigorous professional marketing campaign—but we think it may be inevitable for this program to change both its scope and its name in order to meet the state of North Carolina's minimum requirements for program viability.[47] In the meantime, the program appears to be doing many of the right things, including seeking research collaborations with the Medical School's programs in Physiology and in Biochemistry and Molecular Biology, collaborations that, in our opinion, will have a significant positive impact on the program's research

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[44] We avoided programs in Kinesiology or other exercise programs that are frequently housed within colleges of education.

[45] The same issue exists with a Texas A&M survey provided to us by the program director, in which the program fares well; but this survey is based upon the excising of exercise science from a larger scientific context. As we will discuss in greater detail below, it is not clear to us that bioenergetics at ECU is well-served outside the context of basic biomedical education.

[46] See page 8 above.

[47] There is also an alternative solution. Though we do not believe that the individual basic sciences programs in the Brody School of Medicine are ready to be merged into an integrated biomedical sciences program, we believe that this ultimately will be their course. Should that happen, the program in bioenergetics could become a track of that integrated program.

profile.[48] Though collaborations with Biochemistry and Molecular Biology appeared to have been stalled at the time of our visit to campus, we hope, along with the Bioenergetics program leadership, that new leadership in BMB will rekindle the relationship.

Apart from enrollment, which could be a reflection of program youth or of the phenomenon we described above, program performance indicators show that the program is both well-conceived and well-managed, and the program appears active in benchmarking itself against similar programs in the field. In terms of size, the program is small, but not unduly so. Its faculty of 10 is below the mean cohort faculty size of 12.1, but there are several programs in the comparative cohort that are significantly smaller, including the precise cognate at Ball State. As we have already indicated, the program is under-enrolled. Its 11.7 doctoral students (1.17 students per faculty) is below the mean cohort enrollment of 21 (1.8 students per faculty). In the short term, we think the program should aim to enroll at least two doctoral students per faculty.

Despite the relative youth of the program, it is currently enrolling the highest quality students in the comparative cohort, with three-year average GRE scores that are higher than those of any other program. (This is also one of the rare ECU programs the students of which have above-average verbal scores.) Degree production is extremely low at this point, but we assume this is a function of program newness and would look to have at least two doctorates produced per year from this point forward. Obviously, this should increase as enrollment increases.

This program is another rarity for ECU: it is the only one of the University's doctoral programs for which research performance indicators are uniformly excellent. The mean average annual research earnings of approximately $7 million for this program are literally the highest in the cohort, and significantly above mean research awards of $1.9 million. On average, ECU bioenergetics faculty earn $705,000 per year in grant income—versus $220,000 for the average faculty member in the cohort.

During the five-year period of this study, program faculty published 658 papers (66 per faculty—versus a comparative group mean of 553 papers (42 per faculty). The program's overall and per-faculty citation records are bested only by those at the University of South Carolina's program in Exercise Science, and are well above the means in both categories. Our only complaint related to research performance indicators is, as we mentioned in note 47 above, that the program's amount of research space is inadequate—2,114 net assignable square footage versus a cohort mean of 16,336 NASF. The mean figure is artificially driven up by the enormous amount of space enjoyed by the program at Ohio, but even if we remove this outlier from the data set, the ECU program is still significantly below average in terms of space.

Competitive indicators are also excellent, though we are concerned that some students do not receive full tuition remission. The doctoral stipend of $18,000 is one of the highest stipends in the cohort and well above the mean of $16,108. Since students entering this program will compare it with programs in medical schools, we think it would be better if students were to receive full subsidization of health insurance, which is competitive for such programs. The

[48] Unfortunately, space plans for the new facilities at the Brody School appear to be far advanced. If possible, we would prefer that this program be located there, especially since our analysis confirms the faculty opinion that the program's current location is inadequate in terms of research space.

current time to degree of four years is substantially shorter than the cohort mean of 5.3 years.

In all, we believe this to be an excellent doctoral program, though as we have indicated, time may well dictate that the program, in order to find a wider audience, will need to broaden its scope and change its name. Given this possibility, we think it is important that the University invest some money in promoting the program and that both the program and administrators agree on minimum enrollments over time and track results.

Health Intervention Science

The doctoral program in Health Intervention Science is, at this point, a proposal, and had only begun to be developed at the time of our visit to campus. Both the assessment interview with potential program faculty and the supporting documentation were, therefore, necessarily vague.

We observe first that the whole area of preventive health care is exceptionally important for the University, and it is clear that the program, if it goes forward, could draw on both the cross-departmental research strength in metabolic science and the research prowess of faculty in the bioenergetics program. Beyond this, program planners assume that they could draw on the existing research base in Physical Therapy which, in our view, has yet to be developed, and on the one in Occupational Therapy. Of that particular program we have no direct knowledge, since it did not participate in this study, but the Dean of the School of Allied Health Sciences indicated clearly in his interview with us that OT is an area that is languishing. Consequently, it is doubtful, in our opinion, that faculty research in the relevant areas is strong enough to support a doctoral program in this area.

It is also not clear to us what this program would be trying to produce—academicians and researchers or therapists. If academicians, we refer to our argument of the previous paragraph. If therapists, we are not aware that the field in general would be wiling to accept a new credential. Is the program expecting to create a new kind of health professional that can focus on preventive health from a number of disciplinary perspectives? In our opinion, the allied health sciences have gone to great length over the last decade or so to further delineate the scope of their professions and to refine the training programs for them. It is not clear on what basis this potential program thinks that a different kind of allied health professional would be widely employable.

In a similar vein, the audience for this program is also not clear. The entry level degree for professionals in physical therapy and occupational therapy is already the doctorate; and the doctorate is becoming more prominent in terms of rehabilitation therapy. The program proposes to draw on professionals in this field for its student audience. To us, it is a question if these potential students would be willing to pursue another doctorate.

Finally, we think there would be significant overlap between the content of this program and the existing programs in PT, OT, Bioenergetics, Medical Family Therapy, and Health Psychology. At the time of our visit, it was not clear whether this program was sufficiently differentiated from the existing ones to justify its approval. In retrospect, we are not sure that it can be differentiated or that it should be. If, in fact, there is room in the market for a new professional credential along these lines, we think it would be best pursued in the context of one or more of the existing programs.

College of Human Ecology

Medical Family Therapy

We begin this assessment of the doctoral program in Medical Family Therapy with two observations. The first is that, to our mind, the program is a wonderful idea and the kind of therapist it aims to produce is sorely needed, especially perhaps in the region the University serves. The second observation is that the college developed the Ph.D. program long before it was actually ready to do so. Despite the innovation embodied in this program and the seriousness of the social need it will address, we wonder if East Carolina University will decide that it can afford to pioneer this field once the actual costs of launching and maintaining the program are known.

We are unable to estimate the costs of launching and maintaining the program on the basis of the information we have, but they will certainly be significant: lines and start-up costs for senior research faculty, reduced teaching loads for current faculty who need to begin or ratchet up their research programs, research space, clinical space in close proximity to the medical school, and unquestionably, funding for the care of clients and patients, many of whom are likely to be indigent. We understand that many scholars in the field are looking to this program as a model for development, but the University will need to decide if the prestige of pioneering a new profession is worth the cost of doing so—assuming that the University can afford the cost.

As is the case with many of the programs participating in this study, the program in Medical Family Therapy is difficult to assess, precisely because it is a virtual pioneer in the field and, at this time, is the only program of its kind in the country.[49] The comparative cohort for the assessment consists, for the most part, of traditional programs in family therapy, none of which is an exact cognate to the East Carolina program, though this is the only option available to us.[50] The other difficulty is that since this is a Ph.D. program, we have no choice but to evaluate it in part on the basis of its prowess and potential in attracting external research grants; but the program faculty is wholly committed to an ideal of community engagement that implies action research—and action research is rarely capable of achieving significant funding, which is reserved almost exclusively for large-scale quantitative research studies.

Both the Director of the program and the former Interim Dean of the College indicated that program faculty have, over the last five years, written over $1,000,000 in grant proposals but have thus far been successful in being awarded approximately $50,000 in funding. From our point of view, this pipeline for grant funding is not nearly large enough, and proposal writing needs to be ramped up by some magnitude. We do, however, think that the current faculty strategy of teaming with principal investigators outside the program is viable and will eventually pay off, assuming an increase in proposal activity. But there is no question that, in order to gain the kind of funding that will be necessary to support the program, both existing and new faculty will need to commit themselves to the kind of quantitative research

[49] It and the program in Bioenergetics are the two University programs that present the most difficulty in terms of assessment.

[50] As was also the case with Bioenergetics, some of the family therapy programs in the cohort are tracks of programs of much larger scope, and comparative data was never available at the level of the track. This can make a significant difference in some of the performance indicators.

that is necessary to secure large grants.[51] Unfortunately, we think this will involve a reduction in community engagement, and the faculty will need to discover a balance with which they can live between the two kinds of research.

A final comment before turning to the program's performance indicators: program faculty were very helpful in providing background material of various kinds, including the program proposal itself and the program's first-year review document. In reviewing these, we notice a confusion of purpose. The mission statement in the first-year review gives emphasis on preparing the future professoriate, while the request to establish the program primarily addresses preparing therapists. It would not surprise us if the program intends to follow both courses; but in our view, this is extremely over-ambitious and unwise. From our point of view, the choice is clear: the program needs to focus on training therapists who will be of service to the region. That alone will involve significant effort and expense, and if these pay off, the program can expand to the training of academicians at a later point. It is our opinion that nothing could be more destructive to the program in these early stages when resources are tight than to stretch program faculty too thin by diffusing faculty focus.

Perhaps it is in order to be more direct about the matter: we think the program is far too ambitious for the resources it has available to it: four faculty, none of whose work is particularly grantworthy, is attempting to train both academicians and therapists with no start-up funds, little money for student support, and inadequate clinical and research space. In addition to this, some of the faculty's operational assumptions are naïve. In the first-year review, faculty identify no fewer than 12 program objectives, state that students will be required to experience 1000 hours of direct client contact, and express the expectation that students will secure their own grants to fund dissertation research—and indicate that students will complete their degrees within three years of matriculation. Our best guess is that time to degree will be at least double what faculty project.

In terms of size, the program is very small, with four FTE faculty versus a cohort mean of 13.3 faculty. As we indicate in note 49 above, several of the cohort faculties undoubtedly include faculty from other tracks in programs with a much larger academic scope than simply family therapy. Even if we remove these outliers, however, the ECU faculty would still be only half the size of the cohort mean. Though current resources are undoubtedly placing a cap on program enrollment, the program is still under-enrolled relative to the cohort, with four students (or one per faculty) versus a group mean of 36.1 students (or 3.1 per faculty). Student quality appears to be relatively high, however. The average annual combined GRE score is 77 points above the mean combined score, though we wish the program's average verbal score were higher than it is. Degree production is not an issue at this point, since the program is too new to have produced any, though as we indicated above, we think there will be issues with time to degree and this will undoubtedly have a negative impact on degree production.

In terms of research performance indicators, we must first highlight a discrepancy. The program reported, as we have stated several times, a five-year grant income of $50,000 (or $12,500 per faculty). Institutional Planning and Research gives a five-year average annual

[51] Currently, faculty are having considerable difficulty supporting doctoral students, both in terms of assistantships and travel funds for conference presentations. The program is concerned that it needs to redirect funding that traditionally was used to support master's students, but to us, this is one of the consequences of having a doctoral program; and as we indicated in the general section of this document, the University needs to create a plan to gradually transition the bulk of its master's students to self-funding.

research income of approximately $329,000 (or $82,250 per faculty). Whichever figure is correct, research income is significantly below the mean for the cohort: approximately $2,000,000 (or $671,000 per faculty). The publication record is similarly lackluster. Against a mean cohort of 604 papers published (or 72 per faculty), the East Carolina program published 198 papers (or 50 per faculty); and the citation record is dismal: a cohort mean of 1,906 citations (or 207 per faculty) versus East Carolina's record of 379 citations received (or 95 per faculty).

On competitive indicators, the program fares much better. The doctoral stipend for ECU is $20,000 versus a cohort mean of $12,560. Perhaps the stipend is so high because the program is closely affiliated with the University's medical programs, but it seems to us that this is an area from which some resources could be diverted to other pressing needs.

Space, as we have already mentioned, is an issue. We were not able to obtain research space data for all the programs in the cohort, but for those for which we did, the average square footage is 19,725 net assignable square feet. The ECU program has 520 NASF. The first-year review document states that the program has picked up an additional 33,000 square feet through the expansion of the Rivers Building, but it is not clear how much of this is research space.

Brody School of Medicine

Introduction

Before turning to the assessments of the doctoral programs in the Brody School of Medicine, we wish to acknowledge the graciousness and hospitality with which we were received by administrators there, particularly George Kasperek, Assistant Dean for Ph.D. Education, and John Lehman, Associate Dean for Research and Graduate Studies in the Brody School of Medicine and Associate Vice Chancellor for Research in the University Division of Health Sciences. They did an excellent job of preparing programs for our assessment visit and of orienting us to graduate programs in the Medical School.

As senior University administrators indicated during our first meeting on campus, doctoral programs in the School of Medicine are far advanced relative to ECU's other doctoral programs. This is in part because they are older, more established, and better funded than many of the programs with which we met. It is also, however, a result of BSOM's ability to develop powerful research programs that are directly responsive to their local and regional environment. In general, these programs are related to the study of metabolism, but there are specific applications to the study of obesity, diabetes, human movement, and preventive medicine. Our comparative sense is, in fact, that the University has the potential, in the short term, to become the country's leading research center related to these issues.

From all appearances, this is an exciting time for the Health Sciences Division at ECU, though it is not without its difficulties. During the time of our visit, the division was embarking on a strategic planning process that was designed to address several serious challenges. There is a need to do foundational work with clinical faculty, many of whom are not sufficiently engaged in research. The current Dean of the Medical School has inherited a significant budget deficit, severe enough to prevent some programs from having an operating budget, and this situation has been complicated by the fact that new state fiscal policies are reducing or eliminating payment to the medical center for the care of indigent patients who, unfortunately, comprise a significant part of the center's patient base.

In addition to these challenges, there has not yet developed a sufficient culture of research and self-support among biomedical faculty, some of whom continue to feel a deep sense of entitlement to state support. Finally, despite new building programs, many of BSOM's programs are hampered by both a serious inadequacy of clinical space and by the overly cumbersome bureaucracy related to accounting, hiring, and contracts that we discussed above in the general section of this document. This bureaucracy, as we have said, is a serious issue for the University in general, but it is particularly prohibitive to the conduct of biomedical research and education. The program assessments which follow have attempted as much as possible to take into account these contexts.

At the start of this project, several senior University administrators asked us specifically to address the question of whether critical mass issues in BSOM's basic sciences programs could be addressed by merging the various programs into one integrated biomedical sciences program. Ultimately, we think this is the appropriate solution not only for the critical mass issue but to optimize the interdisciplinary research being performed in the medical school's signature areas. However, the overwhelming feeling of both biomedical program faculty and BSOM administrators is that the programs are not ready for integration at this point, primarily because of a faculty concern about the erosion of the traditional biomedical disciplines; and we see little sense in imposing a structure that has the potential to create disruption, especially in light of the challenges currently being faced by the Health Sciences Division.

It happens that BSOM has a plan to introduce a new master's program in integrated biomedical sciences, which we support, since this seems to be an ideal mechanism to prepare a workforce for the region's nascent biotechnology industry. Our sense is that the better course to follow is to allow faculty engagement in the integrated master's program to convince them that an integrated doctoral program is a sound idea and a preferable alternative to the small and sometimes fragmented programs now being offered.

We have not reached this conclusion without misgivings, however. As we will discuss in greater detail below, faculty concern to prevent the erosion of the traditional biomedical disciplines has in some cases produced programs that feature significantly outdated science, and we think that this situation is at least partly responsible for the relatively flat external research income that these programs are earning.

Anatomy and Cell Biology

The doctoral program in Anatomy and Cell Biology is in a state of transition, spurred on by the University's hiring of new leadership for the program. That transition appears to be focused on the transformation of a teaching mission to a research mission, though it is clearly in its beginning phase, and the program's performance indicators demonstrate that there is still a long way for the program to go.

At the time of our visit, the program's new leadership was only beginning to feel its way. When asked about its principal research strengths, for example, the program responded with particular disciplinary techniques and methodological approaches or with very general topics such as cellular adhesion. This is a model appropriate for very large and comprehensive departments, whereas our sense is that for ECU to achieve excellence in small programs, it will need to be much more focused and precise: the cell biology of diabetes, for example. Because of a new grant and the arrival of new faculty, total grant awards at this time are approximately $1,000,000, but for the period covered by this study, are closer to $400,000 per year.[52]

The materials provided by the program are noteworthy in two ways. First, they focus on teaching, which is, after all, the principal focus of most anatomy departments, particularly in community-based medical schools. Second, the promotional literature for the program addresses itself to students who are only vaguely aware of what anatomy and cell biology are, as though they were written for lower division undergraduates exploring possible majors. The materials are not of the sophistication necessary to build a major biomedical research enterprise. Even the program plan for senior hires is focused on satisfying the teaching needs of the department and indicates, as we have already mentioned, that the department has a long way to go in establishing a research program of national importance.[53]

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[52] Part of the supporting documentation with which the faculty provided us was a list of research grants awarded from 2000 through April 2006. This contained literally only 11 grants. One of the program's benchmarks, Virginia Commonwealth, had more than 100 grants during the same period. The ECU program's research earnings are only about 10% of what they should be.

[53] The program's most recent strategic plan, while also focused on teaching, indicates a new element: territoriality. One of the principal objectives of the plan is to bring all labs and equipment related to anatomy under department control.

In terms of number of faculty, the program is about half the size of the mean for the comparative cohort—14 faculty versus 28.2—though two of the programs in the group (the ones at Ohio University and the University of Wisconsin Milwaukee) are only slightly larger. The program is exceptionally under-enrolled, however. It has the smallest doctoral enrollment of the comparative group—6.3 versus the group mean of 39.2. The mean doctoral-student-to-faculty ratio for the group is 1.8 students per faculty; this program has 0.45 students per faculty. Students appear to be of reasonable quality, however, since the three-year average GRE scores are significantly above the cohort means for both the verbal and quantitative sections of the test. Despite above average students, degree production is in line with enrollment: very low, with only three doctorates granted in five years (0.2 per faculty) versus a cohort mean of 16.5 degrees (0.7 per faculty).

Performance indicators for research are very unfavorable. Apart from the program at the University of North Dakota, the ECU program's average annual research earnings are the lowest in the comparative cohort—$398,000 ($28,000 per faculty) versus a cohort mean of $2.4 million ($94,000 per faculty).

Publication productivity is less straightforward to gauge. The count we developed from the science index struck us as too high, given our other knowledge of the program and the program's own listings of its publications. The high count (still listed in Appendix D) turned out to be the result of the unusually large number of journals in which program faculty have published, indicating a scatter-shot approach to research, with no discernable focus at all. The program's own count seemed to us too low, but we were able to confirm it through BSOM administration. Using the program's own count, therefore, we note that the average faculty member in this cohort published 26 papers over a five-year period, while ECU faculty published 5.4 papers. The bibliography provided by the program indicates that most of their publications are abstracts, which the National Research Council will not count as research publications, or textbooks, which reflect the traditional teaching mission of the program.

On a more positive note, the program's competitive indicators are generally excellent. The stipend of $21,500 is very competitive in terms of the cohort, which has a mean doctoral stipend of $18,685, though we are concerned that not all students appear to be getting full tuition remission. The program does provide full health insurance coverage, and the time to degree of 4.5 years is the shortest in the cohort, which has an average time to degree that is a full year longer.

Biochemistry and Molecular Biology

The doctoral program in Biochemistry and Molecular Biology is very well managed, accustomed to benchmarking itself against external aspirational peers and very much on top of the important details of the program, including having explicit written polices that govern the allocation of fellowships and assistantships. The program also appears to be of very high quality, having placed some of its graduates in very prestigious locations. When the program fell upon hard times in the 1990s, it behaved very strategically and chose areas of focus that have made a great difference to both its scholarship and its productivity, a wise course of action for a program that is relatively small and limited, because of size, in what it can do well. As a result of establishing research focus, it loses approximately half the students in which it is interested simply because the program is unable to accommodate their research interests, but we are confident that those students who do enroll in the program are receiving a very high quality education.

The department also appears to have completed the transition from a primarily teaching department to greater research orientation. Faculty leadership understands how to

accomplish the program's research and scholarship goals, and makes good and concerted efforts to mentor junior faculty in establishing their research programs in order to achieve appropriate levels of external funding. Though the program's performance indicators are mixed, it is clearly moving in the right direction; and we think that the primary benefit of this exercise for this program is that it will establish higher productivity standards, which we are confident the program can achieve.

To turn to performance indicators, the program is—by any measure—very small, with only 10 faculty versus a comparative cohort mean of 22.5.[54] Though we understand the availability of student financial support drives enrollment for this and every other program in the Brody School of Medicine, we note that the program is under-enrolled relative to the cohort, with a doctoral enrollment of 6.3 students (or 0.63 per faculty) versus a cohort mean of 32.1 students (2.4 per faculty). We have mixed opinions about the quality of the program's students, however, since the three-year average combined GRE is lower than those of any other program in the cohort except for the one at Northern Illinois University. The program's academic placements are, as we have already indicated, quite good; and so either the GRE scores are giving a false picture in this case or the program is particularly good at taking average students and turning them into high achievers.[55]

Degree production for the program is very low—three doctorates (or 0.3 per faculty) in five years, versus a cohort mean of 18.1 doctorates (or 1.5 per faculty). We know that the program had an attrition problem in the past, which is now solved, and it is possible that this problem is reflected in this data. It is possible that the program has a degree completion issue, though the indicators are inconclusive on this point.

Performance indicators for research are mixed. As the program leadership indicated to us, faculty need to do much better than they currently do in external funding. The average annual research income for the cohort is approximately $2.6 million (or $195,000 per faculty), while the ECU program is earning $725,000 per year (or $73,000 per faculty). The publication record—almost unique among ECU doctoral programs—is excellent, however. Apart from the program at Virginia Commonwealth, the ECU program has the best publication record in the comparative group; and on a per-faculty basis, it has the best record, publishing eight more papers per faculty than VCU and about double the mean number of papers in the group. On a per-faculty basis, they are cited more than any other faculty except the one at Virginia Commonwealth. The relationship between papers and citations between the two programs is very interesting, however. Because of its large faculty size, VCU is cited far more than any other program in the group, but its faculty, on average, receive only 3% of the total program citations for the cohort. The faculty for the ECU program each receives 10% of the cohort's total citations.

We do think that the program has a problem with research space. Average net assignable square footage for the cohort is almost 31,000 square feet. This program has only 10,480 square feet. Other competitive indicators are, for the most part, good. The doctoral student stipend is well above the mean for the cohort, though IPA reports that some students do not

[54] There are several outliers in the comparative group, either because the programs themselves are exceptionally big relative to this cohort or because they are tracks within integrated programs of much larger scope. Even if we remove the figures for these outliers so that the mean group faculty size is 15.5, the ECU program is still very small.
[55] Whatever the case, we think the program deserves better students and might experiment with requiring for admission a minimum GRE score of 1100 or 1150 to see what effect that has on student quality.

receive full tuition remission, which is essential in this field; and time to degree, though not bad, is slightly above the mean for the cohort—6 years versus 5.9 years.

Interdisciplinary Program in Biological Sciences

Of all the basic science programs in the Brody School of Medicine, we are most concerned with the interdisciplinary doctoral program in Biological Sciences. At the time of our assessment interview, program leadership was relatively new, and it is possible that this skewed the program's presentation of itself, but our sense is that there are much deeper issues here.

The current program was created in 1999 in order to replace a previous program that was failing; but after eight years, it is clear to us that the program still lacks a coherent research identity. On the most practical level, we think the reason for this is that the program has become a magnet for ambitious faculty who want a doctoral program of their own but do not have one; and, in many senses, the various segments of the faculty (chemical and biological, for example) are acting as though they are separate programs.[56] An additional issue is that in other universities, programs of this type ordinarily have an environmental focus. So far as we can tell, this program combines an interest in coastal and estuarine sciences and proteomics, areas which are too far apart to fit coherently into a single program.

Because program faculty are unable to agree on a research focus—or even, perhaps, a common pedagogy—the program design features an individual plan of study approach—plans of study which are different, of course, for biology and chemistry. Our experience generally is that individual plans of study—versus defined curricula—lead to exceptionally long time to degree; and, in fact, this is a serious issue for this program: the average time to degree is seven years, considerably longer than both the average time for the cohort and the national average for the biosciences.

An additional problem is the program's preference for accepting only those students who already have a master's degree, which is way out of line for national practice in the biological sciences. We think this has the general effect of attracting weaker students to the program. The program did say that it considers approximately 80% of the students who apply to it qualified for admission and reports that most of the students who are offered admission do in fact enroll, though the program has lost at least one potential student to another institution and says that some students decide not to enroll because they decide not to enter a Ph.D. program after all. We think that the root cause of this is that the program is more likely to attract potential students whose research interests are insufficiently defined to pursue doctoral studies; and finding no apparent direction in the program that might refine their own interests, they decide not to bother.

This lack of coherent research identity has several practical consequences. The first is that it makes program faculty unconfident about their own prospects for funded research, and they are consequently skittish about accepting students who they might not be able to support over the course of the entire program.[57] The second is that program faculty have no

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[56] In fact, the assessment interview was attended by about five faculty in addition to John Lehman, and our sense is that the additional faculty came because they did not trust program leadership to represent their own part of the program adequately.

[57] The new program director stated repeatedly during our assessment interview that he could not confidently accept students without greater assistantship support from the University—without realizing, apparently, that almost all doctoral students in the biosciences are supported, for the most part, from faculty grant funds.

definitive sense of what they are attempting to train for, and our feeling is that the biological and chemical sections of the faculty, if asked who they were trying to train and why, would give significantly different answers. In this context, it is not surprising that program performance indicators are generally poor, despite the participation in the program of faculty who are, to all appearances, good at what they do and committed to doctoral education.

Current faculty FTE for the program is unbelievably small relative to the comparative cohort—five ECU faculty versus a cohort mean of 30.[58] Despite small faculty size, however, the program has a high doctoral enrollment. In the context of this discussion, we think it is over-enrolled, with a doctoral-student-to-faculty ratio of 2.1 students per faculty versus a cohort mean of 1.1 students per faculty. Despite this situation, the program appears, based on average three-year GRE scores, to be getting students as good as any other program in the cohort, but as we have already indicated above, our concern is that their research interests are ill-defined relative to doctoral students generally, and this undoubtedly accounts in part for the program's exceptionally long time to the doctorate. Not surprisingly, degree production is *very* low, with only one doctorate produced in the last five years (0.2 per faculty) versus a cohort mean of 16 doctorates produced (0.5 per faculty).

The average annual grant earnings for the program are, in our view, not adequate to support a viable doctoral program. Average program earnings for the cohort are in excess of $4,000,000, while this program earns approximately $1,895,691,000 per year. On a per-faculty basis, research earnings appear higher than the mean, but as we have said, we mistrust this figure because of the unusual FTE count. In terms of publications, the program trails some of the big biomedical establishments in the cohort, such as the one at Virginia Commonwealth, but they appear to be ahead of some of the smaller integrated bioscience programs, such as the ones at Florida International and Northern Illinois. If we were to include the publications of all the affiliated faculty, they would have, by far, the lowest publication record in the cohort. Research space is also an issue for the program, since it has only 3000 square feet—versus a mean of approximately 46,000 square feet for the entire cohort.

The doctoral stipend is excellent. At $21,500, it is appropriate for doctoral programs in the biomedical sciences but high for programs with an environmental focus. It appears that some students do not receive full remission of tuition, and this is a serious issue. The provision of full health insurance benefits for students is certainly a plus, though time to the doctorate, as we have already stated, is exceptionally high and needs to be shortened by more than a year.

Microbiology and Immunology

The doctoral program in Microbiology is somewhat puzzling in terms of its research mission and its actual research operations. Among the documentation we examined for this program is its list of five-year grant titles; and this list gives evidence of both fragmentation and an odd interdisciplinarity—odd because some of the grant titles in the list are of the sort that we would expect to find in other departments of the Medical School but there is no evidence—either in the grant record or in our assessment interview with the program—of research collaboration outside the department. We certainly do not see interest in some of the larger

[58] Institutional Planning and Research reports that the program has 44 affiliated faculty on a headcount basis, but it is not clear how much affiliated faculty actually participate in the program. As a result, we are concerned that if we were to use that figure, all of our per-faculty counts, would be artificially high or low.

research strengths of the Health Sciences Division, such as metabolism, diabetes, obesity, and cancer biology; and so it is not clear what this program it attempting to build—unless it is a traditional large and comprehensive department of Microbiology and Immunology. As a result, we find that the program lacks the kind of coherent research mission that we have found in such programs as Bioenergetics and Biochemistry and Molecular Biology.

This lack of coherent identity is reflected in the program's performance indicators. It is a small faculty, though not unduly so. At 14 FTE, it is smaller than the comparative cohort mean of 21.4, but it is significantly larger in terms of faculty size than many of the programs in the cohort: Florida International, University of North Dakota, University of Wisconsin Milwaukee, and Wright State. Its doctoral enrollment is very small, however—15.7 students (or 1.12 per faculty) versus a cohort mean of 38.9 students (or 2.9 per faculty). Moreover, its students appear to be of lower quality relative to the rest of the cohort. Its three-year average GRE scores in both verbal (505) and quantitative (526) are both significantly below the cohort means—522 for verbal and 590 for quantitative. These are among the lowest GRE scores in the cohort.

As a result of both under-enrollment and low GREs, degree production is very low: 11 degrees for the program (versus the mean of 21.7) and 0.8 degrees per faculty (versus the mean of 1.4).

Research performance indicators, though relatively low for the comparative group, are better than those of many of the ECU programs we have examined. On average, program faculty should be earning about double what they currently are in grant income. The average annual grant income for the program is about $1.6 million, versus $2.2 million for the comparative group. Average per-faculty earnings for the ECU program are approximately $114,000 per year, against a cohort per-faculty mean of $165,000 per year. The publication record is better. On the whole, program journal publications are above the mean for the group (632 over five years versus 563 for the cohort); but on a per-faculty basis, performance is somewhat lower: 45.1 for ECU faculty versus 40.6 per faculty for the cohort. Moreover, ECU faculty research appears to be relatively uninfluential. Citation counts are consistently below the means for the comparative group on both a program and a per-faculty basis. Research space also appears to be an issue. The average net assignable square footage of research space for the cohort is 41,548. NASF for the ECU program is approximately 18,500, less than half the mean for the cohort.

Program competitive indicators are excellent. The program is fully competitive in terms of full tuition remission, a doctoral stipend of $21,500—versus a mean of $18,956 and one of the highest stipends in the cohort—and time to the doctorate, at 5.3 years, is slightly shorter than the mean for the group: 5.5 years.

Unique among programs at ECU, the program appears to be very sophisticated at recruiting students and uses careful and meticulous recruiting practices, though we think these efforts are confined too narrowly to the region and should be more national in scope. We think the program would benefit from a faculty retreat, the purpose of which would be to define a coherent research mission that is better aligned with what is happening elsewhere in the Brody School of Medicine.

Pharmacology and Toxicology

The doctoral program in Pharmacology and Toxicology, like the one in Anatomy and Cell Biology, is in an obvious state of transition, in part because of new program leadership. In the case of this program, however, the transition is far enough advanced to be making a

difference, and the program's performance indicators are beginning to reflect this. Part of this transition is the reintegration of toxicology into the curriculum. Some challenges remain, however.

We begin by noting that faculty research interests in the program are not appropriately aligned with the best research strengths in the Brody School of Medicine. This is probably because the program has chosen to hire, over time, one or two faculty working in a number of areas—too many areas, in our view—including cancer biology, drugs of abuse, and neonatal pharmacology. We would prefer that faculty be massed in larger research groups and that these groups deal largely with the principal themes of the University's Health Sciences Division: metabolism, diabetes, obesity, and cardiovascular science.

The most significant problem we see, however, is that much of the program's practice of its discipline is outdated, as evidenced in the program's repeated use of the phrase "from molecule to bedside." This datedness is partly the result of an over-emphasis on translational research, which is of far more importance in this program than in any other Pharmacology and Toxicology program with which we have dealt. We think it is also in part an effect of the community-based medical school's traditional teaching mission, since whole-animal biological science appears to be widely favored by teachers, for pedagogical reasons that we are unable to understand.[59]

This problem of dated science was touched upon, though only lightly, in the program's most recent external review, which recommended that the department devote significantly more attention to areas such as genomics, proteomics, and stem cell biology—in short, to those areas of the biosciences made possible by advances in molecular biology. We wish to state the case more emphatically here. The adherence to traditional biological techniques at the expense of newer approaches to the life sciences impedes the progress of research, and most definitely has a negative impact on the program's ability to earn external grants. Moreover, the continued teaching of outdated science is, in our view, harmful to students, since it will diminish their prospects of achieving productive careers in research. From our point of view, it is vital that the program embrace contemporary biomedical science, even if it means completely forsaking the traditional paradigm of whole-animal biology.

In turning to performance indicators, we begin by stating that, since there were relatively few Pharmacology and Toxicology programs in the official comparative cohort for this study, we were forced, as we were with many programs, to search for cognate programs at other institutions, giving preference to those in the University's official peer group. The specific result in this case is that we are necessarily comparing the ECU program with Pharmacology and Toxicology programs at some of the best academic medical centers in the country, including Texas Tech, Buffalo, Alabama Birmingham, and Louisville. The effect of this is that the program may appear worse in comparison than it actually is, especially in light of some of the changes being implemented by new program leadership.

In terms of program size, the faculty—at 10 FTE—is about half the size of the of the mean for the comparative group, though the mean may be artificially high because of the presence of institutions such as Louisville and VCU, which both have unusually large programs in this area. The typical faculty size in the cohort is about 13 or 14, and the ECU program is

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[59] The program objectives listed in the various documentation we reviewed read very much like the program objectives one would find in a description of an undergraduate program. They are very much focused on teaching, and this, in our opinion, is a distraction from the development of a coherent program research mission.

obviously smaller than that. Despite this, the program is enrolling as many students as it can—or close to it. The mean doctoral-student-to-faculty ratio in the cohort is 1.1, and this is precisely the ratio for the ECU program. Current students also appear to be of high quality, since the three-year average GRE scores for both the verbal and quantitative sections of the test are significantly higher than the cohort mean. For verbal, the ECU program averages 552 versus a group mean of 516; for quantitative, the ECU program averages 704, versus 656. However, doctoral degree production is low; though we agree with the most recent external review that these figures probably reflect a problem of the past rather than the present.

As the external reviewers noted, research performance indicators for the program are far lower than they should be. On a program basis, research earnings are only about 25% of the mean earnings for the cohort. Per-faculty earnings are about half the mean for the cohort. Though we have said this already, it bares repeating: we are convinced that low grant productivity is a direct result of the program's outdated practice of its discipline, and will not increase until the program changes its orientation to its science.

The publication record tells the same story. On a per-faculty basis, the program's five-year publication volume is only 70% of what it needs to be to achieve the mean level of the cohort; and faculty are receiving only half the citations they should be. Again, we expect that low citations are the result of the program's science.

Though the quantity of research space is generally an issue in the Brody School of Medicine, in this program, it appears not to be. In fact, the program has one of the highest space allocations in the cohort. At 10,222 net assignable square feet, it is significantly above the cohort mean NASF of 8,555.

The program's competitive indicators are excellent. The doctoral student financial package is fully competitive at full tuition remission and student health insurance and a stipend of $21,500. The program's average time to degree of 4.8 years is quite good, and one of the shortest times to degree in the cohort.

Physiology

The doctoral program in Physiology is rationally and well-managed from an administrative point of view, though it reports that it is more dependent than it would like to be on international students and our impression is that it is, on the whole, not happy with the quality of its students or the rate of its growth.

As was the case with the program in Pharmacology and Toxicology, our principal concern for the Physiology program is that it is outdated in the practice of its discipline, giving too much emphasis, in our view, to whole animal physiology, though the program reports that it also pays some attention to molecular science. Our sense is that the reason for such datedness is the same as it was with the other program. The department of Physiology has heavy service instruction obligations to the programs in nursing, occupational therapy, physical therapy, and nurse-anesthetist. Unquestionably, the datedness has the same effect on this program as on Pharmacology and Toxicology: its research income is not nearly what it could be; and consequently, it is unable to support the enrollment growth it desires. In this case, we think the solution to the problem is comparatively more simple than it is for Pharmacology and Toxicology. The Physiology program reports that it has some interest in neuroscience. We think it should have a lot of interest in neuroscience, hiring faculty specifically in this area

as positions open up; and if the program develops in this direction, we feel confident that its approach to its discipline will update without a great deal of trouble.[60]

The program's performance indicators are about what we would expect from a program with an outdated approach to its discipline and that is reluctant to recruit students. The program is small relative to others in the comparative cohort—in fact, the second-smallest—with an FTE faculty count of 14 versus a cohort mean of 26.5. As the program indicated, it is under-enrolled, with a doctoral-student-to-faculty ratio of 0.76 students per faculty against a group mean of 1.3 students per faculty. To illustrate the severity of the under-enrollment issue, we note that a smaller faculty at the University of South Carolina enrolls 38.7 students (versus this program's 10.7) and a faculty only slightly larger at Virginia Commonwealth enrolls more than 50 students.

As the program also indicated, the quality of its students is relatively low. Three-year average GRE scores are well below the means for both the verbal and quantitative sections of the test, and total a combined score of 1124, the lowest in the cohort. Interestingly, department faculty reported that students who have a combined score of below 1500 tend to struggle in the program, so that these figures confirm our sense that the faculty is not happy with the quality of the students it is getting. Degree production is low, but the completion rate appears to be high. Our sense, therefore, is that low degree production is a function of low enrollment.

The program's research performance indicators are its weakest suit, unquestionably—to us—because of the program's emphasis on whole animal physiology. Average annual research income for the program is approximately $1,000,000, only 35% of the mean figure for the cohort. On a per-faculty basis, annual research earnings are $72,449, about 45% of the group mean of approximately $162,000 per faculty. Because of small faculty size, the program's number of publications is significantly low, but the per-faculty publication record makes the more important point: ECU Physiology faculty publish only about 38% of the number of papers published by the average faculty member in the comparative group. The per-faculty citation record speaks directly to the problem of research currency: ECU faculty receive fewer citations than almost every other program in the cohort—349 per faculty versus a group mean of 1,519 per faculty. As with other programs in BSOM, the quantity of research space is a serious issue. This program, partly as a result of its building being found in violation of federal regulations, has a net assignable square footage of 12,000 versus the mean cohort NASF of 29,000.

As with other programs in the Medical School, competitive indicators are generally excellent. There is full tuition remission and full subsidization of student health insurance, though we are concerned that time to degree is too long by about half a year. This is probably a reflection of student quality.

[60] Making this transition will definitely improve the department's ability to recruit. Program faculty report that they are currently reluctant to recruit because funding is so uncertain. With a more current approach to science, we expect funding will become both greater and more regular. Developing some strength will also help to plug a hole in the Division of Health Sciences, which has never really done much in terms of neuroscience.

School of Nursing

Nursing

In assessing the new doctoral program in Nursing, we note with interest that the description of the program provided by the Dean of Nursing to one Yardley Group interviewer was very different from the description provided by the program director to another interviewer. It is not that the descriptions are incompatible; but it is notable that while the program director focused specifically on the quality of education and its impact on clinical care, the Dean spoke principally of the research prowess of the program, particularly in terms of obesity care, including post-operative care for gastric bypass patients. We think it is important that faculty activities be more thoroughly integrated with the strategic vision of the Dean. There is no reason why the doctoral program in Nursing at East Carolina cannot come to be regarded as the premiere program in the country to develop specific nursing specializations.

The program's performance indicators, reflecting its youth, are mixed. In terms of size, the East Carolina program has the smallest faculty in the cohort, with 11 FTE versus a cohort mean of 23.9. Doctoral enrollment is, therefore, also small; but the doctoral-student-to-faculty ratio of 1.34 is significantly above the comparative cohort mean of 1.0, and ECU nursing faculty are training more doctoral students per faculty than all but two of the more established programs in the group. We think this bodes well for the future of the program.

The quality of the program's students could be better than it is, but this is also probably the effect of the program's youth. The program has the lowest three-year average combined GRE score in the comparative cohort, with ECU students demonstrating particular deficiency in mathematics. We are unsure of the significance of these indicators, however, since many nursing programs nationwide, including some in this comparative cohort, do not require the GRE at all. Whether student quality will have an impact on degree production, it is too early to tell, since the program has thus far had time to graduate only one student. We would look for a degree completion rate at the end of this academic year of about 55%. A rate lower than this would indicate that something is amiss.

Performance indicators related to research are primarily positive. We do note that we have discrepant research figures. The official figure reported to us by Institutional Planning and Research is lower than the one cited in the Office of Research and Scholarships' Annual report dated May 1, 2004. In using the IPR figure, we note that average annual research income for the program is respectable but about $350,000 below the mean figure for the cohort. This is reflective of program size, however. Individual ECU nursing faculty earn, on average, $82,475 per year in grant income—against a cohort mean of $59,137 per year. The publication record is similar. Because of small program size, the program's five-year publication volume of 309 papers is slightly below the cohort mean of 328 papers. On a per-faculty basis, however, the program bests every other program in the cohort except for the one at Virginia Commonwealth, with 28.1 publications per faculty against a group mean of 14.7 papers per faculty. The program also boasts more citations per faculty than any program in the cohort except for the one at VCU. The quantity of research space is currently an issue, since it is less than half of the mean square footage for the program; but we assume this problem will be alleviated when the program moves into its new space on the medical campus.

Competitive indicators are also primarily positive. Though not all students receive tuition remission, the doctoral stipend is the highest in the cohort and nearly $5000 above the mean stipend amount. Time to degree, though based on only one student, is thus far excellent.

Division of Research and Graduate Studies

Coastal Resources Management

Because the University requires the development of second and third areas of research strength in addition to its traditional strength in basic biomedical sciences, the doctoral program in Coastal Resources Management has been potentially targeted for growth and increased investment by the University's Vice Chancellor for Research. We have had some misgivings about this choice from the beginning of the project, in part because the field is one of the most competitive in terms of attracting external funding and in part because there are already several excellent programs in the region in precisely this area, at least as it is typically defined. During the course of this study, both performance indicators and unproductive behavior by program faculty have emerged to increase these concerns; and we think that these issues need to be addressed seriously before any further investments are committed.

We begin by addressing the apparent scope of the program. Though the program director points to a good balance between policy and science in the program, our analysis of the curriculum indicates that the emphasis on science is not nearly strong enough; and within what representation there is of science, the balanced is skewed heavily in favor of marine scientists, though we believe that to be competitive, the program will also need to develop a focus in climate sciences. Much of the program's current focus is on nautical archeology, which though interesting and valuable for its own sake, is an academic novelty that—without a significant added emphasis on coastal sciences—is incapable of attracting the kind of external research profile that the VCR is interested in developing.[61]

We are also concerned that the program appears primarily interested in training policy practitioners and draws a significant part of its student audience from adults who are undergoing career transitions. In our opinion, this does not bode well for creating a competitive research doctorate, and we think that the program needs to be equally concerned with training scientists who are educated about public policy.

The program's performance indicators reflect the lack of balance between science and social science and the program's student base of career transitioners. They also reflect considerable fragmentation of faculty research interests. We note, however, the fact that although the program has on the books many contributing faculty, relatively few faculty actually contribute to the program, since their primary allegiances are to the departments in which they are housed. It is possible that this factor exaggerates our picture of research fragmentation.

In terms of program size, the number of 7.5 FTE faculty participating in the program is very small in relation to the comparative cohort mean of 31.4 FTE. From the point of view of several of the comparator programs, the faculty is, in fact, dramatically under-sized:

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[61] To complicate matters, those contributing faculty from the History department have shown a great reluctance to participate in the program, preferring instead to have a program of their own. We can understand this desire, though we specifically do not advocate the development of a history doctoral program based so narrowly on nautical archeology. The yoking together of the various segments of the faculty seems to have been painted with too broad a brush. So far as we can tell, coastal science and policy and nautical archeology have in common only that they both have to do with the sea; and this is not nearly enough commonality to create a coherent research mission.

Delaware's Marine Studies program has a faculty of 56; the University of Rhode Island's program in Oceanography and Marine Affairs has a faculty of 48. Despite small faculty size, the program's enrollment is quite high—32.3 doctoral students (4.34 per faculty) versus a mean of 44 for the cohort (1.7 per faculty)—but in this particular case, we do not regard high enrollment as a positive indicator. To begin with, the quality of doctoral students is poor relative to the cohort. The three-year average combined GRE score for the program is the lowest in the comparative group—1047 for the ECU program versus a mean of 1160 for the cohort.[62] The more important issue, however, is that doctoral production is exceptionally low—the lowest in the cohort, in fact—with only three students completing their degrees during the five-year period of this study.

Per-faculty degree completions for the program (0.3) are also below the cohort mean of 0.6 degrees per faculty; and we wonder if the issue is that the energies of the faculty are too scattered to handle as many students as they do, most of which have been languishing in the program for some time without completing their degrees. We also have the impression that low completion rates are caused by an undue emphasis on student achievement of curricular structural milestones and a lack of adequate mentoring when students reach the crucial stage of writing their dissertations. Unquestionably, the fact that many students are working adults also contributes to this problem.

In this particular field, those programs that grow to vibrancy basically function as research institutes, in the sense that most of their activities are funded out of soft money—significant amounts of soft money at that. In this program, the faculty are primarily focused on departmental demands, including the generation of student credit hours in their home departments, and this is not conducive to building a significant grant profile. Structural division also plays a role in this. As we were compiling data for this study, the director of the Center for Coastal and Marine Resources argued fairly strenuously that research dollars earned through the Center not be attributed to the doctoral program—even for analytical purposes. This is an illustration of the tendency we noted in the general section of this document: because of competition for resources, faculty are preoccupied with factors of separation, and this is not healthy for an interdisciplinary program that needs to function as a research institute in order to be competitive.

It is not simply that the FTE faculty count is very low, though this is a serious issue. The more important issue is that its research interests—especially for such a small faculty—are more scattered than those of any program in our experience. In mapping journal titles to ISI taxonomic fields, which is necessary to obtain publication and citation counts, we noted that the program FTE faculty of 7.5 are publishing in 19 separate disciplines—an enormously disproportionate number, even allowing for the fact that journal publications probably represent the work of faculty who are only minimally involved in the program.

As much as any of the other issues we have discussed, this research fragmentation probably accounts for the very poor research performance indicators for the program. Average annual research earnings for programs in the comparative cohort are roughly $9 million (or $261,000 per faculty); research earnings for ECU faculty are $1 million per year (or $146,000 per faculty)—the lowest performance in the cohort on a program basis and the second-lowest on a per-faculty basis.

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[62] As with many other programs at ECU, the problem with below-average GRE scores is low scores on the verbal section of the test, particularly problematic in this program since it has a focus on the social sciences.

The publication record, also low, appears confusing at first. As a program, ECU's Coastal Resources Management program published the fewest papers of any program over the five-year period we examined—644 versus the cohort mean of 1,434. On a per-faculty basis, the ECU count appears above the mean, 86.4 papers versus 54.7; but we are certain that this is a false reading caused by the unusually high number of fields represented in the faculty's publishing history. Unquestionably, program faculty are receiving undue credit for publications that have nothing to do with coastal science and policy but that were written by faculty in participating departments. We think the same phenomenon is at work for the apparently high number of citations received—355 citations versus a mean of 216.5 citations for the cohort.

Competitive indicators are mixed. Some students in the program (presumably the working adults) receive no tuition remission at all, while we think the standard for the cohort is full tuition remission. The stipend of $18,000 is quite good—the second-highest in the comparative group and considerably above the mean doctoral stipend of $16,747. Lack of student health insurance, as with other ECU programs that are outside the health sciences, is obviously a competitive issue.

We cannot say definitively if research space is an issue for the program or not. Since NSF does not collect or release space data for this type of program, we are unable to derive square footage for the other programs in the cohort. Two of the cohort programs, however—the ones at the University of Massachusetts at Dartmouth and the University of South Carolina—have been our clients during the past year. Research space for the ECU program is smaller than the space allotted to these two comparator programs.

During our assessment interview, the director of the program indicated that he felt the program was ripe for a retreat to determine its future direction. We concur with this belief. Beyond this, we think that because of the separationist tendencies of ECU faculty when it comes to the sharing of resources, it is in the best interests of this program to have a core of faculty whose primary appointment is to the program.

College of Technology and Computer Science

Doctor of Technology Systems

This proposed doctoral degree had completed its request to plan document at the time of our visit to campus. We have both reviewed this document and met at length with the Dean of the College and the Director of the proposed program.

In our view, the program documentation to date is excellent, demonstrates that there are strong markets both regionally and nationally for the program, and indicates clearly that College administrators have thoroughly investigated both the amount of investment required to launch the program and the amount of time it will take for the program to pay back the investment.

We believe that this potential program fits perfectly with ECU's mission of service to the region and could have a significant impact on the region's existing manufacturing and production services base.

We do, however, think that one question needs to be better answered. Why does this program need to be a professional doctorate rather than a professional master's? What financial and other benefits will accrue to graduates of the program because their degree is a doctorate rather than a master's?

Assessments of Enrollment Capacity

Assessment of Doctoral Enrollment Capacity

We were asked, in addition to conducting assessments of the academic competitiveness of doctoral programs, to assess each program's capacity for doctoral student enrollment. This report examines doctoral enrollment capacity from two perspectives. The first is contained in the program assessments above; and from this perspective, we judge by comparison with aspirational peers whether a program is over- or under-enrolled. This is a partial analysis only, since it cannot identify the causes of under-enrollment, such as insufficient funds for student support, an inadequate number of research-active mentors, and the like. Enrollment capacity from this point of view is really a commentary on institutional priorities: actions and circumstances (research activity, graduate school funding, external funding, recruiting, etc.) have developed in a way to produce a certain enrollment level.

The second perspective from which we examine enrollment is an attempt to navigate faculty and administrative discussions regarding the actions and circumstances that produce enrollment. In order to do this, we administered a questionnaire to faculty that solicits from each program both current enrollment information and their assumptions about factors such as reasonable load:

- Average time to degree
- Average degree completion rate
- Total enrollment
- First year enrollment
- Number of FTE faculty
- Percentage of FTE faculty who are research-active
- Maximum number of advisees per faculty
- Average annual placement of completers in academic jobs
- Average annual placement of completers in non-academic jobs
- Number of teaching, research, and other graduate assistants required to help fulfill the relevant departments' teaching and research missions
- Total budget, by source, for graduate assistants, fellows, and others who receive financial support
- Stipend amount for graduate assistants (expressed on a half-time equivalency basis)

Upon receiving completed questionnaires from program faculty and confirming data provided with each Dean, we plotted both program current data and their goals and assumptions into a spreadsheet instrument. Using that instrument, we then calculated the program's capacity for total enrollment and for new student cohorts, using an algorithm that, in most cases, gives equal weight to mentoring load, placement, teaching and research needs, and available resources.[63]

The table below gives for each program the size of its current entering cohort and current enrollment, and our calculations of the program's capacity for total and new enrollment. It also notes whether programs are over, at, or under capacity (or whether capacity is to be determined based on further review of resources); whether current budget dollars support

[63] We provide both faculty data and resulting calculations in an Excel workbook recorded on a compact disc attached to the back cover of this document in order that faculty and administrators be able to examine and renegotiate enrollment assumptions. It may be, for example, that it will be necessary to increase financial support, faculty expectations about mentoring loads, or both in order to produce the desired enrollment. In using the workbook, it is also possible to assign varying weights to the various enrollment factors.

both the current enrollment as well as the projected total enrollment capacity; and whether or not we assigned an equal weighting to factors (mentoring load, placement, teaching and research needs, resources). We stress that these capacity estimates are based on faculty responses provided in the above-referenced questionnaire and, in some cases, were confirmed by their Deans or other administrators in their Colleges.

We recommend that both programs and administrators give serious consideration to the data previously provided, especially in those cases in which capacity is to be determined because of insufficient or questionable data provided (Biological Sciences, Coastal Resources Management, Nursing, Physical Therapy, Physiology, and Rehabilitation Counseling and Administration), or in which available funding resources do not at this time support either current or projected total enrollment (Anatomy and Cell Biology, Biochemistry and Molecular Biology, Bioenergetics, Biological Sciences, Medical Family Therapy, Microbiology and Immunology, Nursing, Pharmacology and Toxicology, Physiology, Rehabilitation Counseling and Administration, and Technical and Professional Discourse), or in which we did not apply an equal weighting of factors (Anatomy and Cell Biology, Biological Sciences, Communication Sciences and Disorders, Educational Leadership, Medical Family Therapy, Microbiology and Immunology, Nursing, Physiology, and Technical and Professional Discourse.) A final capacity should be calculated by inserting into the blank versions of the capacity instrument those assumptions agreed among the Deans of the Colleges, the Provost, the Vice Chancellor for Research and Graduate Studies, and program faculty.

As we have already indicated, the algorithm we employ to calculate total enrollment capacity gives weight to mentoring, placement, departmental mission, and resources, and takes into account program goals related to completion and time to degree. The effect of this is that there may not be a linear relationship between the estimated capacity for a new student cohort and the estimated capacity for total enrollment. It is possible, for example, that the size of the entering cohort increases over the size of the current one, but the overall enrollment capacity decreases.

Table I
Doctoral Program Enrollment Capacity

Academic Unit	Current New Cohort	Projected New Cohort	Current Total Enrollment	Projected Total Enrollment	Over (O) At (A) or Under (U) Capacity	Current Budget Dollars Support Current Enrollment	Current Budget Dollars Support Projected Enrollment	Equal Weighting of Factors
Anatomy & Cell Biology	0	2	5	11	U	Y	N	N
Biochemistry and Molecular Biology	2	2	6	11	U	Y	N	Y
Bioenergetics	4.5	4	11	14	U	Y	N	Y

Academic Unit	Current New Cohort	Projected New Cohort	Current Total Enrollment	Projected Total Enrollment	Over (O) At (A) or Under (U) Capacity	Current Budget Dollars Support Current Enrollment	Current Budget Dollars Support Projected Enrollment	Equal Weighting of Factors
Biological Sciences	3	1	10	4	To Be Determined	N	N	N
Biomedical Physics	3	5	20	15	A/O	Y	Y	Y
Coastal Resources Management	4	2	34	13	To Be Determined	N	Y	Y
Communication Sciences and Disorders	2	4	14	16	U	Y	Y	N
Educational Leadership	30	25	129	112	O	N/A	N/A	N
Medical Family Therapy	5	2	3	5	U	N	N	N
Microbiology & Immunology	2	3	14	17	U	Y	N	N
Nursing	6	5	19	15	To Be Determined	N	N	N
Pharmacology & Toxicology	3	3	9	13	U	Y	N	Y
Physical Therapy	30	13	90	38	To Be Determined	To Be Determined	To Be Determined	Y
Physiology	1	2	9	10	To Be Determined	Y	N	N
Rehabilitation Counseling & Administration	5	4	6	12	To Be Determined	N	N	Y

Academic Unit	Current New Cohort	Projected New Cohort	Current Total Enrollment	Projected Total Enrollment	Over (O) At (A) or Under (U) Capacity	Current Budget Dollars Support Current Enrollment	Current Budget Dollars Support Projected Enrollment	Equal Weighting of Factors
Technical & Professional Discourse	6	4	13	16	U	N	N	N

Assessment of Master's Program Capacity

As part of this assessment project, we were asked to assess enrollment capacity for master's programs as well. In fulfilling this task, we first classified master's programs as academic—defined as any program requiring faculty mentoring time to supervise theses—and professional. To determine enrollment capacity for *academic* master's programs, we solicited the following information from the Graduate School:

- Average time to degree
- Average degree completion rate
- Total enrollment
- First year enrollment
- Number of FTE faculty participating in programs
- Number of teaching, research, and other graduate assistants required to fulfill the relevant departments' teaching and research missions
- Total budget for graduate assistants

We made the following assumptions for each program's capacity:

- All faculty are sufficiently research-active to supervise students' master's theses
- An equal weighting is given to all factors considered in calculating potential enrollment, including mentoring, mission, and student funding. The exception to this assumption is for those programs (noted in the table below with an asterisk) in which no assistantship data was provided. In these cases, capacity is based on mentoring alone.
- We used a three-year average of budget dollars (AY03-04, AY04-05, and AY05-06) to calculate TA, RA, and other GA support available
- Actual completion rates provided by the Colleges are also applied as program goals. (This is an item for negotiation.)
- The average number of advisees per faculty member is four with the following exceptions: MFA in Art, 3; MLS in Library Science, 8; MM in Music Performance, 3; MM in Music Theory and Composition, 3; MS in Occupational Safety, 8. These assumptions are also items for negotiation.

As we did with doctoral enrollment data, we plotted the master's program data into a spreadsheet instrument. Using that instrument, we then calculated the program's capacity for total enrollment and for new student cohorts, using an algorithm that gives weight to mentoring load, placement, teaching and research needs, and available resources.[64]

The table below gives for each program the size of its current cohort, its current enrollment, and our calculations of the program's capacity for total and new enrollment. It also notes whether programs are over, at, or under capacity as well as the weighted average total enrollment; and whether or not an equal weighting of factors (mentoring load, placement, teaching and research needs, resources) was given. We stress that these capacity estimates

[64] As with the doctoral programs, we provide both faculty data and resulting calculations in an Excel workbook recorded on a compact disc attached to the back cover of this document in order that faculty and administrators be able to examine and renegotiate enrollment assumptions. The blank versions of the instrument can be used to facilitate enrollment assumptions among the Deans of the Colleges, the Provost, the Vice Chancellor for Research and Graduate Studies, and the programs.

are based on the data provided by the Graduate School, with completion rates provided to the Dean of the Graduate School by the Colleges.

Table II
Master's Program Enrollment Capacity

Academic Unit	Current Total Enrollment	Projected Total Enrollment	Current New Cohort	Projected New Cohort	Capacity Over At Under
Anthropology (MA)	19	22	11	9	**At/Under**
Art (MFA)	40	133	16	43	**Under**
Biology (MS)	56	116	15	37	**Under**
Chemistry (MS)	18	45	13	19	**Under**
Child Development & Family Relations (MS)	30	28	15	14	**At/Over**
Computer Science* (MS)	21	45	6	21	**Under**
English (MA)	111	150	52	58	**Under**
Exercise & Sport Science (MA)	56	59	33	28	**At/Under**

Academic Unit	Current Total Enrollment	Projected Total Enrollment	Current New Cohort	Projected New Cohort	Capacity Over At Under
Geography (MA)	20	61	6	23	**Under**
Geology (MS)	22	34	9	9	**Under**
History (MA)	28	65	11	18	**Under**
International Studies (MA) *No faculty assigned to this program*	27	9	13	4	**Over**
Library Science (MLS)	150	38	83	20	**Over**
Maritime Studies* (MA)	37	122	7	25	**Under**
Marriage & Family Therapy (MS)	25	17	14	9	**Over**
Mathematics (MA)	10	52	6	21	**Under**
Molecular Bio & Biotech* (MS)	19	151	2	54	**Under**

Academic Unit	Current Total Enrollment	Projected Total Enrollment	Current New Cohort	Projected New Cohort	Capacity Over At Under
Music Education (MM)	14	4	20	1	**Over**
Music Performance (MM)	33	32	15	16	**At**
Music Theory-Comp (MM)	3	7	1	3	**Under**
Music Therapy (MM)	4	3	3	2	**At**
Nutrition (MS)	26	21	6	7	**Over**
Occupational Safety (MS)	43	45	12	14	**At**
Physics (MS)	11	33	9	17	**Under**
Psychology, Clinical (MA)	21	51	8	23	**Under**
Psychology, General & Theoretical (MA)	24	51	15	17	**Under**

Academic Unit	Current Total Enrollment	Projected Total Enrollment	Current New Cohort	Projected New Cohort	Capacity Over At Under
Sociology (MA)	25	35	17	10	**Under**

* No assistantship data provided; capacity based on mentoring alone

This kind of analysis, based as it is on faculty instructional capacity and the availability of student financial support, cannot be used to determine capacity for non-academic master's programs, including non-thesis tracks of the academic programs listed in the table above, since neither factor—faculty instructional capacity nor student financial support—is especially important in determining enrollment for professional programs. For professional master's programs, therefore, we discuss factors that could possibly limit enrollment, apart from the obvious limitations imposed by the number of available qualified faculty and functional class size.[65]

In our view, the following factors serve to limit enrollment in professional—that is, non-thesis—master's programs:

- Physical space, including physical space available for off-campus course offerings. We did not study physical space at ECU. Our sense from working with other universities, however, is that this is rarely an issue, especially if instructional space is common and not "owned" by particular departments. In one case where lack of physical space was a serious issue, the University solved the problem by forcing the offering of classes at non-peak times during the weekly schedule and encouraging the development of weekend programming.

- Technical infrastructure—in the case of courses and programs offered online. This is a question of the number of simultaneous users who can be accommodated by the existing technical platform, though this, too, is rarely a serious issue, since it is relatively easy and inexpensive to install additional bandwidth.

- Availability of placement opportunities for student practica, particularly in programs requiring clinical experiences. In our view, this factor does create significant enrollment limitations at ECU, especially in light of the bureaucratic cumbersomeness surrounding the signing of contracts, to which we referred above (see page 12).

[65] We should note here that our original intention had been to classify master's programs into three categories—academic, professional, and distance—though our conversation with the University's Associate Vice Chancellor for Academic Outreach convinced us that to separate distance programs from others is not appropriate for the particular model of distance learning that ECU has evolved, especially since that model is characterized by student support services online that match those services available on campus. In many cases, distance-delivered courses are embedded in traditional degree programs; even if it were desirable to separate them out, it would probably be infeasible to do so.

- Enrollment caps imposed by professional accrediting agencies, such as AACSB International (the Association to Advance Collegiate Schools of Business), ASHA (the American Speech-Language-Hearing Association), or NCATE (the National Council for Accreditation of Teacher Education). Our research indicates, however, that accrediting agencies never impose specific caps or faculty-student ratios. Most agencies simply call for enrollment or ratios that permit interactive learning and faculty-student interaction, leaving it to the accredited programs themselves to define appropriate ratios. It may be that specific programs have identified ratios against which the agencies now evaluate; but these should be subjected to benchmarking against programs at aspirational institutions.

New Program Development

Introduction

As we have already indicated above in the general section of this document (see page 18), we think that the future for ECU as a competitive research institution lies in developing concentrated research excellence in areas that have immediate regional impact—both on quality of life and on economic development. Apart from several doctoral programs in the basic arts and sciences, which we think are necessary for creating the intellectual foundation of a research university, we think that program development at ECU should be very closely aligned with regional economic development initiatives. To this end, we used an existing economic cluster analysis of North Carolina's Eastern Region (NCER)[66] to frame queries that we executed against several data sets provided by the Employment Security Commission of North Carolina—one related to current employment, one related to occupational projections for 2012, and one which indicates educational background necessary for specific occupations.

It is worth spending some time to review the economic cluster analysis, hereafter referred to as the CREC Study. The CREC Study follows three earlier economic studies commissioned by NCER, the economic development agency for Eastern North Carolina—one of which was conducted by ECU's Regional Development Service. It synthesizes those studies, summarizes regional economic trends, and extends the conceptual framework for economic clustering to include global supply chains through analysis of labor and employment trends and projections.[67]

The CREC Study begins by pointing to a region facing challenges as it undergoes an economic transition. That transition amounts to a movement away from the region's traditional industries requiring low-cost and low-skill labor and toward knowledge-intensive industries that require the kind of highly skilled workers who are typically the product of higher education. This transition is challenging for several reasons: population growth in the region is modest relative to growth elsewhere in the state[68]; the Research Triangle area attracts many skilled workers from the region since the average annual wage there is 37% (or $10,800 per year) higher than it is in eastern North Carolina; the Eastern region has no major urban area to serve as a hub of activity; and, though the state of North Carolina tends to treat the region as a single entity for planning and investment purposes, it is, in fact, not a single economic entity but four smaller sub-regions, each of which has distinctly different emphases in terms of economic development—the North sub-region (Nash, Edgecombe, and Wilson counties), Pitt County; the Central sub-region (Wayne, Lenoir, Duplin counties), and the Coastal sub-region (Onslow, Carteret, Craven, Pamlico, and Jones counties).

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[66] Center for Regional Economic Competitiveness [CREC] (Kenneth E. Poole, Edward Feser, Mark White, Pofen Salem, and Julie Allardyce), "Cluster Analysis of North Carolina's Eastern Region," December 2005.

[67] The CREC Study definitions for economic clusters and cluster analysis are as good as any we've seen: "Clusters are groups of industries organized in a variety of ways. 'Value-chain' clusters buy and sell from one another in global supply chains. Some industries in a value-chain cluster may be more likely to choose a location near other firms in their supply chain. Cluster analysis helps to identify groups of industries in which [a region] appears to specialize. The goal is to help economic developers seek out firms that might be more interested in locating in the region to be near potential customers or suppliers." We would add that the kind of regional strategic economic planning that results from cluster analysis helps align institutional educational programming, research, and technology transfer priorities with regional economic development initiatives.

[68] According to CREC, Wake County alone added more than four new residents in the period between 2000 and 2004 for every one new resident in the entire Eastern region.

During the recession of 2001, the region lost nearly 11,000 net jobs, most of which were in the manufacturing sector that is the region's traditional economic mainstay; and slower than most of the rest of the country to rebound from the recession of 2001-02, the region began to add new jobs only very late in 2004.[69] During the same period, the region added approximately 12,000 net new jobs in the service sector—in healthcare, education, hospitality, and the military. In fact, according to the CREC Study, "active military employment [in 2002] surpassed manufacturing as the region's largest sector. In 2004, healthcare and social assistance became the second largest sector as manufacturing continued to lose jobs."[70]

These changes have produced the following current employment profile for the Eastern region.

Table III
2004 Employment[71]

Sector	Percentage of Total
Military	17%
Health Care and Social Assistance	12%
Manufacturing	12%
Retail Trade	11%
Educational Services	8%
Accommodation and Food Services	7%
Other Sectors	33%

The CREC Study makes clear that manufacturing will probably never again be a major source of new jobs for the region, but it also demonstrates that not all sub-sectors of manufacturing are losing jobs. From 1998, electrical equipment and appliances added nearly 1000 jobs, half of them in 2004; food manufacturing added 329 jobs in 2004; furniture and related products gained 661 jobs, and both plastics and rubber and transportation equipment manufacturing each added 100 jobs. The Study stipulates that although "the manufacturing sector represents a relatively small proportion of the region's employment and employment growth, the sector remains vital to the region's ability to create economic wealth."[72]

Though regional configuration is slightly different and sub-sector categories are taxonomized differently, 2012 employment projections by the Employment Security Commission of North Carolina indicate that this new employment profile will hold. The table below lists the fastest growing occupations for the Eastern region through 2012.

Table IV
Fastest Growing Occupations by Job Growth
2002 – 2012

Occupation	Total Growth Openings	Total Percentage Increase
Combined food preparation and serving workers	1,921	40.97
Waiters and waitresses	1,261	35.19

[69] Most job losses in the manufacturing sector resulted from apparently permanent downsizing in the region's formerly principal industries: tobacco production and textiles and apparels.
[70] CREC Study, p. 6.
[71] CREC Study, p. 6.
[72] CREC Study, p, 7.

Occupation	Total Growth Openings	Total Percentage Increase
Registered nurses	1,254	31.12
Cashiers	1,185	17.74
Retail salespersons	1,057	17.27
First-line supervisors and managers of retail sales work	967	25.97
Customer service reps	789	36.04
Janitors and cleaners, except maids and housekeepers	670	24.72
General and operations managers	646	22.18
Truck drivers, heavy and tractor-trailer	639	21.01
Managers, all other	631	29.82
Home health aides	594	32.25
Nursing aides, orderlies, and attendants	591	24.11
Carpenters	576	26.06
Office clerks	574	15.20
Child care workers	571	31.94
First-line supervisors/managers of food preparation work	533	32.22
Landscaping and grounds-keeping workers	513	31.32
Food preparation workers	500	33.00
Correctional officers and jailers	468	32.93
All other teachers—primary, secondary, and adult	455	34.16
Construction laborers	449	26.79
Preschool teachers, except special education	426	33.10
Maintenance and repair workers, general	423	18.00
First-line supervisors and managers of construction	412	25.12

That the transition from a manufacturing-based to a knowledge-based service economy is both necessary and desirable is beyond question; but both the numbers and the occupation descriptors in the table above give pause and indicate that the transition is at this time in its earliest phase. We will return to this question following a discussion of the clusters themselves.

Economic Clusters for the Eastern Region

Based on analysis of current and projected employment statistics, commuter patterns, and industry supply chains, the CREC Study identifies 24 economic clusters in three categories. Existing clusters include a relatively large number of both firms and employees in the region; emerging clusters show signs of reaching large numbers of both firms and sectors; potential clusters are small and vulnerable to market and civic conditions, and though they sometimes exhibit rapid job growth, they are dominated by only one or two firms. The CREC Study

further classifies clusters based on whether they use or produce technology-related products and services, since firms in such clusters tend to require more in the form of innovation and educational background, and since they obviously produce higher-paying jobs.

Table V
NCER Economic Clusters

	Low-Tech Buyer-Supply Chains	High-Tech Buyer-Supply Chains
Existing	Textiles and Apparel Packaged Food Products Feed Products Tobacco Products Farming Appliances Grain Milling Wood Processing Marine Trades Hotels and Transportation Services Military (industry)	
Emerging	Pharmaceuticals Construction Machinery & Equipment Concrete & Building Block Products Wood Building Products	Pharmaceuticals[73] Engine Equipment
Potential	Metalworking & Fabricated Medal Products Precision Instruments Nonresidential Building Products Rubber Products	Industrial Machinery & Distribution Equipment Military (aviation) Wiring Devices and Switches Precision Instruments Cable Manufacturing

In some senses, the CREC Study's presentation of clusters is over-complicated, though it is important for reasons that we will discuss below. In the meantime, it is helpful to define the principal actionable clusters as NCER itself does:

- advanced manufacturing
- marine trades
- biopharmaceuticals and health care
- food processing
- tourism
- defense

Issues Related to Economic Clusters

In terms of influencing graduate level programming at ECU, the region's economic profile is deeply problematic. With the exception of hotels and transportation services and the military, all of the existing clusters—and many of the emerging and potential clusters—are related to manufacturing. The following table lists the occupations available and the current number of people employed in those occupations in one of the sub-sectors of the food processing cluster, animal slaughtering and processing. The occupational profile of this sub-

[73] Some clusters (the military, pharmaceuticals, and precision instruments) have both low-tech and high-tech supply chains.

sector, though specific to animal processing, is representative of the profiles of all the manufacturing sectors and sub-sectors.

Table VI
Occupations in Animal Slaughtering and Processing Industries
North Carolina Eastern Region[74]

SOC Code	Occupational Classification	Percent of Total	Number of Workers
513023	Slaughterers and meat packers	37.86	12.235
513022	Meat, poultry, and fish cutters and trimmers	18.37	5,936
537064	Packers and packagers, hand	3.42	1,105
537062	Laborers and freight, stock, and material movers, hand	2.77	894
499042	Maintenance and repair workers, general	2.70	871
511011	First-line supervisors/managers of production and operating	2.61	843
519198	Helpers—production workers	2.25	726
533032	Truck drivers, heavy and tractor-trailer	1.84	595
519111	Packaging and filling machine operators and tenders	1.81	586
537063	Machine feeders and offbearers	1.62	524
519061	Inspectors, testers, sorters, samplers, and weighers	1.52	490
537061	Cleaners of vehicles and equipment	1.47	474
499041	Industrial machinery mechanics	1.42	458
372011	Janitors and cleaners, except maids and housekeeping	1.18	382
537051	Industrial truck and tractor operators	0.96	311
519192	Cleaning, washing, and metal pickling equipment operators and tenders	0.85	276
113051	Industrial production managers	0.83	268
452093	Farmworkers, farm and ranch animals	0.83	268
519193	Cooling and freezing equipment operators and tenders	0.74	239
435111	Weighers, measurers, checkers, and samplers, recordkeeping	0.67	217
519032	Cutting and slicing machine setters, operators, and tenders	0.66	214
439061	Office clerks, general	0.63	203
491011	First-line supervisors/managers of mechanics and installers	0.49	157
435071	Shipping, receiving, and traffic clerks	0.40	129
414012	Sales representatives, wholesale and manufacturing	0.39	126
433031	Bookkeeping, accounting, and auditing clerks	0.36	117
513092	Food batchmakers	0.35	112
111021	General and operations managers	0.32	104
519023	Mixing and blending machine operators	0.32	103

[74] Appendix F: Labor Market Statistics contains similar tables for many of the sub-sectors in the region's existing, emerging, and potential clusters.

SOC Code	Occupational Classification	Percent of Total	Number of Workers
531021	First-line supervisors/ managers of helpers and laborers	0.30	98
493031	Bus and truck mechanics and diesel engine specialists	0.29	95
499043	Maintenance workers, machinery	0.29	93
435081	Stock clerks and order fillers	0.27	88
434161	Human resources assistants, except payroll and timekeeping	0.23	75
435061	Production, planning, and expediting clerks	0.23	75
431011	First-line supervisors/managers of office and administrative	0.20	64
434151	Order clerks	0.18	59
533033	Truck drivers, light or delivery services	0.18	57
499021	Heating, air conditioning, and refrigeration mechanics	0.16	53
436014	Secretaries, except legal, medical, and executive	0.16	51
433021	Billing and posting clerks and machine operators	0.15	47
113071	Transportation, storage, and distribution managers	0.15	47
519041	Extruding, forming, pressing, and compacting machine setters	0.14	45
436011	Executive secretaries and administrative assistants	0.14	44
433051	Payroll and timekeeping clerks	0.13	42
113040	Human resources managers	0.11	36
113031	Financial managers	0.10	32
531031	First-line supervisors/ managers of transportation and materials	0.09	29
132011	Accountants and auditors	0.09	29
533031	Driver/sales workers	0.08	27
434051	Customer service representatives	0.08	27
411012	First-line supervisors/managers of non-retail sales workers	0.07	22
439021	Data entry keyers	0.07	22
519012	Separating, filtering, clarifying, precipitating	0.07	22
112022	Sales managers	0.07	22
131023	Purchasing agents, except wholesale, retail, and farm production	0.06	21
111011	Chief executives	0.06	18
434171	Receptionists and information clerks	0.05	15
131073	Training and development specialists	0.04	14
131071	Employment, recruitment, and placement specialists	0.04	13
371011	First-line supervisors/managers of housekeeping and janitorial staff	0.04	13
433061	Procurement clerks	0.04	13
131199	Business operations specialists, all other	0.04	12
194031	Chemical technicians	0.03	11

SOC Code	Occupational Classification	Percent of Total	Number of Workers
113061	Purchasing managers	0.03	11
172111	Health and safety engineers, except mining	0.03	9
412011	Cashiers	0.03	9
432011	Switchboard operators, including answering service	0.02	6
112021	Marketing managers	0.02	6
131051	Cost estimators	0.02	5
119041	Engineering managers	0.01	4
172141	Mechanical engineers	0.01	3
151021	Computer programmers	0.01	3
331099	First-line supervisors/managers, protective service workers	0.01	3

The numbers and the occupation descriptors in the table above indicate the same problems we saw in the table of fastest growing jobs (see pp. 69-69). First, in no single sector or sub-sector of any cluster is there a critical mass of employees in particular occupations. Second, the overwhelming majority of jobs available in any sector require no higher education at all. Those few that do require higher education are in almost every case already serviced by an existing ECU graduate program. This is true even for the pharmaceutical industry, which in eastern North Carolina consists primarily of pharmaceutical production. Within that cluster, biochemists and biophysicists represent only 1% of the workforce; industrial engineers, microbiologists, training and development specialists, database administrators, mechanical engineers, health and safety engineers, computer specialists, registered nurses, computer software engineers, financial analysts, and electrical engineers each represents less than 1% of the total workforce—in most cases, significantly less.

Cluster Supply Chains

The CREC Study is unique among economic cluster studies in that it extends its economic development analysis to include the buyer-supply chains appropriate to those clusters. First tier suppliers are companies that sell goods and services directly to firms in the target cluster; second tier suppliers are companies that sell goods and services to first tier companies. The Marine Trades cluster, for example, draws inputs from a variety of industries that support boat building: textiles, fabricated structural metals, veneer and plywood manufacturing, etc. In many instances, especially in manufacturing-based industries, companies prefer to be located close to their suppliers, since this facilitates production efficiencies and reduces costs related to the shipment of large materials.

The CREC Study finds that in some cases, there are a noteworthy number of supply chain firms that both serve regional cluster companies and are located within the region.[75] In cases where this is not true, CREC recommends that the economic development specialists in NCER launch campaigns to attract such companies to the region. We have a particular interest in first tier suppliers that serve several of the region's clusters and that both require highly skilled labor and use advanced technology.

[75] The CREC Study has a series of appendices that list supply chain industries for each cluster and identify the number of first tier and second tier suppliers located in the region.

Conclusions and Recommendations

Despite the region's problematic economic development profile, we think that there are new graduate program development opportunities for East Carolina University. Some of these are obvious from the regional economic profile and can serve the existing economic clusters. To begin with, we think the region's economic profile alone is reason enough to approve the College of Technology and Computer Science's proposal to offer a professional doctorate in technology systems, since its aim is to foster innovation in the application of existing technologies. In addition, we think there needs to be an on-campus master's degree that focuses on manufacturing systems, called Industrial Engineering, Mechanical Engineering, or Advanced Manufacturing Systems, depending upon what is needed to overcome duplicative programming objections. Either of these programs could be augmented with tracks that have specific applications to regional manufacturing industries, such as food processing or wood processing. Since engine equipment manufacturing appears to be on the verge of becoming regionally important, CTCS may also want to consider a master's degree in automotive engineering; and a degree in construction engineering would serve not only those emerging clusters related to construction but the military as well.[76] Finally, we think that there should be graduate level programming in logistics and supply chain management, possibly offered in cooperation with the College of Business.

While we think that the College of Technology and Computer Science could develop programming that supports the existing economic clusters, other ECU colleges can develop new programs that support both the emerging and potential clusters and the high-tech suppliers that support them. Given the predominance of the health sciences in ECU's research profile and the development of a potential cluster in precision instruments, we think that the University should develop a Ph.D. program in Biomedical Engineering—in partnership with another state institution if need be to quell objections about duplication and competition. We also think there is a need for a Ph.D. in Pharmaceutical Chemistry, probably offered jointly by the Brody School of Medicine and the Department of Chemistry.[77] One of the most important of the eastern region's clusters is Packaged Food Products; and for this reason, we think the University should consider an interdisciplinary degree in Food Science and Technology.

Turning to the supply chain, we note that many of the manufacturing clusters are supplied by various companies that work with advanced materials; and we think, therefore, that graduate level programming in materials science and engineering is in order. This could be called Applied Materials, if need be; or alternatively, it could be configured as a chemical and materials program that would be of service to both the manufacturing and pharmaceutical

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[76] We do not often address the military in this analysis, since labor market statistics divide military employees into job-related categories and do not treat the military as a separate entity. The CREC Study sites a report, however, that divides defense-related industry in the region into four broad categories: defense technologies, defense consumables, base construction, and base support services. Since defense technologies are invisible to us and since ECU currently has no faculty working in that area, we recommend instead that the military be served by programs in construction engineering and logistics.

[77] Though we have no details on the program, we understand that the Medical School is interested in the development of a master's degree in biomedical science, presumably to feed the emerging pharmaceutical/biotechnology cluster. We have already endorsed this program elsewhere in this document.

clusters.[78] Several of the clusters (food products, wood processing, pharmaceuticals) have significant relationships with suppliers of complex packaging; and we think it makes sense for ECU to consider a master's degree in Packaging Science, probably modeled after the one at Clemson University.

We are specifically not recommending graduate programming to support the travel and tourism cluster. Though this is an important existing cluster for the region, it is not developed to the point that it requires workers with advanced education. The eastern region has approximately 300 hotels and other lodging establishments, but almost 80% of these employ fewer than 20 employees, indicating that they are small family-held establishments, probably concentrated in the coastal sub-region. Beyond this, the occupation profile for the cluster is not encouraging. The bulk of the cluster's employees—nearly 30%—work in housekeeping services. Fewer than 5% of the total workforce in the cluster work in jobs that could be described as professional or managerial; and none of these requires an advanced degree.

The state of the travel and tourism industry is illustrative of the region's economic dilemma. The greatest concentration of jobs are in low-skill, low-wage sectors, with intellectual capital and management taking place outside the region if at all; and the projected economic clusters for the region largely continue this pattern. There is a wood products cluster, for example, but the Eastern region's share of that cluster is in kitchen cabinet manufacturing. There is pharmaceutical production, for example, but pharmaceutical research and development happen elsewhere. As we indicated in the general section of this document, we think it will be East Carolina's role to *initiate* knowledge-based economic development in the region.

Of the potential new programs we have recommended here, University administrators have expressed an interest in immediately exploring five programs—doctoral programs in Pharmaceutical Chemistry, Technology Systems, Biomedical Engineering, and Risk Economics, and a master's program in Logistics and Supply Chain Management. Cost estimates to launch these programs over a five-year period are provided in Appendix G: Cost Estimates for Selected New Programs.

[78] Advanced programming in materials could also have the effect of transforming the region's textile industry, which is highly outdated. Elsewhere in the country, the textile industry is developing materials for biomedical purposes. It is not clear if this is the particular direction in which the textile sector in Eastern North Carolina should go, but the need for transformation of the industry is quite clear.

Appendix A
Interview Protocols

During the week of April 2, 2006 Yardley Research Group personnel conducted on-campus interviews with directors of graduate study and the relevant department chairs of the 18 programs participating in this study. Also, faculty interviews for proposed programs were conducted in order to explore how proposed programs related to institutional mission and strategies, how existing resources could contribute to program development, and how gaps could be addressed. For background purposes and in order to discover institutional strategic intent, we also interviewed the Deans of each of the participating colleges and some of the University's senior administrators, including the Chancellor, the Provost, the Vice Chancellor for Research and Graduate Studies, the Graduate Dean, and others.

For the most part, these interviews were spontaneous conversations rather than scripted question-and-answer sessions. Nevertheless, the conversations were governed by protocols so that we could be certain of acquiring a minimum standard of information from each interview. Questions were designed to be broad enough to encourage the responders to say what they thought to be most important.

Protocols for all interviews are reprinted here.

East Carolina University
Chancellor

1. What is your strategic vision for graduate programs at East Carolina? Are there specific initiatives in place to achieve this vision? Do you have a personal role in this?

2. What does the University need to accomplish these initiatives? What obstacles are in the way?

3. In what discipline areas is the University primed to be excellent? What is needed to get there? Are there any areas primed for failure?

4. In your view, does every academic area in the University have the same scope? Or are some programs geared to local or regional service?

5. Do you have any thoughts about how doctoral programs should be structured? Should they be aligned with departments? Why or why not?

East Carolina University
Provost

1. What is your strategic vision for graduate programs at East Carolina? Are there specific initiatives in place to achieve this vision?

2. What does the University need to accomplish these initiatives? What obstacles are in the way?

3. In what discipline areas is the University primed to be excellent? What is needed to get there? Are there any areas primed for failure?

4. In your view, does every academic area in the University have the same scope? Or are some programs geared to local or regional service?

5. Do you have any thoughts about how doctoral programs should be structured? Should they be aligned with departments? Why or why not?

East Carolina University
Vice Chancellor for Research and Graduate Studies

1. Discuss the national standing of the University in relation to research funding.

2. What plans are in place or are being developed to improve this standing?

3. Where could East Carolina University be in terms of technology transfer? What plans are in place to get there? What are the principal obstacles?

4. From a research point of view, where could the centers of excellence be, and how can you get there? What are the obstacles?

5. How is research integrated into doctoral programming and mentoring?

6. Are there formal partnerships and collaborations with organizations outside the University that further its research work? Are they integrated into graduate programming?

7. How could graduate programs be structured to optimize the achievement of research goals?

8. How do you measure research productivity? Are there any ways you incentivize improved productivity?

East Carolina University
Graduate Dean

Enrollment and Recruitment

1. Commentary on Enrollment Numbers

2. Current Recruiting Methods [pertaining to Graduate School activities]

Method	We do this	This works
Faculty networking		
Newspaper advertising		
Radio advertising		
TV advertising		
Direct mail		
Graduate fairs		
Professional meetings		
GRE Locater Service		
Public Relations		
Other (_____)		
Other (_____)		
Other (_____)		

3. What is your most successful recruiting tool? Why?

4. What is your least successful recruiting tool? Why?

5. From what sources do you believe you are most likely to draw prospective students? Identify feeder institutions and programs, academic disciplines, geography, and other appropriate sources.

Academic Competitiveness

1. With which universities do you compete (that is, to which universities do you lose admitted students)?

2. Which universities/programs are your peers?

3. Which universities/programs are your aspirational peers?

4. What advantages do your competitors/peers have over you? (Why do students choose to go there rather than here?)

5. What advantages do you have over your competitors? (Why do students choose to come here rather than there?)

Institutional Vision

1. In your estimation, what are the strongest programs here?

2. In terms of academic reputation, for what is East Carolina University best known?

3. For what could the University be best known?

4. Is there a specific list of actions you would have to take to raise East Carolina University to the level of your aspirational peers within three to five years?

East Carolina University
Dean of the College of _____

1. What is your vision for doctoral programs in your area?

2. What are your specific strategic initiatives for the next five years?

3. What resources do you need to accomplish these initiatives?

4. What are your obstacles?

5. In what disciplines is the College primed to be excellent? What is needed to get there? Is there a discipline that is primed for failure?

6. In your opinion, what is East Carolina University's scope? What should its scope be?

7. Do you see any immediate areas for cross-college collaboration?

8. Do you have any thoughts on how these programs might be structured?

East Carolina University
Program: _____

Student Profile

1. *Current* Student Profile

Full-time: _____	Part-time: _____
% Male: _____	% Female: _____
% U.S.: _____	% Foreign: _____
% In-state: _____	% Out-state: _____
% Trad: _____	% Non-trad: _____
% Minority: _____	% FT Work: _____

Break down by ethnicity:

Typical undergraduate degrees:

Other characteristics of students:

2. *Desired* Student Profile

Full-time: _____	Part-time: _____
% Male: _____	% Female: _____
% U.S.: _____	% Foreign: _____
% In-state: _____	% Out-state: _____
% Trad: _____	% Non-trad: _____
% Minority: _____	% FT Work: _____

Break down by ethnicity:

Typical undergraduate degrees:

Other characteristics of students:

Enrollment Analytics: History and Projections

Number of incoming students last year:	_____
Desired number of incoming students next year:	_____
Number of applications last year:	_____
% of last year's applications considered qualified for admission:	_____
% of admitted students who enrolled:	_____

1. From what sources do you believe you are most likely to draw prospective students?

2. Identify feeder institutions and programs, academic disciplines, geography, and other appropriate sources.

Current Recruiting Methods

Method	We do this	This works
Faculty networking		
Newspaper advertising		
Radio advertising		
TV advertising		
Direct mail		
Graduate fairs		
Professional meetings		
GRE Locater Service		
Public Relations		
Other (_____)		
Other (_____)		
Other (_____)		

1. What is your most successful recruiting tool? Why?

2. What is your least successful recruiting tool? Why?

Competitive Landscape

1. With which universities/programs do you compete (that is, to which universities do you lose admitted students?

2. Which universities/programs are your peers?

3. Which universities/programs are your aspirational peers?

4. What advantages do your competitors/peers have over you? (Why do students choose to go there rather than here?)

5. What advantages do you have over your competitors? (Why do students choose to come here rather than there?)

Program Vision Questions

1. What is the single best thing about your program?

2. For what is your program best known?

3. For what could your program be best known?

4. Is there a specific list of actions you would have to take to raise your program to the level of your aspirational peers within three to five years?

5. If the president of the university were to give you a large of amount of money in order to found a research institute, what would be the subject of the institute? With which other departments on campus would you work?

East Carolina University
New Programs
Name: _____
Name of Program: _____

Give a brief description of this proposed program. How is it related to the institutional mission and strategic plan?

What are the educational goals of the program? Address prerequisites (or student background), requirements (including requirements for original research), and outcomes.

Comment on how existing resources can be used to contribute to the development of this program? What gaps exist in necessary resources to support the program? Do "cognate" programs need to be developed to support this program?

Identify the research thrusts and foci of the program. Discuss how the scholarly achievements of the current faculty will contribute to program development. Are there gaps in faculty research and scholarly achievement that need to be addressed? Are all faculty in the department qualified as doctoral faculty?

What infrastructure improvements will be necessary to support this program? Address library holdings, laboratory and instructional space, research facilities, etc.

Address market demand for the program. Do you have specific evidence of this demand?

Are there plans to offer this program via distance? If so, explain. How will this impact enrollment?

Estimate enrollments for this program over a 5-year period. Do you have specific evidence to support these estimates?

Identify aspirational peers for this program. How will this program be distinguished from those?

Identify the minimum level of competitiveness for this program. Address number and amount of stipends, time to degree, student health insurance, etc.

What plans do you have to evaluate this program? What measures would you use to judge whether or not it is successful?

Appendix B
Instructional and Research Peers

In order to develop the comparative cohort for this study, we queried the databases of the Department of Education for public or private doctoral-research extensive universities with spending patterns similar to East Carolina's. In the first query, we looked for institutions which, over a three-year period, spent 20% more or less on instruction than East Carolina University had in the same period. In the second query, we looked for institutions that had spent 20% more or less than East Carolina University on research. The query results follow.

Instructional Peer Candidates

Florida State University	Texas Tech University
George Mason University	Tulane University of Louisiana
Georgetown University	University of California-San Francisco
Georgia Institute of Technology-Main Campus	University of California-Santa Barbara
Georgia State University	University of Colorado Health Sciences Center
Howard University	University of Connecticut
Iowa State University	University of Georgia
Louisiana State University-Health Sciences Center	University of Hawaii at Manoa
Medical College of Georgia	University of Houston
Medical College of Wisconsin	University of Kansas
Medical University of South Carolina	University of Louisville
Northeastern University	University of Maryland-Baltimore
Ohio University	University of Medicine and Dentistry of New Jersey
Oregon Health & Science University	University of Nebraska at Lincoln
Princeton University	University of New Mexico
Rice University	University of Notre Dame
Rochester Institute of Technology	University of Oklahoma Norman
Saint Louis University	University of South Carolina
San Diego State University	Wake Forest University
San Jose State University	Washington State University
Southern Illinois University-Carbondale	West Virginia University
Syracuse University	

Research Peer Candidates

East Tennessee State University	Sam Houston State University
Eastern Michigan University	Seton Hall University
Embry Riddle Aeronautical University	Smith College
Finch Univ of Health Science-Chicago Medical School	Sonoma State University
Fisk University	South Dakota School of Mines and Technology
Florida Institute of Technology - Melbourne	Southern Methodist University
Fordham University	Southwest Missouri State University
Hampshire College	Southwest Texas State University
Hampton University	Stephen F Austin State University
Hesser College	Stevens Institute of Technology
Hofstra University	Swarthmore College
Hope College	Tarleton State University
Humboldt State University	Teachers College at Columbia University
Idaho State University	Tennessee State University
Indiana State University	Tennessee Technological University
Ithaca College	The University of Tennessee-Chattanooga
John Carroll University	The University of Texas at San Antonio
Kentucky State University	The University of West Florida
Lamar University	Towson University
Lincoln University	Tuskegee University
Louisiana Tech University	University of Alaska Anchorage
Loyola College	University of Arkansas at Little Rock
Marshall University	University of Baltimore
Meharry Medical College	University of Colorado at Denver
Miami University-Oxford	University of Hartford
Middle Tennessee State University	University of Massachusetts-Dartmouth
Middlebury College	University of Michigan-Dearborn
Milwaukee School of Engineering	University of Missouri-St Louis
Montana Tech of the University of Montana	University of Nebraska at Omaha
Monterey Institute of International Studies	University of North Carolina at Charlotte
Morehouse College	University of North Carolina-Wilmington
Morris Brown College	University of North Florida
Mount Holyoke College	University of North Texas-Health Science Ctr at Ft Worth
Murray State University	University of Northern Iowa
New Mexico Highlands University	University of Richmond
New Mexico Institute of Mining and Technology	University of Scranton
New School University	University of South Dakota
New York Institute of Technology	University of Southern Maine
Norfolk State University	University of the Sciences in Philadelphia
Northeastern Ohio Universities College of Medicine	University of Toledo

Northern Illinois University	University of Tulsa
Oakland University	Vassar College
Occidental College	Villanova University
Old Dominion University	Wellesley College
Palmer College of Chiropractic	Wesleyan University
Pennsylvania State University	Western Illinois University
Polytechnic University	Western Kentucky University
Pomona College	Western Michigan University
Prairie View A&M University	Western Oregon University
Saint Francis University	Western Washington University
Salisbury University	Worcester Polytechnic Institute

Appendix C
Taxonomy of Program Cognates

After selecting the cohort of benchmark institutions, we then chose the specific comparator programs. We reviewed catalogs and other published descriptive information, searching for similarity of credentials offered, program curricula, and faculty research. This allowed us to compare programs that, whatever their official names, are similar in content, strategic intent, and organization to the ECU program. We did not accept tracks or concentrations that are part of larger programs as cognates, since the arrangement of a track within a program indicates both a different strategic intent and principle of organization, and since no university, in our experience, tracks data at the level of tracks.

Cognate programs are listed below by College. Shading indicates that no cognate program exists at that particular institution.

School of Allied Health Sciences

East Carolina University	*Communication Sciences and Disorders*
Bowling Green State University	Communication Disorders
Florida International University	
Florida State University	Communication Science and Disorders
Louisiana State University and A&M College	Communication Science and Disorders
Northern Illinois University	
Ohio University	Hearing, Speech, and Language Sciences
Old Dominion University	
University of Missouri Kansas City	
University of North Dakota	Communication Sciences and Disorders
University of Pittsburgh	Communication Science and Disorders
University of South Carolina	Communication Sciences and Disorders
University of Wisconsin Milwaukee	
Virginia Commonwealth University	
Wright State University	

East Carolina University	*Physical Therapy*
Florida International University	
Northern Illinois University	
Ohio University	Physical Therapy
Old Dominion University	Physical Therapy
University at Buffalo	Physical Therapy
University of Missouri Kansas City	
University of North Dakota	Physical Therapy
University of South Carolina	Physical Therapy
University of Wisconsin Milwaukee	
Virginia Commonwealth University	
Wright State University	Physical Therapy

Institution	Program
East Carolina University	*Rehabilitation Counseling & Administration*
Florida International University	
Florida State University	Rehabilitation Counseling Services
Michigan State University	Rehabilitation Counselor Education
Northern Illinois University	
Ohio University	
Old Dominion University	
Southern Illinois University Carbondale	Rehabilitation
University at Buffalo	Rehabilitation Science
University of Arkansas	Rehabilitation Education and Research
University of Arizona	Special Education, Rehabilitation, and School Psychology (Rehabilitation)
University of Missouri Kansas City	
University of North Dakota	
University of South Carolina	
University of Wisconsin Milwaukee	
Virginia Commonwealth University	Rehabilitation and Movement Science
Wright State University	

Thomas Harriot College of Arts and Sciences

Institution	Program
East Carolina University	*Biomedical Physics*
Florida International University	
Northern Illinois University	
Ohio University	
Old Dominion University	
Purdue University	Medical Physics
University of California Los Angeles	Biomedical Physics
University of Minnesota	Biophysical Sciences and Medical Physics
University of Missouri Kansas City	
University of North Dakota	
University of South Carolina	
University of Texas Graduate School of Biomedical Sciences at Houston	Medical Physics
University of Wisconsin Madison	Medical Physics
University of Wisconsin Milwaukee	
Virginia Commonwealth University	Medical Physics
Wright State University	

Institution	Program
East Carolina University	*Technical and Professional Discourse*
Clemson University	Rhetorics, Communication, and Information Design
Florida International University	
Michigan Technological University	Rhetoric and Technical Communication
Northern Illinois University	
Ohio University	Communication Studies (Rhetoric and Public Culture)
Old Dominion University	
Texas Tech University	Technical Communication and Rhetoric
University of Minnesota	Rhetoric and Scientific and Technical Communication
University of Missouri Kansas City	
University of North Dakota	Communication and Public Discourse
University of South Carolina	
University of Wisconsin Milwaukee	
Virginia Commonwealth University	Media, Art, and Text
Wright State University	

Institution	Program
East Carolina University	*Health Psychology*
Duke University	Psychology (Health Psychology)
Florida International University	
Northern Illinois University	
Ohio University	
Old Dominion University	
Rutgers, the State University of New Jersey	Psychology (Interdisciplinary Health Psychology)
San Diego State University	Psychology (Behavioral Medicine/Health Psychology)
Stony Brook University	Social and Health Psychology
University of Florida	Psychology (Clinical and Health Psychology)
University of Miami	Psychology (Health Clinical Psychology)
University of Missouri Kansas City	
University of North Dakota	
University of North Texas	Psychology (Health Psychology and Behavioral Medicine)
University of South Carolina	
University of Wisconsin Milwaukee	
Virginia Commonwealth University	
Wright State University	

College of Education

Institution	Program
East Carolina University	*Educational Leadership*
Florida International University	
Northern Illinois University	
Ohio University	
Old Dominion University	Education (Educational Leadership)
University at Buffalo	Educational Administration
University of Louisville	Educational Leadership and Organizational Development
University of Missouri Kansas City	
University of Nevada Reno	Educational Leadership
University of North Dakota	Educational Leadership
University of South Carolina	Education Administration
University of Wisconsin Milwaukee	
Virginia Commonwealth University	Education (Educational Leadership)
Wright State University	

College of Health and Human Performance

Institution	Program
East Carolina University	*Bioenergetics*
Arizona State University	Interdisciplinary Program in Exercise Sciences
Ball State University	Human Bioenergetics
Florida International University	
Florida State University	Movement Sciences
Northern Illinois University	
Ohio University	Biological Sciences (Exercise Physiology and Muscle Biology)
Old Dominion University	Human Movement Science
University of Missouri Kansas City	
University of North Dakota	
University of South Carolina	Exercise Science
University of Wisconsin Milwaukee	
Virginia Commonwealth University	
West Virginia University	Exercise Physiology
Wright State University	

College of Human Ecology

Institution	Program
East Carolina University	*Medical Family Therapy*
Drexel University	Couple and Family Therapy
Florida International University	
Florida State University	Family and Child Sciences (Marriage and Family Therapy)
Iowa State University of Science and Technology	Human Development and Family Studies (Marriage and Family Therapy)
Kansas State University	Human Ecology (Marriage and Family Therapy)
Michigan State University	Family and Child Ecology (Marriage and Family Therapy)
Northern Illinois University	
Ohio University	
Old Dominion University	
Purdue University	Child Development and Family Studies (Marriage and Family Therapy)
University of Minnesota	Family Social Science (Marriage and Family Therapy)
University of Missouri Kansas City	
University of North Dakota	
University of South Carolina	
University of Wisconsin Milwaukee	
Virginia Commonwealth University	
Wright State University	

Brody School of Medicine

Institution	Program
East Carolina University	*Anatomy and Cell Biology*
Florida International University	Biological Sciences (Integrative Biology/ Physiology/Neurobiology/Anatomy)
Northern Illinois University	Biological Sciences (Cell and Molecular Biology)
Ohio University	Molecular and Cellular Biology (Cell Biology and Physiology)
Old Dominion University	Biomedical Sciences (Cell Biology and Molecular Pathogenesis)
University of Missouri Kansas City	Cell Biology and Biophysics
University of North Dakota	Anatomy and Cell Biology
University of South Carolina	Biomedical Science (Cell and Developmental Biology and Anatomy)
University of Wisconsin Milwaukee	Biological Sciences (Cellular and Molecular Biology)
Virginia Commonwealth University	Integrative Life Sciences **[New]**
Wright State University	Biomedical Sciences (Cell Biology and Physiology)

Institution	Program
East Carolina University	*Biochemistry and Molecular Biology*
Florida International University	Biological Sciences (Genetics/Molecular Biology/Biochemistry/Cell Biology)
Northern Illinois University	Biological Sciences (Biochemistry and Biophysics)
Ohio University	Molecular and Cellular Biology (Biochemistry)
Old Dominion University	Biomedical Sciences (Biological Chemistry)
University of Missouri Kansas City	Biological Sciences (Molecular Biology and Biochemistry)
University of North Dakota	Biochemistry and Molecular Biology
University of South Carolina	
University of Wisconsin Milwaukee	
Virginia Commonwealth University	Biochemistry
Wright State University	Biomedical Sciences (Biochemistry and Molecular Biology)

Institution	Program
East Carolina University	*Biological Sciences*
Florida International University	Biology
Northern Illinois University	Biological Sciences
Ohio University	Biological Sciences
Old Dominion University	Ecological Sciences
University of Missouri Kansas City	
University of North Dakota	Biology
University of South Carolina	Biological Sciences
University of Wisconsin Milwaukee	Biological Sciences
Virginia Commonwealth University	Integrative Life Sciences
Wright State University	

Institution	Program
East Carolina University	*Microbiology and Immunology*
Florida International University	Biology (Microbiology/Immunology and Developmental Biology)
Northern Illinois University	Biological Sciences (Microbiology)
Ohio University	Biological Sciences (Microbiology)
Old Dominion University	Biomedical Sciences (Pure and Applied Biomedical Sciences; Cell Biology and Molecular Pathogenesis)
University of Missouri Kansas City	
University of North Dakota	Microbiology and Immunology
University of South Carolina	Biomedical Science (Pathology and Microbiology)
University of Wisconsin Milwaukee	Biological Sciences (Microbiology)
Virginia Commonwealth University	Microbiology and Immunology
Wright State University	Biomedical Sciences (Immunology)

Institution	Program
East Carolina University	*Pharmacology and Toxicology*
Florida International University	
Northern Illinois University	
Ohio University	
Old Dominion University	
Texas Tech University Health Science Center	Pharmacology and Neuroscience
University at Buffalo	Pharmacology
University of Alabama Birmingham	Pharmacology and Toxicology
University of Louisville	Pharmacology and Toxicology
University of Missouri Kansas City	
University of North Dakota	Pharmacology, Physiology, and Therapeutics
University of South Carolina	Pharmacology
University of Wisconsin Milwaukee	
Virginia Commonwealth University	Pharmacology and Toxicology
Wright State University	

Institution	Program
East Carolina University	*Physiology*
Florida International University	
Northern Illinois University	
Ohio University	
Old Dominion University	Biomedical Sciences (Systems Biology and Biophysics)
Texas Tech University Health Sciences Center	Physiology
University at Buffalo	Physiology
University of Louisville	Physiology and Biophysics
University of Missouri Kansas City	
University of North Dakota	
University of South Carolina	Biomedical Science (Pharmacology, Physiology, and Neuroscience)
University of Wisconsin Milwaukee	
Virginia Commonwealth University	Physiology
Wright State University	Biomedical Science (Cell Biology and Physiology)

School of Nursing

Institution	Program
East Carolina University	*Nursing*
Florida International University	Nursing **[New]**
Northern Illinois University	
Ohio University	
Old Dominion University	
University at Buffalo	Nursing
University of Missouri Kansas City	Nursing
University of North Dakota	Nursing **[New]**
University of South Carolina	Nursing Science
University of Wisconsin Milwaukee	Nursing
Virginia Commonwealth University	Nursing
Wright State University	

Division of Research and Graduate Studies

Institution	Program
East Carolina University	*Coastal Resources Management*
Florida International University	
Louisiana State University and A&M College	Oceanography and Coastal Sciences
Northern Illinois University	
Ohio University	
Old Dominion University	
University of Delaware	Marine Studies
University of Massachusetts	Marine Science (Coastal Systems Science)
University of Missouri Kansas City	
University of North Dakota	
University of Rhode Island	Oceanography and Marine Affairs
University of South Carolina	Marine Science
University of Wisconsin Milwaukee	
Virginia Commonwealth University	
Wright State University	

College of Technology and Computer Science

Institution	Program
East Carolina University	*Technology Systems*
Eastern Michigan University	Engineering Technologies
Florida International University	
Northern Illinois University	
Ohio University	
Old Dominion University	
Portland State University	Engineering and Technology Management
Robert Morris University	Information Systems and Communication
Southern Methodist University	Engineering Management
University of Massachusetts Lowell	Health and Environment
University of Michigan	D. Eng. in Manufacturing
University of Missouri Kansas City	
University of Missouri Rolla	Engineering Management
University of North Dakota	
University of South Carolina	
University of Wisconsin Milwaukee	
Virginia Commonwealth University	
Wright State University	

Appendix D
Doctoral Program Comparative Data

We assessed each program participating in this study on the basis of productivity indicators that we anticipate will be used by the National Research Council in its upcoming assessment of doctoral programs. Tables containing these comparative data are organized below by College.

Light shading indicates either that a cognate program does not exist at that institution. Dark shading indicates that the data exist but were unavailable for this study.

The comparative charts contain the following data groups:

- Data related to program size. For East Carolina University, the source of this data was the Office of Institutional Planning, Research, and Effectiveness. (This is the source of all data for ECU, unless otherwise noted below). For all other institutions, the source of the data is the universities' offices of Institutional Research.

- Data related to students. The source for this data is the universities' offices of Institutional Research, except that some degree completion data is taken from the U.S. Department of Education's Integrated Post-Secondary Education Data System.

- Data related to faculty and research. Data on research awards (including ECU's awards) is from the universities' Office of Sponsored Research. Periodical publications and citations counts are taken from the humanities, social sciences, and sciences indices published by the Institute for Scientific Information.[79]

- Competitive indicators. The source of NASF data is either the universities' offices of Institutional Research or the National Science Foundation. The source of stipend and time to degree data is usually the comparator programs themselves, though it is sometimes Institutional Research.

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[79] Our methodology for counting papers and citations resembles the one the NRC used in its 1995 study. The factor that makes counting complex is that the ISI taxonomy of fields does not necessarily match the structure of academic departments anywhere. The ISI databases measure, therefore, not the publication productivity of *departments* but institutional productivity in particular *fields*. We collected from program faculty the titles of journals in which faculty had published in the previous five years. This helped us identify the fields in which faculty had been active. We then counted publications and citations in those fields which contained the institutional address "East Carolina University." This obviously results in over-counting—because a program in the biosciences, for example, is likely to get credit for papers published by faculty who have been active in the same field but who are housed in the Chemistry department. The alternative method is to undercount, using only those fields which resemble the name of the actual department. We have used both alternatives and have found that comparative patterns are the same, whether we over-count or undercount. We note also that counts labeled as "per faculty" are actually *per unit* counts and include the work of pre- and post-doctoral students in a program. The per faculty counts simply represent an attempt to normalize by program size.

School of Allied Health Sciences

Communication Science and Disorders

	Program Size		Student Indicators						Faculty a
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Communication Science and Disorders									
East Carolina University	*8.0*	*17.7*	*2.21*	*449*		*549*		*8.0*	*1.0*
Bowling Green State University Communication Disorders	12.0	7.7	0.64					3.0	0.3
Florida International University									
Florida State University Communication Science and Disorders	19.0	18.3	0.96	500		500		17.0	0.9
Louisiana State University and A&M College Communication Science and Disorders	17.0	18.0	1.06				1000	11.0	0.6
Northern Illinois University									
Ohio University Hearing, Speech, and Language Sciences	13.5	6.3	0.47					5.0	0.4
Old Dominion University									
University of Missouri Kansas City									
University of North Dakota Communication Sciences and Disorders	4.0	2.7	0.68		4.5		1,000	0.0	0.0
University of Pittsburgh Communication Science and Disorders	25.0	23.0	0.92				1,050	17.0	0.7
University of South Carolina Communication Sciences and Disorders	23.0	10.0	0.43	500	4.0	509		18.0	0.8
University of Wisconsin Milwaukee									
Virginia Commonwealth University									
Wright State University									
Mean	**15.2**	**13.0**	**0.9**	**483**	**4.3**	**519**	**1,017**	**9.9**	**0.6**

Communication Science and Disorders

	Pnd Research Indicators						Con
	Research Awards Five-Year Average 2000-01 through 2004-05	Research $ per Faculty Five-Year Average 2000-01 through 2004-05	Papers Published 2000-01 through 2004-05	Papers Published Per Faculty 2000-01 through 2004-05	Citations Received in Periodical Literature 2000-01 through 2004-05	Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05	Net Assignable Square Footage Research Space (Current)
Communication Science and Disorders							
East Carolina University	*$224,031*	*$28,004*	*559*	*69.9*	*2,098*	*262*	*2,348*
Bowling Green State University Communication Disorders	$706,302	$58,859	310	25.8	1,117	93	575
Florida International University							
Florida State University Communication Science and Disorders	$2,551,075	$134,267	737	38.8	2,965	156	8,719
Louisiana State University and A&M College Communication Science and Disorders	$80,087	$4,711	2,149	126.4	12,998	765	7,115
Northern Illinois University							
Ohio University Hearing, Speech, and Language Sciences	$405,304	$30,023	371	27.5	1,615	120	170
Old Dominion University							
University of Missouri Kansas City							
University of North Dakota Communication Sciences and Disorders	$30,760	$7,690	249	62.3	1,185	296	700
University of Pittsburgh Communication Science and Disorders	$115,044	$4,602	6,429	257.2	60,786	2,431	6,550
University of South Carolina Communication Sciences and Disorders	$89,847	$3,906	688	29.9	3,465	151	6,914
University of Wisconsin Milwaukee							
Virginia Commonwealth University							
Wright State University							
Mean	**$525,306**	**$34,008**	**1,436.5**	**79.7**	**10,778.6**	**534.2**	**4,136.4**

Communication Science and Disorders

Ppetitive Indicators						
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Communication Science and Disorders						
East Carolina University	*None to Full*	*9*	*$12,000*	*Full*	*None*	*5.4*
Bowling Green State University Communication Disorders	None to Full	10	$11,000	None	None	5.0
Florida International University						
Florida State University Communication Science and Disorders	Full	12	$23,000	Partial	None	5.5
Louisiana State University and A&M College Communication Science and Disorders	Full	9	$12,000	None	None	5.8
Northern Illinois University						
Ohio University Hearing, Speech, and Language Sciences	None to Full	9	$12,000	None	None	6.0
Old Dominion University						
University of Missouri Kansas City						
University of North Dakota Communication Sciences and Disorders	Full	9	$13,518	Full	None	5.4
University of Pittsburgh Communication Science and Disorders	Full	12	$16,605	Full	None	6.0
University of South Carolina Communication Sciences and Disorders	Partial	9	$17,000	Partial	None	5.2
University of Wisconsin Milwaukee						
Virginia Commonwealth University						
Wright State University						
Mean			**$14,640**			**5.5**

Physical Therapy

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Physical Therapy									
East Carolina University	*8.0*	*32.0*	*4.00*	*463*		*621*			
Florida International University									
Northern Illinois University									
Ohio University Physical Therapy **[New]**	12.5	40.0	3.20					0.0	0.0
Old Dominion University Physical Therapy	8.0	71.3	8.91	450		450		36.0	4.5
University at Buffalo Physical Therapy	22.0	105.7	4.80					73.0	3.3
University of Missouri Kansas City									
University of North Dakota Physical Therapy	7.0	116.5	16.64					141.0	20.1
University of South Carolina Physical Therapy	8.5	38.7	4.55	477	4.1	615		15.0	1.8
University of Wisconsin Milwaukee									
Virginia Commonwealth University Physical Therapy	11.0	159.7	14.52					54.0	4.9
Wright State University									
Mean	**11.0**	**80.6**	**8.1**	**463**	**4.1**	**562**		**53.2**	**5.8**

Physical Therapy

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Physical Therapy							
East Carolina University	*$13,346*	*$1,668*	*403*	*50.4*	*2,027*	*253*	*1,357*
Florida International University							
Northern Illinois University							
Ohio University Physical Therapy **[New]**	$484,338	$38,747	366	29.3	1,717	137	120
Old Dominion University Physical Therapy	$58,976	$7,372	128	16.0	382	48	1,610
University at Buffalo Physical Therapy	$254,030	$11,547	1,430	65.0	10,313	469	1,500
University of Missouri Kansas City							
University of North Dakota Physical Therapy	$159,598	$22,800	263	37.6	1,196	171	2,100
University of South Carolina Physical Therapy	$0	$0	671	78.9	4,268	502	1,450
University of Wisconsin Milwaukee							
Virginia Commonwealth University Physical Therapy	$224,621	$20,420	1,339	121.7	13,138	1,194	2,938
Wright State University							
Mean	**$170,701**	**$14,651**	**657.1**	**57.0**	**4,720.1**	**396.4**	**1,582.1**

Physical Therapy

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Physical Therapy						
East Carolina University	*None to Full*	*9*	*$7,500*	*None*	*None*	
Florida International University						
Northern Illinois University						
Ohio University Physical Therapy **[New]**	None to Full	9	$7,950	None	None	
Old Dominion University Physical Therapy	Full	9	$10,000	None	None	3.0
University at Buffalo Physical Therapy	None	9	$11,000	Partial	Partial	3.2
University of Missouri Kansas City						
University of North Dakota Physical Therapy	None			None	None	3.5
University of South Carolina Physical Therapy	Partial	9	$10,000	Partial	None	3.0
University of Wisconsin Milwaukee						
Virginia Commonwealth University Physical Therapy	Full	9	$15,500	Full	None	3.5
Wright State University						
Mean			**$10,325**			**3.2**

Rehabilitation Counseling and Administration

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Rehabilitation Counseling and Administration									
East Carolina University ***[New]***	*8.0*	*6.0*	*0.75*	*515*		*560*		*0.0*	*0.0*
Florida International University									
Florida State University Rehabilitation Counseling Services	34.0	56.0	1.65				1,000	1.0	0.0
Michigan State University Rehabilitation Counselor Education	32.7	165.3	5.06					140.0	4.3
Northern Illinois University									
Ohio University									
Old Dominion University									
Southern Illinois University Carbondale Rehabilitation	18.0	6.0	0.33					4.0	0.2
University at Buffalo Rehabilitation Science	22.0	13.7	0.62	500	4.0	500		4.0	0.2
University of Arkansas Rehabilitation Education and Research	6.0	25.3	4.22	500	4.5	500		15.0	2.5
University of Arizona Special Education, Rehabilitation, and School Psychology (Rehabilitation)	17.0	7.5	0.44				1,100	12.0	0.7
University of Missouri Kansas City									
University of North Dakota									
University of South Carolina									
University of Wisconsin Milwaukee									

Rehabilitation Counseling and Administration

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Virginia Commonwealth University Rehabiliation and Movement Science	6.0	17.6	2.93				1,050	13.0	2.2
Wright State University									
Mean	**18.0**	**37.2**	**2.0**	**505**	**4.3**	**520**	**1,050**	**23.6**	**1.3**

Rehabilitation Counseling and Administration

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Rehabilitation Counseling and Administration							
East Carolina University ***[New]***	*$112,719*	*$14,090*	*160*	*20.0*	*215*	*27*	*1,300*
Florida International University							
Florida State University Rehabilitation Counseling Services	$61,977	$1,823	537	15.8	1,581	47	5,694
Michigan State University Rehabilitation Counselor Education	$5,221,996	$159,694	613	18.7	2,060	63	338
Northern Illinois University							
Ohio University							
Old Dominion University							
Southern Illinois University Carbondale Rehabilitation	$5,279,819	$293,323	307	17.1	689	38	
University at Buffalo Rehabilitation Science	$254,030	$11,547	481	21.9	1,655	75	13,237
University of Arkansas Rehabilitation Education and Research	$1,713,841	$285,640	269	44.8	709	118	
University of Arizona Special Education, Rehabilitation, and School Psychology (Rehabilitation)	$354,343	$20,844	499	29.4	1,701	100	
University of Missouri Kansas City							
University of North Dakota							
University of South Carolina							
University of Wisconsin Milwaukee							

Rehabilitation Counseling and Administration

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Virginia Commonwealth University Rehabiliation and Movement Science	$2,573,831	$428,972	452	75.3	1,267	211	8,136
Wright State University							
Mean	**$1,946,570**	**$151,992**	**414.8**	**30.4**	**1,234.6**	**84.9**	**5,741.0**

Rehabilitation Counseling and Administration

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Rehabilitation Counseling and Administration						
East Carolina University ***[New]***	*Full*	*12*	*$15,000*	*None*	*None*	
Florida International University						
Florida State University Rehabilitation Counseling Services	Full	9	$4,300	Partial	None	4.3
Michigan State University Rehabilitation Counselor Education	None to Full	9	$14,500	Full	Partial	4.5
Northern Illinois University						
Ohio University						
Old Dominion University						
Southern Illinois University Carbondale Rehabilitation	None to Full	9	$11,700	Full	None	5.0
University at Buffalo Rehabilitation Science	Full	9	$11,200	Partial	Partial	4.6
University of Arkansas Rehabilitation Education and Research	Full	12	$7,400	Partial	Partial	5.0
University of Arizona Special Education, Rehabilitation, and School Psychology (Rehabilitation)	None to Full	10	$10,500	Partial	Partial	6.5
University of Missouri Kansas City						
University of North Dakota						
University of South Carolina						
University of Wisconsin Milwaukee						

Rehabilitation Counseling and Administration

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Virginia Commonwealth University Rehabiliation and Movement Science	Full	9	$13,000	Full	None	4.5
Wright State University						
Mean			**$10,950**			**4.9**

Thomas Harriot College of Arts and Sciences

Biomedical Physics

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Biomedical Physics									
East Carolina University	*20.0*	*18.0*	*0.90*	*476*		*735*		*6.0*	*0.3*
Florida International University									
Northern Illinois University									
Ohio University									
Old Dominion University									
Purdue University Medical Physics	9.5	11.0	1.16					7.0	0.7
University of California Los Angeles Biomedical Physics	40.5	38.0	0.94					33.0	0.8
University of Minnesota Biophysical Sciences and Medical Physics	28.0	19.3	0.69	520	4.8	720		12.0	0.4
University of Missouri Kansas City									
University of North Dakota									
University of South Carolina									
University of Texas Graduate School of Biomedical Sciences at Houston Medical Physics	34.0	18.0	0.53	518	4.4	704		8.0	0.2
University of Wisconsin Madison Medical Physics	32.0	60.0	1.88		4.5		1200	39.0	1.2
University of Wisconsin Milwaukee									
Virginia Commonwealth University Medical Physics **[New]**	22.0	11.0	0.50	550		710		0.0	0.0
Wright State University									
Mean	**26.6**	**25.0**	**0.9**	**505**	**3.4**	**720**	**1200**	**15.0**	**0.5**

Biomedical Physics

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Biomedical Physics							
East Carolina University	*$536,517*	*$26,826*	*815*	*40.8*	*4,581*	*229*	*7,944*
Florida International University							
Northern Illinois University							
Ohio University							
Old Dominion University							
Purdue University Medical Physics	$1,095,508	$115,317	5,401	568.5	30,576	3,219	3,572
University of California Los Angeles Biomedical Physics	$8,776,918	$216,714	12,685	313.2	126,388	3,121	5,544
University of Minnesota Biophysical Sciences and Medical Physics	$8,693,536	$310,483	9,537	340.6	81,802	2,922	7,500
University of Missouri Kansas City							
University of North Dakota							
University of South Carolina							
University of Texas Graduate School of Biomedical Sciences at Houston Medical Physics	$4,521,326	$132,980	5,400	158.8	50,879	1,496	5,214
University of Wisconsin Madison Medical Physics	$9,376,247	$293,008	9,546	298.3	79,334	2,479	8,000
University of Wisconsin Milwaukee							
Virginia Commonwealth University Medical Physics **[New]**	$3,357,994	$152,636	2,645	120.2	24,035	1,093	8,814
Wright State University							
Mean	**$5,194,006**	**$178,281**	**6,575.6**	**262.9**	**56,799.3**	**2,079.7**	**6,655.4**

Biomedical Physics

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Biomedical Physics						
East Carolina University	*Full*	*12*	*$21,500*	*Full*	*None*	*5.2*
Florida International University						
Northern Illinois University						
Ohio University						
Old Dominion University						
Purdue University Medical Physics	None to Full	9	$16,500	Full	Partial	8.1
University of California Los Angeles Biomedical Physics	Full	12	$22,500	Full	Partial	5.5
University of Minnesota Biophysical Sciences and Medical Physics	Full	12	$20,000	Partial	None	5.0
University of Missouri Kansas City						
University of North Dakota						
University of South Carolina						
University of Texas Graduate School of Biomedical Sciences at Houston Medical Physics	Full	12	$23,000	Partial	Partial	5.2
University of Wisconsin Madison Medical Physics	Full	12	$21,744	Full	Full	5.5
University of Wisconsin Milwaukee						
Virginia Commonwealth University Medical Physics **[New]**	Full	12	$20,000	Full	None	
Wright State University						
Mean			**$20,749**			**5.8**

Health Psychology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Health Psychology									
*East Carolina University [**New**]*	*32.0*	*0.0*	*0.00*						
Duke University Psychology (Health Psychology)	32.0	69.3	2.17	630		711		41.0	1.3
Florida International University									
Northern Illinois University									
Ohio University									
Old Dominion University									
Rutgers, the State University of New Jersey Psychology (Interdisciplinary Health Pscyhology)	14.0	38.4	2.74				1,120	46.0	3.3
San Diego State University Psychology (Behavioral Medicine/Health Psychology)	35.0	12.7	0.36	611		605		53.0	1.5
Stony Brook University Social and Health Psychology	11.5	22.3	1.94	600	5.0	660		14.0	1.2
University of Florida Psychology (Clinical and Health Pscyhology)	37.0	17.0	0.46	603		680		61.0	1.6
University of Miami Pscyhology (Health Clinical Psychology)	14.0	30.0	2.14	617		704		48.0	3.4
University of Missouri Kansas City									
University of North Dakota									

Health Psychology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
University of North Texas Psychology (Health Psychology and Behavioral Medicine)	24.0	51.3	2.14	500	4.0	500		99.0	4.1
University of South Carolina									
University of Wisconsin Milwaukee									
Virginia Commonwealth University									
Wright State University									
Mean	**24.9**	**30.1**	**1.5**	**594**	**4.5**	**643**	**1,120**	**51.7**	**2.4**

Health Psychology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Health Psychology							
East Carolina University [***New]***	*$83,213*	*$2,600*	*504*	*15.8*	*1,648*	*52*	
Duke University Psychology (Health Psychology)	$6,742,369	$210,699	4,326	135.2	39,474	1,234	6,000
Florida International University							
Northern Illinois University							
Ohio University							
Old Dominion University							
Rutgers, the State University of New Jersey Psychology (Interdisciplinary Health Pscyhology)	$891,852	$63,704	3,537	252.6	20,498	1,464	10,000
San Diego State University Psychology (Behavioral Medicine/Health Psychology)	$5,911,645	$168,904	866	24.7	3,828	109	36,333
Stony Brook University Social and Health Psychology	$3,305,796	$287,460	1,273	110.7	10,247	891	5,250
University of Florida Psychology (Clinical and Health Pscyhology)	$1,196,227	$32,330	3,404	92.0	15,441	417	37,927
University of Miami Pscyhology (Health Clinical Psychology)	$11,694,832	$835,345	1,906	136.1	15,223	1,087	35,000
University of Missouri Kansas City							
University of North Dakota							

Health Psychology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
University of North Texas Psychology (Health Psychology and Behavioral Medicine)	$208,712	$8,696	465	19.4	1,545	64	
University of South Carolina							
University of Wisconsin Milwaukee							
Virginia Commonwealth University							
Wright State University							
Mean	**$3,754,331**	**$201,217**	**2,035.1**	**98.3**	**13,488.0**	**664.8**	**21,751.7**

Health Psychology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Health Psychology						
East Carolina University [***New]***		*9*	*$12,000*	*None*	*None*	
Duke University Psychology (Health Psychology)	Full	12	$22,000	None	None	5.8
Florida International University						
Northern Illinois University						
Ohio University						
Old Dominion University						
Rutgers, the State University of New Jersey Psychology (Interdisciplinary Health Pscyhology)	Full	9	$18,000	Full	Full	6.5
San Diego State University Psychology (Behavioral Medicine/Health Psychology)	Full	9	$17,500	None	None	4.9
Stony Brook University Social and Health Psychology	Full	12	$17,263	Partial	Partial	5.9
University of Florida Psychology (Clinical and Health Pscyhology)	Partial to Full	12	$15,000	Partial	None	6.1
University of Miami Pscyhology (Health Clinical Psychology)	Full	12	$17,250	None	None	6.1
University of Missouri Kansas City						
University of North Dakota						

Health Psychology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
University of North Texas Psychology (Health Psychology and Behavioral Medicine)	Full	12	$20,000	Full	None	6.0
University of South Carolina						
University of Wisconsin Milwaukee						
Virginia Commonwealth University						
Wright State University						
Mean			**$17,377**			**5.9**

Technical and Professional Discourse

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Technical and Professional Discourse									
East Carolina University ***[New]***	*49.0*	*10.0*	*0.20*	*521*		*432*		*0.00*	*0.0*
Clemson University Rhetorics, Communication, and Information Design **[New]**	4.0	5.0	1.25		4.0		1,000	0.0	0.0
Florida International University									
Michigan Technological University Rhetoric and Technical Communication	24.5	36.3	1.48					20.0	0.8
Northern Illinois University									
Ohio University Communication Studies (Rhetoric and Public Culture)	8.0	36.7	4.59				1,150	40.0	5.0
Old Dominion University									
Texas Tech University Technical Communication and Rhetoric	47.0	32.0	0.68	545		585		14.0	0.3
University of Minnesota Rhetoric and Scientific and Technical Communication	21.0	36.0	1.71	619	5.4	608		13.0	0.6
University of Missouri Kansas City									
University of North Dakota Communication and Public Discourse **[New]**	11.5	14.0	1.22				1,000	0.0	0.0
University of South Carolina									
University of Wisconsin Milwaukee									

Technical and Professional Discourse

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Virginia Commonwealth University									
Media, Art, and Text	23.0	32.0	1.39					11.0	0.5
Wright State University									
Mean	**23.5**	**25.3**	**1.6**	**562**	**4.7**	**542**	**1,050**	**12.3**	**0.9**

Technical and Professional Discourse

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Technical and Professional Discourse							
East Carolina University ***[New]***	*$13,146*	*$268*	*171*	*3.5*	*322*	*7*	*3,250*
Clemson University Rhetorics, Communication, and Information Design **[New]**	$0	$0	79	19.8	43	11	
Florida International University							
Michigan Technological University Rhetoric and Technical Communication	$3,343	$136	23	0.9	8	0	
Northern Illinois University							
Ohio University Communication Studies (Rhetoric and Public Culture)	$405,115	$50,639	235	29.4	424	53	
Old Dominion University							
Texas Tech University Technical Communication and Rhetoric	$30,960	$659	190	4.0	189	4	
University of Minnesota Rhetoric and Scientific and Technical Communication	$107,351	$5,112	1,001	47.7	2,786	133	
University of Missouri Kansas City							
University of North Dakota Communication and Public Discourse **[New]**	$86,767	$7,545	37	3.2	53	5	
University of South Carolina							
University of Wisconsin Milwaukee							

Technical and Professional Discourse

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Virginia Commonwealth University							
Media, Art, and Text	$2,412	$105	237	10.3	423	18	
Wright State University							
Mean	**$81,137**	**$8,058**	**246.6**	**14.8**	**531.0**	**28.8**	

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Technical and Professional Discourse						
East Carolina University ***[New]***	*None to Full*	*12*	*$14,000*	*None*	*None*	
Clemson University Rhetorics, Communication, and Information Design **[New]**	Full	9	$15,000	None	None	
Florida International University						
Michigan Technological University Rhetoric and Technical Communication	Full	9	$10,252	Partial	None	7.5
Northern Illinois University						
Ohio University Communication Studies (Rhetoric and Public Culture)	None to Full	9	$16,800	None	None	6.9
Old Dominion University						
Texas Tech University Technical Communication and Rhetoric	None to Full	9	$14,500	Partial	Partial	7.3
University of Minnesota Rhetoric and Scientific and Technical Communication	Full	12	$21,000	Partial	None	6.1
University of Missouri Kansas City						
University of North Dakota Communication and Public Discourse **[New]**	None to Full	9	$13,586	Full	None	
University of South Carolina						
University of Wisconsin Milwaukee						

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Virginia Commonwealth University Media, Art, and Text	Partial	9	$12,503	None	None	7.0
Wright State University						
Mean			**$14,705**			**7.0**

College of Education

Educational Leadership

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Educational Leadership									
East Carolina University	*14.0*	*130.0*	*9.29*	*480*		*558*		*45.0*	*3.2*
Florida International University									
Northern Illinois University									
Ohio University									
Old Dominion University Education (Educational Leadership) **[New]**	5.0	0.0	0.00					0.0	0.0
University at Buffalo Educational Administration	14.0	17.0	1.21		4.5		1,000	26.0	1.9
University of Louisville Educational Leadership and Organizational Development	19.0	92.0	4.84				1,000	22.0	1.2
University of Missouri Kansas City									
University of Nevada Reno Educational Leadership	11.0	22.3	2.03					14.0	1.3
University of North Dakota Educational Leadership	13.5	65.3	4.84					32.0	2.4
University of South Carolina Education Administration	19.0	113.3	5.96	420	5.0	480		63.0	3.3
University of Wisconsin Milwaukee									
Virginia Commonwealth University Education (Educational Leadership)	9.5	133.0	14.00					49.0	5.2
Wright State University									
Mean	**13.1**	**71.6**	**5.3**	**450**	**4.8**	**519**	**1,000**	**31.4**	**2.3**

Educational Leadership

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Educational Leadership							
East Carolina University	*$102,649*	*$7,332*	*14*	*1.0*	*11*	*1*	*1,820*
Florida International University							
Northern Illinois University							
Ohio University							
Old Dominion University Education (Educational Leadership) **[New]**	$64,768	$12,954	9	1.8	11	2	
University at Buffalo Educational Administration	$72,006	$5,143	43	3.1	38	3	
University of Louisville Educational Leadership and Organizational Development	$742,514	$39,080	21	1.1	13	1	
University of Missouri Kansas City							
University of Nevada Reno Educational Leadership	$149,347	$13,577	17	1.5	7	1	
University of North Dakota Educational Leadership	$0	$0	5	0.4	7	1	
University of South Carolina Education Administration	$297,352	$15,650	62	3.3	52	3	
University of Wisconsin Milwaukee							
Virginia Commonwealth University Education (Educational Leadership)	$0	$0	21	2.2	19	2	
Wright State University							
Mean	**$178,579**	**$11,717**	**24.0**	**1.8**	**19.8**	**1.5**	

Educational Leadership

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Educational Leadership						
East Carolina University	*None to Full*	*9*	*$10,000*	*None*	*None*	*6.0*
Florida International University						
Northern Illinois University						
Ohio University						
Old Dominion University Education (Educational Leadership) **[New]**	None to Full	9	$9,000	None	None	
University at Buffalo Educational Administration	None to Full	9	$8,000	Partial	Partial	6.5
University of Louisville Educational Leadership and Organizational Development	Full	12	$12,000	Full	None	4.0
University of Missouri Kansas City						
University of Nevada Reno Educational Leadership	Full	9	$12,600	Full	None	5.8
University of North Dakota Educational Leadership	None to Full	9	$7,500	Full	None	5.4
University of South Carolina Education Administration	Partial	9	$13,000	Partial	None	4.8
University of Wisconsin Milwaukee						
Virginia Commonwealth University Education (Educational Leadership)	Full	9	$13,000	None	None	5.6
Wright State University						
Mean			**$10,638**			**5.4**

College of Health and Human Performance

Bioenergetics

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Bioenergetics									
East Carolina University	*10.0*	*11.7*	*1.17*	*507*		*641*		*1.0*	*0.1*
Arizona State University Interdisciplinary Program in Exercise Sciences	17.0	11.7	0.69	480	4.5	570		10.0	0.6
Ball State University Human Bioenergetics	5.0	6.3	1.26	400		510		8.0	1.6
Florida International University									
Florida State University Movement Sciences	13.0	22.7	1.75				1,000	7.0	0.5
Northern Illinois University									
Ohio University Biological Sciences (Exercise Physiology and Muscle Biology)	8.0	35.3	4.41					41.0	5.1
Old Dominion University Human Movement Science **[New]**	8.0	6.0	0.75				960	0.0	0.0
University of Missouri Kansas City									
University of North Dakota									
University of South Carolina Exercise Science	16.0	53.0	3.31				1,000	11.0	0.7
University of Wisconsin Milwaukee									
Virginia Commonwealth University									
West Virginia University Exercise Physiology	19.5	21.0	1.08		4.0		1,000	9.0	0.5
Wright State University									
Mean	**12.1**	**21.0**	**1.8**	**462**	**4.3**	**574**	**990**	**10.9**	**1.1**

Bioenergetics

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Bioenergetics							
East Carolina University	*$7,051,366*	*$705,137*	*658*	*65.8*	*4,044*	*404*	*2,114*
Arizona State University Interdisciplinary Program in Exercise Sciences	$61,453	$3,615	805	47.4	4,241	249	
Ball State University Human Bioenergetics	$2,701,854	$540,371	157	31.4	792	158	
Florida International University							
Florida State University Movement Sciences	$765,073	$58,852	581	44.7	3,358	258	12,953
Northern Illinois University							
Ohio University Biological Sciences (Exercise Physiology and Muscle Biology)	$2,083,381	$260,423	356	44.5	2,515	314	70,400
Old Dominion University Human Movement Science **[New]**	$219,919	$27,490	97	12.1	335	42	4,140
University of Missouri Kansas City							
University of North Dakota							
University of South Carolina Exercise Science	$2,416,554	$151,035	943	58.9	6,950	434	7,285
University of Wisconsin Milwaukee							
Virginia Commonwealth University							
West Virginia University Exercise Physiology	$313,657	$16,085	825	42.3	4,285	220	1,128
Wright State University							
Mean	**$1,951,657**	**$220,376**	**552.8**	**43.4**	**3,315.0**	**260.1**	**16,336.7**

Bioenergetics

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Bioenergetics						
East Carolina University	*None to Full*	*12*	*$18,000*	*None*	*None*	*4.0*
Arizona State University Interdisciplinary Program in Exercise Sciences	None to Full	9	$13,540	Full	None	6.0
Ball State University Human Bioenergetics	Partial	9	$16,325	None	None	5.1
Florida International University						
Florida State University Movement Sciences	None to Full	9	$8,000	Partial	None	5.6
Northern Illinois University						
Ohio University Biological Sciences (Exercise Physiology and Muscle Biology)	None to Full	12	$22,000	None	None	5.5
Old Dominion University Human Movement Science **[New]**	Partial	9	$15,000	None	None	
University of Missouri Kansas City						
University of North Dakota						
University of South Carolina Exercise Science	Partial	9	$16,000	Partial	None	5.1
University of Wisconsin Milwaukee						
Virginia Commonwealth University						
West Virginia University Exercise Physiology	Full	12	$20,000	Full	None	5.8
Wright State University						
Mean			**$16,108**			**5.3**

College of Human Ecology

Medical Family Therapy

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Medical Family Therapy									
East Carolina University	*4.0*	*4.0*	*1.00*	*497*		*630*		*0.0*	*0.0*
Drexel University Couple and Family Therapy	6.0	34.7	5.78				1,200	4.0	0.7
Florida International University									
Florida State University Family and Child Sciences (Marriage and Family Therapy)	12.0	48.2	4.02				1,000	12.0	1.0
Iowa State University of Science and Technology Human Development and Family Studies (Marriage and Family Therapy)	37.0	75.3	2.04	500	4.0	500		40.0	1.1
Kansas State University Human Ecology (Marriage and Family Therapy)	5.0	20.0	4.00				1,000	10.0	2.0
Michigan State University Family and Child Ecology (Marriage and Family Therapy)	21.0	49.7	2.37					42.0	2.0
Northern Illinois University									
Ohio University									
Old Dominion University									
Purdue University Child Development and Family Studies (Marriage and Family Therapy)	3.0	7.7	2.57				1,000	5.5	1.8

Medical Family Therapy

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
University of Minnesota Family Social Science (Marriage and Family Therapy)	18.0	49.3	2.74	527	4.6	623		7.0	0.4
University of Missouri Kansas City									
University of North Dakota									
University of South Carolina									
University of Wisconsin Milwaukee									
Virginia Commonwealth University									
Wright State University									
Mean	**13.3**	**36.1**	**3.1**	**508**	**4.3**	**584**	**1,050**	**15.1**	**1.1**

Medical Family Therapy

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	Research $ per Faculty Five-Year Average 2000-01 through 2004-05	Papers Published 2000-01 through 2004-05	Papers Published Per Faculty 2000-01 through 2004-05	Citations Received in Periodical Literature 2000-01 through 2004-05	Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05	Net Assignable Square Footage Research Space (Current)
Medical Family Therapy							
East Carolina University	*$329,057*	*$82,264*	*198*	*49.5*	*379*	*95*	*520*
Drexel University Couple and Family Therapy	$281,450	$46,908	201	33.5	629	105	
Florida International University							
Florida State University Family and Child Sciences (Marriage and Family Therapy)	$710,069	$59,172	615	51.3	1,824	152	9,950
Iowa State University of Science and Technology Human Development and Family Studies (Marriage and Family Therapy)	$3,529,497	$95,392	415	11.2	1,297	35	37,644
Kansas State University Human Ecology (Marriage and Family Therapy)	$3,010,966	$602,193	192	38.4	324	65	
Michigan State University Family and Child Ecology (Marriage and Family Therapy)	$955,496	$45,500	820	39.0	2,410	115	11,580
Northern Illinois University							
Ohio University							
Old Dominion University							
Purdue University Child Development and Family Studies (Marriage and Family Therapy)	$2,013,609	$671,203	797	265.7	2,243	748	

Medical Family Therapy

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
University of Minnesota Family Social Science (Marriage and Family Therapy)	$563,766	$31,320	1,594	88.6	6,142	341	
University of Missouri Kansas City							
University of North Dakota							
University of South Carolina							
University of Wisconsin Milwaukee							
Virginia Commonwealth University							
Wright State University							
Mean	**$1,424,239**	**$204,244**	**604.0**	**72.1**	**1,906.0**	**206.9**	

Medical Family Therapy

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Medical Family Therapy						
East Carolina University	*None to Full*	*12*	*$20,000*	*None*	*None*	
Drexel University Couple and Family Therapy	None			None	None	6.2
Florida International University						
Florida State University Family and Child Sciences (Marriage and Family Therapy)	Full	9	$15,000	Partial	None	5.2
Iowa State University of Science and Technology Human Development and Family Studies (Marriage and Family Therapy)	Partial to Full	9	$12,750	Full	Partial	5.0
Kansas State University Human Ecology (Marriage and Family Therapy)	Full	9	$9,000	Full	None	6.0
Michigan State University Family and Child Ecology (Marriage and Family Therapy)	None to Full	9	$5,436	Full	None	5.0
Northern Illinois University						
Ohio University						
Old Dominion University						
Purdue University Child Development and Family Studies (Marriage and Family Therapy)	None to Full	10	$15,500	Full	Partial	5.5

Medical Family Therapy

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
University of Minnesota Family Social Science (Marriage and Family Therapy)	Full	9	$10,232	Partial	None	4.9
University of Missouri Kansas City						
University of North Dakota						
University of South Carolina						
University of Wisconsin Milwaukee						
Virginia Commonwealth University						
Wright State University						
Mean			**$12,560**			**5.4**

Brody School of Medicine

Anatomy and Cell Biology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Anatomy and Cell Biology									
East Carolina University	*14.0*	*6.3*	*0.45*	*497*		*613*		*3.0*	*0.2*
Florida International University Biological Sciences (Integrative Biology/ Physiology/Neurobiology/Anatomy)	32.0	54.7	1.71				1,120	23.0	0.7
Northern Illinois University Biological Sciences (Cell and Molecular Biology)	31.0	20.0	0.65	471		577		12.0	0.4
Ohio University Molecular and Cellular Biology (Cell Biology and Physiology)	17.0	49.7	2.92	480		480		39.0	2.3
Old Dominion University Biomedical Sciences (Cell Biology and Molecular Pathogenesis)	70.0	57.0	0.81					21.0	0.3
University of Missouri Kansas City Cell Biology and Biophysics	16.5	11.0	0.67				1,600	0.0	0.0
University of North Dakota Anatomy and Cell Biology	12.0	73.0	6.08	405	4.0	410		7.0	0.6
University of South Carolina Biomedical Science (Cell and Developmental Biology and Anatomy)	40.0	50.0	1.25	511		603		23.0	0.6
University of Wisconsin Milwaukee Biological Sciences (Cellular and Molecular Biology)	17.0	47.0	2.76	610		612		22.0	1.3

Anatomy and Cell Biology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Virginia Commonwealth University Integrative Life Sciences **[New]**	37.5	18.0	0.48	570	4.5	700		0.0	0.0
Wright State University Biomedical Sciences (Cell Biology and Physiology)	23.0	44.3	1.93	600	4.5	600		32.0	1.4
Mean	**28.2**	**39.2**	**1.8**	**460.5**	**4.3**	**510.6**		**16.5**	**0.7**

Anatomy and Cell Biology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Anatomy and Cell Biology							
East Carolina University	*$397,679*	*$28,406*	*750*	*53.6*	*4,866*	*348*	*11,631*
Florida International University Biological Sciences (Integrative Biology/ Physiology/Neurobiology/Anatomy)	$3,670,384	$114,700	195	6.1	903	28	51,000
Northern Illinois University Biological Sciences (Cell and Molecular Biology)	$1,475,945	$47,611	171	5.5	794	26	42,000
Ohio University Molecular and Cellular Biology (Cell Biology and Physiology)	$2,083,381	$122,552	349	20.5	2,306	136	70,400
Old Dominion University Biomedical Sciences (Cell Biology and Molecular Pathogenesis)	$2,328,031	$33,258	94	1.3	380	5	4,140
University of Missouri Kansas City Cell Biology and Biophysics	$5,444,336	$329,960	683	41.4	4,252	258	36,040
University of North Dakota Anatomy and Cell Biology	$137,266	$11,439	287	23.9	1,582	132	2,100
University of South Carolina Biomedical Science (Cell and Developmental Biology and Anatomy)	$6,845,231	$171,131	982	24.6	7,413	185	46,465
University of Wisconsin Milwaukee Biological Sciences (Cellular and Molecular Biology)	$986,476	$58,028	345	20.3	1,789	105	50,000

Anatomy and Cell Biology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Virginia Commonwealth University Integrative Life Sciences **[New]**	$1,419,187	$37,845	2,541	67.8	24,109	643	123,421
Wright State University Biomedical Sciences (Cell Biology and Physiology)	$1,816,067	$78,959	390	17.0	2,069	90	127,000
Mean	**$2,418,544**	**$93,990**	**617.00**	**25.63**	**4,587.55**	**177.77**	**51,290.64**

Anatomy and Cell Biology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Anatomy and Cell Biology						
East Carolina University	*None to Full*	*12*	*$21,500*	*Full*	*None*	*4.5*
Florida International University Biological Sciences (Integrative Biology/ Physiology/Neurobiology/Anatomy)	Partial to Full	9	$15,000	Partial	None	6.4
Northern Illinois University Biological Sciences (Cell and Molecular Biology)	Full	9	$7,155	Full	None	5.8
Ohio University Molecular and Cellular Biology (Cell Biology and Physiology)	Full	12	$22,000	None	None	5.5
Old Dominion University Biomedical Sciences (Cell Biology and Molecular Pathogenesis)	Partial to Full	12	$20,000	None	None	6.1
University of Missouri Kansas City Cell Biology and Biophysics	Full	12	$22,000	None	None	5.9
University of North Dakota Anatomy and Cell Biology	None to Full	9	$10,475	Full	None	5.4
University of South Carolina Biomedical Science (Cell and Developmental Biology and Anatomy)	Partial	12	$20,000	Partial	None	4.9
University of Wisconsin Milwaukee Biological Sciences (Cellular and Molecular Biology)	Partial to Full	9	$23,401	Partial	None	5.0

Anatomy and Cell Biology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Virginia Commonwealth University Integrative Life Sciences **[New]**	None to Full	12	$22,000	Full	None	
Wright State University Biomedical Sciences (Cell Biology and Physiology)	Full	12	$22,000	None	None	5.2
Mean			**$18,685**			**5.5**

Biochemistry and Molecular Biology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Biochemistry and Molecular Biology									
East Carolina University	*10.0*	*6.3*	*0.63*	*471*		*626*		*3.0*	*0.3*
Florida International University Biological Sciences (Genetics/Molecular Biology/Biochemistry/Cell Biology)	7.0	54.7	7.81				1,120	23.0	3.3
Northern Illinois University Biological Sciences (Biochemistry and Biophysics)	31.0	20.0	0.65	471		*577.0*		12.0	0.4
Ohio University Molecular and Cellular Biology (Biochemistry)	9.0	21.0	2.33					39.0	4.3
Old Dominion University Biomedical Sciences (Biological Chemistry)	70.0	57.0	0.81					21.0	0.3
University of Missouri Kansas City Biological Sciences (Molecular Biology and Biochemistry)	15.5	33.0	2.13					0.0	0.0
University of North Dakota Biochemistry and Molecular Biology	15.0	16.0	1.07	570	4.5	580		7.0	0.5
University of South Carolina									
University of Wisconsin Milwaukee									
Virginia Commonwealth University Biochemistry	37.0	37.0	1.00				1,200	26.0	0.7

Biochemistry and Molecular Biology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Wright State University Biomedical Sciences (Biochemistry and Molecular Biology)	8.0	44.3	5.54				1,250	32.0	4.0
Mean	**22.5**	**32.1**	**2.4**					**18.1**	**1.5**

Biochemistry and Molecular Biology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Biochemistry and Molecular Biology							
East Carolina University	*$725,109*	*$72,511*	*811*	*81.1*	*5,247*	*525*	*10,480*
Florida International University Biological Sciences (Genetics/Molecular Biology/Biochemistry/Cell Biology)	$3,670,384	$524,341	257	36.7	1,119	160	51,000
Northern Illinois University Biological Sciences (Biochemistry and Biophysics)	$2,367,566	$76,373	201	6.5	1,153	37	42,000
Ohio University Molecular and Cellular Biology (Biochemis-try)	$2,083,381	$231,487	404	44.9	2,681	298	3,351
Old Dominion University Biomedical Sciences (Biological Chemistry)	$2,328,031	$33,258	114	1.6	432	6	4,140
University of Missouri Kansas City Biological Sciences (Molecular Biology and Biochemistry)	$5,444,336	$351,247	706	45.5	5,004	323	31,960
University of North Dakota Biochemistry and Molecular Biology	$2,564,909	$170,994	327	21.8	1,901	127	3,360
University of South Carolina							
University of Wisconsin Milwaukee							
Virginia Commonwealth University Biochemistry	$2,579,774	$69,724	2,693	72.8	28,894	781	4,520

Biochemistry and Molecular Biology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Wright State University Biomedical Sciences (Biochemistry and Molecular Biology)	$1,773,071	$221,634	489	61.1	2,540	318	127,000
Mean	**$2,615,173**	**$194,619**	**666.9**	**41.3**	**5,441.2**	**286.0**	**30,867.9**

Biochemistry and Molecular Biology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Biochemistry and Molecular Biology						
East Carolina University	*None to Full*	*12*	*$21,500*	*Full*	*None*	*6.0*
Florida International University Biological Sciences (Genetics/Molecular Biology/Biochemistry/Cell Biology)	None to Full	9	$15,000	Partial	None	6.4
Northern Illinois University Biological Sciences (Biochemistry and Biophysics)	Full	9	$9,540	Full	None	5.8
Ohio University Molecular and Cellular Biology (Biochemis-try)	None to Full	12	$22,000	None	None	5.5
Old Dominion University Biomedical Sciences (Biological Chemistry)	None to Full	12	$20,000	None	None	6.1
University of Missouri Kansas City Biological Sciences (Molecular Biology and Biochemistry)	Full	12	$22,000	None	None	6.5
University of North Dakota Biochemistry and Molecular Biology	None to Full	12	$21,120	Full	None	5.5
University of South Carolina						
University of Wisconsin Milwaukee						
Virginia Commonwealth University Biochemistry	None to Full	12	$21,000	None	None	5.9

Biochemistry and Molecular Biology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Wright State University Biomedical Sciences (Biochemistry and Molecular Biology)	Full	12	$22,000	None	None	5.2
Mean			**$19,351**			**5.9**

Biological Sciences

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Biological Sciences									
East Carolina University	*5.0*	*12.3*	*2.46*	*483*		*643*		*1.0*	*0.2*
Florida International University Biology	33.0	54.7	1.66				1,120	23.0	0.7
Northern Illinois University Biological Sciences	31.0	20.0	0.65	471		577		12.0	0.4
Ohio University Biological Sciences	45.0	49.7	1.10	600	4.5	700		33.0	0.7
Old Dominion University Ecological Sciences	25.0	20.7	0.83				1,200	17.0	0.7
University of Missouri Kansas City									
University of North Dakota Biology	17.0	6.7	0.39	405	4.0	410		12.0	0.7
University of South Carolina Biological Sciences	44.5	51.7	1.16	555	4.8	678		29.0	0.7
University of Wisconsin Milwaukee Biological Sciences	33.0	15.0	0.45	610		612		19.0	0.6
Virginia Commonwealth University Integrative Life Sciences **[New]**	37.5	52.0	1.39	500		610		0.0	0.0
Wright State University									
Mean	**30.1**	**31.4**	**1.1**	**518**	**4.4**	**604**	**1,160**	**16.2**	**0.5**

Biological Sciences

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Biological Sciences							
East Carolina University	*$1,895,671*	*$379,134*	*1,049*	*209.8*	*6,307*	*1,261*	*3,075*
Florida International University Biology	$3,670,384	$111,224	686	20.8	2,824	86	51,000
Northern Illinois University Biological Sciences	$1,475,945	$47,611	459	14.8	2,349	76	42,000
Ohio University Biological Sciences	$2,083,381	$46,297	980	21.8	4,882	108	70,400
Old Dominion University Ecological Sciences	$111,867	$4,475	430	17.2	1,505	60	4,140
University of Missouri Kansas City							
University of North Dakota Biology	$670,621	$39,448	524	30.8	2,737	161	20,000
University of South Carolina Biological Sciences	$5,615,808	$126,198	2,253	50.6	16,799	378	46,465
University of Wisconsin Milwaukee Biological Sciences	$986,456	$29,893	742	22.5	4,231	128	50,000
Virginia Commonwealth University Integrative Life Sciences **[New]**	$21,132,508	$563,534	3,303	88.1	31,168	831	123,421
Wright State University							
Mean	**$4,182,516**	**$149,757**	**1,158.4**	**52.9**	**8,089.1**	**343.3**	**45,611.2**

Biological Sciences

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Biological Sciences						
East Carolina University	*Partial to Full*	*12*	*$21,500*	*Full*	*None*	*7.0*
Florida International University Biology	Partial to Full	12	$18,000	Partial	None	6.4
Northern Illinois University Biological Sciences	Full	9	$9,540	Full	None	5.8
Ohio University Biological Sciences	None to Full	12	$22,000	None	None	5.5
Old Dominion University Ecological Sciences	Partial to Full	12	$20,000	None	None	5.9
University of Missouri Kansas City						
University of North Dakota Biology	Full	9	$13,946	Full	None	4.8
University of South Carolina Biological Sciences	Partial	9	$15,000	Partial	None	4.9
University of Wisconsin Milwaukee Biological Sciences	Partial to Full	9	$23,401	Partial	None	7.0
Virginia Commonwealth University Integrative Life Sciences **[New]**	Full	12	$21,000	Full	None	
Wright State University						
Mean			**$18,265**			**5.9**

Microbiology and Immunology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Microbiology and Immunology									
East Carolina University	*14.0*	*15.7*	*1.12*	*505*		*526*		*11.0*	*0.8*
Florida International University Biology (Microbiology/Immunology and Developmental Biology)	6.0	54.7	9.12				1,120	23.0	3.8
Northern Illinois University Biological Sciences (Microbiology)	31.0	20.0	0.65	471		577		12.0	0.4
Ohio University Biological Sciences (Microbiology)	28.0	49.7	1.78					33.0	1.2
Old Dominion University Biomedical Sciences (Pure and Applied Biomedical Sciences; Cell Biology and Molecular Pathogenesis)	70.0	57.0	0.81				1,150	21.0	0.3
University of Missouri Kansas City									
University of North Dakota Microbiology and Immunology	7.0	5.3	0.76					3.0	0.4
University of South Carolina Biomedical Science (Pathology and Microbiology)	15.0	38.7	2.58	500	5.0	645		23.0	1.5
University of Wisconsin Milwaukee Biological Sciences (Microbiology)	9.0		0.00	610		612			0.0
Virginia Commonwealth University Microbiology and Immunology	17.0	65.0	3.82				1,200	37.0	2.2
Wright State University Biomedical Sciences (Immunology)	10.0	44.3	4.43					32.0	3.2
Mean	**20.7**	**38.9**	**2.5**	**522**	**5.0**	**590**	**1,157**	**21.7**	**1.4**

Microbiology and Immunology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Microbiology and Immunology							
East Carolina University	*$1,599,184*	*$114,227*	*632*	*45.1*	*4,714*	*337*	*18,470*
Florida International University Biology (Microbiology/Immunology and Developmental Biology)	$3,670,384	$611,731	173	28.8	846	141	51,000
Northern Illinois University Biological Sciences (Microbiology)	$1,475,945	$47,611	150	4.8	966	31	42,000
Ohio University Biological Sciences (Microbiology)	$2,083,381	$74,406	323	11.5	2,114	76	70,400
Old Dominion University Biomedical Sciences (Pure and Applied Biomedical Sciences; Cell Biology and Molecular Pathogenesis)	$2,328,031	$33,258	77	1.1	296	4	4,140
University of Missouri Kansas City							
University of North Dakota Microbiology and Immunology	$788,157	$112,594	284	40.6	1,674	239	1,260
University of South Carolina Biomedical Science (Pathology and Microbiology)	$1,053,751	$70,250	954	63.6	8,180	545	46,465
University of Wisconsin Milwaukee Biological Sciences (Microbiology)	$988,656	$109,851	315	35.0	2,324	258	50,000
Virginia Commonwealth University Microbiology and Immunology	$6,940,412	$408,260	2,345	137.9	26,714	1,571	4,746
Wright State University Biomedical Sciences (Immunology)	$629,387	$62,939	372	37.2	2,088	209	127,000
Mean	**$2,155,729**	**$164,513**	**562.5**	**40.6**	**4,991.6**	**341.2**	**41,548.1**

Microbiology and Immunology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Microbiology and Immunology						
East Carolina University	*Full*	*12*	*$21,500*	*Full*	*None*	*5.3*
Florida International University Biology (Microbiology/Immunology and Developmental Biology)	Partial to Full	9	$18,000	Partial	None	6.4
Northern Illinois University Biological Sciences (Microbiology)	Full	9	$9,540	Full	None	5.8
Ohio University Biological Sciences (Microbiology)	Full	9	$17,000	None	None	5.5
Old Dominion University Biomedical Sciences (Pure and Applied Biomedical Sciences; Cell Biology and Molecular Pathogenesis)	Full	12	$20,000	None	None	6.1
University of Missouri Kansas City						
University of North Dakota Microbiology and Immunology	Full	12	$19,116	Full	None	5.2
University of South Carolina Biomedical Science (Pathology and Microbiology)	Partial	9	$18,000	Partial	None	4.9
University of Wisconsin Milwaukee Biological Sciences (Microbiology)	Partial to Full	9	$23,401	Partial	None	5.0
Virginia Commonwealth University Microbiology and Immunology	Full	12	$21,000	Full	None	6.0
Wright State University Biomedical Sciences (Immunology)	Full	12	$22,000	None	None	5.2
Mean			**$18,956**			**5.5**

Pharmacology and Toxicology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Pharmacology and Toxicology									
East Carolina University	*10.0*	*11.3*	*1.13*	*552*		*704*		*8.0*	*0.8*
Florida International University									
Northern Illinois University									
Ohio University									
Old Dominion University									
Texas Tech University Health Science Center Pharmacology and Neuroscience	13.0	9.0	0.69				1,250	7.0	0.5
University at Buffalo Pharmacology	23.5	27.0	1.15				1,150	34.0	1.4
University of Alabama Birmingham Pharmacology and Toxicology	14.0	34.3	2.45				1,220	19.0	1.4
University of Louisville Pharmacology and Toxicology	30.5	51.3	1.68						
University of Missouri Kansas City									
University of North Dakota Pharmacology, Physiology, and Therapeutics	14.0	4.0	0.29				1,250	3.0	0.2
University of South Carolina Pharmacology	21.0	26.0	1.24	480	3.8	608		31.0	1.5
University of Wisconsin Milwaukee									
Virginia Commonwealth University Pharmacology and Toxicology	39.0	6.0	0.15					34.0	0.9
Wright State University									
Mean	**20.6**	**21.1**	**1.1**	**516**	**3.8**	**656**	**1,218**	**19.4**	**1.0**

Pharmacology and Toxicology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Pharmacology and Toxicology							
East Carolina University	*$882,951*	*$88,295*	*505*	*50.5*	*3,268*	*327*	*10,222*
Florida International University							
Northern Illinois University							
Ohio University							
Old Dominion University							
Texas Tech University Health Science Center Pharmacology and Neuroscience	$3,164,876	$243,452	648	49.8	3,301	254	
University at Buffalo Pharmacology	$1,107,242	$47,117	1,647	70.1	10,407	443	5,124
University of Alabama Birmingham Pharmacology and Toxicology	$4,529,834	$323,560	3,630	259.3	36,786	2,628	12,600
University of Louisville Pharmacology and Toxicology		$0	1,217	39.9	10,451	343	6,656
University of Missouri Kansas City							
University of North Dakota Pharmacology, Physiology, and Therapeutics	$3,842,085	$274,435	303	21.6	1,727	123	3,780
University of South Carolina Pharmacology	$796,118	$37,910	665	31.7	5,025	239	14,500
University of Wisconsin Milwaukee							
Virginia Commonwealth University Pharmacology and Toxicology	$10,444,209	$267,800	2,138	54.8	19,678	505	7,006
Wright State University							
Mean	**$3,538,188**	**$160,321**	**1,344.1**	**72.2**	**11,330.4**	**607.6**	**8,555.4**

Pharmacology and Toxicology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Pharmacology and Toxicology						
East Carolina University	*Full*	*12*	*$21,500*	*Full*	*None*	*4.8*
Florida International University						
Northern Illinois University						
Ohio University						
Old Dominion University						
Texas Tech University Health Science Center Pharmacology and Neuroscience	None to Full	9	$18,000	Partial	Partial	6.0
University at Buffalo Pharmacology	Full	12	$21,000	Partial	Partial	5.2
University of Alabama Birmingham Pharmacology and Toxicology	Full	12	$23,000	Full	None	5.0
University of Louisville Pharmacology and Toxicology	None to Full	12	$20,000	Full	None	5.5
University of Missouri Kansas City						
University of North Dakota Pharmacology, Physiology, and Therapeutics	None to Full	12	$18,000	Full	None	4.5
University of South Carolina Pharmacology	Partial	9	$18,000	Partial	None	4.5
University of Wisconsin Milwaukee						
Virginia Commonwealth University Pharmacology and Toxicology	Full	12	$21,000	Full	None	4.7
Wright State University						
Mean			**$20,063**			**5.0**

Physiology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Physiology									
East Carolina University	*14.0*	*10.7*	*0.76*	*499*		*625*		*10.0*	*0.7*
Florida International University									
Northern Illinois University									
Ohio University									
Old Dominion University Biomedical Sciences (Systems Biology and Biophysics)	70.0	57.0	0.81				1,150	21.0	0.3
Texas Tech University Health Sciences Center Physiology	18.0	4.0	0.22					12.0	0.7
University at Buffalo Physiology	30.0	4.3	0.14				1,150	9.0	0.3
University of Louisville Physiology and Biophysics	20.0	22.0	1.10	524		628		15.0	0.8
University of Missouri Kansas City									
University of North Dakota									
University of South Carolina Biomedical Science (Pharmacology, Physiology, and Neuroscience)	13.0	38.7	2.98	550	5.0	620		23.0	1.8
University of Wisconsin Milwaukee									
Virginia Commonwealth University Physiology	18.0	50.3	2.79	520	4.5	750		17.0	0.9

Physiology

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Wright State University Biomedical Science (Cell Biology and Physiology)	29.0	44.3	1.53					32.0	1.1
Mean	**26.5**	**28.9**	**1.3**	**523**	**4.8**	**656**	**1,150**	**17.4**	**0.8**

Physiology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Physiology							
East Carolina University	*$1,014,280*	*$72,449*	*915*	*65.4*	*4,885*	*349*	*12,061*
Florida International University							
Northern Illinois University							
Ohio University							
Old Dominion University Biomedical Sciences (Systems Biology and Biophysics)	$2,328,031	$33,258	113	1.6	424	6	4,140
Texas Tech University Health Sciences Center Physiology	$1,749,357	$97,187	996	55.3	4,447	247	
University at Buffalo Physiology	$2,075,129	$69,171	2,464	82.1	16,856	562	8,967
University of Louisville Physiology and Biophysics	$1,388,880	$69,444	2,606	130.3	17,412	871	2,688
University of Missouri Kansas City							
University of North Dakota							
University of South Carolina Biomedical Science (Pharmacology, Physiology, and Neuroscience)	$796,118	$61,240	1,017	78.2	7,565	582	46,465
University of Wisconsin Milwaukee							
Virginia Commonwealth University Physiology	$2,912,534	$161,807	3,108	172.7	27,337	1,519	3,842

Physiology

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Wright State University Biomedical Science (Cell Biology and Physiology)	$1,816,067	$62,623	504	17.4	2,592	89	127,000
Mean	**$1,760,049**	**$78,397**	**1,465.4**	**75.4**	**10,189.8**	**528.1**	**29,309.0**

Physiology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Physiology						
East Carolina University	*Full*	*12*	*$21,500*	*Full*	*None*	*5.5*
Florida International University						
Northern Illinois University						
Ohio University						
Old Dominion University Biomedical Sciences (Systems Biology and Biophysics)	Full	12	$20,000	None	None	6.1
Texas Tech University Health Sciences Center Physiology	None to Partial	12	$20,000	Partial	Partial	4.5
University at Buffalo Physiology	None to Full	12	$20,000	Partial	Partial	4.8
University of Louisville Physiology and Biophysics	None to Full	12	$18,000	Full	None	5.5
University of Missouri Kansas City						
University of North Dakota						
University of South Carolina Biomedical Science (Pharmacology, Physiology, and Neuroscience)	Partial	9	$18,000	Full	None	4.9
University of Wisconsin Milwaukee						
Virginia Commonwealth University Physiology	Full	12	$21,500	Full	None	4.5

Physiology

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Wright State University Biomedical Science (Cell Biology and Physiology)	Full	12	$22,000	None	None	5.2
Mean			**$20,125**			**5.1**

School of Nursing

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Nursing									
East Carolina University	*11.0*	*14.7*	*1.34*	*507*		*484*		*1.0*	*0.1*
Florida International University Nursing **[New]**	17.0	5.0	0.29				1,120	0.0	0.0
Northern Illinois University									
Ohio University									
Old Dominion University									
University at Buffalo Nursing	32.0	15.3	0.48					14.0	0.4
University of Missouri Kansas City Nursing	31.0	25.0	0.81					9.0	0.3
University of North Dakota Nursing **[New]**	24.0	11.5	0.48					0.0	0.0
University of South Carolina Nursing Science	17.0	39.7	2.34				1,000	21.0	1.2
University of Wisconsin Milwaukee Nursing	30.0	37.0	1.23					21.0	0.7
Virginia Commonwealth University Nursing	29.0	32.0	1.10					16.0	0.6
Wright State University									
Mean	**23.9**	**22.5**	**1.0**	**507**		**484**	**1,060**	**10.3**	**0.4**

Nursing

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Nursing							
East Carolina University	*$907,230*	*$82,475*	*309*	*28.1*	*1,414*	*129*	*6,705*
Florida International University Nursing **[New]**	$1,969,306	$115,842	93	5.5	343	20	8,000
Northern Illinois University							
Ohio University							
Old Dominion University							
University at Buffalo Nursing	$480,823	$15,026	517	16.2	2,639	82	16,226
University of Missouri Kansas City Nursing	$1,288,363	$41,560	222	7.2	916	30	22,320
University of North Dakota Nursing **[New]**	$935,415	$38,976	69	2.9	303	13	16,380
University of South Carolina Nursing Science	$1,170,625	$68,860	377	22.2	1,562	92	25,211
University of Wisconsin Milwaukee Nursing	$946,100	$31,537	148	4.9	558	19	10,650
Virginia Commonwealth University Nursing	$2,285,766	$78,820	887	30.6	6,161	212	10,396
Wright State University							
Mean	$1,247,954	$59,137	**327.8**	**14.7**	**1,737.0**	**74.5**	**14,486.0**

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Nursing						
East Carolina University	*None to Full*	*12*	*$20,000*	*None*	*None*	*3.0*
Florida International University Nursing **[New]**	None to Full	10	$7,500	Partial	None	
Northern Illinois University						
Ohio University						
Old Dominion University						
University at Buffalo Nursing	Full	9	$12,600	Partial	Partial	3.5
University of Missouri Kansas City Nursing	Partial to Full	9	$18,500	None	None	3.0
University of North Dakota Nursing **[New]**	None to Full	9	$12,000	Full	None	
University of South Carolina Nursing Science	Partial	9	$18,000	Partial	None	3.8
University of Wisconsin Milwaukee Nursing	None to Full	9	$10,919	Partial	None	4.0
Virginia Commonwealth University Nursing	Full	9	$18,000	Full	None	4.0
Wright State University						
Mean			**$14,690**			**3.6**

Division of Research and Graduate Studies

Coastal Resources Management

	Program Size			Student Indicators					
	Number Faculty FTE (Current)	Number Doctoral Students (3-Year Avg)	Doctoral Students to Faculty Ratio (x:1)	Average GRE Scores for Entering Cohorts 2002-03 through 2004-05				Doctoral Degree Completions 2000-01 through 2004-05	Doctoral Degree Completions Per Faculty 2000-01 through 2004-05
				Verbal	Analytical Writing	Math	Total		
Coastal Resources Management									
East Carolina University	*7.5*	*32.3*	*4.34*	*493*		*554*		*3.0*	*0.4*
Florida International University									
Louisiana State University and A&M College Oceanography and Coastal Sciences	27.0	40.7	1.51				1120	32.0	1.2
Northern Illinois University									
Ohio University									
Old Dominion University									
University of Delaware Marine Studies	56.0	101.0	1.80	550	4.5	650		47.0	0.8
University of Massachusetts Marine Science (Coastal Systems Science) **[New]**	21.0	8.0	0.38		4.5		1200	0.0	0.0
University of Missouri Kansas City									
University of North Dakota									
University of Rhode Island Oceanography and Marine Affairs	48.0	63.7	1.33	500	4.5	600		41.0	0.9
University of South Carolina Marine Science	29.0	18.0	0.62	498		635		10.0	0.3
University of Wisconsin Milwaukee									
Virginia Commonwealth University									
Wright State University									
Mean	**31.4**	**44.0**	**1.7**	**510**	**4.5**	**610**	**1160**	**22.2**	**0.6**

Coastal Resources Management

	Faculty and Research Indicators						
	Research Awards Five-Year Average 2000-01 through 2004-05	**Research $ per Faculty Five-Year Average 2000-01 through 2004-05**	**Papers Published 2000-01 through 2004-05**	**Papers Published Per Faculty 2000-01 through 2004-05**	**Citations Received in Periodical Literature 2000-01 through 2004-05**	**Citations Received Per Faculty in Periodical Literature 2000-01 through 2004-05**	**Net Assignable Square Footage Research Space (Current)**
Coastal Resources Management							
East Carolina University	*$1,086,903*	*$145,893*	*644*	*86.4*	*2,646*	*355*	*1,900*
Florida International University							
Louisiana State University and A&M College Oceanography and Coastal Sciences	$6,802,547	$251,946	3,129	115.9	12,868	477	
Northern Illinois University							
Ohio University							
Old Dominion University							
University of Delaware Marine Studies	$11,234,000	$200,607	2,025	36.2	7,691	137	
University of Massachusetts Marine Science (Coastal Systems Science) **[New]**	$7,183,813	$342,086	619	29.5	656	31	
University of Missouri Kansas City							
University of North Dakota							
University of Rhode Island Oceanography and Marine Affairs	$24,358,592	$507,471	1,110	23.1	4,350	91	
University of South Carolina Marine Science	$3,313,126	$114,246	1,079	37.2	6,026	208	
University of Wisconsin Milwaukee							
Virginia Commonwealth University							
Wright State University							
Mean	**$8,996,497**	**$260,375**	**1,434.3**	**54.7**	**5,706.2**	**216.5**	

Coastal Resources Management

	Competitive Indicators					
	Tuition Remisson	**Usual and Customary Stipend Time (Months)**	**Average HTE Stipend Amount**	**Health Insurance for Student**	**Health Insurance for Student's Dependents**	**Average Time to Degree 2000-01 through 2004-05 (Years)**
Coastal Resources Management						
East Carolina University	*None to Full*	*12*	*$18,000*	*None*	*None*	*5.2*
Florida International University						
Louisiana State University and A&M College Oceanography and Coastal Sciences	None to Full	12	$17,000	None	None	5.9
Northern Illinois University						
Ohio University						
Old Dominion University						
University of Delaware Marine Studies	None to Full	9	$20,600	Full	None	6.0
University of Massachusetts Marine Science (Coastal Systems Science) **[New]**	Full	12	$17,926	None	None	
University of Missouri Kansas City						
University of North Dakota						
University of Rhode Island Oceanography and Marine Affairs	Full	9	$12,956	Full	None	5.5
University of South Carolina Marine Science	Partial	9	$14,000	Partial	None	6.4
University of Wisconsin Milwaukee						
Virginia Commonwealth University						
Wright State University						
Mean			**$16,747**			**5.8**

Appendix E
Professionalizing the Role of the Director of Graduate Studies

During the course of this study, it became clear to us that the quality of the directors of graduate study in the various departments is uneven. Since further professional development is necessary, we thought it would be helpful to include in this document an essay on this question that we published several years ago in our now defunct journal, *The Journal for Higher Education Strategists*.

The essay was written by Suzanne Ortega, former Vice Provost for Advanced Studies and Dean of the Graduate School at the University of Missouri-Columbia and now Vice Provost and Dean of the Graduate School at the University of Washington. Ortega describes an ongoing professional development program for graduate directors that she developed in a pilot project at Missouri, with funding from Yardley Group CEO Michael Ditchkofsky's foundation for academic affairs in his former company.

Since the file containing the essay is in a format inconsistent with Microsoft Word, we have included it on a disc attached to the back cover of this document. The essay can also be accessed in the publication section of the Yardley Research Group web site at http://www.yardleygroup.com/journal/v1n1_ortega.pdf.

Appendix F
Selected Labor Market Statistics

As we have already indicated above in the section of this document dealing with new program development, we used several data sets from various agencies in North Carolina to profile the current and projected labor market for the eastern region. The purpose of this appendix is to give both a sampling of the jobs currently available in the region and a sense of the numbers of employees in particular kinds of jobs. The entire data set, which is too large to be included here, can be searched at the web site for the Employment Security Commission of North Carolina (http://www.ncesc.com). Occupation statistics given below are organized by economic cluster.

Textiles and Apparel Cluster

Table VII
Occupations in Cut and Sew Apparel Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
516031	Sewing Machine Operators	36.57	4,841
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	8.29	1,098
511011	First-Line Supervisors/Managers of Production and Operating	3.35	443
537062	Laborers and Freight, Stock, and Material Movers, Hand	2.91	359
516062	Textile Cutting Machine Setters, Operators, and Tenders	2.71	359
537064	Packers and Packagers, Hand	2.48	328
519198	Helpers—Production Workers	1.99	264
516021	Pressers, Textile, Garment, and Related Materials	1.44	190
439061	Office Clerks, General	1.20	159
499041	Industrial Machinery Mechanics	1.16	153
111021	General and Operations Managers	1.10	145
434051	Customer Service Representatives	1.03	137
435061	Production, Planning, and Expediting Clerks	0.97	128
499042	Maintenance and Repair Workers, General	0.89	118
434151	Order Clerks	0.82	109
113051	Industrial Production Managers	0.76	100
516092	Fabric and Apparel Patternmakers	0.71	94
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.71	94
515023	Printing Machine Operators	0.64	85
433031	Bookkeeping, Accounting, and Auditing Clerks	0.63	83
435081	Stock Clerks and Order Fillers	0.49	65
431011	First-Line Supervisors/Managers of Office and Administrative	0.48	64
412031	Retail Salespersons	0.44	58
433021	Billing and Posting Clerks and Machine Operators	0.39	51
499043	Maintenance Workers, Machinery	0.38	50
172112	Industrial Engineers	0.36	47

SOC Code	Occupational Classification	Percent of Total	Number of Workers
414012	Sales Representative, Wholesale and Manufacturing	0.34	45
433051	Payroll and Timekeeping Clerks	0.32	42
113031	Financial Managers	0.32	42
113061	Purchasing Managers	0.30	40
436014	Secretaries, Except Legal, Medical, and Executive	0.29	39
112022	Sales Managers	0.29	38
132011	Accountants and Auditors	0.24	32
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.23	30
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.22	29
436011	Executive Secretaries and Administrative Assistants	0.20	27
151021	Computer Programmers	0.20	26
119199	Managers, All Other	0.19	25
112021	Marketing Managers	0.18	24
519031	Cutters and Trimmers, Hand	0.17	23
533032	Truck Drivers, Heavy and Tractor-Trailer	0.17	22
113021	Computer and Information Systems Managers	0.17	22
113040	Human Resources Managers	0.15	20
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.15	20
434171	Receptionists and Information Clerks	0.15	20
271022	Fashion Designers	0.14	19
113011	Administrative Services Managers	0.14	18
537063	Machine Feeders and Offbearers	0.14	18
439011	Computer Operators	0.11	14
111011	Chief Executives	0.10	13
151041	Computer Support Specialists	0.10	13
533033	Truck Drivers, Light or Delivery Services	0.10	13
499098	Helpers—Installation, Maintenance, and Repair Workers	0.09	12
411011	First-Line Supervisors/Managers of Retail Sales Workers	0.07	9
271024	Graphic Designers	0.07	9
519032	Cutting and Slicing Machine Setters, Operators, and Tenders	0.05	7
131071	Employment, Recruitment, and Placement Specialists	0.04	5
371011	First-Line Supervisors/Managers of Housekeeping and Janitors	0.03	4

Table VIII
Occupations in Apparel Knitting Mills Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
516031	Sewing Machine Operators	17.57	3,374

SOC Code	Occupational Classification	Percent of Total	Number of Workers
519061	Textile Knitting and Weaving Machine Setters, Operators, and Tenders	13.08	2,512
537064	Packers and Packagers	8.99	1,726
516021	Pressers, Textile, Garment, and Related Materials	7.26	1,395
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	6.18	1,187
499041	Industrial Machinery Mechanics	5.71	1,097
516061	Textile Bleaching and Dyeing Machine Operators and Tenders	3.24	623
511011	First-Line Supervisors/Managers of Production and Operating	3.23	620
537062	Laborers and Freight, Stock, and Material Movers, Hand	3.09	593
516099	Textile, Apparel, and Furnishings Workers, All Other	2.64	506
512092	Team Assemblers	2.23	428
519111	Packaging and Filling Machine Operators and Tenders	1.87	259
519198	Helpers—Production Workers	1.79	343
111021	General and Operations Managers	1.46	281
435071	Shipping, Receiving, and Traffic Clerks	1.02	195
435061	Production, Planning, and Expediting Clerks	0.98	189
499043	Maintenance Workers, Machinery	0.93	179
499042	Maintenance and Repair Workers, General	0.87	167
439061	Office Clerks, General	0.78	150
433031	Bookkeeping, Accounting, and Auditing Clerks	0.71	136
435081	Stock Clerks and Order Fillers	0.65	125
537051	Industrial Truck and Tractor Operators	0.61	118
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.59	114
434051	Customer Service Representatives	0.59	113
537063	Machine Feeders and Offbearers	0.53	101
431011	First-Line Supervisors/Managers of Office and Administrative	0.49	95
113051	Industrial Production Managers	0.49	94
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.43	83
111011	Chief Executives	0.41	79
112022	Sales Managers	0.41	79
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.41	78
433021	Billing and Posting Clerks and Machine Operators	0.39	74
113031	Financial Managers	0.38	73
433051	Payroll and Timekeeping Clerks	0.35	67
414012	Sales Representatives, Wholesale and Manufacturing	0.31	60
434151	Order Clerks	0.30	58
151021	Computer Programmers	0.27	51

SOC Code	Occupational Classification	Percent of Total	Number of Workers
132011	Accountants and Auditors	0.24	46
531021	First-Line Supervisors/Managers of Helpers, Laborers, and Machine Operators	0.24	46
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.23	45
113021	Computer and Information Systems Managers	0.23	44
113040	Human Resources Managers	0.21	40
172112	Industrial Engineers	0.20	39
436011	Executive Secretaries and Administrative Assistants	0.20	38
113011	Administrative Services Managers	0.19	37
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.18	35
515023	Printing Machine Operators	0.17	33
434171	Receptionists and Information Clerks	0.16	30
271022	Fashion Designers	0.15	29
436014	Secretaries, Except Legal, Medical, and Executive	0.14	26
533033	Truck Drivers, Light or Delivery Services	0.12	24
379099	Building and Grounds Cleaning and Maintenance Workers, All Other	0.12	23
432011	Switchboard Operators, Including Answering Service	0.09	18
439021	Data Entry Keyers	0.09	17
151061	Database Administrators	0.08	16
151041	Computer Support Specialists	0.08	15
433061	Procurement Clerks	0.08	15
119041	Engineering Managers	0.07	14
439011	Computer Operators	0.07	13
131073	Training and Development Specialists	0.06	12
516092	Fabric and Apparel Patternmakers	0.06	11
472111	Electricians	0.05	9
271024	Graphic Designers	0.05	9
131071	Employment, Recruitment, and Placement Specialists	0.05	9
194031	Chemical Technicians	0.04	8
112011	Advertising and Promotions Managers	0.04	8
151071	Network and Computer Systems Administrators	0.04	7
411011	First-Line Supervisors/Managers of Retail Sales Workers	0.03	6
299010	Occupational Health and Safety Specialists and Technicians	0.03	5
518021	Stationary Engineers and Boiler Operators	0.02	4
172111	Health and Safety Engineers, Except Mining Safety Engineers	0.02	3

Table IX
Occupations in Textile Furnishings Mills Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
516031	Sewing Machine Operators	19.26	2,044
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	9.93	1,054
516063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders	4.78	507
511011	First-Line Supervisors/Managers of Production and Operations	4.13	438
516062	Textile Cutting Machine Setters, Operators, and Tenders	4.05	430
537051	Industrial Truck and Tractor Operators	3.64	386
516099	Textile, Apparel, and Furnishings Workers, All Other	3.60	382
537064	Packers and Packagers, Hand	3.18	337
519198	Helpers—Production Workers	2.54	270
512092	Team Assemblers	2.40	255
435081	Stock Clerks and Order Fillers	2.28	242
499041	Industrial Machinery Mechanics	2.15	228
537062	Laborers and Freight, Stock, and Material Movers, Hand	1.92	204
499042	Maintenance and Repair Workers, General	1.84	195
435071	Shipping, Receiving, and Traffic Clerks	1.71	182
516064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	1.56	166
519111	Packaging and Filling Machine Operators and Tenders	1.40	149
111021	General and Operations Managers	1.29	137
435061	Production, Planning, and Expediting Clerks	1.17	124
519031	Cutters and Trimmers, Hand	1.05	111
434051	Customer Service Representatives	1.02	108
516092	Fabric and Apparel Patternmakers	0.92	98
439061	Office Clerks, General	0.75	80
519199	Production Workers, All Other	0.64	68
113051	Industrial Production Managers	0.58	62
433031	Bookkeeping, Accounting, and Auditing Clerks	0.54	57
434151	Order Clerks	0.53	56
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.50	53
414012	Sales Representatives, Wholesale and Manufacturing	0.48	51
514031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders	0.48	51
431011	First-Line Supervisors/Managers of Office and Administrative	0.47	50
172112	Industrial Engineers	0.41	44
531021	First-Line Supervisors/Managers of Helpers and Laborers	0.37	39
533033	Truck Drivers, Light or Delivery Services	0.34	36
433051	Payroll and Timekeeping Clerks	0.34	36

SOC Code	Occupational Classification	Percent of Total	Number of Workers
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.34	36
412031	Retail Salespersons	0.31	33
151021	Computer Programmers	0.30	32
519032	Cutting and Slicing Machine Setters, Operators, and Tenders	0.30	32
113031	Financial Managers	0.29	31
113040	Human Resources Managers	0.27	29
173026	Industrial Engineering Technicians	0.25	27
436011	Executive Secretaries and Administrative Assistants	0.25	27
132011	Accountants and Auditors	0.25	27
472111	Electricians	0.23	24
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.23	24
433021	Billing and Postal Clerks and Machine Operators	0.22	23
434171	Receptionists and Information Clerks	0.20	21
151041	Computer Support Specialists	0.20	21
113021	Computer and Information Specialists	0.20	21
533032	Truck Drivers, Heavy and Tractor-Trailer	0.17	18
499098	Helpers—Installation, Maintenance, and Repair Workers	0.15	16
112021	Marketing Managers	0.15	16
112022	Sales Managers	0.14	15
173099	Drafters, Engineering, and Mapping Technicians, All Other	0.14	15
499099	Installation, Maintenance, and Repair Workers, All Other	0.13	14
151071	Network and Computer Systems Administrators	0.12	13
439011	Computer Operators	0.12	13
131051	Cost Estimators	0.12	13
119041	Engineering Managers	0.11	12
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.11	12
113061	Purchasing Managers	0.09	10
151061	Database Administrators	0.09	19
113011	Administrative Services Managers	0.08	9
299010	Occupational Health and Safety Specialists and Technicians	0.07	7
432011	Switchboard Operators, Including Answering Service	0.06	6
436014	Secretaries, Except Legal, Medical, and Executive	0.06	6
111011	Chief Executives	0.05	5
411011	First-Line Supervisors/Managers of Retail Sales Workers	0.04	4
291111	Registered Nurses	0.04	4

SOC Code	Occupational Classification	Percent of Total	Number of Workers
439999	Secretaries, Administrative Assistants, and Other Office Support	0.03	3
113071	Transportation, Storage, and Distribution Managers	0.03	3

Table X
Occupations in Textile and Fabric Finishing and Fabric Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
516061	Textile Bleaching and Dyeing Machine Operators and Tenders	11.23	2,267
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	7.22	1,457
516064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	6.72	1,356
537062	Laborers and Freight, Stock, and Material Movers, Hand	5.43	1,096
516099	Textile, Apparel, and Furnishings Workers, All Other	4.44	896
537064	Packers and Packagers, Hand	4.32	871
511011	First-Line Supervisors/Managers of Production and Operations	4.26	860
516031	Sewing Machine Operators	4.07	822
516062	Textile Cutting Machine Setters, Operators, and Tenders	3.39	685
537051	Industrial Truck and Tractor Operators	3.01	608
516063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders	2.95	596
435071	Shipping, Receiving, and Traffic Clerks	2.60	525
519111	Packaging and Filling Machine Operators and Tenders	2.29	462
512092	Team Assemblers	2.11	426
499042	Maintenance and Repair Workers, General	2.05	413
499041	Industrial Machinery Mechanics	1.93	389
515023	Printing Machine Operators	1.70	343
435061	Production, Planning, and Expediting Clerks	1.68	339
537063	Machine Feeders and Offbearers	1.63	329
519199	Production Workers, All Other	1.55	312
516021	Pressers, Textile, Garment, and Related Materials	1.41	284
111021	General and Operations Managers	1.39	280
519198	Helpers—Production Workers	1.20	243
113051	Industrial Production Managers	1.11	225
431011	First-Line Supervisors/Managers of Office and Administrative	1.02	206
439061	Office Clerks, General	1.02	205
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.74	150
435081	Stock Clerks and Order Fillers	0.73	148

SOC Code	Occupational Classification	Percent of Total	Number of Workers
516091	Extruding and Forming Machine Setters, Operators, and Tenders	0.73	148
519023	Mixing and Blending Machine Setters, Operators, and Tenders	0.72	146
414012	Sales Representatives, Wholesale and Manufacturing	0.68	138
434051	Customer Service Representatives	0.65	132
533032	Truck Drivers, Heavy and Tractor-Trailer	0.59	120
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.48	97
194031	Chemical Technicians	0.45	90
531021	First-Line Supervisors/Managers of Helpers and Laborers	0.44	88
433031	Bookkeeping, Accounting, and Auditing Clerks	0.40	81
172112	Industrial Engineers	0.39	78
433021	Billing and Posting Clerks and Machine Operators	0.38	76
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.38	76
492094	Electrical and Electronics Repairers, Commercial and Industrial	0.37	74
434151	Order Clerks	0.35	70
472111	Electricians	0.32	65
537061	Cleaners of Vehicles and Equipment	0.27	54
112022	Sales Managers	0.25	51
519032	Cutting and Slicing Machine Setters, Operators, and Tenders	0.24	49
433051	Payroll and Timekeeping Clerks	0.23	47
436011	Executive Secretaries and Administrative Assistants	0.22	45
111011	Chief Executives	0.21	43
132011	Accountants and Auditors	0.21	43
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.21	42
518021	Stationary Engineers and Boiler Operators	0.19	38
514041	Machinists	0.19	38
492092	Electric Motor, Power Tool, and Related Repairers	0.18	36
436014	Secretaries, Except Legal, Medical, and Executive	0.18	36
432011	Switchboard Operators, Including Answering Service	0.17	35
113061	Purchasing Managers	0.17	35
192031	Chemists	0.15	31
519051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	0.15	31
439021	Data Entry Keyers	0.15	30
533033	Truck Drivers, Light or Delivery Services	0.15	30
113031	Financial Managers	0.14	29

SOC Code	Occupational Classification	Percent of Total	Number of Workers
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.14	29
131073	Training and Development Specialists	0.14	29
499098	Helpers—Installation, Maintenance, and Repair Workers	0.14	28
113040	Human Resources Managers	0.14	28
434171	Receptionists and Information Clerks	0.13	27
151021	Computer Programmers	0.13	27
433061	Procurement Clerks	0.12	25
119041	Engineering Managers	0.12	25
113021	Computer and Information Systems Managers	0.12	25
173026	Industrial Engineering Technicians	0.12	24
439999	Secretaries, Administrative Assistants, and Other Office Support	0.12	24
271022	Fashion Designers	0.09	18
516051	Sewers, Hand	0.08	17
411012	First-Line Supervisors/Managers of Non-Retail Sales Workers	0.07	15
172141	Mechanical Engineers	0.07	14
151041	Computer Support Specialists	0.06	13
499021	Heating, Air Conditioning, and Refrigeration Mechanics	0.06	13
271099	Art and Design Workers, All Other	0.06	12
299010	Occupational Health and Safety Specialists and Technicians	0.05	11
412031	Retail Salespersons	0.05	11
531031	First-Line Supervisors/Managers of Transportation and Materials Workers	0.04	9
472152	Plumbers, Pipefitters, and Steamfitters	0.04	8
291111	Registered Nurses	0.04	8
172041	Chemical Engineers	0.03	7
119199	Managers, All Other	0.03	7
131022	Wholesale and Retail Buyers, Except Farm Products	0.03	7
131071	Employment, Recruitment, and Placement Specialists	0.03	6
131072	Compensation, Benefits, and Job Analysis Specialists	0.03	6
113011	Administrative Services Managers	0.02	5
112021	Marketing Managers	0.02	5
472031	Carpenters	0.02	5
151071	Network and Computer Systems Administrators	0.02	4
151061	Database Administrators	0.01	3

Packaged Food Products

Table XI
Occupations in Animal Food Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
533032	Truck Drivers, Heavy and Tractor-Trailer	16.10	253
519023	Mixing and Blending Machine Setters, Operators, and Tenders	6.87	108
537062	Laborers and Freight, Stock, and Material Movers, Hand	5.60	88
519021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	4.33	68
511011	First-Line Supervisors/Managers of Production and Operating	4.26	67
519111	Packaging and Filling Machine Operators and Tenders	4.01	63
414012	Sales Representatives, Wholesale and Manufacturing	3.95	62
499042	Maintenance and Repair Workers, General	3.50	55
537064	Packers and Packagers, Hand	3.25	51
452093	Farmworkers, Farm and Ranch Animals	3.12	49
435071	Shipping, Receiving, and Traffic Clerks	2.61	41
434151	Order Clerks	2.42	38
433031	Bookkeeping, Accounting, and Auditing Clerks	1.78	28
113051	Industrial Production Managers	1.78	28
533033	Truck Drivers, Light or Delivery Services	1.53	24
499041	Industrial Machinery Mechanics	1.53	24
433021	Billing and Posting Clerks and Machine Operators	1.40	22
439061	Office Clerks, General	1.15	18
513092	Food Batchmakers	1.15	18
519198	Helpers—Production Workers	1.15	18
493031	Bus and Truck Mechanics and Diesel Engine Specialists	1.02	16
111021	General and Operations Managers	0.95	15
537051	Industrial Truck and Tractor Operators	0.89	14
531031	First-Line Supervisors/Managers of Transportation and Materials	0.70	11
436014	Secretaries, Except Legal, Medical, and Executive	0.70	11
436011	Executive Secretaries and Administrative Assistants	0.51	8
132011	Accountants and Auditors	0.51	8
112022	Sales Managers	0.45	7
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.45	7
412011	Cashiers	0.38	6
113051	Financial Managers	0.32	5
113071	Transportation, Storage, and Distribution Managers	0.25	4
433051	Payroll and Timekeeping Clerks	0.25	4

SOC Code	Occupational Classification	Percent of Total	Number of Workers
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.25	4

Table XII
Occupations in Animal Slaughtering and Processing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
513023	Slaughterers and Meat Packers	37.86	12.235
513022	Meat, poultry, and Fish Cutters and Trimmers	18.37	5,936
537064	Packers and Packagers, Hand	3.42	1,105
537062	Laborers and Freight, Stock, and Material Movers, Hand	2.77	894
499042	Maintenance and Repair Workers, General	2.70	871
511011	First-Line Supervisors/Managers of Production and Operations	2.61	843
519198	Helpers—Production Workers	2.25	726
533032	Truck Drivers, Heavy and Tractor-Trailer	1.84	595
519111	Packaging and Filling Machine Operators and Tenders	1.81	586
537063	Machine Feeders and Offbearers	1.62	524
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	1.52	490
537061	Cleaners of Vehicles and Equipment	1.47	474
499041	Industrial Machinery Mechanics	1.42	458
372011	Janitors and Cleaners, Except Maids and Housekeeping	1.18	382
537051	Industrial Truck and Tractor Operators	0.96	311
519192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	0.85	276
113051	Industrial Production Managers	0.83	268
452093	Farmworkers, Farm and Ranch Animals	0.83	268
519193	Cooling and Freezing Equipment Operators and Tenders	0.74	239
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.67	217
519032	Cutting and Slicing Machine Setters, Operators, and Tenders	0.66	214
439061	Office Clerks, General	0.63	203
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.49	157
435071	Shipping, Receiving, and Traffic Clerks	0.40	129
414012	Sales Representatives, Wholesale and Manufacturing	0.39	126
433031	Bookkeeping, Accounting, and Auditing Clerks	0.36	117
513092	Food Batchmakers	0.35	112
111021	General and Operations Managers	0.32	104
519023	Mixing and Blending Machine Operators	0.32	103
531021	First-Line Supervisors/ Managers of Helpers and Laborers	0.30	98
493031	Bus and Truck Mechanics and Engine Specs	0.29	95

SOC Code	Occupational Classification	Percent of Total	Number of Workers
499043	Maintenance Workers, Machinery	0.29	93
435081	Stock Clerks and Order Fillers	0.27	88
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.23	75
435061	Production, Planning, and Expediting Clerks	0.23	75
431011	First-Line Supervisors/Managers of Office and Administrative	0.20	64
434151	Order Clerks	0.18	59
533033	Truck Drivers, Light or Delivery Services	0.18	57
499021	Heating, Air Conditioning, and Refrigeration Mechanics	0.16	53
436014	Secretaries, Except Legal, Medical, and Executive	0.16	51
433021	Billing and Posting Clerks and Machine Operators	0.15	47
113071	Transportation, Storage, and Distribution Managers	0.15	47
519041	Extruding, Forming, Pressing, and Compacting Machine Setters	0.14	45
436011	Executive Secretaries and Administrative Assistants	0.14	44
433051	Payroll and Timekeeping Clerks	0.13	42
113040	Human Resources Managers	0.11	36
113031	Financial Managers	0.10	32
531031	First-Line Supervisors/ Managers of Transportation and Materials	0.09	29
132011	Accountants and Auditors	0.09	29
533031	Drivers/Sales Workers	0.08	27
434051	Customer Service Representatives	0.08	27
411012	First-Line Supervisors/Managers of Non-Retail Sales Workers	0.07	22
439021	Data Entry Keyers	0.07	22
519012	Separating, Filtering, Clarifying, Precipitating	0.07	22
112022	Sales Managers	0.07	22
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.06	21
111011	Chief Executives	0.06	18
434171	Receptionists and Information Clerks	0.05	15
131073	Training and Development Specialists	0.04	14
131071	Employment, Recruitment, and Placement Specialists	0.04	13
371011	First-Line Supervisors/Managers of Housekeeping and Janitorial Staff	0.04	13
433061	Procurement Clerks	0.04	13
131199	Business Operations Specialists, All Other	0.04	12
194031	Chemical Technicians	0.03	11
113061	Purchasing Managers	0.03	11
172111	Health and Safety Engineers, Except Mining	0.03	9
412011	Cashiers	0.03	9
432011	Switchboard Operators, Including Answering	0.02	6

SOC Code	Occupational Classification	Percent of Total	Number of Workers
112021	Marketing Managers	0.02	6
131051	Cost Estimators	0.02	5
119041	Engineering Managers	0.01	4
172141	Mechanical Engineers	0.01	3
151021	Computer Programmers	0.01	3
331099	First-Line Supervisors/Managers, Protective Service Workers	0.01	3

Table XIII
Occupations in Bakeries and Tortilla Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
537064	Packers and Packagers, Hand	21.25	1,900
513011	Bakers	10.09	902
412011	Cashiers	4.21	376
519198	Helpers—Production Workers	4.16	372
511011	First-Line Supervisors/Managers of Production and Operations	3.68	329
499042	Maintenance and Repair Workers, General	3.30	295
435071	Shipping, Receiving, and Traffic Clerks	3.29	294
533032	Truck Drivers, Heavy and Tractor-Trailer	2.91	260
513092	Food Batchmakers	2.62	234
537062	Laborers and Freight, Stock, and Material Movers, Hand	2.49	223
519023	Mixing and Blending Machine Setters, Operators, and Tenders	2.33	208
513091	Food and Tobacco Roasting, Baking, and Drying Machine Operators	1.93	173
537051	Industrial Truck and Tractor Operators	1.47	131
112022	Sales Managers	1.06	95
414012	Sales Representatives, Wholesale and Manufacturing	1.03	92
519111	Packaging and Filling Machine Operators and Tenders	0.94	84
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.92	82
353021	Combined Food Preparation and Serving Workers, Including Fast Food	0.86	77
111021	General and Operations Managers	0.83	74
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	0.76	68
531021	First-Line Supervisors/Mangers of Helpers and Laborers	0.72	64
353022	Counter Attendants, Cafeteria, Food Concession, and Coffee Servers	0.62	55
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.56	50
411011	First-Line Supervisors/Managers of Retail Sales Workers	0.55	49
113051	Industrial Production Managers	0.53	47

SOC Code	Occupational Classification	Percent of Total	Number of Workers
499041	Industrial Machinery Mechanics	0.48	43
113031	Financial Managers	0.45	40
113071	Transportation, Storage, and Distribution Managers	0.34	30
533033	Truck Drivers, Light or Delivery Services	0.34	30
436011	Executive Secretaries and Administrative Assistants	0.32	29
352021	Food Preparation Workers	0.31	28
339032	Security Guards	0.26	23
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.26	23
431011	First-Line Supervisors/Managers of Office and Administrative	0.23	21
433051	Payroll and Timekeeping Clerks	0.21	19
111011	Chief Executives	0.21	19
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.20	18
433021	Billing and Posting Clerks and Machine Operators	0.18	16
412031	Retails Salespersons	0.17	15
113040	Human Resources Managers	0.17	15
359021	Dishwashers	0.16	14
434151	Order Clerks	0.15	13
435061	Production, Planning, and Expediting Clerks	0.15	13
439011	Computer Operators	0.15	13
436014	Secretaries, Except Legal, Medical, and Executive	0.13	12
151021	Computer Programmers	0.12	11
119041	Engineering Managers	0.08	7
112011	Advertising and Promotions Managers	0.08	7
112021	Marketing Managers	0.06	5
151061	Database Administrators	0.04	4
433061	Procurement Clerks	0.04	4
434171	Receptionists and Information Clerks	0.04	4
113011	Administrative Services Managers	0.03	3

Tobacco Products Cluster

Table XIV
Occupations in Tobacco Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
519198	Helpers—Production Workers	15.33	2,112
519111	Packaging and Filling Machine Operators and Tenders	13.99	1,927
499041	Industrial Machinery Mechanics	7.99	1,101
519041	Extruding, Forming, Pressing, and Compacting Machine Setters	6.24	859
537051	Industrial Truck and Tractor Operators	5.24	722

SOC Code	Occupational Classification	Percent of Total	Number of Workers
537062	Laborers and Freight, Stock, and Material Movers, Hand	4.13	569
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	2.79	384
519023	Mixing and Blending Machine Setters, Operators, and Tenders	2.59	357
513091	Food and Tobacco Roasting, Baking, and Drying Machine Operators	2.56	353
511011	First-Line Supervisors/Managers of Production and Operating	2.48	342
519032	Cutting and Slicing Machine Setters, Operators, and Tenders	2.45	337
499042	Maintenance and Repair Workers, General	1.52	209
537063	Machine Feeders and Offbearers	0.99	136
172112	Industrial Engineers	0.96	132
131199	Business Operations Specialists, All Other	0.90	124
472111	Electricians	0.89	123
435071	Shipping, Receiving, and Traffic Clerks	0.73	101
113051	Industrial Production Managers	0.66	91
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.62	85
499043	Maintenance Workers, Machinery	0.57	79
436011	Executive Secretaries and Administrative Assistants	0.51	70
531031	First-Line Supervisors/Managers of Transportation and Materials	0.51	70
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.44	60
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.44	60
435081	Stock Clerks and Order Fillers	0.40	55
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.38	53
132011	Accountants and Auditors	0.38	53
533032	Truck Drivers, Heavy and Tractor-Trailer	0.36	50
433031	Bookkeeping, Accounting, and Auditing Clerks	0.33	45
472211	Sheet Metal Workers	0.32	44
172111	Health and Safety Engineers, Except Mining Safety Engineers	0.28	39
499021	Heating, Air Conditioning, and Refrigeration Mechanics	0.27	37
518021	Stationary Engineers and Boiler Operators	0.25	35
435061	Production, Planning, and Expediting Clerks	0.25	34
113040	Human Resources Managers	0.24	33
113031	Financial Managers	0.23	32
111021	General and Operations Managers	0.20	27
113071	Transportation, Storage, and Distribution Managers	0.17	24
151051	Computer Systems Analysts	0.16	22

SOC Code	Occupational Classification	Percent of Total	Number of Workers
499044	Millwrights	0.16	22
113021	Computer and Information Systems Managers	0.15	21
113061	Purchasing Managers	0.12	17
472152	Plumbers, Pipefitters, and Steamfitters	0.12	17
433051	Payroll and Timekeeping Clerks	0.11	15
434171	Receptionists and Information Clerks	0.10	14
492092	Electric Motor, Power Tool, and Related Repairers	0.10	14
431011	First-Line Supervisors/Managers of Office and Administrative	0.09	13
172141	Mechanical Engineers	0.09	12
439061	Office Clerks, General	0.07	10
339032	Security Guards	0.07	9
113011	Administrative Services Managers	0.07	9
119041	Engineering Managers	0.05	7
433021	Billing and Postal Clerks and Machine Operators	0.05	7

Marine Trades Cluster

Table XV
Occupations in Ship and Boat Building Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
512091	Fiberglass Laminators and Fabricators	26.28	963
512092	Team Assemblers	9.55	350
132011	Accountants and Auditors	0.30	242
511011	First-Line Supervisors/Managers of Production and Operations	4.09	150
519022	Grinding and Polishing Workers, Hand	2.16	79
499042	Maintenance and Repair Workers, General	1.86	68
537062	Laborers and Freight, Stock, and Material Movers, Hand	1.45	53
519122	Painters, Transportation Equipment	1.36	50
435081	Stock Clerks and Order Fillers	1.28	47
111021	General and Operations Managers	0.93	34
514121	Welders, Cutters, Solderers, and Brazers	0.82	30
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	0.68	25
519121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	0.68	25
514033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters	0.68	25
436011	Executive Secretaries and Administrative Assistants	0.60	22
414012	Sales Representatives, Wholesale and Manufacturing	0.57	21
439061	Office Clerks, General	0.52	19
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.49	18

SOC Code	Occupational Classification	Percent of Total	Number of Workers
433031	Bookkeeping, Accounting, and Auditing Clerks	0.46	17
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.46	17
113051	Industrial Production Managers	0.44	16
514041	Machinists	0.44	16
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.38	14
435071	Shipping, Receiving, and Traffic Clerks	0.33	12
472111	Electricians	0.33	12
173026	Industrial Engineering Technicians	0.33	12
112022	Sales Managers	0.33	12
111011	Chief Executives	0.30	11
113031	Financial Managers	0.25	9
119041	Engineering Managers	0.25	9
431011	First-Line Supervisors/Managers of Office and Administrative	0.22	8
434171	Receptionists and Information Clerks	0.22	8
533033	Truck Drivers, Light or Delivery Services	0.19	7
112021	Marketing Managers	0.19	7
151051	Computer Systems Analysts	0.16	6
113061	Purchasing Managers	0.16	6
113040	Human Resources Managers	0.14	5
113011	Administrative Services Managers	0.11	4
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.08	3

Hotels and Transportation Services Cluster

Table XVI
Occupations in Traveler Accommodation Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
372012	Maids and Housekeeping Cleaners	29.79	10,872
434081	Hotel, Motel, and Resort Desk Clerks	15.77	5,754
353031	Waiters and Waitresses	5.73	2,090
499042	Maintenance and Repair Workers, General	3.81	1,391
516011	Laundry and Dry-Cleaning, Workers	2.83	1,032
119081	Lodging Managers	2.81	1,024
353041	Food Servers, Non-restaurant	2.69	981
371011	First-Line Supervisors/Managers of Housekeeping and Janitorial	2.35	857
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	2.33	850
352014	Cooks, Restaurant	2.30	840
434181	Reservation and Transportation Ticket Agents and Travel Clerks	2.07	754
359021	Dishwashers	1.94	708
111021	General and Operations Managers	1.45	529
373011	Landscaping and Groundskeeping Workers	1.32	482
353011	Bartenders	1.26	459

SOC Code	Occupational Classification	Percent of Total	Number of Workers
359031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	1.25	457
359011	Dining Room and Cafeteria Attendants and Bartender Helpers	1.17	428
433031	Bookkeeping, Accounting, and Auditing Clerks	1.13	413
396011	Baggage Porters and Bellhops	1.11	405
412011	Cashiers	0.90	327
339032	Security Guards	0.87	319
112022	Sales Managers	0.84	308
352021	Food Preparation Workers	0.82	299
132011	Accountants and Auditors	0.79	287
351011	Chefs and Head Cooks	0.67	246
351012	First-Line Supervisors/Managers of Food Preparation and Servers	0.66	242
431011	First-Line Supervisors/Managers of Office and Administrative	0.66	241
393091	Amusement and Recreation Attendants	0.65	238
436011	Executive Secretaries and Administrative Assistants	0.63	229
119051	Food Service Managers	0.61	224
439061	Office Clerks, General	0.55	201
131121	Meeting and Convention Planners	0.54	197
352012	Cooks, Institution and Cafeteria	0.51	186
396012	Concierges	0.49	178
533041	Taxi Drivers and Chauffeurs	0.41	150
432011	Switchboard Operators, Including Answering Service	0.41	149
379099	Building and Grounds Cleaning and Maintenance Workers, All Other	0.36	130
434051	Customer Service Representatives	0.30	108
399032	Recreation Workers	0.28	103
352015	Cooks, Short Order	0.27	97
371012	First-Line Supervisors/Managers of Landscaping, Lawn Service	0.24	89
113031	Financial Managers	0.24	89
353022	Counter Attendants, Cafeteria, Food Concession, and Coffee Servers	0.24	86
436014	Secretaries, Except Legal, Medical, and Executive	0.22	79
359099	Food Preparation and Serving Related Workers, All Other	0.21	75
536021	Parking Lot Attendants	0.20	74
434171	Receptionists and Information Clerks	0.20	73
113011	Administrative Services Managers	0.15	56
433021	Billing and Posting Clerks and Machine Operators	0.15	53
113040	Human Resources Managers	0.12	43
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.12	42
419031	Sales Engineers	0.12	42

SOC Code	Occupational Classification	Percent of Total	Number of Workers
419099	Sales and Related Workers, All Others	0.11	41
513011	Bakers	0.11	41
433051	Payroll and Timekeeping Clerks	0.11	39
112011	Advertising and Promotions Managers	0.10	37
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.08	31
411011	First-Line Supervisors/Managers of Retail Sales Workers	0.07	25
391021	First-Line Supervisors/Managers of Personal Service Workers	0.07	24
435071	Shipping, Receiving, and Traffic Clerks	0.06	22
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.06	22
119199	Managers, All Other	0.05	20
113061	Purchasing Managers	0.04	14
271023	Floral Designers	0.03	10
411012	First-Line Supervisors/Managers of Non-Retail Sales Workers	0.02	7
511011	First-Line Supervisors/Managers of Production and Operations	0.02	6
151041	Computer Support Specialists	0.01	5
331099	First-Line Supervisors/Managers, Protective Service Workers	0.01	5
111011	Chief Executives	0.01	4
273031	Public Relations Specialists	0.01	3

Pharmaceuticals Cluster

Table XVII
Occupations in Pharmaceutical and Medicine Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
499042	Maintenance and Repair Workers, General	4.22	869
519012	Separating, Filtering, Clarifying, Precipitating, and Still	4.02	827
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	3.53	726
511011	First-Line Supervisors/Managers of Production and Operations	2.72	561
519023	Mixing and Blending Machine Setters, Operators, and Tenders	2.32	477
131199	Business Operations Specialists, All Other	1.87	385
194031	Chemical Technicians	1.71	353
436011	Executive Secretaries and Administrative Assistants	1.62	334
194021	Biological Technicians	1.50	308
434051	Customer Service Representatives	1.15	237
113051	Industrial Production Managers	1.10	227
191021	Biochemists and Biophysicists	1.01	207

SOC Code	Occupational Classification	Percent of Total	Number of Workers
172112	Industrial Engineers	0.93	192
119199	Managers, All Other	0.67	137
435071	Shipping, Receiving, and Traffic Clerks	0.59	122
518091	Chemical Plant and System Operators	0.53	109
435061	Production, Planning, and Expediting Clerks	0.52	108
435081	Stock Clerks and Order Fillers	0.48	99
433031	Bookkeeping, Accounting, and Auditing Clerks	0.48	99
191022	Microbiologists	0.47	97
111021	General and Operations Managers	0.47	96
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.45	92
131041	Compliance Officers, Except Agriculture, Construction, and Health	0.41	84
434999	Financial, Information, and Record Clerks, All Other	0.39	81
431011	First-Line Supervisors/Managers of Office and Administrative	0.39	80
119041	Engineering Managers	0.36	75
439061	Office Clerks, General	0.34	70
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.32	65
173026	Industrial Engineering Technicians	0.28	57
113061	Purchasing Managers	0.27	55
131073	Training and Development Specialists	0.27	55
151061	Database Administrators	0.23	48
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.21	43
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.21	43
151071	Network and Computer Systems Administrators	0.20	42
439999	Secretaries, Administrative Assistants, and Other Office Support	0.20	42
172141	Mechanical Engineers	0.15	31
172111	Health and Safety Engineers, Except Mining Safety Engineers	0.15	31
151099	Computer Specialists, All Other	0.15	30
291111	Registered Nurses	0.14	29
113071	Transportation, Storage, and Distribution Managers	0.14	29
173027	Mechanical Engineering Technicians	0.13	27
492094	Electrical and Electronics Repairers, Commercial and Industrial	0.13	26
151031	Computer Software Engineers, Applications	0.12	25
433061	Procurement Clerks	0.11	23
439011	Computer Operators	0.11	23
111011	Chief Executives	0.11	22
192032	Materials Scientists	0.10	21
434151	Order Clerks	0.09	19
113011	Administrative Services Managers	0.08	17

SOC Code	Occupational Classification	Percent of Total	Number of Workers
434171	Receptionists and Information Clerks	0.07	15
433051	Payroll and Timekeeping Clerks	0.07	15
533041	Taxi Drivers and Chauffeurs	0.07	14
151081	Network Systems and Data Communications Analysts	0.06	13
132051	Financial Analysts	0.05	11
434071	File Clerks	0.04	9
433021	Billing and Posting Clerks and Machine Operators	0.03	7
371011	First-Line Supervisors/Managers of Housekeeping and Janitorial	0.03	7
472111	Electricians	0.03	6
172071	Electrical Engineers	0.02	5
432011	Switchboard Operators, Including Answering Service	0.01	3

Concrete and Building Block Products Cluster

Table XVIII
Occupations in Cement and Concrete Product Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
533032	Truck Drivers, Heavy and Tractor-Trailer	33.27	2,115
519195	Molders, Shapers, and Casters, Except Metal and Plastic	6.12	389
537062	Laborers and Freight, Stock, and Material Movers, Hand	4.62	294
472051	Cement Masons and Concrete Finishers	3.19	203
111021	General and Operations Managers	3.15	200
414012	Sales Representatives, Wholesale and Manufacturing	3.05	194
537051	Industrial Truck and Tractor Operators	2.99	190
472073	Operating Engineers and Other Construction Equipment Operators	2.82	179
519023	Mixing and Blending Machine Setters, Operators, and Tenders	2.60	165
511011	First-Line Supervisors/Managers of Production and Operations	2.12	135
433031	Bookkeeping, Accounting, and Auditing Clerks	1.97	125
531031	First-Line Supervisors/Managers of Transportation and Materials	1.89	120
512092	Team Assemblers	1.82	116
435032	Dispatchers, Except Police, Fire, and Ambulance	1.81	115
493031	Bus and Truck Mechanics and Diesel Engine Specialists	1.78	113
519041	Extruding, Forming, Pressing, and Compacting Machine Setters	1.40	89
533033	Truck Drivers, Light or Delivery Services	1.29	82
499042	Maintenance and Repair Workers, General	1.24	79

SOC Code	Occupational Classification	Percent of Total	Number of Workers
472061	Construction Laborers	1.18	75
514121	Welders, Cutters, Solderers, and Brazers	0.98	62
519198	Helpers—Production Workers	0.96	61
113051	Industrial Production Managers	0.93	59
436011	Executive Secretaries and Administrative Assistants	0.82	52
472031	Carpenters	0.79	50
436014	Secretaries, Except Legal, Medical, and Executive	0.72	46
433021	Billing and Posting Clerks and Machine Operators	0.71	45
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	0.71	45
439061	Office Clerks, General	0.69	44
434151	Order Clerks	0.63	40
434051	Customer Service Representatives	0.61	39
493042	Mobile Heavy Equipment Mechanics, Except Engines	0.61	39
537072	Pump Operators, Except Wellhead Pumpers	0.61	39
471011	First-Line Supervisors/Managers of Construction Trades and Equipment	0.58	37
431011	First-Line Supervisors/Managers of Office and Administrative	0.55	35
531021	First-Line Supervisors/Managers of Helpers and Laborers	0.47	30
537021	Crane and Tower Operators	0.46	29
112022	Sales Managers	0.46	29
435071	Shipping, Receiving, and Traffic Clerks	0.42	27
435061	Production, Planning, and Expediting Clerks	0.39	25
519022	Grinding and Polishing Workers, Hand	0.39	25
519021	Crushing, Grinding, and Polishing Setters, Operators, and Tenders	0.36	23
113031	Financial Managers	0.35	22
419031	Sales Engineers	0.27	17
499043	Maintenance Workers, Machinery	0.27	17
411012	First-Line Supervisors/Managers of Non-Retail Workers	0.25	16
433051	Payroll and Timekeeping Clerks	0.25	16
111011	Chief Executives	0.20	13
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.20	13
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.19	12
131051	Cost Estimators	0.17	11
132011	Accountants and Auditors	0.17	11
472111	Electricians	0.17	11
499041	Industrial Machinery Mechanics	0.16	10
119021	Construction Managers	0.14	9
537011	Conveyer Operators and Tenders	0.13	8
434171	Receptionists and Information Clerks	0.13	8

SOC Code	Occupational Classification	Percent of Total	Number of Workers
432011	Switchboard Operators, Including Answering Service	0.13	8
172112	Industrial Engineers	0.11	7
435081	Stock Clerks and Order Fillers	0.11	7
112021	Marketing Managers	0.11	7
113071	Transportation, Storage, and Distribution Managers	0.11	7
113040	Human Resources Managers	0.09	6
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.08	5
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.06	4
433011	Bill and Account Collectors	0.06	4
119041	Engineering Managers	0.06	4

Wood Building Products Cluster

Table XIX
Occupations in Household and Institutional Furniture Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
516093	Upholsterers	10.69	5,892
517011	Cabinetmakers and Bench Carpenters	8.59	4,734
516031	Sewing Machine Operators	7.47	4,116
517042	Woodworking Machine Setters, Operators, and Tenders	6.51	3,587
517021	Furniture Finishers	6.02	3,320
512092	Team Assemblers	4.74	2,611
511011	First-Line Supervisors/Managers of Production and Operations	4.20	2,314
519198	Helpers—Production Workers	4.17	2,299
519031	Cutters and Trimmers, Hand	3.84	2,118
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	2.88	1,587
517041	Sawing Machine Setters, Operators, and Tenders, Wood	2.47	1,362
537062	Laborers and Freight, Stock, and Material Movers, Hand	2.42	1,336
537064	Packers and Packagers, Hand	1.92	1,057
519121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	1.78	984
516062	Textile Cutting Machine Setters, Operators, and Tenders	1.30	719
435071	Shipping, Receiving, and Traffic Clerks	1.15	634
434051	Customer Service Representatives	1.07	589
519111	Packaging and Filling Machine Operators and Tenders	1.06	586
519022	Grinding and Polishing Workers, Hand	1.06	584
113051	Industrial Production Managers	1.05	577
499042	Maintenance and Repair Workers, General	1.00	554

SOC Code	Occupational Classification	Percent of Total	Number of Workers
516092	Fabric and Apparel Patternmakers	0.98	542
439061	Office Clerks, General	0.91	504
514121	Welders, Cutters, Solderers, and Brazers	0.87	482
414012	Sales Representatives, Wholesale and Manufacturing	0.86	472
514041	Machinists	0.82	453
435061	Production, Planning, and Expediting Clerks	0.79	436
537051	Industrial Truck and Tractor Operators	0.77	423
434151	Order Clerks	0.74	410
111021	General and Operations Managers	0.69	380
516099	Textile, Apparel, and Furnishings Workers, All Other	0.67	369
533032	Truck Drivers, Heavy and Tractor-Trailer	0.60	333
519191	Cementing and Gluing Machine Operators and Tenders	0.58	321
433031	Bookkeeping, Accounting, and Auditing Clerks	0.55	306
514072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders	0.55	303
435081	Stock Clerks and Order Fillers	0.53	292
472031	Carpenters	0.47	261
519123	Painting, Coating, and Decorating Workers	0.42	231
372011	Janitors, Cleaners, Except Maids and Housekeeping Cleaners	0.38	212
436011	Executive Secretaries and Administrative Assistants	0.35	193
533033	Truck Drivers, Light or Delivery Services	0.33	182
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.30	167
514031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders	0.30	163
113031	Financial Managers	0.29	162
531021	First-Line Supervisors/Managers of Helpers and Laborers	0.28	156
517099	Woodworkers, All Other	0.27	148
112022	Sales Managers	0.26	144
517031	Model Makers, Wood	0.25	137
433021	Billing and Posting Clerks and Machine Operators	0.24	132
433051	Payroll and Timekeeping Clerks	0.23	125
431011	First-Line Supervisors/Managers of Office and Administrative	0.22	124
172112	Industrial Engineers	0.22	119
499041	Industrial Machinery Mechanics	0.21	115
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.21	114
436014	Secretaries, Except Legal, Medial, and Executive	0.20	110
434171	Receptionists and Information Clerks	0.19	106
516091	Extruding and Forming Machine Setters, Operators, and Tenders	0.19	104

SOC Code	Occupational Classification	Percent of Total	Number of Workers
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.18	97
433011	Bill and Account Collectors	0.16	90
131051	Cost Estimators	0.16	88
512099	Assemblers and Fabricators, All Other	0.15	81
113040	Human Resources Managers	0.14	78
537011	Conveyor Operators and Tenders	0.14	76
132011	Accountants and Auditors	0.13	74
518021	Stationary Engineers and Boiler Operators	0.13	74
173026	Industrial Engineering Technicians	0.13	73
113021	Computer and Information Systems Managers	0.13	72
516064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	0.13	71
432011	Switchboard Operators, Including Answering Service	0.13	70
517032	Patternmakers, Wood	0.12	66
113061	Purchasing Managers	0.11	61
518099	Plant and System Operators, All Other	0.11	60
113011	Administrative Services Managers	0.11	59
472111	Electricians	0.10	57
113071	Transportation, Storage, and Distribution Managers	0.09	52
514081	Multiple Machine Tool Setters, Operators, and Tenders, Metal	0.09	49
339032	Security Guards	0.09	49
119199	Managers, All Other	0.09	48
11101	Chief Executives	0.08	43
11201	Marketing Managers	0.08	42
119041	Engineering Managers	0.07	39
412031	Retail Salespersons	0.07	39
151021	Computer Programmers	0.07	36
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.06	31
439021	Data Entry Keyers	0.06	31
434071	File Clerks	0.05	28
514194	Tool Grinders, Filers and Sharpeners	0.05	28
439011	Computer Operators	0.05	26
371011	First-Line Supervisors/Managers of Housekeeping and Janitorial	0.04	23
433061	Procurement Clerks	0.04	21
172141	Mechanical Engineers	0.04	20
131073	Training and Development Specialists	0.03	17
173013	Mechanical Drafters	0.03	15
151041	Computer Support Specialists	0.03	15
516051	Sewers, Hand	0.03	15
499043	Maintenance Workers, Machinery	0.03	14
112011	Advertising and Promotions Managers	0.03	14
411012	First-Line Supervisors/Managers of Non-Retail Sales Workers	0.02	13

SOC Code	Occupational Classification	Percent of Total	Number of Workers
131071	Employment, Recruitment, and Placement Specialists	0.02	11
471011	First-Line Supervisors/Managers of Construction Trades and Equipment	0.02	9
151061	Database Administrators	0.02	9
519051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	0.02	9
531031	First-Line Supervisors/Managers of Transportation and Materials	0.01	8
271021	Commercial and Industrial Designers	0.018	
291111	Registered Nurses	0.01	8
131072	Compensation, Benefits, and Job Analysis Specialists	0.01	6
131199	Business Operations Specialists, All Other	0.01	4

Engine Equipment Cluster

Table XX
Occupations in Motor Vehicle Parts Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
512092	Team Assemblers	17.96	3,226
512023	Electromechanical Equipment Assemblers	3.81	684
511011	First-Line Supervisors/Managers of Production and Operations	3.79	680
537063	Machine Feeders and Offbearers	3.76	676
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	3.44	618
514031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders	2.63	472
537051	Industrial Truck and Tractor Operators	2.47	444
499042	Maintenance and Repair Workers, General	1.73	310
499041	Industrial Machinery Mechanics	1.53	274
435071	Shipping, Receiving, and Traffic Clerks	1.41	253
172112	Industrial Engineers	1.35	242
516031	Sewing Machine Operators	1.35	242
514032	Drilling and Boring Machine Tool Setters, Operators, and Tenders	1.14	204
537064	Packers and Packagers, Hand	1.12	202
514072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders	1.07	193
172141	Mechanical Engineers	1.00	179
11021	General and Operations Managers	0.97	175
514191	Heat Treating Equipment Setters, Operators, and Tenders	0.86	154
514111	Tool and Die Makers	0.44	150
435061	Production, Planning, and Expediting Clerks	0.80	143
519121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	0.79	142

SOC Code	Occupational Classification	Percent of Total	Number of Workers
113051	Industrial Production Managers	0.71	128
436011	Executive Secretaries and Administrative Assistants	0.68	123
173026	Industrial Engineering Technicians	0.57	102
514023	Rolling and Machine Setters, Operators, and Tenders, Metal	0.54	97
132011	Accountants and Auditors	0.51	92
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.51	91
434051	Customer Service Representatives	0.46	83
119041	Engineering Managers	0.44	79
433031	Bookkeeping, Accounting, and Auditing Clerks	0.43	78
435081	Stock Clerks and Order Fillers	0.41	73
439061	Office Clerks, General	0.38	68
172199	Engineers, All Other	0.37	67
113031	Financial Managers	0.37	66
173013	Mechanical Drafters	0.35	63
151051	Computer Systems Analysts	0.32	58
131073	Training and Development Specialists	0.32	58
113040	Human Resources Managers	0.28	50
113061	Purchasing Managers	0.26	47
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.26	46
434151	Order Clerks	0.25	45
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.24	43
472111	Electricians	0.23	42
436014	Secretaries, Except Legal, Medial, and Executive	0.22	40
112022	Sales Managers	0.21	37
431011	First-Line Supervisors/Managers of Office and Administrative	0.21	37
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.19	35
419031	Sales Engineers	0.19	34
113021	Computer and Information Systems Managers	0.19	34
131072	Compensation, Benefits, and Job Analysis Specialists	0.19	34
131199	Business Operations Specialists, All Other	0.18	32
531021	First-Line Supervisors/Managers of Helpers and Laborers	0.17	30
499098	Helpers—Installation, Maintenance and Repair Workers	0.15	27
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.15	27
492096	Electronic Equipment Installers and Repairers, Motor Vehicle	0.14	26
113071	Transportation, Storage, and Distribution Managers	0.14	25
11101	Chief Executives	0.14	25

SOC Code	Occupational Classification	Percent of Total	Number of Workers
172131	Materials Engineers	0.14	25
151041	Computer Support Specialists	0.13	23
173099	Drafters, Engineering, and Mapping Technicians, All Other	0.13	23
131111	Management Analysts	0.12	22
172071	Electrical Engineers	0.12	21
516062	Textile Cutting Machine Setters, Operators, and Tenders	0.11	20
172072	Electronics Engineers, Except Computer	0.11	19
113011	Administrative Services Managers	0.10	18
514061	Model Makers, Metal and Plastic	0.10	18
172111	Health and Safety Engineers, Except Mining Safety Engineers	0.09	17
132031	Budget Analysts	0.09	16
151021	Computer Programmers	0.08	15
433021	Billing and Posting Clerks and Machine Operators	0.08	15
493023	Automotive Service Technicians and Mechanics	0.08	14
112021	Marketing Managers	0.07	13
434171	Receptionists and Information Clerks	0.07	13
151061	Database Administrators	0.07	13
132099	Financial Specialists, All Other	0.07	12
151032	Computer Software Engineers, Systems Software	0.06	11
173023	Electrical and Electronic Engineering Technicians	0.06	10
131071	Employment, Recruitment, and Placement Specialists	0.06	10
432011	Switchboard Operators, Including Answering Service	0.05	9
433061	Procurement Clerks	0.05	9
131051	Cost Estimators	0.02	3

Precision Instruments Cluster

Table XXI
Occupations in Medical Equipment and Supplies Manufacturing Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
519081	Dental Laboratory Technicians	14.06	951
512092	Team Assemblers	13.21	894
519082	Medical Appliance Technicians	8.90	602
537064	Packers and Packagers, Hand	7.08	479
511011	First-Line Supervisors/Managers of Production and Operations	4.74	321
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	3.50	237
435071	Shipping, Receiving, and Traffic Clerks	2.10	142
111021	General and Operations Managers	1.74	118

SOC Code	Occupational Classification	Percent of Total	Number of Workers
512022	Electrical and Electronic Equipment Assemblers	1.32	89
499042	Maintenance and Repair Workers, General	1.15	78
435081	Stock Clerks and Order Fillers	1.15	78
435061	Production, Planning, and Expediting Clerks	1.02	69
433031	Bookkeeping, Accounting, and Auditing Clerks	0.99	67
433021	Billing and Posting Clerks and Machine Operators	0.96	65
113051	Industrial Production Managers	0.92	62
537062	Laborers and Freight, Stock, and Material Movers, Hand	0.89	60
537051	Industrial Truck and Tractor Operators	0.84	57
119041	Engineering Managers	0.83	56
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.83	56
436011	Executive Secretaries and Administrative Assistants	0.80	54
414012	Sales Representatives, Wholesale and Manufacturing	0.75	51
172141	Mechanical Engineers	0.72	49
434051	Customer Service Representatives	0.67	45
431011	First-Line Supervisors/Managers of Office and Administrative	0.64	43
519198	Helpers—Production Workers	0.61	41
514041	Machinists	0.59	40
439061	Office Clerks, General	0.58	39
172112	Industrial Engineers	0.56	38
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.55	37
533033	Truck Drivers, Light or Delivery Services	0.50	34
113031	Financial Managers	0.49	33
112021	Marketing Managers	0.46	31
436014	Secretaries, Except Legal, Medical, and Executive	0.46	31
435021	Couriers and Messengers	0.46	31
514011	Computer-Controlled Machine Tool Operators, Metal and Plastics	0.44	30
132011	Accountants and Auditors	0.37	25
434151	Order Clerks	0.35	24
113021	Computer and Information Systems Managers	0.31	21
531021	First-Line Supervisors/Managers of Helpers and Installers	0.30	20
519083	Ophthalmic Laboratory Technicians	0.24	16
113040	Human Resources Managers	0.24	16
113061	Purchasing Managers	0.24	16
514111	Tool and Die Makers	0.22	15
173023	Electrical and Electronic Engineering Technicians	0.22	15
271021	Commercial and Industrial Designers	0.22	15
432011	Switchboard Operators	0.16	11

SOC Code	Occupational Classification	Percent of Total	Number of Workers
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.16	11
119199	Managers, All Other	0.16	11
112011	Advertising and Promotions Managers	0.15	10
434171	Receptionists and Information Clerks	0.15	10
131073	Training and Development Specialists	0.13	9
433051	Payroll and Timekeeping Clerks	0.12	8
439011	Computer Operators	0.10	7
131199	Business Operations Specialists, All Other	0.10	7
439021	Data Entry Keyers	0.09	6
151071	Network and Computer Systems Administrators	0.09	6
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.07	5
299199	Health Professionals and Technicians, All Other	0.07	5
113071	Transportation, Storage, and Distribution Managers	0.07	5
435111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.06	4
172071	Electrical Engineers	0.04	3

Table XXII
Occupations in Navigational, Measuring, Electromedical, and Control Instrumentation Industries

SOC Code	Occupational Classification	Percent of Total	Number of Workers
514041	Machinists	7.85	739
512092	Team Assemblers	7.46	702
512022	Electrical and Electronic Equipment Assemblers	3.91	368
511011	First-Line Supervisors/Managers of Production and Operations	2.58	243
131199	Business Operations Specialists, All Other	2.30	217
519051	Inspectors, Testers, Sorters, Samplers, and Weighers	2.03	191
434051	Customer Service Representatives	1.85	174
435071	Shipping, Receiving, and Traffic Clerks	1.81	170
514031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders	1.38	130
499042	Maintenance and Repair Workers, General	1.34	126
435061	Production, Planning, and Expediting Clerks	0.96	90
436011	Executive Secretaries and Administrative Assistants	0.93	88
119199	Managers, All Others	0.90	85
172072	Electronics Engineers, Except Computer	0.86	81
111021	General and Operations Managers	0.83	78
172141	Mechanical Engineers	0.79	74
113051	Industrial Production Managers	0.79	74
537064	Packers and Packagers, Hand	0.75	71

SOC Code	Occupational Classification	Percent of Total	Number of Workers
435081	Stock Clerks and Order Fillers	0.72	68
537062	Laborers and Freight, Stock, and Material Movers, Hand	0.70	66
433031	Bookkeeping, Accounting, and Auditing Clerks	0.66	62
439061	Office Clerks, General	0.66	62
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.64	60
372011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.59	56
492094	Electrical and Electronics Repairers, Commercial and Industrial	0.58	5455
434151	Order Clerks	0.57	54
172112	Industrial Engineers	0.57	54
173023	Electrical and Electronic Engineering Technicians	0.57	54
173024	Electro-Mechanical Technicians	0.57	54
151032	Computer Software Engineers, Systems Software	0.56	53
514011	Computer-Controlled Machine Tool Operators, Metal and Plastics	0.55	52
514121	Welders, Cutters, Solderers, and Brazers	0.50	47
151021	Computer Programmers	0.48	45
173012	Electrical and Electronics Drafters	0.47	44
112021	Marketing Managers	0.47	44
273042	Technical Writers	0.39	37
173026	Industrial Engineering Technicians	0.37	35
113031	Financial Managers	0.34	32
491011	First-Line Supervisors/Managers of Mechanics and Installers	0.34	32
173027	Mechanical Engineering Technicians	0.33	31
151011	Computer Support Specialists	0.33	31
172071	Electrical Engineers	0.32	30
514034	Lathe and Turning Machine Tool Setters, Operators, and Tenders	0.32	30
132011	Accountants and Auditors	0.31	29
113061	Purchasing Managers	0.29	27
514111	Tool and Die Makers	0.28	26
113011	Administrative Services Managers	0.27	25
173013	Mechanical Drafters	0.24	23
111011	Chief Executives	0.23	22
113040	Human Resources Managers	0.23	22
431011	First-Line Supervisors/Managers of Office and Administrative	0.22	21
434171	Receptionists and Information Clerks	0.21	20
436014	Secretaries, Except Legal, Medical, and Executive	0.21	20
434999	Financial, Information, and Record Clerks, All Other	0.18	17
192031	Chemists	0.18	17

SOC Code	Occupational Classification	Percent of Total	Number of Workers
151071	Network and Computer Systems Administrators	0.15	14
434161	Human Resources Assistants, Except Payroll and Timekeeping	0.15	14
499043	Maintenance Workers, Machinery	0.15	14
433051	Payroll and Timekeeping Clerks	0.14	13
433021	Billing and Posting Clerks and Machine Operators	0.14	13
131051	Cost Estimators	0.13	12
499021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	0.12	11
432011	Switchboard Operators, Including Answering Service	0.11	10
193021	Market Research Analysts	0.10	9
531021	First-Line Supervisors/Managers of Helpers and Laborers	0.10	9
271011	Art Directors	0.08	8
132051	Financial Analysts	0.08	8
433061	Procurement Clerks	0.07	7
339099	Protective Service Workers, All Other	0.04	4
371011	First-Line Supervisors/Managers of Housekeeping and Janitorial	0.04	4
173099	Drafters, Engineering, and Mapping Technicians, All Other	0.04	4
273041	Editors	0.03	3
131072	Compensation, Benefits, and Job Analysis Specialists	0.03	3
499098	Helpers—Installation, Maintenance, and Repair Workers	0.03	3

Appendix G
Cost Estimates for Selected New Programs

Introduction

As we indicated in the new program development section of this document (see page 75), the University has expressed an interest in immediately exploring the feasibility of launching five of the possible new programs we recommended for consideration: doctoral programs in Pharmaceutical Chemistry, Technology Systems, Biomedical Engineering, and Economics and a master's degree in Logistics and Supply Chain Management. The purpose of this appendix, accomplished in the tables below, is to estimate the cost of launching those programs over a five-year period.

Our principal assumption in estimating costs is that in order to be viable, doctoral programs need to be competitive within an appropriate range of peer institutions. To this end and for each of the fields in which ECU administrators expressed interest, we examined model programs at peer aspirant institutions in order to identify competitive levels of staffing, stipends, facilities and equipment, etc. We looked, for example, at model programs in Biomedical Engineering, and assumed for planning purposes that in order to launch a competitive program in this area, ECU would need to have or hire the average number of ranked faculty in the model programs and would need to offer a stipend that would permit it to compete effectively with those programs for students.

It is likely that some of the cost estimates below—particularly those having to do with faculty compensation—are overstated. This is because our analysis has not permitted us to see existing ECU resources that could contribute to the proposed doctoral programs. Our analysis of Biomedical Engineering, for example, indicates that ECU would need to have 6 assistant professors, 5 associate professors, and 9 full professors in order to staff the program competitively and create the possibility for a competitive research profile. Accordingly, we have estimated faculty compensation based on those numbers; but it is possible that there are some existing ECU faculty who could participate in the program; and if so, that would reduce the number of new dollars the University would need to spend in faculty compensation for the new program.

In order to allow the University to judge the impact of existing resources on the total development costs for each program, we have included an Excel workbook file (entitled Program Feasibility Estimates) on the CD attached to the back cover of this document. That workbook contains:

- Linked worksheets for each of the first five years of the program (entitled Year 1, Year 2, etc.) and for the total five-year period. (To see our estimates for what it would cost the University to operate a program in the third year, for example, go to the worksheet called Year 3.)
- Additional linked worksheets that spell out those financial assumptions that feed the annual worksheets. These financial assumptions, having to do with faculty compensation, stipends, average annual grant income, and marketing expenses, are driven principally by the number of faculty working in the programs at particular points in time. Formulas are linked between worksheets in such a way that administrators can see precisely how we derived particular figures and can change the numbers in the formulas to reflect new or more accurate assumptions.

Total cost estimates for the five-year launch period are given in the worksheet entitled "Total." These estimates do not include the costs of faculty start-up packages, since practices

related to these vary so widely from case to case that it is impossible to give definitive estimates for them. Nevertheless, we discuss the range of possible start-up costs in the sections below.

Explanation of General Financial Assumptions

The following financial assumptions hold true for all expense categories and for all programs:

- *Faculty Compensation*: The number of professors by rank is determined by the average number of professors of that rank in the model programs.[77] In the first year, we assume that faculty size will be 20% of the average size; in the second year, 40%; in the third year, 60%; in the fourth year, 80%; and in the fifth year, 100%. Salary estimates by rank are taken from the College and University Professional Association for Human Resources' National Faculty Salary Survey for the 2005-06 academic year. To estimate benefits, we use the ECU formula of 28.4% of salary.

- *Tuition and Fees*: These are taken from various ECU tuition scales, and the figures we use are the averages of in-state and out-of-state tuition. In the second and subsequent years of the program, we assume annual tuition increases of 6.5%, since this is the cap recently imposed by the University of North Carolina system. Tuition figures are multiplied by the estimated number of students in the program during a particular year, which is in turn derived from the number of faculty in that year times the average faculty-student ratio for the discipline. For research doctorates, we estimate tuition as an expense paid by the University for doctoral students—who, we assume, will always be fully supported. For professional degrees, we estimate tuition as an income, since we assume students will pay to enroll in the program.

- *Health Insurance*: We assume the University will subsidize health insurance by $500 per student, which is half of the average annual student health insurance premium. In the second and subsequent years, we assume a premium increase of 5%.

- *Stipends*: This is the average doctoral stipend for the model programs times the number of students projected to be enrolled in a particular year. In the second and subsequent years, we assume stipend increase of 5%.

- *Facilities and Equipment*: We estimate costs for these only in two cases in which we believe existing facilities may not be adequate to offer the proposed program. Because equipment needs vary from lab to lab, we give low and high ranges for these costs, based on the experience of programs in the field. Where we think expenditures for equipment will be necessary, we assume in the second and subsequent years that the University will need to spend 30% of the original cost on maintenance contracts and replacement.

- *Marketing*: Marketing expenses include funds for faculty recruiting travel ($1500 per faculty), student travel to campus ($1000 per enrolled student), national and local advertising, and the design, printing, and mailing of brochures and other promotional materials. It is possible that these may be overstated in the case of one program for which we think enrollment will be primarily local.

[77] Some of the model programs in several of the proposed fields—Pharmaceutical Chemistry, Technology Systems, Biomedical Engineering, and Economics—also have a number of research, clinical, and non-tenure track faculty. The average numbers of these are indicated in the worksheet "Faculty Compensation," but are not included in the cost estimates.

- *Total Expense*: This is given in low and high ranges for those disciplines in which there may be necessary expenditures for facilities and equipment.

- *Tuition*: as above.

- *Grants and Contracts*: The figures for Year 5 represent the average annual research income either for the model programs or for programs in the discipline for which we have data extending back five years. We assume that programs will earn 20% of these figures in the first year; 40% in the second year; 60% in the third year; and 80% in the fourth year.

- *Total Income*: the sum of grants and contracts and, where applicable, tuition revenues.

- *Net Investment*: given in low and high ranges for those disciplines in which there may be necessary expenditures for facilities and equipment.

As we have already indicated, faculty start-up packages are notoriously inconsistent and vary literally from hire to hire. One source[78] indicates that start-up packages in the sciences can range from $300,000 to $500,000; another cites the range as $175,000 - $1,000,000. In examining model programs, we have uncovered amounts far less than these; but the rule of thumb appears to be that faculty requiring equipment purchases demand much larger start-ups. The estimates below represent our best guesses on a per-discipline basis. Sometimes these are derived from the recent experience of model programs. In other cases, we have looked up the average size of an NSF equipment grant for a particular discipline. Generally speaking, associate professors require $20,000 to $50,000 more than assistant professors; full professors require $20,000 to $50,000 beyond that.

For some potential programs, we were required to individualize our assumptions. These are recorded below in conjunction with the tables.

Table XXIII
Pharmaceutical Chemistry

Expenses	
Faculty Compensation	$2,388,675
Tuition and Fees	$671,398
Health Insurance	$28,245
Stipends	$906,899
Facilities and Equipment	$14,080,000 - $17,600,000
Marketing	$129,000
Income	
Tuition and Fees	$0
Grants and Contracts	$3,446,454
Net Investment (Low)	-$15,636,418
Net Investment (High)	-$19,156,418

Faculty: Model programs had an average of one research professor and one clinical professor in addition to ranked faculty.
Start-ups: For assistant professors, $50,000; for associate professors, $90,000; for full professors: $300,000.

[78] at the National Science Foundation.

Equipment: As far as we can tell, much of the equipment required for programs in this discipline is also required for programs in general chemistry. Should ECU already have some of this, facilities and equipment costs could drop sharply. Based on examination of several model programs, the following appears to be standard for the discipline: a laser-induced breakdown spectrometer; a nuclear magnetic resonance spectrometer; a near infrared spectrometer; a gas chromotograph; a high-pressure liquid chromotograph; an atomic absorption spectrophotometer; an ultraviolet-visible spectrophotometer; a GC-mass spectrometer; a rheometer; a refractive index detector; differential pressure viscometry; a DNA synthesizer; capillary electrophoresis; a gamma counter; a densitometer; a microfluidizer; a fluid bed dryer; a spray dryer; a tablet press; a capsule-filling machine; and a high-shear mixer.

Table XXIV
Technology Systems

Expenses	
Faculty Compensation	$4,145,430
Tuition and Fees	$0
Health Insurance	$0
Stipends	$0
Facilities and Equipment	$0
Marketing	$360,000
Income	
Tuition and Fees	$853,985
Grants and Contracts	$1,823,502
Net Investment	-$1,827,943

Faculty Compensation: The program planning document indicates that the program already has more faculty than the average for the model programs. This will significantly decrease expenditures for new faculty. Model programs have an average of 2 clinical faculty and 3 non-tenure system faculty.
Start-ups: For assistant professors, $40,000; for associate professors, $70,000; for full professors: $150,000. These figures could be significantly less when there are no expenditures for equipment required.
Tuition and Fees; Health Insurance; Stipends: We do not count expenses for these since this is a professional program.
Facilities and Equipment: The planning document provided to us by the program indicates that it will require no additional equipment beyond what the College of Technology and Computer Science already has.
Tuition and Fees: We assume that half of the students will be enrolled via distance and half in the on-campus program. Tuition figures for the distance program are those set on the Continuing Education tuition schedule.

Table XXV
Biomedical Engineering

Expenses	
Faculty Compensation	$6,890,677
Tuition and Fees	$1,383,487
Health Insurance	$58,201
Stipends	$2,351,256
Facilities and Equipment	$286,000 - $5,720,000
Marketing	$255,000

Income	
Tuition and Fees	$0
Grants and Contracts	$6,917,100
Net Investment (Low)	-$6,600,577
Net Investment (High)	-$12,034,577

Faculty Compensation: Model programs have an average of 1 research faculty and 26 clinical faculty.
Start-ups: For assistant professors, $75,000; for associate professors, $125,000; for full professors: $300,000. These figures could be significantly less when there are no expenditures for equipment required.
Facilities and Equipment: Figures are based on the experience of two model programs that have developed specializations in instrumentation and on equipment grants from both the National Science Foundation and the Whitaker Foundation.

Table XXVI
Economics

Expenses	
Faculty Compensation	$7,224,180
Tuition and Fees	$1,932,813
Health Insurance	$81,311
Stipends	$2,605,356
Facilities and Equipment	$0
Marketing	$403,500
Income	
Tuition and Fees	$0
Grants and Contracts	$8,505,915
Net Investment	-$5,965,290

Faculty Compensation: Model programs have an average of 1 research faculty and 2 non-tenure-system faculty.
Start-ups: For assistant professors, $35,000; for associate professors, $50,000; for full professors: $75,000.
Grants and Contracts: We have found no model programs in Risk Economics and have been required to use start-up costs and grant figures for programs in Applied Economics, some of which focus on agriculture. Our sense is that this skews figures for both grants and start-up packages, and we think that a program in Risk Economics would be significantly cheaper. However, we caution against development by synecdoche, as we discussed above in the general section of this document.

Table XXVII
Logistics

Expenses	
Faculty Compensation	$4,238,961
Tuition and Fees	$0
Health Insurance	$0
Stipends	$0
Facilities and Equipment	$0
Marketing	$201,600

Income	
Tuition and Fees	$2,425,188
Grants and Contracts	$3,886,602
Net Investment	$1,871,229

Faculty Compensation: Salary figures used are the average salaries for both business faculty and technology management faculty, which are sometimes located in Colleges of Engineering. Model programs have an average of 2 non-tenure-system faculty.
Start-ups: For assistant professors, $25,000; for associate professors, $40,000; for full professors: $55,000. These costs reflect start-up funding for engineering rather than business faculty.
Tuition and Fees; Health Insurance; Stipends: We do not count expenses for these since this is a professional program.

Maritime Studies

In addition to some of the possible new programs we recommended for consideration, ECU administrators also asked us to provide cost estimates for a possible Ph.D. program in Maritime Studies, which we provide in Table XXVIII below. We are, frankly, less confident of these estimates than we are of those for the other possible new programs, for several reasons. First, there is only one other Maritime Studies program in the United States—at Texas A&M University, central administrators of which generally refuse to divulge to the public information which they consider sensitive. In this case, sensitive information includes the amounts of the doctoral student stipend and faculty start-up packages, which we collected from program faculty in Anthropology, the department in which the Nautical Archeology program is housed.

There is also a similar program in scope and secretiveness in the department of Anthropology at Florida State, which we have used as a model, but nautical archeology is a research interest there, rather than a formal track. Two institutions is not enough to establish reliable averages for the field; and we, therefore, looked at two additional programs which apply in only a tangential way. The first is the Ph.D. program in Public History at Western Michigan University, which has several faculty interested in maritime studies and a small research and outreach center: the Great Lakes Center for Maritime Studies. The second additional model is the Industrial Heritage and Archeology program at Michigan Tech, on the grounds that it is an archeology program focused on a particular niche.[79]

The programs at both Texas A&M and Florida State have a fleet of ocean-going vessels and significant equipment for underwater exploration. Given the unwillingness of both institutions to cooperate in this study, we have been unable to learn the precise details of these; and we assume that at least some of the resources of the current Coastal Resources Management program would be available to any potential program in Maritime Studies. Currently, we list no expense for facilities and equipment for this possible new program, but in fact, facilities and equipment expenses could be quite significant, both for start-up and for ongoing maintenance.

[79] For each of these model programs, we have counted only faculty and students who are specifically designated as focused on maritime studies or nautical archeology. The obvious exception is Michigan Tech, in which case we counted only faculty and students in industrial archeology, which is part of a larger department of social sciences.

Table XXVIII
Maritime Studies

Expenses	
Faculty Compensation	$7,224,180
Tuition and Fees	$1,932,813
Health Insurance	$81,311
Stipends	$2,605,356
Facilities and Equipment	$0
Marketing	$403,500
Income	
Tuition and Fees	$0
Grants and Contracts	$8,505,915
Net Investment	-$5,965,290

Faculty compensation: We use average salary figures for the liberal arts and sciences, general studies, and humanities. Model programs have an average of one research professor, one affiliated professor from another academic unit, and one non-tenure-system faculty.
Start-ups: For assistant professors, $22,125; for associate professors, $28,750; for full professors: $40,000.
Grants and Contracts: This is the average grant income of programs in the humanities, including Anthropology, with which we have worked over the last three years.