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ABSTRACT

Population science, a combination of natural science, social science, and management science, deals with the phenomena associated with the human population size. Subjects include the rates of change of the sizes of the various subsets of the human population, the causes and results of those changes, the societal pressures for control of population subset size, and the methodology and results of such control. The education of the population scientist, therefore, must integrate demography, sociology, anthropology, psychology, political science, information science, management science/operations research, reproductive biology, and human ecology. The population scientist must be educated in his roles in the collection and organization of knowledge about the sizes of subsets of the human population and in the management of those sizes. Existing graduate programs at various universities across the country display a miscellany of approaches and emphases; most programs are not taught within a single department, and few or none require management science. (Author/JH)

THE EDUCATION OF POPULATION SCIENTISTS

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ABSTRACT

Population science, a combination of natural science, social science, and management science, deals with the phenomena associated with the human population size. Subjects include the rates of change of the sizes of the various subsets of the human population, the causes and results of those changes, the societal pressures for control of population subset size, and the methodology and results of such control. The education of the population scientist, therefore, must integrate demography, sociology, anthropology, psychology, political science, information science, management science/operations research, reproductive biology, and human ecology. The population scientist must be educated in his roles in the collection and organization of knowledge about the sizes of subsets of the human population and in the management of those sizes.

The proper education of a scientist in any discipline is dictated by the characteristics and scope of that science and by the functional role of the scientist in society. Scientists in the field of population have tended in the past to work either in the social or behavioral sciences, including demographic, economic, and statistical aspects, or in the biological sciences, including contraceptive development. Recent emphasis upon population has been evident in the past five years by increased spending upon research by our Federal government. Family planning services have also been expanded both domestically and abroad. These programs in population research and services have involved numerous scientists in a new role - the role of program administrator or manager.

Recognizing this newer and very important management dimension to the functional role of scientists in the field of population, we wish to propose a conception of the population field which is broader in scope, is organized around a fundamentally different paradigm, and possesses characteristics sufficiently unique to warrent recognition for a new discipline - population science.

The new paradigm is: Population science is a problem-solving discipline.

We propose for this new discipline the following definition:

> Population science is a discipline dealing with problems associated with the size, characteristics, needs, and desires of the human population and its various subsets and which utilizes the facts and methods of natural, social, and management sciences, such as the disciplines

> of reproductive biology, demography, economics, ecology, management science/operations research, international studies, and/or other pertinent disciplines.

Population science may also be defined as:

> the study of the size of the human population and its various subsets, the changes in those sizes, the causes and results of those changes, the societal pressures for management of population subset size to solve population-related problems, and the methodology and results of such management.

The rapid growth of the human population in the aggregate is of concern in relation to the human environment. The earth has finite amounts of certain natural resources needed for supporting human life. Living space is finite. Waste products resulting from human industrial and agricultural activities pose a serious threat to the biosphere. There are other problems associated with specific subsets of the human population. An example is the educational and cultural deprivation of children in inner city ghettos.

A population scientist is one engaged in population science. He contributes to the accumulation of new knowledge for the purpose of enhancing the likelihood of a solution to population-related problems. His objective includes the formulation or definition of population-related problems and the provision of the information and methodology needed for their solution. There is a necessity for the observation and analysis of the existing system

and for identifying alternative solutions and projecting the results of policy changes required for each of the alternative courses of action. The population scientist is concerned with the identification of all the subsets of the human population which are involved in the solution of population problems. He carefully distinguishes those subsets which are doing the controlling from those which are being controlled and those affected secondarily. He is therefore concerned with the value systems, the state of wellbeing, and the economic, political, and military power of the various subsets. He is concerned with the methods of defining and choosing optimal subset size.

The methods of attaining those optimal sizes and the effectiveness of those methods are also of interest to the population scientist. Methods exist for changing subset size other than by manipulation of fertility, mortality, and migration. For example, the number of malnourished persons can be reduced by providing food or by providing ways for the people to produce enough food to feed themselves.

The subsets of a population coexist and compete in a dynamic system. The individuals in these subsets interact with a physical, biological, and social environment. Thus natural science, social science, and management science are each an important part of population science. The education of the population scientist must include the proper integration of all three fields.

The Education of Population Scientists

The role of the population scientist is to generate new information relevent to population problem-solving. His education must therefore be that of a scientist. He must learn to observe, to analyze what he has observed, to formulate generalizations or hypotheses, to devise empirical tests of those hypotheses and to carry them out, and to draw logical conclusions. He must be educated so that his work as a scientist may be unbiased in so far as possible. The process of preparing a Ph.D. thesis under the guidance of an experienced scientist contributes to the attainment of these goals. Research experience beyond the Ph.D. will strengthen the scientific qualifications of graduates in population science.

The subject matter of population science is extremely broad. Demography is of primary importance. Demographers collect and analyze data on populations to "reveal the significant aspects of the composition and dynamics of populations." (25) Although demographers historically have not emphasized the solution of population problems, the statistics which they provide are information of great importance and necessary for developing problem solutions.

Population science includes pertinent aspects of many other established disciplines in the natural, social, and management sciences. Reproductive biology describes the physiological processes by which human reproduction occurs and is pertinent to contraceptive technology. Sociology and

anthropology provide insight into how group behavior affects both reproduction and mortality, and how the value systems of different groups determine their outlook on optimal population subset size. Psychology relates to the behavior of individuals, which in part determines subset size. Political science is pertinent because population policy making is often a political decision. Economics is concerned with the production, distribution, and consumption of material goods and services which are needed or considered desirable by man. Agricultural science and chemistry provide knowledge for increasing production of food, natural and synthetic. Human ecology is the study of man's interdependence with his environment. Management science/operations research brings a scientific approach to the problems associated with the management of men and resources in the operating system which consists of man and his environment. Information science treats the collection, classification, storage, retrieval and communication of population-related information.

Specific, population-related knowledge from these disciplines provides the student of population science with the fundamentals for his discipline just as mathematics and physics provide necessary fundamentals for the chemistry student. Included in his courses of study would be subject matter selected from the pertinent disciplines chosen for its relevence to population-related problems and the methods for their solution.

In many cases it would be desirable to integrate the applicable parts of several disciplines into new courses for population science students. Subjects in which extensive knowledge is required, such as demography, should be

studied in the respective departments. A student should avoid programs consisting of numerous introductory courses. His courses must give him a working knowledge of the fundamental subject matter.

It is desirable that students have one of the physical, biological, or social sciences as an undergraduate major. A background in mathematics through calculus and probability and statistics is desirable as preparation for demography and management science/operations research.

The core of the curriculum in population science should consist of courses related to population problems and their solution. An overview of current and historical population-related problems should be included. A course in the process of population problem formulation which includes the identification of population decision makers, their objectives, and the population subsets whose size is considered a problem, is recommended. The methodology of population problem solution should be studied. It includes the approaches and techniques for studying the system in which the problem exists, for determining all the pertinent relationships and parameters, and for finding and finally evaluating possible solutions. A seminar course is recommended for treating more recently recognized and less traditional population-related problems such as the impact of multinational firms upon the international labor market or the security problems of small nations.

Since individual population problems require specialized knowledge and students have particular interests, the balance of the course work in

a doctoral program in population science could be made up of electives chosen with the help of an advisor so as to relate meaningfully to the subject of the dissertation.

The Existing Educational Process

Various graduate educational programs (1-24, 26-32) have been developed in the field of population. Most have provided the kind of education formerly believed necessary for family planners working in public health programs or demographers. Over time, the subject matter included in these programs has been broadened. Nevertheless, few or none require management science. In terms of content, existing population education programs form a broad spectrum. It is difficult to classify the various programs into sharply defined categories. In some universities, both single-purpose programs and inter or multidisciplinary programs coexist. Some programs, primarily in departments of sociology or demography, treat changes in population size primarily as phenomena to be observed, analyzed, and predicted. Other programs, mainly in schools of public health, concentrate on family health and family planning programs and their administration. Bean, Anderson, and Tatum (2) noted that there is a range of population-related problems requiring the attention of a variety of professionals including "political scientists and lawyers dealing with population policy," but nevertheless restricted their population and family planning manpower and training

study to demographers and population program specialists, the latter being apparently interpreted as family planning specialists. (3)

A growing awareness that population changes can be socio-political phenomena has led to some more integrated policy-oriented programs which tend to treat the human population in its environment as a system and view the formulation and implementation of population policy as an important aspect of the problem of managing man and his resources. (6,11,15,23,24, 28,29) At the present time most population curricula are interdisciplinary to some degree. Most of the universities with broad programs in population do not provide all of the population-related courses within a single department. Appropriate courses in the natural, social, and management sciences are, in some instances, supplemented with independent reading courses.

Summary

The education of population scientists includes the integration of the pertinent parts of the natural, social, and management sciences and is oriented toward the application of scientific methodology to finding solutions to the problems associated with population size, whatever they may be.

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