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Occupational Trends and Program Priorities

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Abstract

Institutions of higher education that respond to the economic base in their region will remain competitive and be better positioned to obtain public funds and donor support. In addition to mandated program viability standards based on measures such as graduation rate, individual institutions and state coordinating boards can use ten-year occupational trend data to assess future program viability. We used an occupational demand model to determine whether academic programs can meet projected statewide needs for high demand and high growth occupations. For example, computer engineering, the highest growth rate occupation in Alabama, is projected to have 365 annual average job openings, with 93.6% total growth over ten years. But only 46 computer engineering majors graduate annually from all Alabama institutions of higher education. We recommend using an occupational demand model as a

planning tool, decision-making tool, and catalyst for collaborative initiatives.

Introduction

Institutions of higher education operate in a highly competitive environment. The push for increased state funds, new programs, more students, and expanded services led to increased emphasis on statewide coordination during the 1950s and 1960s as states sought to bring rationality to their rapidly growing higher education systems. However, competition took on new meaning during the 1980s and 1990s when state revenue for higher education began to dwindle or disappear as other state functions moved into priority funding positions. In addition, state legislatures and the public at large began to raise questions about accountability, performance, and productivity of the higher education systems (McGuinness, 1997). At the same time, business and industry began calling for more effective responses to employment needs.

By the late 1990s, it was clear that the market for higher education had changed. While the values and traditions of the academy remained "venerable sources of strength," institutions and their governing boards began to look to the external environment to understand the context in which those values and traditions must operate (Mingle, 1998). That environment included a changing labor market that demanded new skills for workers, the emergence of technologies such as the Internet, the challenge to market share of traditional colleges and universities by new providers of postsecondary education, and the intensely competitive and changing public policy context, which exacerbated cost, price, and productivity pressures on institutions of higher education (Mingle, 1998).

To strike a balance between the demands of the market, the academy, and the public, some state-level higher education agencies have taken steps to link occupational trends to academic program priorities based on (a) the connection between higher education and the economy; (b) the current focus on meeting student and employer demands for job and skills training; (c) the need for public institutions of higher education to respond to state policy directives and demonstrate wise stewardship of public resources; and (d) the benefits of academic program planning and review in a statewide context.

Connection Between Higher Education and the Economy

In response to a growing demand for agricultural and technical education, Congress passed the Morrill Act of 1862 to provide funds to establish land-grant colleges so that members of the working class could obtain a liberal, practical education. Every state and territory now has one or more land-grant colleges (National Association of State Universities and Land-Grant Colleges, 2000).

The Carnegie Foundation for the Advancement of Teaching (1976) suggested the two best restraints on higher education are competition and state budgets. An institution that responds to the economic base in its region will remain competitive and be better positioned to obtain financial support from donors and legislators.

According to Seymour (1988), one of the key characteristics of strategic planning is "matching institutional capabilities with environmental conditions to achieve goals," and listed three considerations for determining program priority: mission, internal

factors, and external factors. Toombs and Tierney (1991) recognized environmental factors, and specifically "market forces," in their components of curriculum design. Hines (1988) points out in a review of the relationship between higher education and state governments that:

Increased investment of public funds in higher education toward the goal of increased economic development is predicated on the assumption that there will be a payoff, that economic activity will increase, that the tax base will expand, and that revenue will increase. (p. 33)

Although it may be appealing to define mission, role, and program priorities in isolation, successful universities understand that this process cannot occur without consideration of their constituencies (Western Interstate Commission for Higher Education, 1992a). In fact, many higher education plans include the education of personnel needed for "an advanced economy" (Western Interstate Commission for Higher Education, 1992b). For example, colleges and universities have added academic programs in areas such as computer engineering and management information systems when those knowledge areas became crucial for industrial development.

Current Focus on Meeting Student and Employer Demands for Job and Skills Training

Mingle (1998) noted that higher education is moving from a producer-dominated enterprise to one fully sensitive to and focused on the consumer. Public expectations of higher education appear to have no bounds, putting considerable pressure on colleges and universities:

The American labor market is both extraordinarily diverse and exceptionally dynamic, making it difficult not only to generalize about the knowledge and "skill sets" college graduates need but also to make predictions about the future demand for specific occupations. Through surveys and interviews of employers and external advisory groups, increasing numbers of colleges stay closely tuned to this changing job market. This information is shaping college programs in important ways. (p. 6)

The Joint Commission on Accountability Reporting (1996) emphasized the need to stay focused on the consumer and recommends that institutions survey graduates and report placement rates (pp. 38- 50). While placement is an important measure of accountability, it is more closely related to current employment than to future employability. Nor can placement identify employment possibilities for which no programs are in place. State-level coordinating agencies currently explore ways to conduct market analyses to determine how best to address the needs of their state. A review of the Alabama Commission on Higher Education (1999) recommended that the agency devote more effort and resources to statewide market analyses, and the State Higher Education Executive Officers Association offers "State and System Tools for Success in the New Market Environment" as an on-line seminar for state higher education agency staff.

With respect to employer needs, there is a well-documented national disequilibrium between the supply and demand for information technology workers.

Evidence for a severe worker shortage includes a high job vacancy rate, low unemployment, projected demand outstripping supply, higher than average salary increases, and demand for foreign workers (Freeman & Aspray, 1999). The national failure to develop sufficient technical talent is so severe that it could "substantially undermine" the future growth of the electronics and information technology industry (Platzer, Novak, & Kazmierczak, 1999, p 13).

Need for Public Institutions of Higher Education to Respond to State Policy Directives and Demonstrate Wise Stewardship of Public Resources

In recent years, many states have required academic program review and approval as a way to curb unnecessary duplication of programs among public institutions and to judge the appropriateness of existing programs (McGuinness, 1997). Most criteria for program review require employer needs analyses that indicate whether new or existing programs respond to employment needs. In some cases the link between employment opportunities and program graduates is a critical factor. For example, Alabama passed "program viability" legislation in 1996 that requires academic programs in all public institutions to meet minimum graduation rates or be terminated (Program Viability Act, 1996). After a three-year monitoring period of non-viable programs, institutions can request waivers for programs that still do not meet graduation rate standards provided they can document unique or extraordinary characteristics of the program. Factors that may be considered in this evaluation are placement of graduates in program-related areas of employment, success of program graduates, and market demands. Alabama institutions are evaluating how best to assess the link between graduates in low-producing programs and the state's employment needs.

Benefits of Academic Program Planning and Review in a Statewide Context

One economy driven process is the relationship between occupational trends and institutional programs. While individual institutions and groups of institutions can analyze occupational trends within their state, the institutional approach does not take into account what other in-state and out-of-state institutions are doing to meet the need. With limited resources available to higher education, institutional representatives, legislators, and policy makers must be committed to the most effective use of state dollars for the citizenry. A statewide approach to academic program planning and review requires institutions to think "outside the box," because what appears to be best for an individual institution may not be the best course of action for the region. While an institution may identify a high-demand occupation based on labor market projections and employer feedback, it must consider the productivity of existing and planned programs in the region to avoid potential duplication and market oversupply. The public trust requires that state dollars be spent on programs that have high priority and provide substantial benefit.

Previous Use of Occupational Trends at the State Level

Although state-level agencies have been interested in links between occupational projections and academic programs for some time, the challenge has been to assess these relationships as a context for institutional program review. Some states have developed comprehensive proactive approaches to program needs assessment, while others simply

react to institutional plans.

Arizona. In 1998, the Arizona legislature challenged the Board of Regents and the State Board of Directors for Community Colleges to develop a mutual statewide process for identifying and meeting needs for advanced postsecondary education. In response, the two boards jointly convened the 1998 Higher Education Study Committee. The process utilizes a Joint Review Committee to evaluate requests for new or expanded programs on the basis of statewide criteria for need. Although needs assessment remained an institutional function, the case for a new program could be strengthened if multiple institutions partnership to meet the need. They recommend several sources of data to demonstrate program need, including the Arizona Department of Commerce, the Arizona Department of Economic Security, and the Bureau of Labor Statistics (Arizona Board of Regents and the State Board of Directors of Community Colleges for Arizona, 1998).

Florida. Sanchez, Laanan, and Wiseley (1999) provide an excellent summary of state efforts to measure students' post-college earnings. Most initiatives follow program completers or graduates into the workplace to estimate average annual earnings or placement. Florida pioneered in this area with the Florida Education and Training Placement Information Program, established by a legislative directive and a joint agreement between the Florida State Department of Education and the Florida Department of Labor and Employment. Other states such as Ohio, California, North Carolina, Texas, and Washington have pursued similar approaches. However, these efforts provide little information on whether graduates are being trained in the fields most needed by employers. Idaho has taken a somewhat broader approach to needs assessment through statewide roundtable discussions and the use of specific advisory committees (Dodson, 1999).

Illinois. The Illinois Board of Higher Education is a member of a consortium with other state agencies committed to sharing labor market information. The board has conducted statewide analyses by field of study, comparing employment projections with graduate survey data. Typically, the board will conduct a statewide study of existing programs in a field, followed by institutional studies of related programs a few years later. The initial analysis gives institutions a useful context for their own assessments. One recent board study included social work and human services (Illinois Board of Higher Education, 1997).

A similar review of health professions education in Illinois in 1992 compared projected average annual job openings with estimated total supply and number of degrees conferred in the state, and made recommendations for capacity adjustment in individual programs. The analysis was followed by recommendations for health professions education in 1993 and the implementation of policies for health professions education in 1995. The purpose of the study was to adjust educational capacity, and the board recommended that some programs be reduced and monitored, some be maintained, and some be expanded (Illinois Board of Higher Education, 1995).

In 1998, the board published a report that identified and proposed solutions to meet the educational needs in Lake County (north of Chicago). The study included market research conducted by a private consulting firm. The board staff convened a number of forums to provide an opportunity for Lake County residents to express their educational needs, and conducted further research to analyze demographic and economic data relevant to educational demand and need. They used the number and percent of positions in Lake County that required postsecondary education as compiled by the Illinois Occupational Information Coordinating Committee to assess educational demand (Illinois Board of Higher Education, 1998). Based on the results, the board

established a University Center in Lake County that offered high quality, convenient, and affordable education built on the resources and programs of existing institutions.

Ohio. Gottlieb (1995) used an industry-occupation matrix combined with occupational projections to identify industries likely to provide future entry level and advanced training jobs as a way to re-prioritize job training programs in two-year institutions in the Cleveland-Akron area of Ohio.

Wisconsin. The University of Wisconsin System supports a market research unit that works with universities to identify needed programs in their region by looking at demand from employers and students. Faculty still identify areas of interest for new programs, but the market research unit then samples regional businesses using the Dunn and Bradstreet list (Sell, 1999).

Statement of the Problem

The state of Alabama needs a systematic statewide process for comparing occupational projections with the number of graduates of academic programs for use in program planning. Although individual institutions have made such comparisons as needed to foster strategic planning for program prioritization, resource allocation, curriculum development, and course availability, the need to analyze occupational and graduation data at the state level has been heightened by several recent developments. They include more limited resources to support higher education, passage of a program viability bill with provisions for waiver of non- viability based on factors related to meeting occupational needs, and recommendations by the Evaluation Committee of the Alabama Commission on Higher Education to increase the agency's use of market research as a planning tool.

The purpose of this study is to compare occupational projections for the state of Alabama with graduation rates in corresponding academic programs to provide a context for state and institutional policy decisions on current programs and new program initiatives, and to comply with recent program viability legislation.

Methods

We employed three major tools to establish a context for state and institutional policy decisions: (a) statewide employment projections, (b) number of degrees conferred, and (c) a crosswalk to relate one with the other. We limited the analysis to high-demand and fast-growing occupations in Alabama that require a Bachelor's degree or higher, as identified by the Alabama Department of Industrial Relations. They define *high-demand occupations* as having at least 535 average annual job openings. *Fast-growing occupations* have at least 50 average annual job openings and an average annual growth rate of at least 3.2% (Alabama Department of Industrial Relations, 1998).

Employment Projections

The Bureau of Labor Statistics has prepared national employment projections since 1957 (U. S. Department of Labor, 1995). Minimal input data was available at first, but by the early 1970s a standard methodology was developed that is still in use today (U. S. Department of Labor, 1986; 1997). The bureau releases ten-year national employment projections every other year. It uses many factors to make projections, including the composition of the labor force, economic growth, demand, and

occupational trends. For example, occupational trends are based on data collected from an Occupational Employment Survey prepared and summarized by the bureau. The survey is administered by each state, and contains data on approximately 775 occupations in 350 industries. The data includes number of employees and salary range by occupation, providing regular empirical information on occupational employment.

Information is stored in a projections database that is programmed to generate employment trends over a ten-year period. The bureau makes several key assumptions during the projection process. For example, work patterns will not change during the projection period (length of average work week), broad social and educational trends will continue, there will be no major war, there will not be a significant change in the size of the armed forces, and there will be fluctuations in economic activity due to the business cycle. The most recent national projections localized for the state level are for the ten-year period 1996 - 2006 (Silvestri, 1997). (See, also, U. S. Department of Labor, 1998.)

The bureau monitors and validates projections, and exceptions to general assumptions are reported. For example, they found that both the manufacturing and health industries suffered unexpected setbacks in 1998 that were attributed to the Asian economic crisis and more stringent health care reimbursement policies (Goodman & Consedine, 1999).

The bureau conducted a detailed analysis of the educational requirements of occupations and published the minimum amount of preparation that most employers required. However, requirements can vary from employer to employer, and there may be more than one way to qualify. For example, the educational preparation listed for registered nurses is associate degree, although baccalaureate graduates take the same licensure exam and are hired for the same entry-level positions. For that reason, bureau educational requirements for each occupation must be evaluated for accuracy in a given state (U. S. Department of Labor, 1995; 1996).

The demand for college graduates continues to increase as duties become more complex due to new technology and changing business practices. This phenomenon, called *educational upgrading*, accounted for one-third of the college-level jobs created between 1983 and 1994 (Shelley, 1996). Changes in employment growth can be due to the growth of an industry as well as changes in occupational structure. For example, employment in the health-related professions is expected to increase along with growth in the health services industry. More use of computer technology, a structural change, will accelerate the need for systems analysts and programmers, and reduce the need for typists (Franklin, 1997).

Nationally, the ten fastest growing occupations *that require a bachelor's degree* are: (a) database administrators, computer support specialists and all other computer scientists, (b) computer engineers, (c) systems analysts, (d) physical therapists, (e) occupational therapists, (f) special education teachers, (g) speech- language pathologists and audiologists, (h) physician assistants, (i) residential counselors, and (j) securities and financial services sales workers (see Table 1); (U. S. Department of Labor, 1998, p. 52).

Table 1
Fast-Growing Occupations in Nation
Requiring a Bachelor's Degree, 1996-2006

Occupation	Ten-Year % Growth
------------	----------------------

Database Administrators	118
Computer Engineers	109
Systems Analysts	103
Physical Therapists	71
Occupational Therapists	66
Special Education Teachers	59
Speech-Language Pathologists and Audiologists	51
Physician Assistants	47
Residential Counselors	41
Financial Services and Sales	38

The bureau provides each state with a data set for making local projections. Using special software, states prepare projections that are parallel to the national but based on local populations, industries, and employees. We used the Alabama Occupational Trends data for April 1998, which are localized from federal projections, to estimate statewide employment demand in various occupations (Alabama Department of Industrial Relations, 1998). We defined employment or *occupational demand* as the projected annual average number of job openings in Alabama for the period 1996 -2006. Specifically, we evaluated the projected employment need for all high-demand and fast-growing occupations that require a bachelor's degree or higher (we excluded first professional preparation). In Alabama these occupations are: (a) secondary school teachers, (b) general managers and top executives, (c) registered nurses, (d) elementary school teachers, (d) systems analysts, (e) special education teachers, (f) accountants and auditors, (g) computer engineers, (h) engineering, math and natural science managers, (i) residential counselors, (j) preschool and kindergarten teachers (combined group), (k) physical therapists, (l) operations research analysts, (m) speech- language pathologists and audiologists, and (n) occupational therapists.

Number of degrees conferred

Public and private institutions of higher education in Alabama prepare a mandatory completions survey as one of the federal reports used in the Integrated Postsecondary Education Data System of the National Center for Education Statistics (U. S. Department of Education, 1994 - 98). The completions survey is a comprehensive report of graduates organized by award level and curriculum. The curriculum area is designated by a program description and six-digit code based on the national Classification of Instructional Programs taxonomy. (For more information on academic program definitions, see Morgan, Hunt, & Carpenter, 1991). Institutions forward an annual completions report to the Alabama Commission on Higher Education, the statutory state coordinating agency, which maintains a longitudinal statewide repository of these reports (Alabama Commission on Higher Education, 1994 - 98).

Using this curricula completion information we were able to determine the number of degrees conferred in a given program in a given year in Alabama. For

example, the number of completions in registered nurse preparation programs is the sum of the number of nursing degree completions reported under program code 51.1601 at each institution in a given year. We can use this method to determine the total number of degree completions reported for any academic discipline in the state. In this study, we define *degrees conferred* as the average annual number of completions reported by postsecondary institutions in Alabama based on the five-year period 1993-94 through 1997-98 (July 1 - June 30 reporting period). Averages include public and private institutions and are based on Integrated Postsecondary Education Data System reports.

Crosswalk

Some occupations listed in the state employment projections have an obvious relationship to an instructional program reported in the completions survey. When questions arose, we consulted a crosswalk database to help identify the relationship. The database relates occupations to academic programs by linking an occupational employment survey code to an instructional program code (National Crosswalk Data Center, April, 1999).

For example, based on statewide repository data and prior knowledge, we identified 24 Alabama colleges and universities that report baccalaureate and master's degree completions in programs that lead to employment in the occupational category *systems analyst*. Colleges confer degrees in the following related instructional programs (and program codes): (a) computer and information sciences, general (11.0101), (b) information sciences and systems (11.0401), (c) computer science (11.0701), (d) computer and information sciences, other (11.9999), and (e) management information systems and business data processing, general (52.1201). Note that all of these programs are offered at the bachelor's level, and programs (a) and (e) are offered at the master's level as well.

A crosswalk database query for *systems analyst* degree program codes pointed to the following occupations (and occupational codes): (a) systems analysts, electronic data processing (25102), (b) data base administrators (25103), (c) computer support specialists (25104), (d) computer programmers (25105), (e) computer programmer aides (25108), (f) all other computer scientists (25199), and (g) computer science teachers, postsecondary (31226).

The crosswalk query shows that graduates who earn a systems analyst or related degree in college are reported on the Occupational Employment Survey as working as systems analysts, as well as in a cluster of related jobs. Thus, we can link the number of systems analyst and related degrees conferred to the number of projected job openings for systems analysts and related occupations, although some graduates will enter other fields. Note that to be conservative in our estimate of needed graduates, we limited the number of projected job openings to systems analyst, eliminating all of the related fields. The articulation between academic program and occupation will be more precise for some occupations than others. Occasionally, crosswalk relationships were adjusted to better reflect specific conditions in Alabama.

Findings

The application of this model to 15 high-demand and fast-growing occupations requiring a minimum of a bachelor's degree yielded the general conclusion that existing programs in Alabama colleges and universities will supply a sufficient number of

graduates to meet the state's demand for many of these occupations through the year 2006. For reporting purposes, we grouped the results of 15 occupational demand analyses into three categories: (a) occupations where the supply of graduates is projected to meet or exceed demand, (b) occupations where the supply of graduates is projected to be insufficient to meet demand, and (c) occupations requiring further study.

Occupations Where the Supply of Graduates is Projected to Meet or Exceed Demand

The supply of graduates is projected to meet or exceed the demand for (a) general managers and top executives, (b) registered nurses, (c) elementary school teachers, (d) accountants and auditors, (e) engineering, math and natural science managers, (f) residential counselors, (g) preschool and kindergarten teachers, (h) physical therapists, (i) speech-language pathologists and audiologists, and (j) occupational therapists.

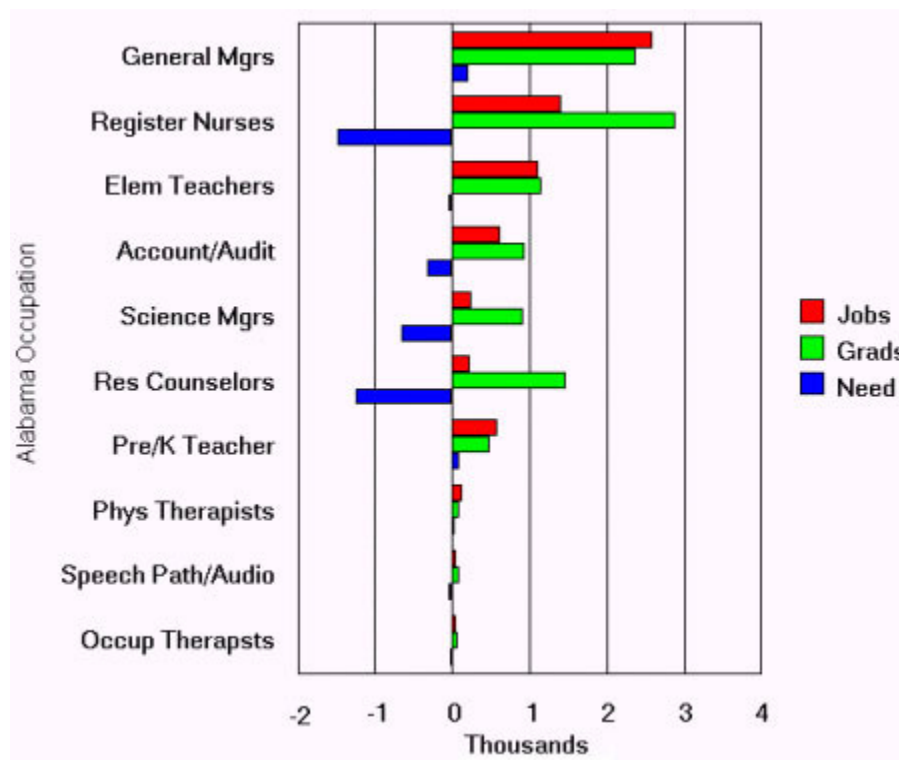


Figure 1. High-demand and fast growing occupations where the supply college graduates is projected to meet or exceed statewide need.

Occupations Where the Supply of Graduates is Projected to be Insufficient to Meet Demand

The supply of graduates is projected to be insufficient to meet the demand for (a) systems analysts, (b) special education teachers, (c) operations research analysts, and (d) computer engineers.

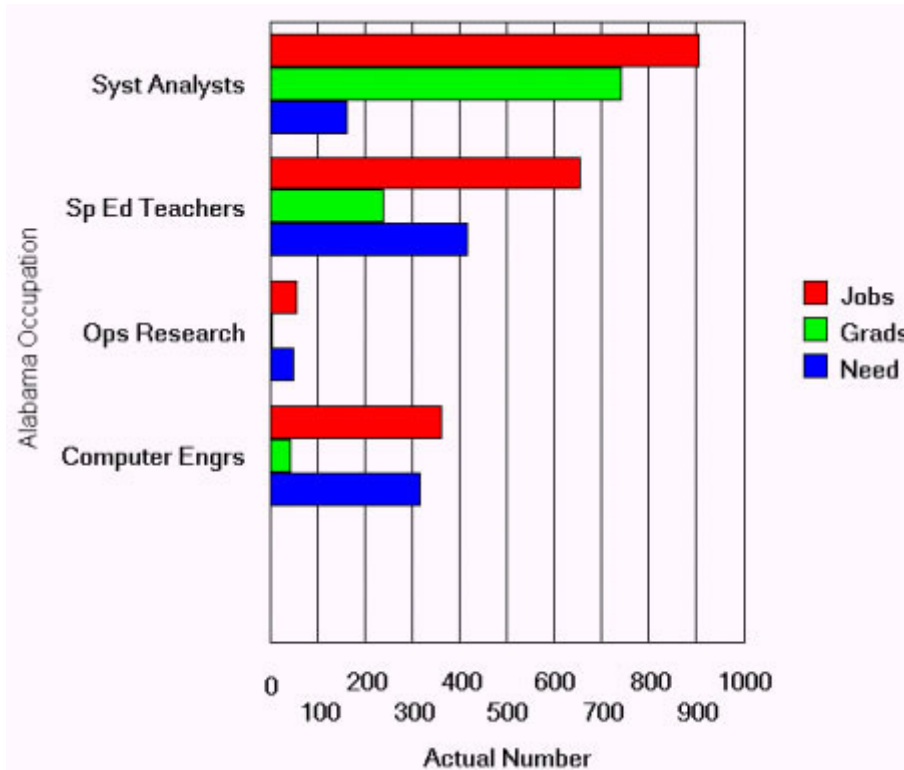


Figure 2. High-demand and fast growing occupations where the supply college graduates is projected to be insufficient to meet statewide need.

Occupations that Require Further Study

The supply of graduates and demand for secondary school teachers requires further analysis with respect to need in specific certification areas.

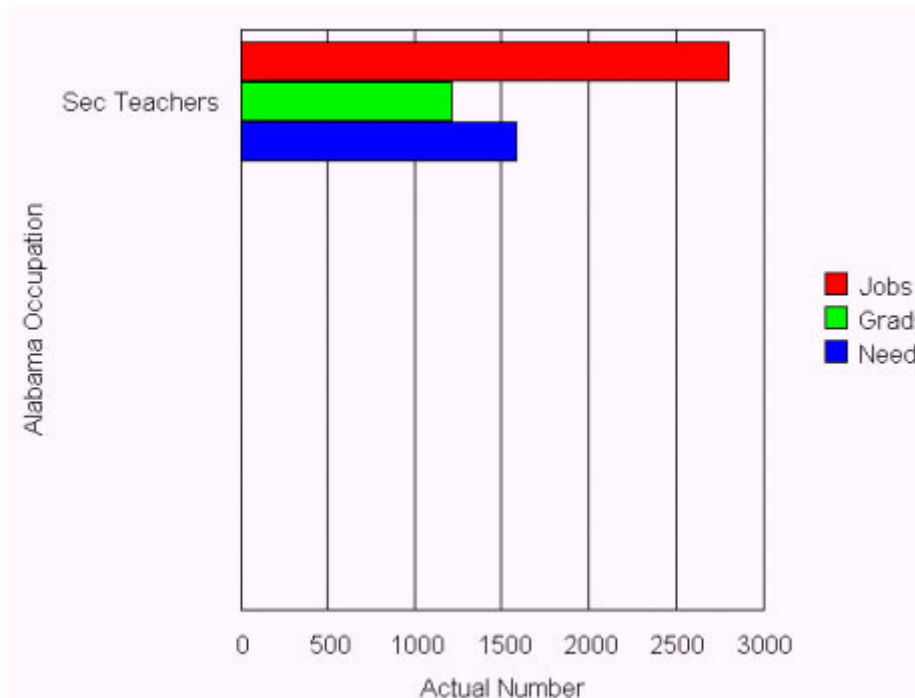


Figure 3. High-demand and fast growing occupations that require further study.

Discussion

We recommend three primary uses for an occupational demand model: (a) as a planning tool, (b) as a decision making tool, and (c) as a catalyst for collaborative initiatives.

Planning Tool

A model of occupational demand provides a valuable contextual base for statewide discussions of employment needs, and ways that higher education can address those needs. Although a demand model cannot provide absolute judgments on the need for particular programs, it can provide a starting point for asking the right questions. For example, we found that Integrated Postsecondary Education Data Systems completions in secondary education are not the best source for the available supply of teachers. Institutions can award teaching certificates without offering academic programs, and teachers may be certified through alternative routes. Therefore, degree completions surveys may underestimate the total number of certifications awarded. The Oklahoma State Regents commissioned the Southern Regional Education Board (1998) to conduct a study of educator supply and demand by type of certification. In Alabama, consultation with officials at the State Department of Education suggested that for the most part, Alabama produces more new teachers than local education agencies need, with the exception of areas such as special education, foreign languages education, and sciences other than biology. Given the difficulty of hiring foreign language teachers and the low productivity in many foreign language programs in the state, we need to formulate policies that lead to an understanding occupational needs and focus on solutions. State policy formulation should involve all stakeholders in meaningful deliberations (institutional representatives, the state coordinating board, the state department of education, business leaders, legislators, etc.).

Decision Making Tool

Individual institutions and state coordinating boards can use data based on an occupational demand model as a tool in making academic program decisions. The relationship between number of college graduates and occupational demand can serve as an important source of information for determining whether institutions of higher education are meeting the employee training needs of business and industry. If an occupation is identified as high-demand or fast-growing, and an institution's faculty express interest in developing an academic program in this field, they should consider the productivity of existing programs, and the potential productivity of newly approved programs. Several years ago the Alabama Commission on Higher Education approved three new master's level programs in physical therapy. When the new programs were included in estimates of future productivity, the supply and demand for physical therapists in the state was in approximate balance, even though physical therapy is projected to be a fast-growing occupation during the period 1996-2006. Institutions will be better able to allocate limited resources to appropriate programs when the regional

productivity of existing programs is considered.

We view comparisons of occupational projections with academic program graduates as a focal point for discussion, rather than an absolute measure of need to continue existing programs or establish new ones. A complex decision, such as whether or not to close an academic program, requires broad-based judgments that include multiple components in the decision process, such as job placement of current students, emerging market trends, and research support (particularly at the graduate level). While research on occupational trends is an important information source, we view it as part of a larger decision-making framework.

Institutions can use the model to identify areas that are not currently being addressed by the educational system. For example, information technology (computer engineers, systems analysts) is an area where existing programs are not producing adequate numbers of professionals. Institutions may want to implement strategies to increase enrollment in existing programs or plan new ones. Another useful process is to identify high-demand and fast-growing programs that are not offered by any institution in the state. Finally, while the selection of an occupation is an individual choice, educational organizations can help consumers make informed decisions by providing valid information about the prospects for occupational employability.

Catalyst for Statewide Cooperative Initiatives

It is difficult for competing institutions to foster cooperative ventures, and collaboration is not the norm among institutions of higher education. However, an occupational demand model can identify program areas that are ripe for cooperative initiatives. Relationships can be encouraged through collaborative inter-institutional discussions and financial incentives, and cooperative programs can be established that benefit the state as a whole.

Other Influences

We used an occupational demand model to compare projected employment needs with statewide graduation rates as a metric for program resource allocation. We mentioned other influences on the demand model, such as the goodness of fit between occupations and academic degrees, variations in minimum educational job qualifications, migration of graduates to (and from) other states. In Alabama, there are graduates of out-of-state corporations that are not accountable to the Alabama Commission on Higher Education. These influences argue for using an occupational demand model as part of a broader decision-making process.

Notes

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