DOCUMENT RESUMF

ED 085 471 CE 000 354

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TITLE	The Design of Curriculum Guidelines for Educational Ladders Using Task Data. Working Paper No. 11.
INSTITUTION	Health Services Mobility Study, New York, N.Y.
SPONS AGENCY	City Univ. of New York, N.Y.; Manpower Administration (DOL), Washington, D.C. Office of Research and Development.; National Institutes of Health (DHEW), Bethesda, Md. Div. of Allied Health Manpower.
PUB DATE	Jul 73
NOTE	240p.
EDRS PRICE	MF-$0.65 HC-$9.87
DESCRIPTORS	Career Ladders; *Curriculum Development; Curriculum Evaluation; Curriculum Planning; *Health Occupations Education; *Job Analysis; *Methodology; Radiology; *Task Analysis

ABSTRACT

The Health Services Mobility Study is engaged in the development of generic methodology to analyze health occupations at the professional, technical, and aide level, with the aim of providing a data base that could result in the design of job ladders, curriculum guidelines for educational ladders, and the design of performance evaluation instruments. This working paper opens with a discussion of general problems with existing curricula for health occupations, with special reference to diagnostic and therapeutic radiology, nuclear medicine and ultrasonics. The theoretical framework for the HSMS methodology and the method for preparing curriculum guidelines utilizing HSMS task data are outlined. Finally the impact of the HSMS curriculum guidelines, the various uses to which they may be put, and other possible utilization of the curriculum outlines are discussed. Appendixes provide a brief review of the HSMS task analysis and job ladder design methodology and a discussion of what happens when an institution attempts to change existing curricula or institute new programs. (SA)

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By
Christina Gullion and Eleanor Gilpatrick

HEALTH SERVICES MOBILITY STUDY

Contract No. 82-34-69-34
Office of Research and Development
Manpower Administration
US Department of Labor
and
Memorandum of Agreement with
Division of Allied Health Manpower
Bureau of Health Manpower Education, NIH
Department of Health, Education and Welfare
Sponsored by
Hunter College and
The Research Foundation, City University of New York

NOTICES

This document presents a model for work which has yet to be fully applied. Therefore it is presented as a Working Paper. Anyone wishing to apply the method described or wishing to gain further information about the task analysis method described, or about the task data, should contact the Health Services Mobility Study.

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The research reported herein was performed pursuant to: a Research and Development contract with the Manpower Administration, U.S. Department of Labor under the authority of the Manpower Development and Training Act; and a Memorandum of Agreement between the Office of Research and Development of the Manpower Administration and the Division of Allied Health Manpower, Bureau of Health Manpower Education, National Institutes of Health, Department of Health, Education and Welfare.

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PREFACE

This document is one of a series of working papers and research reports of the Health Services Mobility Study (HSMS), which has been in existence since 1967 under the sponsorship of the City University of New York, with funds provided by the Federal Government. HSMS deals with the health occupations in relation to the development of methodologies to analyze jobs, to create job ladders, and to design curricula that are preparation for jobs.

As a part of its current research undertaking, the Health Services Mobility Study is studying jobs at the professional, technologist, and aide levels in diagnostic and therapeutic radiology, nuclear medicine and ultrasonics. A portion of the funding for the work (which is directed to the design of job ladders and the design of curriculum guidelines for the related educational ladders) comes from the Division of Allied Health Manpower (DAHM), Bureau of Health Manpower Education, of the Department of Health, Education and Welfare. The DAHM is specifically concerned with the programs for the radiologic technologist and programs which qualify students for the baccalaureate or associate degree, or their equivalents.

Though the data collection phase of the current funding period is specific with respect to given specialty areas, the methodological work reported here is generic. This document, therefore, provides a preliminary report on our work in radiology and related service areas as well as a report on a more generic methodology.

The Health Services Mobility Study is charged by a Memorandum of Agreement as follows:

> Guidelines for the development, modification, or restructuring of curriculum(s) shall meet the following criteria[. These will:]
>
> A. Be designed to teach knowledge and skills at a sequential level above and/or below existing recognized level(s), and to illustrate the validity of establishing such levels if they do not already exist.
>
> B. Be formulated in such a manner that specific levels can be clearly defined and organized to facilitate academic articulation and related occupational mobility within the respective discipline(s) and between or among other related health occupations.

This document fulfills the requirements specified in the Memorandum that a preliminary report shall include the following:

> ... identification of the manpower problems and issues associated with the original curriculum(s); the general and specific goals of the curriculum changes to be made; the methodology to be employed; a general description of the changed curriculum; and an assessment of the expected impact on the profession(s), educational institution(s), students, and health service settings in which students will be employed.

As specified by the Memorandum, we have identified educational "institutions which provide training at the associate and/or baccalaureate or higher levels in the allied health professions" who are interested in developing, modifying or reconstructing one or more curricula through application of a methodology developed by the HSMS. Naturally, these institutions are not <u>bound</u> to do so, and will or will not implement our recommendations based on the feasibility and logic of our proposals and if in-institutional considerations permit. We have developed a strong relationship with a community college (Hostos Community College) at the City University of New York. Senior colleges and medical schools in New York City and elsewhere in the country have expressed interest in our work.

Task collection is well underway at the level of attending physicians for all specialties in diagnostic radiology, radiotherapy, nuclear medicine, and ultrasonics. We are well advanced in our collection of task descriptions for the work of the technologists in these areas, and have collected tasks for most of the related administrative and nursing functions. There is every indication that it will be possible to design job ladder sequences that rise from the entry level, with exit points corresponding to the associate degree, baccalaureate, advanced specialty areas, and on into the medical school levels of education. This means that we expect to be able to design sequential jobs that could be reached in sequential educational steps, but which may require some redesign of existing jobs and existing curricula to implement.

A Note on Methodology

The methodological work for the development of educational ladders using HSMS data was begun at an earlier stage. Working Paper No. 10, written during our prior funding period (Phase III), attempted to raise and deal with what we saw to be the methodological issues involved. However, we were essentially sidetracked by a confusion of the following three areas:

1. Curriculum (content) development. Deals with the specification of subject matter that must be taught. A curriculum is generally expressed in statements about educational objectives and in syllabi, usually written in topic outline form. These are also called curriculum guidelines. The inputs to this area are determined by the institutions of society, among them accrediting bodies.

2. Educational methods. Deal with the transmission of instructional content to the student in such a manner that learning takes place. The inputs to this area usually come from educational psychology, learning theory (as a branch of psychology), or from individuals in other disciplines.

3. Instructional planning. Deals with the translation of syllabus requirements and course outlines into the day-to-day process of teaching. The inputs to this area come from curriculum development and from educational methods.

Working Paper No. 10 was primarily concerned with finding the definition for a unit of analysis that would be analogous to the definition of task. By confusing the process of curriculum development (which should have been its focus) with instructional planning, it concluded that the conceptual size of the unit would rarely correspond with our Knowledge System categories, and that HSMS data could not be used as direct inputs to curriculum design. Our confusion led us to focus on behavioral objectives. In the field of education, behavioral objectives are usually used for instructional planning and not for curriculum development.

While instructional units do not necessarily correspond to the HSMS taxonomic categories, there is no reason that units for curriculum guidelines cannot correspond to HSMS taxonomic categories. Once this was understood, we could say that the HSMS task data could be direct inputs into curriculum development. We also now say that curriculum guidelines are as amenable as instructional plans to being stated in behavioral terms, and that the literature on behavioral objectives can be adapted to our needs. This new approach is reflected in this document.

CHAPTER 1

INTRODUCTION

The Health Services Mobility Study (HSMS) has been engaged in methodological work in job analysis and curriculum design to be used to achieve our overall objectives of facilitating upward mobility and eliminating shortages in the health occupations. The HSMS method of job analysis (which is a task analysis approach), was geared from the inception of the Study to provide a data base that could result in the design of job ladders, the design of curriculum guidelines for educational ladders, and, eventually, the design of performance evaluation instruments.

This document reports on the development of the HSMS methodology for the design of curriculum guidelines for educational ladders. The document provides both the theoretical underpinning of the HSMS methodology and the outline of the methodology itself. It is offered with the hope that it will contribute to the manpower field, specifically health manpower education, and will aid in the clarification of issues in education.

BACKGROUND

The Health Services Mobility Study has been involved in the design and application of a method of job analysis which would help to fill health manpower shortages by minimizing the need for educational resources. The goal has been to design job ladders which could result in upgrading for existing health manpower and, by drawing in a systematic way on skills and knowledges already learned, could provide for efficient educational sequences.

The chief objective of the HSMS job analysis methodology is to relate job activities (tasks) to one another in families and hierarchies which reflect related, learnable skills and knowledge, and from this information to design job ladders and lattices. The HSMS job analysis method is based on the premise that, if the jobs in a ladder (upgrading sequence) are arranged to reflect rising levels of related skills and knowledges, the educational costs and training time between each step on a ladder can be kept to the minimum needed to bridge the gaps between the jobs. This would be far less than that required to train for each job "from scratch" or for job sequences unrelated in skills or knowledge.

Traditionally, job ladders in the blue-collar industries exist where no additional formal education is needed to move up a particular job ladder. In health services, however, there are educational barriers to upward movement because experience in a lower-level job may not be sufficient for performance in the next higher job. Therefore, the ladders cannot be promotional unless the required additional education is provided to trainees while they are in the lower-level jobs.

Job ladders in health services cannot be implemented without the existence of educational ladders. This is because the higher-level jobs are usually reachable only through attainment of degrees, licensure, or other credential requirements. At present, curricula for most health occupations are terminal. Movement from one job level to another requires "starting from scratch" in each course of study regardless of prior training, with the burden resting with the student to obtain the needed credentials.

We conclude that an educational ladder would have to be a related, sequential set of educational courses or programs which would provide for continuous educational movement to parallel a job ladder from its entry level to the professional level; it would have to provide exit credentials for all the intermediary jobs that are rungs on the ladder. Ideally, such programs would not require repetition of course work when an individual reentered the educational process to continue up the ladder (aside from the necessary reinforcement or refresher work needed to bring the student up to date in competence).

STRUCTURE OF THIS REPORT

Chapter 1 covers the general problems and issues involved with existing curricula which prepare for the health occupations, with specific attention to the fields being studied this year. The chapter sets out the HSMS goals for the curriculum guidelines which we expect to produce.

Chapter 2 provides the theoretical framework for our methodology, and provides comments on the state of the art in relation to our particular methodological needs and objectives. Chapter 3 presents the HSMS method for preparing curriculum guidelines utilizing HSMS task data.

Chapter 4 discusses the possible impact of the HSMS curriculum work. It comments on the impact and various uses to which the curriculum guidelines may be put, and discusses other possible utilization of the curriculum objectives.

Appendix A provides a brief review of the HSMS task analysis and job ladder design methodology. It is important for the reader to be familiar with its contents because this document builds on the methodology. The unique characteristics of the task definition, the skill scales, the Knowledge Classification System, the knowledge scale, and the procedural information contained in the task descriptions all make it possible for our curriculum design methodology to result in guidelines for educational ladders, and should be understood.

Appendix B is offered as an indication to the reader of what "real world" procedures are involved when an educational institution attempts to change existing curricula or institute new programs.

MANPOWER PROBLEMS AND ISSUES OF EXISTING CURRICULA

The Health Services Mobility Study takes the position that the greatest social investment in health services lies in the education and training of health manpower. Yet one finds workers in health service occupations locked into dead-end jobs while shortages exist for properly trained professional and skilled personnel. One finds shortages of educational facilities while educators continue to require redundant training.

As new health care functions and occupational titles have been developed, and as professional associations have moved to represent the new titles, entry into new titles and functions has been increasingly hedged with credential barriers such as licensure or certification requirements. These credential requirements have been developed in isolation from, and without consideration of, the relationships of the new functions to existing occupational titles and functions.

It has become increasingly necessary for health manpower to be trained in educational programs accredited by the professional organizations in order to be employed. The developments in education have seen a proliferation of credentialed health care curricula which overlap. They duplicate requirements just as the jobs and titles duplicate functions. When employment in health care titles requires formal, accredited training, one finds that the programs, in most cases, assume no prior experience or training in health care. Therefore, one finds extensive overlap across educational programs with no allowance for prior training. Individuals rarely receive transferable academic credits for relevant job experience or training when moving from one program or occupation to another.

When an individual decides to undergo all that is required in order to move from one credentialed job to another, the burden falls on him or her to obtain the required, often redundant, accredited training and credentialing needed for the new job. The irony is that, once an individual has obtained the credentials, there is no guarantee that the newly acquired training will be relevant or fully utilized in the new institution or job. This is because the proliferation of credential barriers has been concurrent with adaptations of actual job functions to internal needs in the institutions employing health manpower.

When health care delivery institutions provide internal training for their manpower needs, the training is often so specific to the needs of the institution that the trainee finds it of little use for upward mobility or even lateral movement in the open job market. This is particularly true in the so-called "new career" titles. Since the institutions themselves are not permitted to provide academic credits, the training is of no help in the attainment of the degrees which are a part of the credential system.

In the face of rising costs and the demand for quality patient care, the greatest wastes lie in the improper allocation of functions to personnel, in the redundancy of training requirements, and in the non-transferability of much lower-level training.

General Problems and Issues

The existing problems in health occupation curricula are manifold and complex. We have been able to isolate seven specific problems which we believe can be somewhat alleviated by a job oriented methodology of curriculum design based on our task data and reflecting an educational ladder orientation.

To place a discussion of the general problems in a meaningful institutional framework, let us consider the situation confronting the schools offering the occupational programs. (See also Appendix B.)

Educational institutions are very much influenced by curriculum restrictions and requirements covering accreditation for academic degree programs and accreditation for health occupation programs. Accreditation is the process whereby an agency, organization, or government body grants recognition to a program or institution based on a set of standards or qualifications including curriculum guidelines.

The American Medical Association (AMA) accredits the major portion of health occupation programs. (Accrediting agencies operating independently from the AMA cover nursing, dentistry, osteopathy, occupational therapy, pharmacy, cardio-pulmonary technology, speech pathology and audiology, podiatry, clinical and counseling psychology, dietetics, hospital administration and social work.) Course content requirements, such as curriculum guidelines by subject area, the length of the program, and sometimes the division of hours into didactic and clinical training are a part of overall accreditation requirements (called "Essentials" by the AMA and its cooperating organizations). Graduation from an accredited program is required before many professional associations will accept a candidate for membership or before a candidate is permitted to sit for an examination leading to registry (a form of certification).

When a state licenses an occupation, such as RN or radiologic technologist, the occupational programs in the state are under the jurisdiction of the state's department of health and/or education, and the state undertakes the approval of such programs. Examination leading to state licensure are independent from those leading to professional certification; usually one must have completed a state-approved program in order to take a licensure examination.

The process whereby schools can offer academic degrees is regulated by state departments of education. In these cases a totally different and independent set of requirements for accreditation is involved. Thus, for a program leading to a licensed title and an academic degree, it can be necessary to satisfy accreditation requirements for the professional association, the state licensure department and/or the state department of education. In all probability the program must also comply with standards set by associations of colleges, the given institution itself, and local boa s of education.

Thus, the first problem we face is the lack of uniformity of curriculum requirements for a given occupation. This refers both to curriculum content and to the amount of time required. The time problem reflects the fact that students wishing to enter many health occupations may take their preparation in hospital-based, non-degree granting programs, in associate degree programs, or in baccalaureate programs. Thus, varying preparation times result in the same occupational preparation. Since the occupations are not uniformly subject to standards such as licensure, and not all comply with professional organization accreditation requirements, occupational programs vary from state to state and from institution to institution.

The second major problem, already alluded to in this chapter, is that of overlap of curriculum content across occupational titles which is not acknowledged in the form of credit or reduced requirements for individuals.

Redundancies in programs which prepare students for different but related occupations may not be recognized because of non-uniform terminology in course descriptions, requirements, and standards, where the actual work would be the same. Problems of redundancy also reflect the different (and sometimes conflicting) interests of the professional organizations that are involved with accreditation. Redundancies are also the inadvertent result of the relative isolation in which the planning is done for new programs, especially planning for new occupations.

A third major problem with curricula is that there can be <u>redundancies of requirements within a given program for a given occupation</u>. Degree-granting programs are one source of this problem. Since the course requirements for occupational programs are determined by professional organizations and the state agencies concerned with licensure, and are developed independently from requirements for academic degrees, there can be curriculum redundancy <u>within</u> a program, not in the specific content, but in the general subject areas required for credits. For example, a course in physiology, biology, or physics may be required in a liberal arts or sciences program to fill course requirements for the degree. However, these courses may not cover the appropriate specific content required by the "Essentials" for a given occupation. At the same time, occupational courses as specific as "radiation physics" may not be accepted to fulfill science requirements for the degree. The student winds up taking courses which overlap in general content when both degree and occupational needs might be met in a single course.

A fourth problem is that the degree programs actually can add to restrictions on individual choices and mobility. In the absence of counter-pressures, the tendency in degree programs is to place academic and related prerequisite restrictions on student entry to the programs to guarantee successful graduates. It also seems that there is a tendency in associate degree and baccalaureate health occupation programs to teach the required liberal arts and science courses early in the programs so as to screen out students. As a result, the students who fail do not have enough occupational training to qualify in any health services job market. The students are penalized for failure which could be unrelated to actual work requirements for lower levels or the job in question.

The fifth and sixth problems, those of irrelevant requirements and inadequate requirements, relate to the problems of tying the curriculum to the needs of the job for which the student is preparing. On one hand, the student may be asked to learn material which will never be used; and on the other, there may be areas that are not adequately covered. For example, a program in physical therapy may mistakenly require a course in sociology which does not prepare the individual to deal with patient needs, while at the same time failing to provide training in the skills necessary to deal sensitively with individuals. A course in electricity may be required for an occupation so automated that the technologist will never need to know how the equipment works, while a course driving home the effects of excessive radiation exposure or the dangers of infection in the examination room may be totally inadequate.

These problems are compounded when arbitrary and unyielding time requirements are placed on programs for numbers of years or numbers of classroom or clinical hours. The tendency is to maintain or increase time requirements even when the scope of the content which must be covered is reduced.

The seventh major problem is that of transferability. For upward mobility to be possible, the student must be able to build on his or her knowledge in cumulative steps. For academic mobility to be possible, the student must be able to obtain academic credits for the training received. The issues related to transferability are sufficiently complex to be discussed separately. They are presented below.

Education versus Training

This section deals with a major conceptual problem related to curricula and upward mobility. It is at the heart of the issues surrounding "paraprofessional" or vocational training and education. The words "training" and "education" are usually used interchangeably in everyday speech, but important distinctions can be made to clarify different approaches to curricula.

Dr. Mauritz Johnson, Jr., then Dean of the School of Education, Cornell University, wrote in 1967:

> ... a distinction can be made between curriculum selection for training and for education. Training implies learning for use in a predictable situation; education implies learning for use in unpredictable situations. The development of a training curriculum begins with a job analysis in which the tasks to be performed and the knowledge, skills,

and attitudes needed to perform them are identified. The uses of training are ... replicative and applicative. The uses of education are associative and interpretative ... [43, pp. 132-133].[1]

For the purpose of this immediate discussion, we refer to "education" as the student's experience, usually obtained in a general academic framework, in which subjects in programs are taught within the contexts of their broader disciplines, and in which academic credits are usually accumulated for time spent in course work. In contrast, for the purpose of this discussion, we refer to "training" as the experience, usually obtained in a work-oriented framework, where the specific procedures for given work activities are taught, and for which academic credits are not usually accumulated. (Thus, clinical practice or occupational programs may be found in either an educational or a training setting.)

This distinction must retain the word "usually," since many hospital-based, on-the-job programs can and do provide the conceptual content we equate here with "education," and there is no reason why they could not. Similarly, many programs providing academic degrees can be accused of requiring mere rote memorization of information and procedures. This issue is more correctly put in terms of content and approach rather than location of the program. However, since academic credits are the coinage of occupational mobility in health occupations,

1 The number introducing the notation in brackets refers to the bibliography listed alphabetically by author at the end of this document. This system of reference will be used throughout the document except for tables.

the issues emerge of providing academic credits for truly educational programs given in non-academic institutions, and of providing true education, including proper clinical experience, in many academic programs.[2]

Purely technical training is provided for most entry-level jobs, and is the form in which preparation for many emerging specialties first appears. The training teaches students what to do in the immediate context and under the specific conditions of the given institution or the given equipment. It is generally designed to provide rapid results for immediate needs; as a result, the performer is able to carry out routine procedures by rote. (This is not the same as clinical training when clinical training is consciously designed to provide understanding.)

Such preparation is certainly related to work performance, but we maintain that it is not adequate for use in connection with job ladders, and cannot be proposed as the basis for educational ladders. Training for the rote performance of narrowly conceived task procedures (which is offered by many who design curricula for paraprofessionals), does not properly prepare the student for higher level work or learning.

1. "Training" does not prepare the student to deal with contingencies that may arise, such as emergencies, since the student does not learn why he or she is doing a given act or what principles are involved. Thus, the student does not learn enough to be able to function responsibly.

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2 The authors wish to thank Dr. William R. Bishop, assistant director of the Division of Medical Education, Department of Graduate Medical Education, AMA, for these pertinent reminders.

2. "Training" does not prepare the student to apply the activity in a different work situation where, if the principles were understood, the same learning would apply, or to a different set of materials or equipment where, if the reasons were understood, the same procedures would apply. Thus, the student's learning is not transferable laterally.

3. "Training" does not prepare the student with the conceptual groundwork upon which later learning for higher level tasks must be based. The rote learning is not additive and, therefore, is not transferable vertically.

4. "Training" does not provide the student with transferable academic credits when it is not academically based, or is provided in a terminal, technical program. Thus, the time spent in training is wasted if the student aspires to any upward mobility that requires the accumulation of academic credits.

Degree-granting programs usually stress the disciplines upon which technical work is founded and appear to provide implicitly for transferability of learning as well as accumulation of credits. However, there are real objections to academic programs when course requirements are irrelevant, obsolete, or taught in a manner so removed from the contexts in which they are to be applied that they are not useful preparation for work. Such programs require the vitality of relevant content and proper clinical experiences.

HSMS takes the approach that occupational preparation must emphasize transferability of training and must also be job-relevant and additive. This approach is reflected in our task data and is an underlying requirement for our curriculum design methodology.

1. The education and training must permit for <u>transferability</u> of knowledge across specific work contexts or as

technology changes, and must prepare the student to deal with contingencies or emergencies. This requires that knowledges needed in work performance be comprehended in the context of the larger disciplines in which they are found.

2. The education and training must present the academic disciplines and general skills in contexts which will be relevant to the jobs for which they are preparation by referring to the work behaviors in which they are to be applied, including clinical training which is consciously utilized to this end.

3. The educational and training programs must present the skills and knowledges in a manner that is, and in units that are, additive, so that each level provides the groundwork that will be needed for later learning.

4. The provision of transferable credits to be used for academic credentials is an institutional issue and should be granted once the proper education and training are provided.

Specific Problems and Issues

The section above presented some general problems and issues related to health manpower education. This section relates the problems and issues to the occupations and functions with which we are currently concerned.

To highlight the specific institutional complexities involved, let us consider the accreditation of an occupational degree program for radiologic technologist (technician) in New York State:

1. Any school wishing to grant the degree (either associate degree or baccalaureate) must be accredited by the State Department of Education.

2. Since the program covers an occupation which is licensed by the state, it must be accredited by the State Department of Education in cooperation with the Bureau of Radiologic Technology, which covers the occupation. (Three states currently license radiologic technologists: California, New Jersey and New York.)

3. The program for this health occupation must also have accreditation by the American Medical Association (AMA) if it is expected to turn out graduates who can be active in the occupation.

4. If a student wishes to join the American Society of Radiologic Technologists, he must be sure that he is eligible to take the examination of the American Registry of Radiologic Technologists, i.e., he must graduate from a program that is AMA accredited.

The case of New York State's licensure requirements in the areas of x-ray technology and radiation therapy illustrates the emphasis in the legislation on the number of hours of study and years of training as a substitute for evaluation of readiness. The legislation retains fixed time requirements of training even when the original licenses are reduced in scope. It lacks any provisions for recognizing curriculum overlap when individuals seek two licenses. Thus, it remains in the hands of the Bureau of Radiologic Technology whether the legislation is interpreted literally or in a flexible manner.

New York State began to license x-ray technicians in 1964. (The approved terms now used by the field are radiologic technologist and radiation therapy technologist.) By 1965 there were three separate licenses available. One was for the "general x-ray technician," and permitted the licensee to practice in diagnostics and in therapy. The second was limited to the x-ray therapy technician," and a third was a license for the "chest radiographer."

As indicated in Table 1.1, the two technician licenses each required a two-year course of study (in a State approved program) including 320 hours of classroom work in broadly specified areas. There were 2,400 hours of supervised clinical work also required. The first license provided the option of functioning in either diagnostics or therapy. The required subjects for each appear to overlap in four out of ten subject areas; in addition, one is hard-pressed to differentiate between "x-ray physics" and "radiotherapy physics."

The third license, a sub-set, it would appear, of diagnostics, was a one-year program which, however, required only 40 percent (not 50 percent) of the total prescribed minimum months of training for the general two-year license. The overlap of required subjects for the general and chest x-ray curricula appears in four out of nine subject areas. And, in addition, the "techniques" and "anatomy and physiology" subjects for the chest license appear to be subsections of the broader courses for the general license. However, no provision was made to allow for completion of the two-year license by a year's additional work for someone holding the one-year license.

In 1975 New York State will require that "general x-ray technician" licenses apply only to the practice of diagnostic radiologic technology. The license for "x-ray therapy technician" will be the exclusive license for radiotherapy technology. The one-year "chest radiography" license is no longer issued.

Table 1.1. NEW YORK STATE CURRICULUM REQUIREMENTS FOR TECHNICIAN LICENSES IN X-RAY TECHNOLOGY

COURSE CONTENT (Minimum requirements)	PRE-1975 LICENSES			POST-1974 LICENSES	
	General X-ray Technician	X-ray Therapy Technician	Chest Radio-grapher	X-ray Technician (diagnostic)	X-ray Therapy Technician
X-ray Physics	X		X	X	
Radiotherapy Physics		X			X
Radiographic Techniques	X			X	
Techniques of Chest Radiog.			X		
Darkroom Chemistry & Techniques	X		X	X	
Anatomy and Physiology	X	X		X	X
Anatomy & Physiology of Chest			X		
Radiation Protection	X	X	X	X	X
Radiation Therapy	X	X			X
Pathology and Radiobiology		X			X
Clinical Aspects of Radiotherapy		X			X
Ethics	X	X	X	X	X
TOTAL CLASS HOURS	320	320	100	320	320
Clinical Hours	2,400	2,400	1,000	2,200	2,200
(Film Critique)	(80)			(80)	
TOTAL HOURS	2,720	2,720	1,100	2,500	2,500
TOTAL MONTHS	24	24	12	24	24

SOURCE: Public Health Law of New York State and Ammendments.

The diagnostic x-ray technician now will have to complete 24 months of work in an approved program covering 320 hours of class work in order to work in diagnostics alone. There has been no reduction in the prescribed 320 hours of required class work, even though there has been the elimination of a subject area; there is no reduction in the required 24 months, even though there has been a 200-hour reduction in required clinical practice.

The x-ray therapy technician license retains the same requirements except for a reduction of 200 hours in the required clinical practice (but no reduction in the 24 months required); however, the license is now exclusive.

It is clear that it could now take 48 months of training for a person to be able to function in both diagnostics and therapy, or to move from one specialty to another. There is still an overlap in three out of ten subject areas, and the distinction between "x-ray physics" and "radiotherapy physics" remains vague; yet no arrangement is prescribed to give a holder of one license advanced standing in preparation for the other. However, the Bureau can allow for this if it sees fit.

An obvious difficulty is that subjects such as "anatomy and physiology" and "radiation protection" are too broadly named to permit assumptions about the existence of overlap in required curriculum content. Our point is that it is inappropriate for legislation to use such vague terms for curriculum when licensure for occupations is involved without providing acknowledgement that credit for actual overlap of preparation may need to be recognized.

Table 1.2 indicates the manifold organizational jurisdictions involved in the three technologist areas with which we are concerned this year. It is clear that interests at both the physician and technologist levels are intimately concerned with the Essentials, and thereby with the shape of occupational mobility in these fields.

The problem of possible curriculum overlap across programs is evident in AMA Essentials in areas as related as radiologic technology [20], radiation therapy technology [21], [22], and nuclear medicine technology [23]. Curricula in the Essentials are topic outlines, but use different language to describe what may be the same content in given fields. Since there is no common taxonomy of subject areas, the Essentials cannot reflect an awareness or recognition that there may be overlap involved. As a result, the programs reflecting them may involve redundancies for someone wishing to go from one occupational area to another.

The problems of overlap among AMA-approved programs for technologists in diagnostic radiography, radiation therapy and nuclear medicine are highlighted by Table 1.3. The reader will note that there is apparently some attention to ladders, since the one-year program for radiation therapy technologist is available to the registered radiological technologist or RN, and the title of technologist rather than technician in nuclear medicine is available to medical technologists, radiologic technologists and RN's.

Table 1.2. ORGANIZATIONS INVOLVED WITH DRAFTING, REVIEWING, APPROVING OR ADOPTING ESSENTIALS FOR ACCREDITING PROGRAMS OR REGISTRY OF INDIVIDUALS, BY SELECTED TITLES AS OF 1972.

ORGANIZATIONS INVOLVED OR CONCERNED	TITLES						
	Radiologic Technologist	Registry	Radiation Therapy Technologist	Registry	Nuclear Medicine		Registry
					Technician	Technologist	
Council on Medical Education, AMA	X		X		X	X	
American College of Radiology	X[a]		X[a]		X[b]	X[b]	
American Society of Clinical Pathologists					X[b]	X[b]	
American Society for Medical Technology					X[b]	X[b]	
American Society of Radiologic Technologists	X[a]		X[a]		X[b]	X[b]	
Society of Nuclear Medical Technologists					X[b]	X[b]	
Society of Nuclear Medicine					X[b]	X[b]	
American Registry of Radiologic Technologists		X		X			X
Registry of Medical Technologists (ASCP)							X

SOURCE: Council on Medical Education, American Medical Association (AMA).

a. Sponsoring organization of Joint Review Committee on Education in Radiologic Technology.

b. Sponsoring organization of Joint Review Committee on Educational Programs in Nuclear Medicine Technology (and/or Board of Schools of Nuclear Medicine Technology).

Note: Organizations collaborating with the Council on Medical Education, AMA, draft and approve Essentials and their revisions; the Review Committees review the programs which apply for accreditation. The AMA accredits programs and its House of Delegates votes on the Essentials.

Table 1.3. ESSENTIALS FOR SELECTED AMA-ACCREDITED PROGRAMS AS OF 1972.

TITLE	RADIOLOGIC TECHNOLOGIST	RADIATION THERAPY TECHNOLOGIST		NUCLEAR MEDICINE Technologist | Technician[a]
Time	2 Yrs.-410 Class Hrs.	1 Yr.- 257 Class Hrs.	2 Yrs.-465 Class Hrs.	1 Yr.-319-529 Class Hrs.[a]
Subjects and Class Hours	Orientation and Elementary Radiation Protection 5	Introduction to the Course 3	Orientation 10	Orientation and Introduction 4
	Protection to Patients, Personnel 10	Protection and Shielding 15	Radiation Safety 15	Radiation Protection 15
	Anatomy and Physiology 30 Topographic Anatomy 12 Survey of Medical & Surgical Diseases 15	Anatomy 16 Elementary Pathology 16	Anatomy and Physiology 100 Pathology 25	Basic Anatomy, Physiology, Pathology 40-100
	Physics 40	Physics 60	Physics b Radiation Physics 100 Radioisotope Physics 25	Radiation Physics 10-20 Nuclear Physics and Instrumentation 60-100
	Professional Ethics 4 Departmental Administration 10	Ethics 5	Professional Ethics 5 Records and Statistics 5	Records, Administrative Procedures (Regulations) 5
	Nursing Procedures 10	Nursing Procedures 15	Nursing Procedures 20	
	Medical Terminology 10 Radiation Therapy 10 Radiographic Positioning 60 Common Radiographic Procedures Using Contrast Media 8 Special Radiographic Procedures 20	Mathematics 20	Mathematics [illegible]	Mathematics 20
		Radiobiology 12	Radiobiology 25	Radiation Biology 20-30
			Principles of Radiotherapy 30[d]	Basic Lab. Procedures and Techniques 10-50
		Treatment Planning 70	Treatment Planning c	Clinical Application of Radionuclides 100-150
		Radium Therapy 25	Radium Therapy b	Therapeutic Radionuclides 10
			Technical Radiation Therapy c Seminars in Radiation Therapy c Oncology (study of tumors) c	Radiochemistry and Radiopharmaceuticals 25
	Principles of Radiographic Exposure 30		Radiography b *(See footnotes below)*	*(See footnotes below)*

continued next page

Table 1.3. ESSENTIALS FOR SELECTED AMA ACCREDITED PROGRAMS AS OF 1972. (continued)

TITLE	RADIOLOGIC TECHNOLOGIST	RADIATION THERAPY TECHNOLOGIST		NUCLEAR MEDICINE	
				Technologist	Technician[a]
Time	2 Yrs.-410 Class Hrs.	1 Yr.- 257 Class Hrs.	2 Yrs.-465 Class Hrs.	1 Yr.-319-529 Class Hrs[a].	
Subjects and Class Hours	Darkroom Chemistry and Technique 10		Film Processing b		
	Nuclear Medicine Technology 10		Elective in Clinical Nuclear Medicine b		
	Intraoral Radiography 8 Pediatric Radiography 8 Equipment Maintenance 6 Film Critique 70 Elective 4 Review 20		[b]Listed in Essentials without class hours, but not as separate subject in guidelines. [c]Sum of this group equals 105 hours. [d]Listed in guidelines but not in Essentials.	[a]The same 12-month program could result in either technologist or technician title depending on the prior training or additional academic course work taken.	
ADMISSIONS					
				Technologist	Technician
	High school or equivalency	Already registered as radiologic technologist, or RN with course in radiation physics, or equivalent training	High school or equivalency	Already registered as medical or radiologic technologist or RN, or BA with science, or BS.	High school or equivalency
				For baccalaureate: three years of college (or medical school credit) with science major, and program.	For Associate degree: 1 year of college, and program.

SOURCE: AMA, Council on Medical Education and American Society of Radiologic Technologists.

It should be noted, however, that these one-year programs do not really eliminate redundancy of training, because no one could argue that the radiologic technologist, registered nurse (with radiation physics), and/or the medical technologist, and/or the holder of a BS or a BA with science courses all have had the <u>same</u> overlapping, relevant prior training. Yet these candidates are admitted with equal standing to the respective one-year programs.

When one inspects the briefly outlined requirements (more detailed guidelines are also available in [20], [21], [22], [23]), the overlap that is apparent or possible between radiologic technology and radiation therapy seems to be ignored, as are the equally suggestive possibilities among these two programs and the one in nuclear medicine.

The outlines in the Essentials are arranged in Table 1.3 to point up the possible overlaps. It will be seen that these programs are, in fact, self contained and possibly overlapping. The extent to which the overlap exists is not clear, since terms as broad as "anatomy," "physiology" and "physics" cover widely ranging fields. On the other hand, it is impossible to say whether "radiobiology" and "radiation biology" are the same. That is, the problem of finding whether overlap exists is compounded by non-uniform terminology.

One cannot tell how many hours of overlap <u>should</u> be eliminated for the radiologic technologist or the registered nurse who decides to go on to radiation therapy. It is not clear from the outlines in what way the one-year program eliminates work presumed to be required for those students entering the two-year program with the exception of "records statistics," "radiography," and "film processing." (The latter two subjects would not have been previously covered by an RN entering the one-year program.)

The Essentials for the two-year program in radiation therapy do not specify class hours. However, the detailed guidelines for the program [21] do present suggested class hours. In the case of the two-year radiation therapy program however, the subjects listed in the Essentials do not fully match those listed in the guidelines. It is difficult to tell in what way the graduates of the one- and two-year programs are to be compared, and whether it is intended that the graduates of each are to have had equivalent training.

Presumably, class hour requirements should have a bearing on the time requirements set for a program, especially since clinical hours are not specified for programs in the Essentials. However, we find no logic to the relationship between class hours and the designation of programs as one- or two-year programs. If 319 class hours plus the required clinical practice can be associated with a <u>one-year</u> program in nuclear medicine, for example, is the allocation of 410 class hours plus clinical practice to a <u>two-year</u> radiologic technologist program wasteful of time? One has further questions about time requirements when one considers that there is a two-year requirement for the radiologic technologist program regardless of whether it is a hospital-based program or offered in a community college leading to an associate degree. One may conclude, in this case, that the associate degree programs probably cover the Essentials in less than the equivalent of two years and handle the liberal arts courses in the remaining time. Therefore, it is probably the student in the hospital-based program whose time is being wasted. We cannot explain the other anomalies regarding time requirements.

Another anomoly appears on Table 1.3. The reader will note that the 12-month program for nuclear medicine shows no difference between the Essentials for the technologist and the technician. (It is indicated that the former should go more intensively into the materials.) It appears from the admission requirements that the technologist title is a reward (or a recruiting device?) to those who hold academic degrees or to those who are already trained as medical technologists, radiologic technologists or registered nurses. (Why not radiation therapy technologists?) The technologist title appears to be unrelated to any difference in the actual preparation needed to perform tasks in nuclear medicine.

The problem of identifying curriculum overlap among the programs is not solved when one inspects the language of the guidelines for the Essentials [20], [21],[22], [23]. On inspection, one finds it hard to know when the same words cover different content, and when the same content is covered by different words. The attempt to build truly non-overlapping programs for individuals who wish to move sequentially in these fields has no doubt been inhibited by the overwhelming diversity of usage. One can be easily discouraged from trying to sort out and compare the detailed outlines. The following are examples of the problem.

Table 1.3 appears to indicate that the "anatomy and physiology" for the radiologic technologist two-year program (30 hours) might overlap the "anatomy" for the radiation therapy technologist (16 hours), but that the "topographic anatomy" (12 hours) of the former is not duplicated by the latter program. On inspection of the detailed guidelines, we learn that "topographic anatomy" is contained within the outline for "anatomy" for the radiation therapy technologist. The "radiation and nuclear physics" for nuclear medicine technology overlaps considerably with "physics" for the one-year radiation therapy program. There is a good deal less overlap with "physics" for the radiologic technologist; but, still, overlap is evident.

The two-year program for radiation therapy specifically covers "oncology" (the study of tumors) in the outline, and the one-year program lists tumors under "elementary pathology." While "ethics" is listed for the radiologic and radiation therapy technologists and not for the nuclear medicine technologist, one finds the equivalent subject areas covered in all programs.

Overlap within a given occupational program is exemplified in the two-year syllabus for the radiologic technologist. After devoting 42 hours to "anatomy and physiology" and "topographic anatomy," the syllabus has a "review of anatomy" for every part of the body covered under "common radiographic procedures using contrast media" and "special radiographic procedures." The 60 hours of "radiographic positioning" are repeated in review again under these two sections on procedures;

and then the syllabus devotes 20 additional hours to review. This is apparently a problem of presentation. One wonders if, for the distinctly different purposes of keeping to a topic outline and also providing a natural way of teaching the course content, the student isn't being forced into redundant classroom review because the subjects are not taught in efficient conjunction with one another.

Conclusions

The problems in curricula which have been outlined in this chapter suggest the need for a method of curriculum design which will result in curriculum guidelines which can:

1. Provide for upward mobility and educational ladders which eliminate redundancy and provide transferable education.

2. Provide job relevant curricula which can be examined for curriculum overlap,relevance,and adequacy.

3. Provide for an objective allocation of curriculum content to academic levels of education and sequences of jobs that is independent of the subjective or conflicting assessment of various experts and institutions.

4. Provide a common taxonomy to make objective analysis possible.

CHAPTER 2

THEORY AND METHOD

This chapter provides the theoretical framework for our curriculum development methodology and comments on the state of the art in relation to our specific methodological needs and objectives.

To develop our methodology we first reviewed the literature on curriculum development, on the use of task data in curriculum design, and on behavioral objectives. We were searching for a theoretical framework that would support the objectives we had established for curriculum guidelines.[3]

We undertook the literature search because we had no intention of reinventing anything in existence which could suit our purposes. We wished to learn from others who had been involved in similar or related undertakings. The three overlapping areas of the literature mentioned above were explored because we sought a theoretical underpinning on which to base our method of curriculum design; we sought to learn what methods

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[3] As presented in chapter 1, these are that our curriculum guidelines must:

1. Provide for upward mobility and educational ladders which eliminate redundancy and provide transferable education.
2. Provide job relevant curriculum which can be examined for curriculum overlap, relevance, and adequacy.
3. Provide for an objective allocation of curriculum content to academic levels of education and sequences of jobs that is independent of the subjective or conflicting assessment of various experts and institutions.
4. Provide a common taxonomy to make objective analysis possible.

were already in use in the application of task data to curriculum design, and we considered behavioral objectives to be relevant for deciding on a form in which to express our curriculum requirements.

This chapter is organized into three main sections which reflect these three areas of inquiry. It is presented to the reader to indicate the issues involved and to share some of the insights we gained and conclusions we reached. The chapter serves as a limited literature review covering the state of the art as it relates to our four objectives for curriculum guidelines (see footnote 3); it also presents a series of models developed as a result of our study.

The bibliography appended to this document represents the literature we covered in our review. While many of the sources proved to be less useful for our needs than was anticipated, we acknowledge our debt to all whose efforts have provided insights and directions for our specific undertaking. Our textual references are limited to the most relevant of these.

CONCEPTUAL FRAMEWORK

We approached the theoretical literature on curriculum development for very practical reasons. We were convinced that only with a properly selected theory to define and explain the processes involved in curriculum development could we hope to properly delimit the scope of our work in curriculum and devise a methodology to suit our needs.

The relevance of having correct theory became evident as soon as we encountered the literature. We were continually confronted with confusions between instruction and curricula, between processes, such as curriculum development and products, such as curricula. We found that the theory of curriculum development was confused with learning theory, and that curriculum selection was confused with educational goals or the structure of knowledge.

The results of these confusions were manifest to us in the work which was produced. We rarely encountered clear-cut statements of curriculum development methods. We rarely found curricula which were solely curricula. Instead, we found materials and methods which combined curriculum selection, instruction, curricula, instructional materials, curriculum development, and learning objectives in varying combinations, with some using task data and some not.

We decided to first pose several basic theoretical questions:

1. What is a curriculum; what is curriculum development?
2. What are the steps in the processes of education?
3. Are we, as non-health professionals, competent to develop curriculum guidelines for health occupations; what are the boundaries of our competence?
4. How can the HSMS task data best be used in curriculum development to achieve our four objectives?

What Is a Curriculum; What Is Curriculum Development?

Since we have designed a method of task analysis that would have inputs into curriculum design, and since we have accepted the goal of preparing curriculum guidelines for educational ladders, our first theoretical questions sought to define clearly what the terms curriculum and curriculum development do or should signify. We needed to establish exactly what activities should be encompassed by the term "curriculum development."

We turned first to a review of the work of professional educators in the area of curriculum development. These are professionals who are usually trained specifically in education or curriculum design, or a related descipline.

One of the first problems we encountered was that these writers either failed to define the terms they employed or used concepts which they did not apply consistently. The chief confusion was between curriculum and instruction. We found no consistent distinction between the two terms; we found them used interchangeably, as paired terms, or as terms for activities which on inspection turned out to be other than the term suggested.

Dr. Johnson notes in his review of the literature that:

> Accepted usage identifies curriculum with "planned learning experiences." This definition is unsatisfactory, however, if "curriculum" is to be distinguished from "instruction" [43, p. 129].

Curriculum and Instruction (or Curriculum and Teaching) links the terms in a name which is applied to a specialty in graduate schools of education. The specialty combines the study of curriculum development, curriculum research, educational materials and teacher education.

The booklet, The Unit in Curriculum Development and Instruction [98], turns out actually to be concerned with aiding teachers in the planning of instructional units. It has virtually nothing to say about curriculum development. In a book on standard terminology, a figure purporting to show the "Interrelationship of subject matter with other selected aspects of curriculum and instruction," never actually refers to curriculum; the figure is really about instruction alone [74, p. 13]. The same text provides the following definition of curriculum:

> The curriculum is considered to encompass the instructional activities planned and provided for pupils by the school or school system. The curriculum, therefore, is the planned interaction of pupils with instructional content, instructional resources, and instructional processes for the attainment of educational objectives [74, p.3].

Curriculum development is similarly confused with instructional planning. Dr. Jerome Bruner seems to equate curriculum development with "the preparation of textbooks and laboratory demonstrations [and] the construction of films and television programs" [12, p.4]. His reference to "a course for which textbooks, laboratory exercises, films, and special teaching manuals have been prepared, as well as training courses for teachers," as a "highly developed curriculum" [12, p. 2] shows that his confusion is consistent.

Ralph Tyler, in his very influential book, Basic Principles of Curriculum and Instruction [96], also fails to define or distinguish between curriculum and instruction. In raising "four fundamental questions which must be answered in developing any curriculum and plan of instruction," he leaves the reader unable to distinguish whether the questions all apply to curricula, instruction, or both:

> 1. What educational purposes should the school seek to attain?
> 2. What educational experiences can be provided that are likely to attain these purposes?
> 3. How can these educational experiences be effectively organized?
> 4. How can we determine whether these purposes are being attained? [96, p. 1]

It is crucial for our work to have the question answered: Do all four apply to curriculum? If all of Tyler's questions must be answered in order to develop a curriculum, then the curriculum designer must become enmeshed in activities related to the planning of specific educational activities, the selection of appropriate materials and teaching methods, the sequencing of activities, and, finally, the design and validation of test instruments to evaluate instructional results.

These activities would require familiarity with the psychology of learning, with methods of instruction, with the range and applicability of available educational materials, and with the area of test design, not to mention all of the expertise tied up in the fundamental problem of determining the purpose the school should seek to attain. Furthermore, to be appropriate and effective, all of these activities should ideally be carried out with reference to the actual needs and abilities of a particular student body. If all these competencies must be met in order to develop curricula, the HSMS would be disqualified from the very process we now are undertaking.

Even when the literature addresses itself to matters of curriculum reform, we find theory which is narrowly focused. We have in mind the work that grew out of the American reaction to "Sputnik," such as Bruner's The Process of Education [12]. It and related works[4] offer as a basis for curriculum development the tenet that learning would be most exciting and teaching be most effective if the basic structure and principles of a discipline formed the organizing principles for curriculum and instruction. Philip Phenix [69] attempted to develop a taxonomic structure for all knowledge which would serve as the organizing framework for curricula. However, the proponents of curriculum reform also confuse the boundaries between curriculum and instruction. Dr. Johnson points this up in commenting on the reform school:

> It seems evident that many, if not most, of the so-called "curriculum reform" projects of the past decade have been concerned with instruction far more than with curriculum. Indeed, some of them have never made their curriculum explicit, whereas they have trespassed heavily in the instructional planning domain, going as far as to specify not only the learning activities to be provided but the instructional materials to be used, as well. These suggestions may well be excellent ones, so long as it is not assumed that alternative activities and materials could not possibly be devised to carry out the same curriculum as well or better. It seems probable that some of these projects have encroached upon instructional planning in a deliberate, if cynical, effort to make the curriculum "teacher-proof." On the other hand, syllabuses, courses of study, and curriculum guides have for years been freighted with lengthy compilations of suggested activities, materials, evaluation procedures, and other instructional advice, whereas, aside from an extensive list of vague objectives and an expository outline of so-called "content," they have seldom presented any curriculum at all...[43, pp. 134-35].

4 See also [5], [49], [76], and [89].

Writing in 1949, Tyler set forth a rationale for "developing any curriculum and plan of instruction." It is founded on the assumption that the process must begin with the answer to the question, "What educational purposes should the school seek to attain?" While on the surface this seems a relevant question for guiding the design of curriculum, we found that the greatest part of the book is concerned with philosophical and social issues:

> It is certainly true that in the final analysis objectives are matters of choice, and they must therefore be the considered value judgments of those responsible for the school. A comprehensive philosophy of education is necessary to guide in making these judgments [96, p. 4].

Tyler goes on to explore the various types of educational objectives which have been classified as "child-centered," "social-problems oriented," and "subject-matter oriented." For example, "child-centered" objectives would focus on the personal development of individual students, while a "subject-matter orientation" would lead to a primary focus on intellectual achievement. This concern with determining a philosophy of education and the proper objectives of the school as though they were the primary domain of curriculum development is typical of many others in the field.[5]

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[5] For example, see [4], [9], [10], [39], [41], [53], [68], [82].

We began to perceive that an appropriate theory of curriculum and curriculum development was not apparent in the literature. Dr. Johnson points out that:

> ...the non-educationist scholars who have of late interested themselves in curriculum reform projects ...are more concerned with improving school programs than with gaining increased insight into the nature of curriculum. As scholars, all of them are, of course, interested in some kind of theory, but not in curriculum theory...[43, p. 127].

The realization gradually emerged that the relevance, clarity, and value of work in curriculum development rests heavily on the writer's theoretical foundations. For example, a writer such as Tyler, focussing on his four fundamental questions, never deals with the underlying problem of what questions should be asked in the development of a curriculum as distinct from education as a whole or from instruction.

Dr. Johnson's paper, "Definitions and Models in Curriculum Theory" [43] was the single place in which we found our theoretical questions adequately dealt with. His theoretical model became the base which we further elaborated for our own methodological needs.

Dr. Johnson answers the question, "What is a curriculum?" as follows:

> ...curriculum is a structured series of intended learning outcomes. Curriculum prescribes (or at least anticipates) the results of instruction. It does not prescribe the means, i.e., the activities, materials, or even the instructional content, to be used in achieving the results. In specifying outcomes to be sought, curriculum is concerned with ends, but at the level of attainable learning products, not at the more remote level at which these

> ends are justified. In other words, curriculum indicates <u>what</u> is to be learned, not <u>why</u> it should be learned [43, p. 130].
>
> The central thesis of the present paper is that curriculum has reference to what it is intended that students <u>learn</u>, not what it is intended that they do [in the classroom] [43, p. 130].

Dr. Johnson distinguishes between "curriculum" and "curriculum development." He states that curriculum development is a systematic process which results in an end product, the curriculum. Dr. Johnson answers the question, "What is curriculum development?" by indicating that it is a process which has two chief activities. The first is the selection of curriculum items from the available sources.

> It is obvious that all that is available and teachable in the culture cannot be included in a given curriculum. Selection is essential. Although who does the selecting is an important educational policy question, it is not a concern of curriculum theory. What is of concern, however, is that whatever criteria are used be made explicit [43, p. 132].

The second activity of curriculum development is that of structuring based on available theory.

> A curriculum is not a random series of items, but a structured one, even if only to the extent of indicating that the order in which certain outcomes are achieved is immaterial. Insofar as the sequence of development is not considered to be a matter of indifference, the curriculum must be specific about the proper order. But structure is not merely a matter of temporal sequence. It also refers to hierarchial relations among items [43, p. 131].

We are now able to see the relationship between curriculum and instruction. Curriculum guides instruction. By implication, instruction deals with the student's experience in the classroom. It covers what is taught and presents what is to be learned. It deals with what the student will do in the classroom.

> No curriculum item fully defines instructional content. Instructional content includes not only that which is implied or specified in the curriculum, but also a large body of instrumental content selected by the teacher, not to be learned, but to facilitate the desired learning. Concepts and generalizations are not learned directly but rather through numerous encounters with specific manifestations, the selection of which is an instructional, rather than curricular, function.
>
> Every curriculum item defines instructional activity to some degree. Although there are many ways of developing a concept or a skill, the accepted approaches to each kind of outcome are finite. When the intended outcome is specified, therefore, certain possible activities are ruled out and others favored [43, p. 131].

Dr. Johnson defines instruction as "the interaction between a teaching agent and one or more individuals intending to learn" [43, p. 139]. Instruction is organized on the basis of the needs and interests of the students and teacher, in the context of the classroom, and within the constraints imposed by the curriculum.

> ...a useful concept of curriculum must leave some room for creativity and individual style in instruction. In other words, decisions regarding the learning experiences to be provided are the result of instructional planning, not of curriculum development. The curriculum, though it may limit the range of possible experiences, cannot specify them [43, p. 130].

A curriculum, therefore, is the <u>output</u> of a system of curriculum development. It is an <u>input</u> into the instructional system which includes (1) planning, (2) instruction and (3) evaluation.

<u>What are the Steps In the Processes of Education?</u>

At some point in the course of our literature review we began to appreciate why any theory of curriculum development was so lacking in evidence, and why curriculum was so often confused with instruction. It is because, in practice, the act of curriculum development is performed simultaneously with the act of instructional planning; there is no conscious distinction between the processes when they are being carried out by the same person. The curriculum developer in the average educational institution is often the director of a program and/or the teacher of the course.

It is only when an outside agency such as the HSMS is forced to consider its legitimate area of competency that it becomes absolutely necessary to elaborate the theoretical model. However, once an appropriate model is elaborated, it can be of benefit to all users, since it can shed light on the proper sequence of events, can help articulate the proper questions, and, when consciously applied, it can help to improve the processes involved.

Having established a satisfactory basis for dealing with curriculum in relation to instruction, we proceeded to elaborate the model in relation to "real world" events. That is, it is apparent that curriculum development does not take place in a vacuum. On one hand, educators make decisions about the type of education they will offer, are influenced by social values, are oriented to child or adult education, to "normal" or "special" students, are committed to self instruction, modular instruction, etc. On the other hand, educators have to comply with accreditation requirements, semester time-frames, availability of resources and the characteristics of a given student body. How do all these parts relate to one another?

In Dr. Johnson's article there are two phases to the educational model. One is a curriculum development system whose inputs are: (1) the source of curriculum, or the available, teachable culture contents, (2) selection criteria for the contents, and (3) structuring criteria for the contents. The second is an instructional system whose inputs are: (1) curriculum, (2) additional cultural content introduced to facilitate the intended learning, and (3) the repertoire of teaching behavior.

We gather that what makes these "systems" is that Dr. Johnson specifies that each process must have its separate feedback mechanism, i.e., evaluation. Dr. Johnson indicates that "curriculum evaluation involves validation of both selection and structure" [43, p. 139], while instructional evaluation must refer to curriculum in that "the effectiveness of instruction is represented by the extent to which actual outcomes correspond with intended outcomes" [43, p. 139].

This differentiation of educational processes serves to conceptually separate them into stages of development. The elaboration of input-output relationships at each stage makes the available options clear. Dr. Johnson shows that the suggestions on learning activities and instructional materials made by curriculum developers may be excellent, but it must not be assumed "that alternative activities and materials could not possibly be devised to carry out the same curriculum as well or better" [43, p. 134]. This suggested to us that one of the characteristics of a "stage" is that it results in outputs which become inputs to the next stage. But, since they are not the <u>sole</u> inputs to the next stage, they do not <u>determine</u> the outputs of the next stage.

We came to conceive of five stages of educational processes, whereas Dr. Johnson suggests three stages (curriculum development, instructional planning, and instruction). We found that Dr. Johnson mentions activities which do not belong in curriculum development, but affect the nature of the curriculum produced:

> In most discussions of [curriculum]...the sources of the curriculum are regarded to be (1) the needs and interests of the learners, (2) the values and problems of the society and (3) the disciplines or organized subject matter. All three of these may indeed impose criteria for the selection of curriculum items, but only the third can be considered a <u>source</u> of them [43, p. 132].

The content of items (1) and (2) above, and Tyler's "purposes" suggested to us that there is an additional, prior stage in which purposes or objectives are selected, which, in turn, are inputs to curriculum development, but do not determine curriculum. "Selection of Educational Objectives" is the stage at which the values and problems of society have an input into the system. It is at this stage that the purpose of education is decided, the issues involved in education for citizenship and/or for occupational functioning are faced, and priorities are ordered. It is at this stage that the choice between adult vs. childhood education is made, and the nature of the student body is selected. The process of curriculum development therefore follows the establishment of educational objectives.

Our fifth stage is one we conceive of between curriculum development and instructional planning. Our sense of what this stage involves was also suggested in Dr. Johnson's article, in which he refers to "strategic planning" as most "remote" from instruction:

> Instructional planning occurs at various levels, varying in their temporal proximity to the actual instruction. Most remote is that strategic planning which results in the design of "courses" and "instructional units" within courses. Here an appropriate number of curriculum items (intended learning outcomes) are selected and organized for instructional purposes. Course and unit planners have considerable freedom in their selection and organization, so long as they do not violate curriculum stipulations with respect to hierarchy (clusters) and order [43, p. 133].

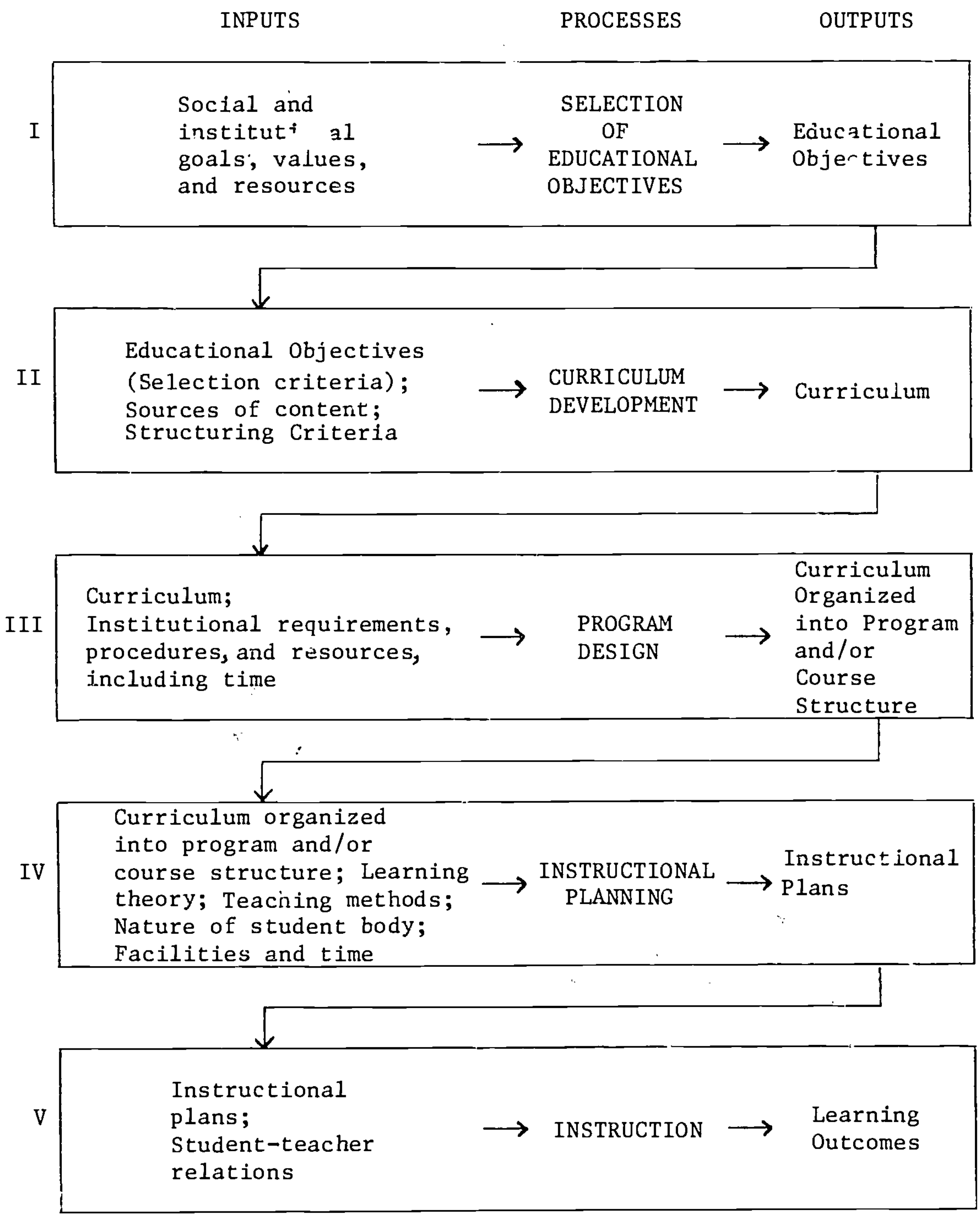
While the activity described above is often done concurrently with curriculum development and/or instructional planning, it is not solely determined by curriculum and is not the sole input to instructional planning. It is an intermediary process we call "program design." The process involves a distinctly separate set of data, is guided by separate objectives and "rules," and has a result distinguishable from curriculum, on one hand, and instructional plans, on the other. Program design is done within a specific institutional setting, sometimes by an administrative office or by a committee of the faculty, and rarely by the individual teacher, as is the case with most instructional planning.

By program we mean the division and arrangement of curriculum into sequences and/or units appropriate to the content and time requirements structured by the institution. A given program may or may not be divided into courses. An educational ladder is made up of a sequence of programs. Institutionally determined objectives such as academic credits, degrees, certification, or other "milestone" divisions of content set the framework for the creation of programs. Programs are named for the degrees to which they lead, for the occupations for which they are preparation, or for the emphasis and academic level of subject matter on which they concentrate, or combinations of these. Curriculum is an input to program design, but so are institutional requirements, procedures, resources and available time.

The structuring criteria for curriculum have an impact on the sequential arrangement of courses or the assignment of curriculum units to programs, however. The arrangement of curriculum units into courses reflects both curriculum restraints and institutional arrangements.

We are now able to elaborate a five-stage process model. In Figure 2.1, each stage is expressed as a set of inputs, a process, and

Figure 2.1. A MODEL OF EDUCATIONAL PROCESSES AND OUTPUTS



an output. The output of each stage is one of the inputs to the next stage, but not the only input. Thus, the character of the output of one stage is not predetermined, only constrained, by the output of the prior stage.

At stage I the process involved is the selection of educational objectives. Social values, institutional goals, and resources made available by society are inputs to the selection process. At this stage the institution decides whether it will grant a degree, will train for an occupation, will emphasize social values of one sort or another, will meet external requirements for licensure or accreditation, will turn out students who are oriented to social needs and/or personal gain. When educational results are being evaluated, the social and/or academic or occupational functioning of the graduates are the validation criteria for whether the educational objectives have been met.

Once the educational objectives are set, curriculum development, Stage II, begins for all the areas for which it is required. The educational objectives become inputs to the process and determine the selection criteria for the content. Structuring criteria, reflecting the relationships among disciplines, are also inputs. They are also determined by educational objectives such as the desire to have educational ladders. The disciplines of organized subject matter and the body of unorganized knowledge and related skills and attitudes are the source of the curriculum[43,p.132]. Intended learning outcomes are chosen from them, based on the educational objectives. The curriculum content chosen for occupational preparation would be different from that chosen for a liberal arts degree; in addition, the content for "training" would be different from that for "education."

The first activity in curriculum development is the selection of content. The fact that the process of selection for curriculum content is determined by the educational objectives is manifest when one considers Johnson's distinction between "training" and "education." If one chooses not only occupational preparation, but also educational ladders as educational objectives, there are implications for selection:

> The selection of curriculum content for training is based on an <u>analysis</u> of the specific functions to be performed and the specific situation in which they are to be performed.
>
> The selection of curriculum content for education is based on its having the widest possible <u>significance</u> and greatest possible <u>explanatory</u> power [43, p. 138].

The second activity in curriculum development is the structuring of content. This process is elaborated by Johnson as follows:

> That curriculum implies...ordering is obviously the assumption underlying the widespread current attention to the structure of knowledge, especially of that knowledge derived from inquiry which constitutes the disciplines....disciplines are structured both conceptually and syntactically (methodologically). Presumably, therefore, curriculum items assume their significance and meaning from their relationship to one another and to the mode of inquiry on the basis of which this relationship was derived or verified [43,p. 131].
>
> ....Concepts and generalizations do not occur singly. They form clusters, and a decision to include one of them is often tantamount to a decision to include a whole cluster. A teacher or curriculum developer is not free to include a concept such as "capillarity" and to exclude, for example, "surface tension." These clusters are not equivalent, however, to "instructional units." The curriculum does not specify what organizational units are to be used in instruc-

tion, but it does indicate organizational relationships among the intended outcomes. In this sense, curriculum is a structured series of intended learning outcomes [43, p. 131].

The units of curriculum are curriculum objectives, i.e., Johnson's structured set of intended learning outcomes expressed as statements.

Stage III, Program Design, has as its major input the curriculum. However, institutional requirements and structures are also inputs and affect the program outputs. The outputs are curriculum objectives organized into program and/or course structures for a given institution.

The program designer takes into account where entering students will begin. This is determined for or by the designer through the establishment of admission requirements. Depending on these requirements, the program designer may have to specify that remedial courses or introductory courses which would not otherwise be included would have to be offered as "enabling" preparation for the course material that is specified in the curriculum. In addition, the program designer must take into consideration (1) the facilities and faculty available to carry out a program (this may limit such things as laboratory courses), and (2) the accreditation requirements which have reference to credit hour distributions for various content areas and, possibly, recommendations for combining certain areas of content.

The program designer must also take into account the way in which the institution organizes learning experiences. One institution may decide to create a modularized curriculum, in which content is organized and taught in short sections, using pre- and post-tests of competencies to determine individual student progress. Another may stress a traditional credit-hour semester; another may provide bilingual education for an ethnically mixed student body. These institutional arrangements have implications for the way in which curriculum content is organized and for the process whereby curricula are added or modified.

At Stage IV, Instructional Planning takes place. Here the teacher takes the "intended learning outcomes" which have been selected for his or her area of instruction (the outputs of program design) as goals or parameters. The teacher uses his or her knowledge of learning theory and teaching methods to select additional content to facilitate learning, to devise sequences of learning, to select instructional units and materials, and to plan presentations. The limits set by his curriculum objectives are further supplemented by limits set by facilities, available time, and the nature of the student body. The outputs are lesson plans.

Stage V is actual Instruction. It is an interaction of the students and the teacher with the teaching environment. It is the culmination of the prior stages; it is the application of the instructional plan and its attendent materials in the educational setting. The outputs are the learning outcomes. As in other stages, these are not predetermined in quality, since they are mediated by the relations of the teacher and the students as these develop.

Actual learning outcomes may or may not correspond to instructional objectives. Similarly, the instructional objectives may or may not produce the curriculum objectives. The curriculum objectives may not be the best to meet the educational objectives. The evaluation of each stage in terms of the objectives of the prior stage, and the resulting feedbacks, turn the five-stage model into an educational system.

What Can HSMS Do and What Are Its Boundaries in Education?

Having elaborated the stages, inputs, and outputs of the processes of education, we are now in a position to evaluate the options open to the Health Services Mobility Study and to identify its areas of competence.[6]

The HSMS has opted by its very existence to become associated with a specific set of educational objectives. These include a commitment to occupational preparation, particularly for health occupations. We have chosen to prepare curricula in the form of educational ladders which, in turn, means opting for curricula which combine both training and education. We have included in our procedures the process of normative review of our task data in order to fulfill the objective of training for occupational performance that emphasizes patient safety and the most desirable professional procedures. We have opted to emphasize education geared to adults, and a form of presentation making modular instruction possible. We have also opted to offer curricula which are

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6 The major portion of this and the next section will refer to the main features of the HSMS task analysis methodology; it is suggested that the reader become familiar with Appendix A, which presents a summary of the method.

designed first without reference to existing accreditation requirements. However, it is our intention that they can be seriously considered as acceptable by the accrediting agencies.

These are our general options and limits at the level of educational objectives. For the current period we are more narrowly confined to the specific objectives of designing educational ladders to parallel job ladders in diagnostic and therapeutic radiography, nuclear medicine, and ultrasonics.

Our methodology of task analysis provides us with a specific set of competencies for the stage of curriculum development. With respect to the selection process related to "education," the creation of the HSMS Knowledge Classification System, the skills, and their respective scales represent a preliminary selection of our sources that reflects the teachable and learnable organized disciplines and related skills. The act of scaling each task for the skills and knowledge categories required for its performance places this specific selection process within the task analysis stage of our method.

It is apparent that, if "training" for occupations requires selection of the knowledge of "specific functions" and "specific situations," then our task descriptions, which conform to our task definition and to quality standards, provide a set of data which have been selected to conform with the specific educational objectives set out for each set of occupations studied. The task descriptions are also a selected source for identifying the "unorganized knowledge" required for task performance.

Our methodology also provides us with a basis for the structuring of curriculum content. This is done by virtue of the way in which the Knowledge Classification System itself is structured, by virtue of the use of scales for skills and knowledge, and by virtue of our use of factor analysis, which permits us to relate tasks in terms of skill and knowledge relationships, to arrange these in hierarchial groupings, and to assign tasks to levels.

We are therefore not only able to associate work behaviors in terms of skills, knowledges and their levels, but are also able to recommend the demarcations between programs so as to reflect the assignment of tasks to job levels. That is, we are able to recommend the structuring of curriculum content and the sequencing of programs because the hierarchical arrangement of tasks in terms of skills and knowledge is an output of our statistical analysis and reflects the arrangement of job ladders.

Since program design is primarily an institutionally based intermediary process, we can make no unique inputs at this stage beyond the insights gained for curriculum development.

The distinction between curriculum development and instructional planning presented here points up the fact that it is possible for us to offer curriculum development without the requirement that we be competent to do instructional planning. However, the nature of our data and results will permit us to offer suggestions for instruction. In fact, our data can be used as instructional materials. Our task descriptions are vivid descriptions of what the clinical experience will be, including what is used and the interactions that occur.

We will have inputs to instructional planning because the skill and knowledge taxonomies have instructional implications. This type of input was anticipated by Dr. Johnson:

> The nature of a particular intended learning outcome limits the range of possible appropriate learning experiences and thus guides instructional planning. A learning experience has an activity component and a content component, i.e., it involves some kind of activity with some kind of content. A curriculum item that deals with a skill-type outcome restricts the range of appropriate activities, but may or may not impose any limitations on the content. On the other hand, an item which concerns facts, concepts or generalizations specifies content, but leaves considerable option with respect to activity. When an affective outcome is specified, neither content nor activity may be greatly restricted, although most affects have fairly definite referents (implying content) and schools are concerned that most affective outcomes be intellectually grounded (implying activity) [43, pp. 130-131].

We conclude, therefore, that our task analysis methodology has provided us with a capability of developing curricula and making inputs and suggestions regarding instruction for health occupations education.

We can specify a set of educational objectives, offer a structured set of intended learning outcomes (curriculum objectives), arranged to provide an educational ladder, and can offer suggestions for instruction, as well as a set of instructional materials, namely, the task descriptions. We refer to this total contribution for an occupational area as <u>curriculum guidelines</u>.

How Can HSMS Task Data Best Be Used In Curriculum Development to Achieve Our Four Objectives?

Having determined that we have a capability for curriculum development, we now turn to the relationship between the HSMS task data and the objectives for curriculum which we have chosen.

Objective 1 states that the curricula must:

> Provide for upward mobility and educational ladders which eliminate redundancy and provide transferable education.

The requirement of designing educational ladders implies that a curriculum be designed whose component programs are developed in relation to one another. This would make it possible to avoid redundancy of requirements. The fact that the HSMS method utilizes task descriptions, formal knowledge categories, and articulated skills, as well as scaled versions of skills and knowledge, permits us to develop the additive curriculum units needed for ladders.

The concept of transferable education also implies units learned in a broad context, and units objectively identifiable across institutions so that credits or advanced standing can be given for instructional experience in given units. Our taxonomy provides for this. The task descriptions permit us to show how the same knowledge or skills ban be used in different tasks or how different knowledge and skills combine in the same task.

Objective 2 states that the curricula must:

> Provide job relevant curricula which can be examined for curriculum overlap, relevance, and adequacy.

We will present formal knowledge and skills at varying scale levels in curriculum units by relating these to their applications in task performance. The resulting curriculum statements will incorporate the content of the disciplines and the unorganized (procedural) knowledge in language that includes the clinical application. When stated in such terms it will be easier to identify overlap of curriculum units, to compare required curriculum with occupational performance, and to find whether all occupational activities are reflected in curricula.

Objective 3 states that the curricula must:

> Provide for an objective allocation of curriculum content to academic levels of education and sequences of jobs that is independent of the subjective or conflicting assessment of various experts and institutions.

The HSMS method of task analysis begins with job analysts trained to use the HSMS taxonomy. The role of experts is to review the data for accuracy and correct use of terms, and to ensure that the best procedures are included. We do not go to the experts to learn how long it takes to train, what academic levels are appropriate, or what to put into curricula, since these are the very issues that are open to question. Instead, by focusing the experts on the task descriptions and the taxonomies of skills and knowledges, their expertise is harnessed to an objective method for ascertaining curriculum requirements. At the same time, since the experts do offer the inputs of their considered judgements, and since these are seriously considered, the results should be acceptable to the educators and professionals in each field.

Objective 4 states that the curricula must:

Provide a common taxonomy to make objective analysis possible.

We begin with a common taxonomy of task definition, skills, knowledge categories and scale levels. The skills and knowledges are non-overlapping and generic. When combined with the language of the task descriptions the resulting statements, which we call "curriculum objectives" provide a common taxonomy for the purposes of building educational ladders and evaluating existing curricula.

We decided on the following four requirements for our curriculum objectives:

1. The curriculum objectives must set the curriculum content in the context of formal disciplines. This would provide for the need to connect content with the underlying principles and concepts, so that the learning is transferable, both laterally to new work situations and vertically to the next educational level.

2. The curriculum objectives for each level in an educational ladder must be written in such a way that it is possible to identify overlapping areas of content at different levels. The objectives must also account for the same area of content as it is added to in successive levels. This will provide for the need to identify and eliminate redundancies for individuals moving up the educational ladder.

3. The curriculum objectives must utilize not only the HSMS scaled skill and knowledge data, but also the procedures

of the tasks themselves and other non-scalable, non-transferable procedural information needed for task performance. This provides for adequate job preparation.

4. The curriculum objectives must show the connections of the skill and knowledge content with the task activities in which the content is applied, and must show the connections among the various areas of knowledge and the skills as they are applied in the same task activities. This provides for the necessary relevance of academic subject matter.

CURRICULUM DESIGN USING TASK DATA

We approached the literature dealing with the use of task data for curriculum design to see whether we could discern a generic method for curriculum development when occupational preparation utilizing task data was involved.

With our four objectives in mind, we explored the possibility that we could find a model for curriculum development that would use task data to provide (1) educational ladders with transferable education, (2) job relevant education, (3) objective allocation of curriculum content to academic levels, and (4) utilization of a common taxonomy for curriculum content and for curriculum objectives.

This section presents our primary literature sources and then examines them in terms of the HSMS objectives. We then ask the question, "Is there a generic model for the use of task data in curriculum design?" and finally present the HSMS model.

The Key Literature Sources

We found that only four major task analysis and curriculum development projects were broad enough in scope to offer us any insights. In addition, a theoretical study based on Army service schools and oriented to Armed Forces task analysis was relevant to our needs.

At Ohio State, a project was carried out and completed in 1972 which developed "Occupational Therapy Job Descriptions and Curricula Through Task Analysis" [77].[7] This project attempted to utilize the Department of Labor's method of task analysis in the field of occupational therapy. It accepted the task methodology as a given, and proceeded to translate the task data into curricula.

The method uses experts to assign tasks to curriculum (job) levels, to develop job descriptions from the task lists, to write task descriptions, to create process-product statements, to identify the needed skills and knowledge, and to design sequences. Report Number Three, "Procedural Manual for Task Analysis and Curriculum Guide Development" presents this project's methodology for the use of task data in curriculum design. This is the only project reviewed by us which provided the reader with a clear idea of what was done, presumably because it provided a detailed account, was not selling a product, and had some consistent approach to its work.

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[7] One of the staff members made a major theoretical input to the curriculum design aspect of the project which reflected his ongoing doctoral studies [11].

The Technical Education Research Centers (TERC) is a national, non-profit research organization which works on public and private projects dealing with technical education. Its overall approach, presented in its promotional materials [90], promises a methodology for the use of task data for career education. This project also appears to be based on derived methodologies, primarily those of Department of Labor and Sidney Fine [19], [27]; but the project is also influenced by Gagné [30]. We were disappointed, however, to find no description of how task data were to be transformed into curricula; the proferred example of a curriculum module was at so low a job level that the task description seemed to serve both as the module and the instructional material. TERC's work in the area of nuclear medicine technologists [91] seems to have abandoned the effort to base the curriculum on task data, and reverts to the use of conferences of experts to assign tasks to levels and jobs, and to specify curriculum requirements.

Technomics, Inc., is a private consulting firm which has been under contract with the Navy to provide a "Systems Approach to Navy Medical Education and Training" [93]. Its statement on its task analysis methodology suggests to us that the Armed Forces task inventory approach is the basis of the methodology used [63]. Technomics, as in the case of TERC, uses educator and practitioner committees to validate and sort tasks, and to specify performance, skills and knowledge. However, their literature includes a methodology outlined for the committee members to use in the development of curriculum from task inventories.

The UCLA Allied Health Professions Projects [8], [38], [105] is a "curriculum research and development program," whose objective is to create curricula and instructional materials for associate degree-level allied health occupations. The project utilizes methodological procedures from various sources, none of which have been clearly identified or consistently applied. The basic approach appears to rely on the use of task inventories. The inventories are reviewed by experts and then used in surveys to collect frequency and other data. The project has no clear-cut statement on how the task data are used to design curricula, because the curriculum development stage does not exist. Instead, the project appears to go directly from task names to instructional design, but, again, without a methodological model. Their instructional materials seem to be what HSMS would call "task descriptions," with lists of the related concepts which must be understood appended. There is no presentation in evidence of any required knowledge of "disciplines" per se.

H. L. Ammerman and W. H. Melching developed a process model for deriving, analyzing, and classifying instructional objectives [3].[8] Because the orientation was to Armed Forces service schools, the authors were by definition talking about occupational preparation. The authors start with performance objectives which are analogous to HSMS task descriptions, and the document produced turned out to be an extremely fruitful source of methodological insights for us.

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[8] Both authors have done research for the Human Resources Research Office (HumRRO) since the early 60's in the areas of training program development, individualized instruction, the use of learning objectives, and related areas. They have been concerned with the preparation of military officers for the most part.

The Projects and the HSMS Objectives For Curriculum Guidelines

Since the four curriculum projects on which we focused do not all share all of our objectives, they cannot be equally evaluated in terms of our needs. The results of our assessment of the projects in terms of our needs are presented here.

Educational ladders with the corollary of transferable and additive curriculum units arranged in sequences did not appear to be specific goals of any of the projects. While each professed an interest in career ladders, none has shown the translation of this concept into a method of curriculum design. The Ohio State study accounts for the relationship of levels only insofar as overlap of function may be obvious. Similarly, the UCLA study seems to consider planned core curricula as the same as job ladders. Technomics seems to consider task overlap a basis for job ladders. But the use of task inventories rather than task descriptions on the part of three of the projects and the lack of an objective knowledge taxonomy or scales permits the possibility of spurious assertion of overlap and lays no foundation for the additive study of disciplines.

The extent to which the projects, in fact, even develop job ladders is in question. Technomics begins with the objective of "building career pathways," but, aside from a common sense arrangement based on the manifest content of jobs, the project has no provision for systematically identifying hierarchies of jobs on the basis of objective data. When they engage in curriculum development, they appear to treat each job as a separate educational unit, without provision for the cumulative academic learning or knowledge or skills which one would expect to see in curricula with career pathways as a goal.

The UCLA project started out with a prior decision about what the allied health occupations should be, and related these only in terms of collateral overlap in functional areas (for example, dental assistant, dental hygienist, and dental laboratory technician).

The Ohio State study and TERC acknowledged the concept of levels within occupational therapy and nuclear medicine technology, respectively; but neither considered closely related occupations from which to draw for upgrading such as physical therapy and nursing on one hand, and radiologic technology, radiotherapy or nursing on the other hand. None has so far linked the MD-level functions with lower-level functions in any clear progression.

Part of the problem appears to be the fact that, without a knowledge taxonomy, scales, and a clear-cut task definition, no way exists to devise ladders until the expert is called upon. A scale for levels of difficulty, as is used by some of the projects in task analysis or at a later stage, is clearly inappropriate, since "difficulty" can only be a subjective measure when it is treated as a single dimension.

One assumes that the act of including task data as an input to curriculum design guarantees our second objective, job relevance. However, not all the projects appreciate the fact that the job relevance of a curriculum can only be assessed if it is amenable to an analysis in which every unit of curriculum is justifiable in relation to work performance or preparation for learning needed for work performance, and in which the curriculum can be scrutinized for adequacy as well. To accomplish this it should be possible to find relatively direct links between the task data and curriculum. However, since all but Ohio State have used task inventories (one-line statements with no consistent task definition applied), the actual content of the work activities as represented in actual performance is lost. The projects turn the task data into activity statements <u>after</u> field work and after experts have been brought in.

Once curricula are being designed their task relatedness is further weakened in some cases by a reference to predetermined curriculum requirements. For example, TERC has not yet related tasks to curricula in nuclear medicine. It uses tasks to provide job descriptions and has thus far only presented the professional organizations' topic outlines for nuclear medicine technologists and technicians. The Ohio State study assigns its derived list of instructional topics to the pre-existing list of topics ("Essentials") adopted by the American Occupational Therapy Association.

Our third interest was the objective allocation of curriculum content to levels. This objective was not met by any of the projects because the process was carried out by experts, based on non-reliable criteria, and because the task description function was not carried out in the field but done by the experts in three of the projects without the benefit of a structured definition. All of the projects deal with the allocation of tasks to jobs, but none do this from a basis of objective allocation of curriculum content to academic levels. All the projects are dependent on experts for the validation of their task data, the assignment of tasks to jobs (whether they are conceived of as levels or not), and the derivation of curriculum content.

Further, by placing the identification of the needed curriculum content in the hands of experts sitting in committee, the projects run the risk of duplicating the faults of already existing curricula, which probably already represent the best ideas and informed opinions of the same class of experts. The preconceived ideas and opinions of the experts are bound to play as large a role in determining the new curriculum as before.

Our fourth objective was the utilization of a common taxonomy for the representation of curriculum content and for the development of curriculum objectives. This was to make possible the analysis of existing curricula and the development of new curricula in terms of relevance, adequacy and overlap.

Since none of the projects provided any taxonomy of knowledge and utilized few scales that were immediately translatable into curriculum, this objective was not fully met. However, the use of behavioral objectives by most of the projects did provide statements that would be more easily objectivized than the topic outlines now currently associated with curriculum "essentials" and most syllabi.

We concluded that the projects might provide insights for us in terms of a generic process model, but were of little help with respect to our four objectives.

<u>Is There a Generic Model For The Use of Task Data in Curriculum Design?</u>

The sequences of events for the major projects we studied are presented in this section, beginning with the Ohio State project.

The Ohio State Project first decided on the Labor Department (DOL) method of task analysis and the collection of all activities performed within the domain of occupational therapy. It then selected facilities in which the task data collection was to be done.[9]

Task descriptions (element activities) were collected by the job analysts and coded for the scales associated with the DOL method, namely, Data, People and Things. The "Worker Trait" requirements, (namely, interests, general educational development, specific vocational preparation, aptitudes, temperament, physical activity, and environmental conditions) were coded for each duty. The analysts also collected data on duties including the titles covering them, supervision, how learned, frequency for competence, minimum qualifications, time needed, frequency of occurrence, and definition of terms. Additional data were also obtained.

A coding system was devised and activity statements were formulated. Then the tasks were grouped by duty for each analysis; similar duties were grouped and then placed in "logical" order (all of this by hand).

Duty statements were then written so that the task statements were generic and in logical order, and a composite list was developed and reviewed.

Job descriptions were written based on a conference of experts called to utilize the composite list.

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9 The task data refer to functions, duties and tasks. The DOL method defines "task" in such a way that it is more comparable to the HSMS definition of "element." Therefore, a later stage of combining "tasks" into "duties" was required.

Two composite scores, based on cognitive involvement and perceptual-motor involvement were developed, and general educational development (GED), and specific vocational preparation (SVP), both DOL scales, were also earmarked for use.

GED was used to determine the number (levels) of jobs involved. Four levels were decided on by the committee. The committee, as individuals and then by consensus, reviewed the organization and order of the list, divided the duty-task groups into levels by assigning tasks to levels, using the verbs and verbal statements as criteria, supplemented by the Data People, Things scales.

The conference reviewed the jobs (levels) activities for continuity, sequence, and adequacy of statements and overlap. Job descriptions emerged after further refinements.

Curriculum development was carried out by staff, with professionals in the field as consultants. They began with the decision that curriculum guides would have to be divided into instructional units or modules. Formats for these were designed.

Curriculum guides were developed as follows:

1. Job descriptions were reconverted into process-product statements.
2. The general educational development needed as a prerequisite before entering the program was specified, and then the additional topics required for learning each activity were specified.
3. The "needed learnings" were placed in sequential order.

We omit from presentation the events leading to the development of instructional units, except to say that much backward tracking was involved. In a reversal of an earlier step in which needed learnings are derived from the process-product statements, staff used the revised and sequenced list of needed learnings as a taxonomy in order to identify what must be learned for each process-product statement.

TERC has no curriculum development model we can actually present as having been followed. However, this project and others [37], [60], [59], [84] have indicated an interest in task analysis for the specification of behaviors for job training.

It is the assumption of this school of thought that "task description" comes first, resulting in a complete set of instructional objectives. The next step is "task analysis," in which these objectives are analyzed in order to determine their implications for teaching. Various writers have developed taxonomies of task behaviors which are differentiated by the way they must be taught. Gagné has developed several taxonomies, one of which includes the categories of "human functions." These include sensing, identifying, and interpreting [31, pp. 41-59].

TERC utilizes another of Gagné's taxonomies in its literature [90, based on 30]. It includes stimulus responding, motor chaining, verbal chaining, multiple discrimination, concepts, principles, and problem solving. TERC makes no statement of how this taxonomy, or any of the others it offers in a kind of catch-all presentation, are to be utilized for curriculum design. It offers no taxonomy to be used when occupations require academic disciplines for task performance. The problem is that Gagné's and similar human functions lists describe "how" we function, and these taxonomies are appropriate for the development of teaching methods rather than for use in developing curriculum content.

Technomics, Inc., begins with a wide-ranging set of task inventories collected in questionnaires and followed up by interviews.

The organization begins with task inventories which use one-line statements which are edited to eliminate overlap of reference. However, the one-line task statements are descriptions as encompassing as "perform vasectomy" and "teach patient self-administration of medications," which need further qualifications for proper understanding; and they also include minutely referenced statements such as "gloves, rubber" (presumably preceeded by the verb "uses"), and "identify radiograph"--which are properly elements attached to larger work units.

The organization itself identified 16 occupational task groupings and a 17th whose tasks are found in all occupations.

The tasks are coded for their appearance in functional groupings and presumably are keyed to a vocabulary of terms verbs and procedures rather than a taxonomy of knowledge.

Data are then collected for each task, covering number doing the task, frequency, a rating on a "difficulty" scale, and whether received training was utilized to do the task. Tasks are designated as general, common, family unique, or job unique for later use in basic, core, and specialty curricula.

The task data are reviewed by experts. They structure the tasks of the 16 fields into "proficiency levels" and assign tasks to levels together with recommendations on education and training.

Curriculum development is designated as a part of a "curriculum specifications technology." The steps are as follows:

Tasks are "translated" into curriculum in a workshop of experts who develop a specifications model. The workshop utilizes tasks designated as general, common, special, and advanced.

The experts decide on which tasks are "valid" within each training level. (It is not clear who decides on the number of levels.) The experts group or sort similar or related tasks into groups that are the basis for "curriculum modules."

The experts then write performance objectives for each task grouping. These are in a type of formalized statement specifying stimulus, conditions, criteria, and any linkage to the next action.

The experts next specify knowledges and skills for each performance objective. No common taxonomy is used, but an attempt is made not to use broad discipline names.

The experts may also recommend teaching modes, and teaching and examination media, though those currently in use are also proposed. The experts group performance objectives into learning units and broader training objectives, and indicate the training time expected. These specifications become guidelines for curriculum specifications.

Thus, task analysis proceeds to program design as well as curriculum design, and the project also makes inputs into instructional planning.

We are unable to specify the precise methodology and set of events used by UCLA.

The project professes to begin with an identification of all tasks required in a functional area specified by the project. These turn out to be task inventories not unlike those used by Technomics and TERC.

Next comes a verification based on a survey in which frequency of occurrence is determined along with scales variously referring to skills, responsibilities and difficulties. Only brief inventory task names are used.

Some intermediary stage occurs whereby the processes involved in performance of the task are determined. We have the impression that these descriptions are referred to as the skills and knowledges required, with definitional material added.

Behavioral objectives are then developed to represent performance goals. At this point we are told that curriculum is developed, but we find that UCLA means instruction, and uses the terms interchangeably. Instructional materials are the actual outputs.

Ammerman and Melching [3] provide a model which specifies training objectives (instruction), but, in the course of their presentation, a model for curriculum development is presented. Their model shows an awareness of the need to combine task analysis with the specification of content (knowledge and skills) in order to generate an approach to the development of occupational programs (which is useful for all levels of a ladder).

Ammerman and Melching provide a five-step sequence for the "development of instruction," as follows [3, pp. 12-14]:

1. They first have the project determine its instructional aim or scope. This includes the establishment of curricular aims and scopes reflecting abstract philosophical values and utilitarian purposes.
2. They next have the "relevant work performance situations of interest" identified. This covers the work situation for which the student is to be prepared and in which he is to perform after instruction.
3. They have "terminal student performance objectives" specified. These are the meaningful units of performance that are relevant and critical to instruction. The authors suggest job and task descriptions for these.
4. They then have "enabling objectives" specified. These are the component actions, knowledges and skills which must be learned if the terminal objectives are to be fulfilled.
5. They then design the learning experience. This includes determining the actual content of instruction and the instructional activities, choosing the instructional materials to be used, and writing the lesson plans.

Using our own conceptual framework, we see that the first four steps of this model are actually at the level of curriculum development, while the fifth step is instructional planning. The intermediate processes of program design (which they recognize in their discussion of feasibility) are not included as a separate step in the model.

Having reviewed the projects in order to determine whether we could discern a generic, common model for the use of task data in curriculum design, we now have reached an answer to the question. The answer is no. No two projects had the same methods, sequences of events, goals, objects, or task analysis methodology.

We have, however, discerned some primary lessons to be drawn from the experiences we encountered. First, unless the educational objectives are clearly articulated, the project's goals and objectives may not be reached due to inadequate methodology or oversight.

The projects which we have reviewed saw their goals variously as the definition of the educational needs of future workers in a field [77]; improving the education and training of personnel and building a viable career pathway system [93]; the creation of curricula and instructional materials for allied health functions [8], [105]; or contributing to the development of career opportunities [91].

These objectives were not sufficiently detailed to provide a critical framework for the evaluation of alternative methodologies. The use of experts at given stages, the lack of common taxonomies for curriculum design, and failure to distinguish among the curriculum development, instructional planning, and instructional materials appear to be the result of inadequate or inappropriate analysis of problems and procedures. The loosely stated goals provided no criteria for the selection and structuring processes of curriculum development. All that was agreed was that task data would be an input. And here, task analysis did not seem to include the collection of task descriptions in all cases.

Our second conclusion is that without a model of the educational process, particularly the model to be used for curriculum development, unnecessary work will be done and undesired results can occur.

Had this principle been followed by the Ohio State project, for example, it would have been noted that the numerous scales used as a part of the task analysis method were developed by DOL for the purpose of job placement and counseling. They are useless for curriculum design, and were never intended for that purpose. None of the scales can be properly used for the assignment of tasks to levels since the scales are not cumulative. The GED and SVP scales beg the very questions about levels that are presumably being asked. Similar criticisms can be applied to the other projects.

Our third conclusion is that the nature of the task analysis methodology chosen is the primary determinant of the steps used in curriculum development for occupational preparation.

When task inventories are used without task descriptions or a rigorous task definition, experts must be relied on to provide descriptions of the required task performance. When experts are used to supply this function, usually during the curriculum development stage, the link to accuracy is weakened. The brief statements in the inventories may mean different things to different people. One cannot assume therefore that the descriptions reliably refer to the particular activities intended by the original inventory statements.

Unless there is a skill and knowledge taxonomy utilized during the period of task analysis, the identification of the required skills and knowledges comes during curriculum development, not in task analysis. This process also cannot be considered reliable or objective. The process is applied several steps removed from the performer, and, thus, it is that far removed from the most obvious source of accurate, detailed information about what the performer needs to know.

If the objective of a project is to develop improved curricula, then it seems logical that the data should be directly based on the actual needs of workers in the occupational area being studied, and only then be reviewed by experts who must use a common taxonomy. When skills and knowledges are identified for an occupational area without a common taxonomy they must be newly developed for each new area, and no common requirements can then objectively be found across occupational areas.

When tasks are assigned by experts to job levels without consistent, objectified scaling criteria, the validity of the results are in question.

HSMS has a particular sequence and structure to its task analysis and job ladder design methodology because it intended, from its inception, (1) to design curriculum for educational ladders, (2) reflecting the preparation for job ladders, (3) based on families (factors) of tasks related through skills and knowledge, (4) with the arrangements of levels based on objective criteria, and (5) reflecting acceptable procedures. These requirements mean that full task descriptions are always collected first, and not merely task lists; a definition of task is always used which makes it impossible to confuse what activity is being referred to. The function of the expert is to <u>review</u> the descriptions. Then, <u>during</u> task analysis, we apply to each task an independent, scaled, taxonomy of skills and knowledges. These data are also reviewed by experts, but <u>after</u> the field work; the reviewers are given the taxonomy to apply in their review. Finally, we use factor analysis to group the tasks. We use the task data to assign the tasks to levels. We thus utilize objective criteria to determine levels based on learnable, teachable variables that have been scaled and reviewed, and which relate to curriculum content.

While all these processes are part of the task analysis stage for us, there are aspects of curriculum development implicitly involved. The selection of the occupational area for study and the decision to include <u>all</u> the tasks for a given occupational level reflects our educational objectives. That decision initiates the selection process. The task descriptions and the skill and knowledge data collected in the field are a part of the <u>selection</u> process that takes place during task analysis. The grouping of the tasks into related factors and the assignment of tasks to levels is part of the <u>structuring</u> process that also takes place during analysis of the task data.

When a task analysis method does not provide task descriptions, a skill and knowledge taxonomy, or curriculum-related variables and scales, its users are necessarily forced to enter the selection and structuring processes <u>after</u> task analysis. The users are probably also forced to rely on "experts" for curriculum development, and for selection and structuring of the content.

We conclude that the projects did not conduct a thorough analysis of the problems of the occupational area(s) they were interested in, and, in conjunction with this, failed to see the necessity of developing or selecting methods of task analysis and curriculum development which would be clearly appropriate for their needs. There seemed to be no awareness of the logical necessity of reconciling project objectives with methodological procedures.

The HSMS Model For the Use of Task Data in Curriculum Development

While the nature of the task analysis method determines the steps in curriculum development, we suggest that two prior stages can be seen as generic to the use of any task methodology.

We suggest, as a first stage in any process to develop curricula based on task analysis data, the clear formulation of the problems to be solved and a clear statement of the educational objectives to be accomplished.

When the problems have been analyzed and the overall goals have been set (in relation to the problems), then it should be relatively obvious what the job analysis method must accomplish. The requirements for the job (or task) analysis method then either become criteria for the selection of an existing method or the guidelines for the development of a new method. The second stage, therefore, is the choice of a methodology for task analysis. (Part of a third stage includes the choice of a methodology for curriculum development.)

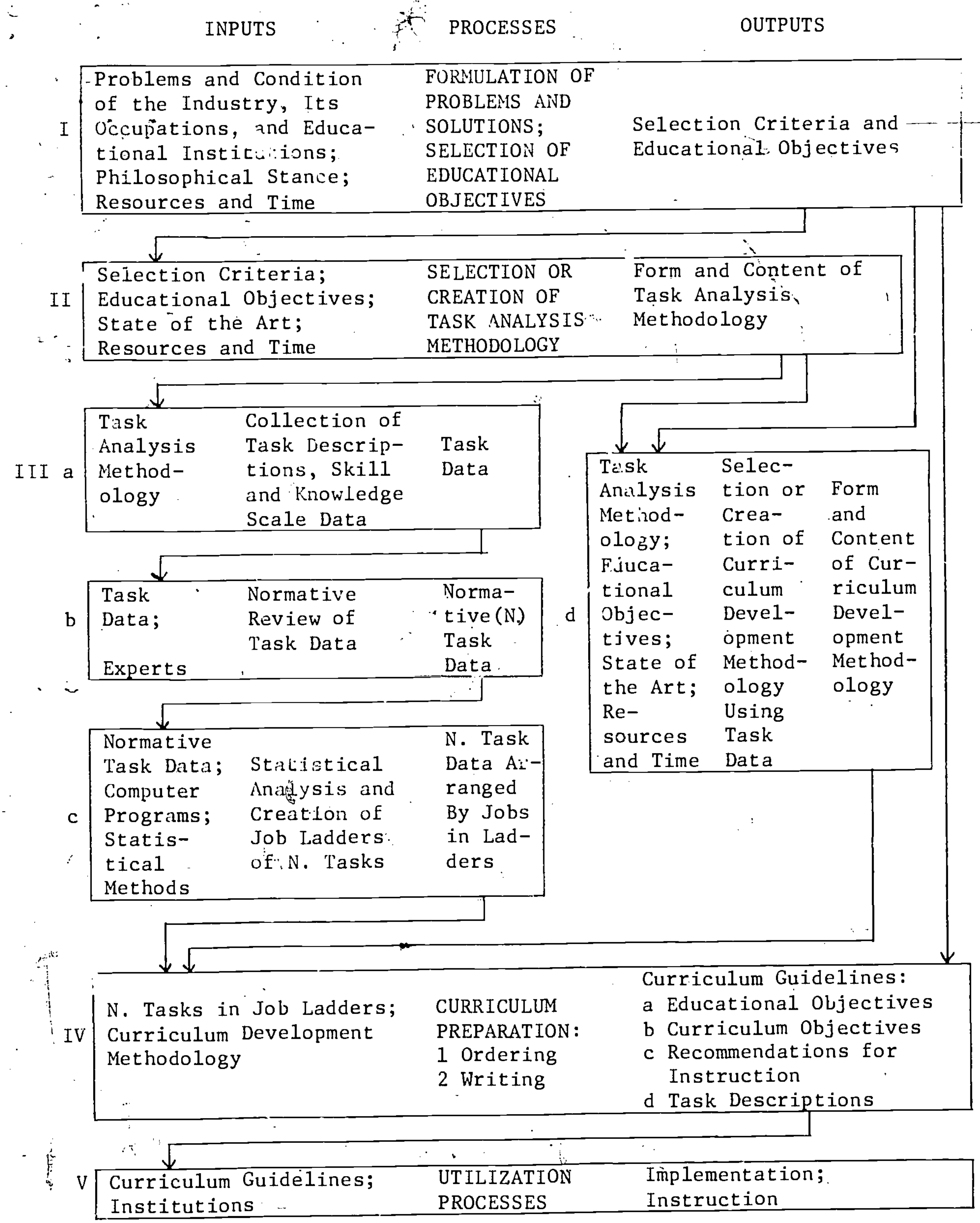
The result of curriculum development should be a curriculum for each occupation which the project sets out to cover. It should be based directly on the task analysis data, and it should provide the guidelines for designing programs and planning instruction which will prepare individuals for occupations in such a way that the initial overall objectives of the project are met.

Figure 2.2 represents the stages as we now conceive them, in terms of inputs and outputs for each process stage. As we indicated, stages I and II are generic, and so is stage V. Stage III (in four parts) and stage IV are stated in general terms, but reflect the work of the Health Services Mobility Study. The model as a whole presents the stages of project activities which lead up to the dissemination of a completed curriculum for occupational preparation.

The Stage I period is covered once by a project in general terms when the project analyzes the manpower and educational problems of an industry in the light of current practices and the project's own philosophical stance. Out of such analysis emerge broad criteria for educational objectives. Criteria for methodologies of task analysis and curriculum design are developed in light of the problems and to achieve the overall objectives. More specific objectives are developed each time a particular occupational area is to be approached or as time and resources set limits on the project. Thus, Stage I also applies to each individual assignment.

The more specific set of goals incorporate the overall goals of the project, but reflect the more limited scope of the particular cur-

Figure 2.2. PROCESS STAGES FOR USE OF HSMS TASK DATA IN CURRICULUM DEVELOPMENT



riculum or curricula to be designed. These become inputs to the selection process in the methodology, and are also worded so that they are understandable and meaningful to those who will eventually utilize the ultimate "curriculum guidelines" which result. Specific educational objectives also refer to the professional standards which graduates of the program will be expected to meet, whether these are behavioral goals or external requirements such as certification or licensure.

Stage II is the selection or creation of the task analysis methodology. At this stage we evaluate the literature in the field using the selection criteria and the educational objectives of Stage I as our critical references. The output of Stage I (which took five years to complete in the case of HSMS) is a method of task analysis which is tailored to meet the objectives of the project and to produce the appropriate data for subsequent utilization in project activities such as curriculum development.

Stage III has two branches. One branch, IIIa, b and c, relates to the three processes whereby the HSMS applies its task analysis methodology to collect task descriptions and their related skill and knowledge data, has these reviewed for normative standards of performance, and applies the statistical processes that assign tasks to related skill and knowledge families and resulting job ladders. The work in these stages includes the first phase of curriculum selection and structuring using the raw task data, and provides objective curriculum content inputs.

Concurrently, another methodology is developed whose inputs are the nature of the task data as determined by the methodology, the educational objectives and the state of the art in curriculum development methods, namely Stage IIIb.

This Working Paper represents Stage IIIb. This is the stage which determines the form, content, and sequences which will be followed in the ensuing curriculum preparation processes of Stage IV.

The inputs to Stage IV, which calls for curriculum preparation, are the task data arranged into job ladders (or the tasks for a given occupation if educational ladders are not one of the objectives) and the methodology designed in Stage IIId. The data include the task descriptions, as presented in the task elements, and the scaled skill and knowledge data, organized into job levels on the basis of similar levels of the related skills and knowledges needed to do the tasks.

The outputs of Stage IV are the written curriculum guidelines. These include the specific educational objectives resulting from Stage I, plus a set of statements, curriculum objectives, arranged to reflect the educational and task content appropriate to each given job level. In addition, the guidelines contain suggestions for instruction and the task descriptions themselves for use as instructional materials (especially for clinical use).

The curriculum objectives are the units of curriculum. Those of the HSMS will be of a form, to be described in the next section, which will permit independent movement from one program to another. The detailed procedures for deriving, writing and organizing the curriculum objectives are developed in Stage IIIb(and presented in Chapter 3). The curriculum objectives are organized or "structured" in Stage IV in ways that are consistent with the nature of the knowledge contained in these curriculum objectives and with the way the knowledges and skills are organized and used in the tasks.

The results are a structured series of intended learning outcomes. There will be a set of curriculum guidelines for each level of an educational ladder.

Stage V is that of utilization. The curriculum guidelines are offered to the institutions which provide health occupations preparation, where they become inputs into the processes of Program Design, Instructional Planning,and Instruction. The term "utilization" is meant to encompass all of the various ways in which a curriculum and the analytic data on which it is based can be used by the various institutions, professional associations, government regulatory agencies, or individuals in the occupational area covered by the guidelines. These may include critical review of existing programs to determine adequacy and relevance, the development of new programs, the revision of accreditation or certification requirements, the creation of instructional materials (such as textbooks, films, simulators for laboratory practice), and/or the development and validation of appropriate tests for certification, licensure,or other validation instruments. HSMS will be available to participate in these processes to the best of its ability.

THE FORM FOR HSMS CURRICULUM OBJECTIVES

Our earlier, exploratory work in curriculum development had indicated the attractiveness of behavioral statements in instruction. These would portray the actions required of a student by a teacher. If teaching does not guarantee learning, and if learning does not necessarily change behavior (only the potential for new behavior), then learning can be detected only by a situation in which changed behavior can be manifested. To specify such behavior produces a link between the curriculum designer, instructional planner, teacher, and student. We resolved to go back to the literature to see how the work in behavioral objectives could assist us to find a way to state our curriculum objectives so as to meet the needs of our educational objectives.

We required three specific characteristics for the curriculum objectives:

1. The statement of the curriculum objective must represent a self-contained unit which can be moved from one program to another.
2. The statement of the curriculum objective must be appropriate to suit the characteristics of the task data which include scaled knowledge categories, scaled skills, non-scalable procedural information, and the language of task activities as found in the elements.
3. The statement of the curriculum objective must be understandable, accurate, and sufficiently detailed so that various users can agree on what is represented by a statement.

Characteristic 1 permits the development of curriculum ladders, the future development of core curricula, and provides for units to be referred to in permitting advanced credit or exemption. Such a "building block" approach also permits the user to select units at will in order to produce a curriculum to meet specific needs.

Characteristic 2 reflects the need of the curriculum to provide for education as well as training, including additive and transferable units, job relevant references to application, and inclusion of non-scalable procedural information.

Characteristic 3 permits the curriculum to be used reliably by others for curriculum analysis in review of overlap, relevancy, and adequacy. It makes it possible for the HSMS curriculum guidelines to be selectively utilized at the desire of the user. (See Chapter 4.)

In combination, the three characteristics would permit the structuring of curriculum units.

The Literature on Behavioral Objectives. What Are They?

The field of behavioral objectives derives from two sources. One school concentrates on the specification of objectives, and includes men such as Bloom, Gagné, and Tyler. The other concentrates on the behavioral manifestation of objectives and has its roots in the work of B. F. Skinner.[10] Neither approach, it should be noted, is concerned with the specification of content; and it is appropriate that we address ourselves to behavioral objectives in a section devoted to form.

[10] While Skinner is the subject of raging controversy among educationists and others concerned with the shaping of human behavior, the use of behavioral objectives for planning instruction and the design of self-instructional materials has become widely accepted as effective and useful.

Robert Mager has written a concise text that explains how one writes behavioral objectives. He defines "objective" as follows:

> An objective is an intent communicated by a statement describing a proposed change in a learner--a statement of what the learner is to be like when he has successfully completed a learning experience [56,p.3].

Mager states that a behavioral objective has three parts. The most important is a statement of the kind of performance, or behavior, that is to result. The second is a definition of the conditions under which the behavior is to be exhibited. The third component is the criterion or standard for determining whether the behavior is acceptable.

Robert G. Kibler refers to "planning objectives" and lists the following five elements:

1. Who is to perform the desired behavior (e.g., "the student" or "the learner")
2. The actual behavior to be employed in demonstrating mastery of the objective (e.g., "to write," or "to speak")
3. The result (i.e., the product or performance) of the behavior, which will be evaluated to determine whether the objective is mastered (e.g., "an essay," or "the speech")
4. The relevant conditions under which the behavior is to be performed (e.g., "in a one-hour quiz," or "in front of the class")
5. The standard which will be used to evaluate the success of the product or performance (e.g., "90 percent correct," or "four out of five correct") [48, p. 33].

Henry Walbesser, et. al., have a six-element list:

1. Who is to exhibit the behavior?
2. What observable performance (action) is the learner expected to exhibit?

3. What conditions, objects, and information is given?
4. Who or what initiates the learners' performance?
5. What responses are acceptable?
6. What special restrictions are there on the acceptable response? [100, p. 24].

On inspection we see that all of these lists refer to a similar set of ideas. The five-and six-component lists can be assigned to Mager's three components, since each elaborates on performance, conditions (restrictions), or standards (criteria). We concluded that Mager's list of three components captures the essence of what a behavioral objective must specify to be complete. This is a definition of form.

We found the concept of behavioral objectives attractive because they are a way of specifying intended learning outcomes which can be applied consistently and reliably, and, if done properly, can be stated unambiguously. This would meet one of our primary requirements for the form of the HSMS curriculum objectives.

Behavioral Objectives and Curriculum

Our next problem was to discover whether there is anything inherent in the concept of behavioral objective that limits its use to instructional planning. While the terms used for behavioral objectives vary (e.g., "behavioral," "performance," "instructional," "informational"), there is general agreement that they are currently used to specify the outcomes of instruction.

On the surface it would appear logical that performance can refer to work performance, that conditions can refer to the technology employed and the type of persons involved, and that standards could refer to the quality of the task output or the way in which the task is performed. Since we know that instruction and curriculum are words that are used interchangeably in the literature, we reviewed the authors to determine the reasons for their attention to instruction.

We discovered that there are two focuses for where the behavior takes place, and each assumes that the specification of content has already been determined.

Those who focus on elementary education, such as Kibler [48], Krathwohl [50], Mager [56], Popham [71, 72], Plowman[70], and Walbesser [100] are indeed concerned with instructional planning. They focus on classroom behaviors. Walbesser, for example is concerned with deriving verbs that can be used in behavioral objectives to describe the intended outcomes. The verbs, such as identify, construct, describe, are clearly related to classroom behavior and not work performance. But the verbs do not define the form of the objective. They are only recommended to describe activity for content already specified.

The writers dealing with classroom behavior seem to take it for granted that a predefined curriculum is already in existence. They talk as though the overall goals and content for the course or program have been specified, and the immediate problem is that of planning a learning sequence in which the immediate goals (or teacher expectations) are specifically stated and organized in order to promote effective, efficient teaching.

There is another group of writers who focus on the specification of training objectives. Miller [59], [60] and Gagné [29] are included in this group, and deal with analysis of the behaviors specified in objectives in order to determine the implications for the programming of instruction. They focus on work-related behaviors; and their verbs are those of human factors engineering. These verbs, as well, do not define the form of the objective.

However, this school of thought goes directly to task descriptions to develop a set of instructional objectives. It does not assume any predetermined curriculum, and, thereby, in concentrating on learning behaviors, completely by-passes the issue of curriculum content--beyond the descriptions of the work behaviors involved. As a result, the outputs are a design for training, and not education, as distinguished by Johnson.

Ammerman and Melching appear to resolve the problem in their conceptual model. They come from the background of research and development for military training which lies behind the work of Mager, Miller, and Gagné, but have been concerned with problems related to education (as we define it) as well as training. Their model includes the use of task descriptions to generate curriculum content (skills and knowledges), and utilizes the form of behavioral objectives.

We conclude that behavioral objectives are as useful for the statement of curriculum objectives as for the statement of instructional objectives, since curriculum objectives for occupational preparation can refer to task performance, the conditions for the performance, and standards for the performance. Since the three-part components are the requirements for the form of behavioral objectives, we, in fact, create curriculum objectives whose contents are expressed in the behavioral form.

Types of Curriculum Objectives

A number of authors have indicated an awareness that curricula for education and training deal with at least three types of contents. Johnson refers to "disciplinary" and "non-disciplinary" content [43, p. 137], and elsewhere recognizes skills [43, p. 130]. The Ohio State study refers to "basic information," "information application" (of skills and technical knowledge), and "clinical application" modules [77, Report No. 3, pp. 47 and 48]. (This seems to confuse content and sequence.) Ammerman and Melching refer to "specific tasks," "generalized skills" and "generalized behaviors" in one framework [3, p. 12], and when discussing the stages of development refer to "relevant work performance situations of interest," "terminal student performance objectives" (which contain the three types of content referred to above) and "enabling objectives" [3, p. 12].

The latter authors correctly point out that there is a vast confusion about terminology. We wish first to reconcile our terminology with respect to the stages of development in the education process and then to present our terminology with respect to the <u>content</u> of curriculum objectives.

When Ammerman and Melching refer to the terms "enabling" and "terminal" they refer to the relative position of an objective in a sequence, and do not have reference to content. When the authors use the term "terminal" they refer to the work activities which students are being prepared to perform. They use the term "enabling" to refer to the directly work-relevant knowledges and skills which "enable" the student to perform the "terminal" task behavior. However, Mager uses the term "terminal" to refer to the end point of a programmed sequence of instruction, referring to classroom behavior.

R. G. Smith notes that a fully structured system of education might consist of several levels of "enabling" objectives, each one consisting of the necessary prerequisite learnings for the next higher level of "enabling" objectives, and so on, until a "terminal" objective is reached [84, p. 93]. This is the sort of hierarchy of objectives with which instructional planners are concerned when they seek to design the most effective sequences of instruction. If no definite starting point is specified, this kind of hierarchy extends logically all the way back to the fundamental reading, writing, psychomotor, and intellectual skills taught to children (or picked up by them as they mature) in the early years of life and in the first days of formal schooling.

We have chosen, therefore, to refer to three types of objectives, any of which may be stated in the <u>form</u> of a behavioral objective, and which specifically refer to the stage involved. Thus, educational objective, curriculum objective and instructional objective refer to the stage, and the adjective "behavioral" designates the form when so required. In point of fact, we should refer to behavioral curriculum objectives, since we have chosen this form, but the term is too ponderous. It should be understood that our plans are to write curriculum objectives in behavioral terms.

There is still the issue of content, however. Are there several types of content, each of which requires separate handling for translation into a behavioral objective? (The issue does not arise for Johnson who did not deal with behavioral objectives.) In our view, the nature of the HSMS educational objectives, which have specified that our curriculum will provide training and education, have required that we utilize three types of content for curriculum development. Therefore, we are dealing with three types of curriculum objectives and four conditions. The conditions are listed below:

1. By virtue of our objective to prepare for occupational performance, we must use the language of the task descriptions to represent the intended learning outcomes.
2. By virtue of our objective to provide education we must refer to disciplinary content (knowledge categories and skills).
3. By virtue of our objective to provide educational ladders in additive units, we must refer to disciplinary content and skills in terms of the scale levels involved.
4. By virtue of our objective to cover all the relevant content needed for task performance, we must refer to non-disciplinary content (non-scalable procedural information).

HSMS Curriculum Objectives

Our task analysis methodology was designed to produce a taxonomy for our disciplinary content and skills through the scale level descriptors of our 16 skills and the Knowledge Classification System and scale. The task descriptions (elements) provide the language which will be used to indicate how the knowledges or skills are used in the tasks. The task descriptions also provide the source for identifying the procedural (non-scalable) knowledge to be expressed as curriculum objectives.

Thus, each curriculum objective will be stated as an intended learning outcome in terms of the tasks to be performed; there will be three types of objectives: knowledge, skill, and procedural. The curriculum unit is therefore determined by the nature of the task data as structured by the methodology and statistical analysis.

In selecting the content of curriculum objectives, the required skills and knowledges for the tasks at the scale levels required will be pre-selected by the method itself.

Procedural objectives will be selected from the task descriptions. Only those activities in the tasks which can be taught in a formal curriculum and in the general setting of a school or clinical affiliate will be included as curriculum objectives.

We will not include those aspects of tasks which are either so specific to the institutional setting or so self-evident that they either cannot be or need not be covered in a formal curriculum. While these may have to be introduced to the new performer, they constitute the kind of orientation training which is given to new employees in all jobs or by remediation training (decided in Program Design).

The knowledge and skill objectives will state in detail the content which must be learned in order to learn and perform the tasks. These objectives will specify the area of knowledge (or type of skill) to be learned, the needed level of competence, and the task activities in which the content must be demonstrated or applied. By combining work behavior in the same objective with a disciplinary knowledge or a skill we assure relevance.

When completed, the curriculum objectives will combine all of the aspects of the traditional "behavioral objective" (i.e., the behavior, the conditions, and the criterion for performance) with the statement of the appropriate content to be learned. We anticipate that criteria (or standards) will be determined in detail during a later phase of the HSMS work, when we embark on the development of performance evaluation instruments. Until then, standards in the curriculum guidelines will be derived from a combination of the implied standards of the normative tasks and the levels of competency indicated by scale values for knowledge categories and skills.

Because the curriculum will be stated in the form of behavioral objectives, will be derived from data, (including a taxonomy of skills and knowledge) collected in a consistent, reliable manner, we expect that the curriculum objectives will meet the requirement that they be consistent, and thus acceptable and usable for the purposes of analysis and modification of existing programs and for the design of new programs.

The curricula will be designed for use in educational ladders. Each curriculum objective will be a unit that can be moved from one program to another. Since each objective will state an "intended outcome" consisting of a distinct combination of content and activity, each will be a discrete unit. These units will be related in a curriculum structure in the following ways:

1. If two or more curriculum objectives at different educational levels refer to the same area of content (knowledge, skill, or procedure) at the same level of competency, these overlapping objectives will be identified as such.

2. If a series of curriculum objectives at successive levels in a ladder cover the same content at incremental (scale) levels, these will be identified as additive sequences.

3. When several curriculum objectives, covering different content areas, refer to the same task activity or task procedure, these will be cross-referenced to indicate their application in a single, common context.

4. Knowledge objectives in related disciplines, such as subgroups of broader disciplines, will be presented in such a way that the interrelationships of the disciplines in the Knowledge Classification System (and, by implication, in the parent discipline) will be explicit.

5. Curriculum objectives whose skill or knowledge content are inter-related systematically for a given job ladder will be cross-referenced to indicate their probable interconnection for instructional purposes.

In summary, we found that we could adapt the concept of behavioral objectives to fit our need for curriculum objectives. These curriculum objectives have the characteristics and meet the conditions which we set for the form of the objectives elsewhere in this chapter; the form selected will permit us to meet our educational objectives.

We have now presented the basic theoretical approach underlying our curriculum development methodology; we have presented a model which uses HSMS task data for curriculum design; and we have described the forms to be used for our curriculum objectives. Chapter 3 now focuses on the HSMS method for curriculum preparation: how we write and organize the objectives and how we present the curriculum guidelines.

CHAPTER 3

PREPARING HSMS CURRICULUM GUIDELINES

This chapter is a general procedural manual for the preparation of HSMS curriculum guidelines. However, since many of the methodological decisions we have made stem from conceptual problems, we also provide a rationale to explain some of the procedures. This chapter is detailed enough for the reader to have the flavor of the actual working procedures to be undertaken, but it is not sufficiently detailed to be used without access to the specific HSMS taxonomy and data base.

This chapter is divided into four sections. The first presents the data base; the second deals with the general procedural issues, assumptions, and rationales for the methodology. The third section describes how the raw materials are collected for the curriculum objectives and how these are structured for each of our three types of curriculum objectives. The fourth section describes the actual writing of the curriculum objectives, their stylistic appearance and their coding.

THE DATA BASE

In order to understand and follow the procedures outlined and the discussion in this chapter, the reader should be familiar with the HSMS job analysis methodology as presented in Appendix A. This section describes the state of the data at the point that preparation for curriculum guidelines begins, and explains some of the conditions involved.

The task data represent the tasks as code numbers to the computer and as task descriptions to the user. The activities encompassed in a given task, their sequence, what is used, alternative procedures, and contingencies are all presented on the Task Identification Summary Sheets (primarily in the List of Elements).

The computer analysis deals with skill and knowledge variables for each task in terms of the scale values involved.

1. The "task factors" reflect the interrelationships of skills and knowledge categories. Each factor is describable in terms of its characteristic skill and knowledge determinants.

2. Every task covered by the jobs studied by HSMS for one or more functional areas is assigned to one or more "task factors" or is identified as an <u>isolet</u>. Not all tasks are assigned to a factor, since some work activities will more properly be closer in required skills and knowledges to functional areas not yet studied, while others will be at such a low level that an assignment to a task factor is a matter of indifference. But, all the tasks studied are dealt with in job ladder design.

3. Tasks assigned to factors are each assigned a rank order position on the factor which reflects the extent to which the tasks require the skill and knowledge determinants of the factor, and the scale values of these.

4. <u>All</u> the skills and knowledges required for <u>all</u> the tasks, regardless of factor assignment, are to be reflected in the curriculum objectives and will be utilized. All are present in our computer results.

5. Once the factors have been identified and tasks have been assigned to each, we have a computer program array the tasks for each factor in a "Matrix." The tasks are arranged (by code number) in ascending order of their "loading" on a factor.

   For each task on a factor each skill and/or knowledge category required for the task and its scale value is listed. This array of scale values for each factor looks something like the model presented in Figure 3.1. There is a step-like effect as new skills and knowledges are added (from top to bottom) as the tasks are presented in rising levels (from left to right). Once a skill or knowledge enters, one can see its scale value for other tasks by reading from left to right along its row.

6. We divide each factor into levels which correspond to job levels. The levels are suggested by the data, in that we find breaks in the task array. Each level emerges as a jump in the number of skills and knowledges that are required and/or when a rise in the scale values appears. Thus, all the tasks for a given level are at relatively comparable scale values of given skills and knowledges (but not necessarily at the same scale value for each skill and knowledge category).

7. Job ladders emerge when tasks are assigned to jobs to reflect levels within an occupation's characteristic factor. However, since many tasks beside the characteristic tasks may be performed in a job, a given job structure may be represented by tasks in more than one factor and/or may include isolet tasks.

8. If more than one factor emerges for a given job ladder, curriculum objectives will be prepared for each; the curriculum for the level will be based on all the tasks for that particular occupational level, including isolet tasks.

The nature of the data base and the conditions imposed by the way in which the data are displayed require the solution of several problems with respect to the curriculum objectives. These are discussed as they arise in the various sections of this chapter. Figure 3.1 will be referred to throughout this chapter to illustrate the issues, problems, and procedures as they are presented. The figure is a mock representation of nine tasks, in a single factor, which are arranged into three levels. The tasks (in total) require four skills and eight knowledge categories. In "real life" a factor can include thirty or more tasks, and may involve as many as 16 skills and 150 knowledge categories (of which only a much smaller number will have "determined" the factor).

Figure 3.1 MODEL OF "MATRIX" ARRAY OF SKILLS AND KNOWLEDGES BY TASK AND JOB LEVEL

Skills and Knowledge Categories	FACTOR I LADDER								
	Level I			Level II			Level III		
	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9
Skill 1	1.0	1.0	2.0	2.0	2.0	4.0	4.0	9.0	9.0
* Skill 2	1.0	2.0	2.0	2.0	2.0	2.0	4.0	7.0	9.0
Skill 3		2.0	2.0	4.5		4.5	2.0	7.0	7.0
* Knowledge 1				1.5	1.5	1.5	7.0	1.5	7.0
Knowledge 2				3.5	3.5	2.5	5.5	2.5	9.0
Skill 4				5.0	5.0	5.0	5.0		5.0
Knowledge 3							5.0	6.0	
* Knowledge 4							3.5	9.0	9.0
Knowledge 5							8.5	8.5	8.5
Knowledge 6							3.5	7.5	7.5
Knowledge 7							7.0	7.0	9.0
Knowledge 8							7.0		8.5

* Asterisk denotes variables that determined the factor.

1. Tasks are listed from left to right in ascending order of loading on "task factor."
2. Skills and knowledge categories are listed from top to bottom in order of appearance in the task array.
3. Tasks are assigned to levels based on increasing numbers of skills and knowledges required and their scale values.
4. Not every skill or knowledge appears in all subsequent, higher-level tasks.
5. Scale values do not necessarily rise from level to level.
6. Scale values may vary within a level.

GENERAL PROCEDURES

The reader may notice that this chapter refers to "curriculum guidelines" rather than to "curriculum objectives." We consider that curriculum objectives must be structured and arranged in an educational ladder to meet our educational objectives. We consider that we must also provide the user with information on the educational objectives, with suggestions on instruction, and with the task descriptions to be used as instructional materials. The term curriculum guideline thus encompasses our total output; these are our ultimate products.

Each occupational level (job) in an educational ladder will have a document divided into three parts. First will come a general introduction which will deal primarily with the general and specific educational objectives for a given curriculum. Next will follow the structured set of curriculum objectives, annotated with respect to educational ladder references and instructional suggestions if appropriate. This will be followed by the task descriptions covered by the given curriculum.

This section first offers an outline for the presentation of the educational objectives of our curriculum guidelines, and then presents other procedural issues.

Educational Objectives

We believe that we owe the reader an explanation of what we are presenting, how it was developed, its underlying objectives, and guidance in its use. The first part of our document for a given occupational level (job) will present our educational objectives and related matters in a textual form for which the outline is presented below:

1. We state the name of the occupation or job, its position in relation to higher and/or lower level jobs in the job ladder for the functional area, and the academic level assumed for the curriculum.

2. We indicate the number of factors represented in the job and the nature of the skills and knowledges which determined the factor(s). We will provide Matrix arrays for each factor similar to the model in Figure 3.1.

3. We present a listing of all the tasks which the graduate is to be prepared to perform, grouped by factor, with isolet tasks so identified.

4. We refer the reader to the task descriptions which will be appended and explain their function as a source of one type of procedual knowledge: the knowledge of the procedures and sequences for the individual tasks, and a description of the clinical behaviors which are the ultimate work performance units for the occupation. We explain that this type of procedural information will not be presented in the curriculum objectives, but will be considered a part of the curriculum. The task descriptions embody both educational and curriculum objectives as well as being, in themselves, instructional materials. (It may be appropriate to suggest that higher and lower level tasks be used to prepare students for an understanding of the work behaviors to be expected of other health team members.)

5. We provide the reader with a discussion of the source of the task data, where collected, the reviewers, and the nature of the normative review of the task data.

6. We indicate the educational objectives which were involved in the normative review and which affect ultimate performance standards. (The four being used for the current work are presented below, but any other standards which are used in the process of reviewing and editing the tasks will be listed.)

   a. Performers of tasks involving ionizing radiation and radioactivity will be trained to provide maximum safety to themselves, their co-workers and their patients by the use of adequate, appropriate shielding for all procedures.

b. Performers of tasks involving ionizing radiation and radioactivity will be trained to minimize the exposure to radiation of the general population by always considering how to minimize the exposure required while still obtaining all the information needed, and how to minimize the need for any repetition of exposures due to inadequate performance.

c. Performers of tasks involving patients in the diagnostic or therapeutic use of ionizing radiation and/or ultrasound will give sensitive, sympathetic attention to the patient, attending to the fears, anxieties, and pain experienced by the patient, and recognizing the need of patients for reassurance, information, and dignity.

d. Performers of tasks involving patients in the diagnostic or therapeutic use of ionizing radiation and/or ultrasound will conduct their task procedures in such a way as to minimize the possibility of transmitting infection or communicable diseases by practicing appropriate sterile, antiseptic and decontamination procedures before and after examinations and/or treatments.

7. We present general suggestions on instruction as insights gained from our work. Among these, we indicate how the interrelated skill and knowledge categories which determine a given factor provide a structured package which, if taught in relation to one another, may enhance the effectiveness of teaching.

We provide a discussion of our approach to the teaching of skills which may enhance the effectiveness of teaching. We reason as follows:

a. Skills must be consciously taught and consciously learned, and their salient characteristics should be presented explicitly.

b. Skills require practice to be proficiently learned.

c. The most efficient way to have skills practiced is to utilize the knowledge which must be learned in any case to provide the skills with their substantive practice content.

d. Skills taught with one type of substantive content may be considered to be transferable to another type of substantive content. The skill at one level in a factor is transferable to similar levels once the new procedures (substantive content) are taught.

8. We present the reader with our concept of educational ladders and indicate how the curriculum objectives to follow are arranged in a manner to provide a basis for exempting and crediting students already proficient in given objectives. We describe the additive nature of the skill and knowledge objectives.

9. We provide the reader with a description of the form in which the curriculum objectives appear and are arranged; we cover the style, coding and cross referencing to higher and lower job levels, related skills and knowledges, and the structure of knowledge disciplines.

Who Does the Curriculum Preparation?

The task analysis methodology of HSMS is designed to be used by individuals who enjoy and are good at interviewing performers, who can be trained to use the HSMS method, and who are willing to follow the rigorous tenets of the methodology. The HSMS job analysts are not themselves health occupations practitioners or educators. Thus, we require the use of experts to review the data.

Similarly, the curriculum preparation methodology of HSMS is designed to be used by individuals who enjoy and are good at technical content analysis of data and the synthesis of such material in written form, who can be trained to use the HSMS method, and who are willing to follow the rigorous tenets of the methodology. The HSMS curriculum analysts, not being health occupation practitioners or educators, will rely on experts to clarify how knowledge categories are applied in tasks, or what aspects of a knowledge category are being applied in a task. We will also require the use of experts to review the curriculum objectives.

The curriculum analysts will be trained in several areas, in a manner similar to the job analysts. First, the curriculum analysts will learn the use of the job analysis methodology and taxonomy, including the task definition, the sixteen skill scales, and the Knowledge Classification System and scale. Their training will include practice in determining what task elements are referred to when a task is coded at a given scale value for a given skill or knowledge category.

Second, for each occupational area, the curriculum analysts will be expected to read the literature collected for the analysts which describe the work and disciplines involved, including glossaries, manuals, and texts. They will also be expected to review the task data.

Third, the curriculum analysts will be trained in the theory and the use of the procedures outlined in this document, as well as in more specific in-house procedures to be prepared. The analysts will be trained by the senior staff member in charge of curriculum analysis.

Finally, the curriculum analysts will be made familiar with the general and the specific educational objectives for the particular ladder.

The stages of preparation of the curriculum objectives will proceed in a team setting, so that the first draft of the objectives will be approved by a team of curriculum analysts. The team will consult the Director of the Project,who edited the tasks, the job analysts who collected the task data, and "resource respondents" (experts) to clarify questions of content as the work progresses.

The Director of the HSMS will review the first drafts; approved curriculum objectives for a given level will be submitted to appropriate resource respondents for review. The final, edited version will then be ready for publication.

Methodological Decisions

Since our task data are arranged in factors, by level, we had to decide where to begin in the process of writing curricula. Our intent is that the procedures be usable for a single level as well as for an educational ladder, and for multi-factor occupations as well as for single-factor jobs.

We have specifically chosen to work on one level at a time, cutting across factors as required to cover all the tasks at a given job level, but preserving the distinctions among factors.

We have chosen to start from the lowest levels of the job (educational) ladder and to progress upwards.

We have chosen to work first with the skills, then the knowledges, and finally the procedural contents for a given job level.

We have chosen to prepare the raw materials for all the curriculum objectives for a given level before writing any of the objectives. That is, we will first find for each skill and knowledge category scale value the language that describes its use in the task. We will also read each task and identify the non-scalable procedural knowledge. After all this has been done for each task, the raw material will be structured, and only then will the curriculum objectives be written.

We have decided that the curriculum objectives for skills will be written so that the reader will not be required to consult the HSMS skill scales in order to understand what is being referred to by the skill name or the scale value involved.

We have decided that the curriculum objectives for knowledge categories will be written using the brief version of the HSMS knowledge category names, which are fairly traditional, and the code number, but we will append to the document a list of each knowledge category name with its fuller description and any qualifying information for use as presented in the HSMS taxonomy. The objectives will not require the user to know the HSMS knowledge scale.

We have decided that when tasks are to be mentioned as references, we will use an abbreviated version of the name (the underlined portion of item 5 on the Task ID Summary Sheet) and the code number.

The decisions presented above are current; they are subject to review and revision as we gain experience in the actual curriculum preparation work.

COLLECTING AND STRUCTURING THE RAW MATERIALS FOR THE CURRICULUM OBJECTIVES

The first step in preparing the curriculum objectives is to assemble all the task descriptions for a given job level, separate these into their respective factors, and place the isolets together.

The easiest way to treat the isolet tasks is to place each low-level task isolet in the "Matrix" array for the factor which has the most related context,according to the task's (low)loading. Higher-level isolet tasks should be treated as a group, with the tasks placed in any logical order that appears appropriate. Then a "Matrix" array should be produced for this group. The Matrix will not have the clear,step-like structure of the Matrix arrays for the factors, but any common skills and knowledges will be made apparent. (The Matrix arrays will be presented in the document containing the curriculum guidelines.)

The following procedures will be applied separately to each factor for a given level (job). The curriculum analysts will first work with the "characteristic factor," and then proceed to the secondary factor(s) and the grouping of the isolets for the level.[11]

Preparing the Task Descriptions

1. The left hand side of the Task Identification Summary Sheet and then the List of Elements on the Task Identification Summary Sheets for each task in a factor (at a given level) will be glued in sequence on blank sheets so that only the left hand side of a page will contain task description material. That is, the pages are to be cut in half and laid out in sequence, on the left hand side of blank pages.(Using Figure 3.1 as an example, we would first deal with Tasks 1, 2 and 3 for Level I.)

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11 The reader will note that tasks on one factor may require one or more skills and knowledge categories at a given scale level which also are required for tasks in a secondary factor or an isolet group. We have decided that there will be separate curriculum objectives in such cases, so that the factors can be treated as independent curricula. In the curriculum guidelines these objectives will be presented together, but reference to the parent factor will be retained.

2. The curriculum analysts will refer to the Matrix array for the factor to see which skills and knowledge categories are involved. In Figure 3.1, for Factor I, at Level I, these are Skills 1, 2 and 3; at Level II these would be Skills 1, 2, 3 and 4, and Knowledge Categories 1 and 2.

3. The analysts will note which skills and which knowledge categories are required for each task, and at what scale value, by reading the Matrix array. In the case of Level I in Figure 3.1, Task 1 requires Skill 1 at 1.0 and Skill 2 at 1.0. Task 4 in Level II requires Skills 1, 2, 3 and 4 and Knowledge Categories 1 and 2.

4. The analysts will review the prototypes for writing the curriculum objectives (presented later in this chapter) so as to be prepared to deal appropriately with the language of the task descriptions.

5. Raw Materials for Skill Objectives. Proceeding with the first skill in the Matrix array for the level and factor (reading from the top down), the analyst reads the elements of the tasks requiring that skill (proceeding with the tasks from left to right within the level). The analyst knows that each task is scaled for the highest scale value of that skill. Therefore, the scale value shown in the Matrix represents the highest manifestation of the skill in the task. (It is optional whether one proceeds a task at a time or a skill at a time.)

   a. The analyst finds the description (element) which requires the skill in that task at that scale value, and circles or marks it with brackets.

   b. In the blank right-hand margin, next to the circled element, the analyst records:

      i) The code number of the task.

      ii) The job level.

      iii) The factor number (and/or name).

      iv) The eight letter code for the skill.[12]

      v) The scale value.

---

[12] These have already been prepared. They are letter codes that suggest the skill content and take up the same eight spaces as do the eight-digit numbers for the knowledge categories.

c. If the analyst finds that more than one element represents the given scale value, then this is done for as many elements as appear which require that value.

d. If the analyst cannot determine which element is involved, the Director, the job analysts and/or the appropriate resource respondent is consulted.

e. The analyst does not mark elements that require lower scale values of the skill.[13] However, it is possible for tasks at a given level to require different scale values. Thus, as in the case of Figure 3.1, a skill can be at 1.0 for two tasks and at 2.0 for a third. The raw materials would show two elements at 1.0 and one at 2.0.

f. The analyst may find that, for certain skills, the demonstration of the skill does not adhere in any given elements, but applies to the task as a whole. For example, Decision Making on Quality or the Error Consequences Skills are of this sort. It is necessary for the analyst to be aware of the prototype form that is used in writing the curriculum objectives for each particular skill (discussed in the next section). The referent for the skill may be the task as a whole or a statement written by the analyst in preparation for the objective for the skill. It may be necessary to include the errors that have been scaled for the Error Consequences scales. Thus, the options for preparation of raw materials for skills in a given task are:

   i) Circling of the element(s) manifesting the scale value.

   ii) Circling of the "name" of the task (Item 5 on the Task ID Summary Sheet).

   iii) Writing a preliminary statement reflecting the prototype for the skill objective and/or including information such as the errors.

   In any of these cases the same identification information is included as described in 4(b), above.

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13 Since we assume the scales are additive, and since the sequence of procedures for the entire task are a separate educational objective, lower scale value performances are accounted for in tasks that are scaled lower.

g. The result of the preparation for skill objectives is that every task that requires a skill at any scale value above zero has a referent of some sort which indicates the activity in which the skill is manifested in the task, at the scale value for which it has been coded.

6. The analysts proceed to the next skill and repeat the process until all the skills for all the tasks have designated referents marked out on the tasks in which they are used (for the factor and level).

The analysts may note that a given element in the task may require more than one skill. This is expected, and is not a problem. The analysts will write in the needed information for as many skills as are represented in an element.

7. Raw Materials for Knowledge Objectives. The analysts proceed with the knowledge categories, one at a time, in the Matrix array for the level and factor (except when the given level includes no knowledge categories, as is the case with Level I in Figure 3.1). There is again the option of doing one task at a time or one category at a time.

   a. Since the scale values for a knowledge category refer to "amounts of detailed knowledge" as well as to depth of understanding, it is important to first circle each element in the task that requires any knowledge of the category. In the right hand margin the analysts enter:

      i) The code number of the task.

      ii) The level.

      iii) The factor number (and/or name).

      iv) The eight digit code of the knowledge category (and a short version of the name).

   b. The analysts then determine and list for each circled element, what area of detailed knowledge from the knowledge category is being referred to in the task activity described. This is a function with which the experts may be called upon to assist the analysts.

   c. Once all the elements that require the category are circled and the detailed areas identified, the analysts select the element(s) that represent the scale value assigned to the task. This will be based on a combination of the amount of detailed knowledge involved, and the depth of understanding required. The scale value for the task is then entered next to these elements.

d. The analysts then compare all the elements at different scale values which require the category. Those elements that require the same detailed area of knowledge as those already scaled (but at lower scale levels of understanding or in less detail) are then eliminated. Their right hand references are crossed out. For all remaining elements which cover detailed information not covered by the scaled elements, the analyst enters the word "unscaled" where the scale value would have gone, for use in later preparation of the curriculum objectives.

e. The result is that the total breadth of detailed knowledge required for any category in any task at a scale value above zero has a circled referent, with some showing the scale value and some not, but all referenced to the task, level, factor and area of detailed knowledge of the category

f. Any element which is the referent for several skills and knowledges has a right hand column filled out to reflect all the skills and/or knowledges referenced to it.

8. Raw Materials for Procedural Objectives. The analysts now proceed to mark out those elements or descriptive passages in the task descriptions that refer to non-scalable procedural information. That is, they read the task descriptions to select those activities in which the knowledge needed is not already represented in the detailed or theoretical knowledge of a category in the Knowledge System, or is not a skill, or is not orientation knowledge (that would be specific to an institution and not appropriate for curriculum content).

An example of non-scalable knowledge for use in a procedural objective might be the reading of measurements or the use of general purpose tools and equipment. (Specialized equipment would be covered by the subject category for which the equipment is special.) Thus, the use of a drill would be procedural, but the use of an x-ray machine would be covered under "radiographic analysis," or other knowledge categories, depending on the aspects involved.[14]

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14 The actual sequence of steps in the task is also procedural information, but this is included in the task descriptions themselves, which will be appended, and are not referred to here.

a. The curriculum analyst circles or marks the elements covering the procedural information for each task, one task at a time.

b. Next to each, in the blank, right-hand margin, the analyst records:

   i) The code number of the task.

   ii) The level.

   iii) The factor number (and/or name).

   iv) The eight letter code for all procedural information: PROCEDUR, without a scale value, since there is none.

c. If there is a question, the analysts consult the Director, job analysts or resource respondents.

d. The result is that all the procedural information not covered by a skill, by a knowledge category, or by the actual sequencing of the task has a circled referent.

Arranging the Raw Materials

The analysts will decide what the most convenient form is for separating out the task referents and arranging them in files. The goal is to have every circled task element or descriptive referent statement and its coded reference to task, level, factor, variable (skill, knowledge, or procedure) and scale value in a form that can be handled individually.

The way we suggest is to take each of the sheets for each task and reproduce the pages in as many copies as there are individual skills, knowledges or procedures involved. These task pages would be cut apart and mounted on file cards or blank pages so that each description and its identification code would appear on a separate page or card. Thus, if a given element applied to several skills and/or knowledges, all the references would appear, but there would be one copy available for each. In each case the appropriate coded information would be attached. The analysts would retain, as a master copy, an uncut set of the task descriptions showing all the referents. This would be used for later review and in cross-referencing.

The individual items would be arranged into files in the order listed below. Once the separate sheets or cards are prepared, they can be handled in any sequence chosen (by task or by variable) for a given factor and level.

1. The skills would come first, in the order of their HSMS numbers. (The skills are numbered in the HSMS methodology, but appear in the coding with letter symbols.)

2. The knowledge categories would come next, in the rising order of their Classification System code. (This retains the structural relationships in the outline, and, as a result, the "fine" level categories appear after their "broad" level subsuming parent disciplines, and before the next discipline in the System.

3. There may be skills or knowledge categories for which more than one scale value appears (because the tasks at that level do not all require the category at the same scale value). On Figure 3.1, for example, this is true for Skills 1 and 2 in Level I, and for Knowledge 2.

    a. The task items are to be grouped within the skill or knowledge category <u>separately for each scale value</u>.

    b. The scale value groups are to be arranged in rising order, with the lowest scale value first.

    c. The knowledge category items that were marked "unscaled" are to be placed together before the first scaled items.

Processing the Raw Materials

Before the groupings of raw materials are transformed into curriculum objectives, three further stages are required. First, it is necessary to identify the number of knowledge objectives to be required for any given knowledge category at any given scale level. (All of the referents at a given scale value for a skill are grouped to become a single skill objective.) Second, it is necessary to determine the scope and number of procedural objectives, and, third, it is necessary to prepare the raw materials for later cross-referencing.

The reason that the breadth of detailed information in a knowledge category needed earlier specification is due to the nature of the knowledge scale. One of the scaling principles for the scale deals with the amount of detailed knowledge required. The levels for this scaling principle refer to "a limited amount," "a moderate amount" and "a very great amount" of "detailed knowledge in [the] subject area, including such things as technical or special terms or facts." This also refers to procedures and equipment specific to the subject area.

Given this scaling principle, it is clear that the scale value of 1.5 for one task which refers to "a limited amount" may not be referring to the same limited amount of detailed knowledge as in another task which also is scaled at 1.5. In addition, not all the elements in a single task may be referring to the same breadth of detail.

Our intention is to have separate knowledge objectives for each separate area of detailed knowledge when a given scale value refers to more than one area of detailed knowledge in the tasks involved.

The analysts first inspect all of the scaled task referents for each scale value of a category. They group together for use in a single objective all the descriptions that refer to the same detailed area. (Narrower areas for one task which are covered by broader areas in another are grouped for the same objective.) There are as many objectives for a given category at a scale level as there are different, non-overlapping areas of detailed knowledge for the category.

The analysts then examine the elements (descriptions) which were marked "unscaled." Knowing the scale value for the task in the category, the analysts have thereby determined that the scale values for these are at some point on the scale below the value assigned to the task.

For each "unscaled" description, all the referents for the scale values below the one assigned to the parent task are inspected. The unscaled item is matched against any referents that cover the same area of detailed information or under which the unscaled item can be included. If a match is found, an unscaled item is given that scale value and included in that group for representation in that objective.

For any "unscaled" descriptions that cannot be matched, the curriculum analysts will, in consultation with the relevant job analysts, assign a scale value to the element (lower than the one for the parent task). They mark the scale value "assigned in curriculum analysis." These are placed in the file in the appropriate scale level position, and become separate objectives.

All the procedural referents are reviewed for the level as a whole. Only by inspection will it be possible to identify how many are overlapping. The analysts will separate these so that there are as many separate groups of referents as there are distinct, non-scalable procedures or knowledges in all of the tasks involved, with no overlaps among them.

Now the analysts are ready to make preliminary cross-references for the structured guidelines. Any curriculum objective may bear a symbol (letter) denoting: [a] an objective already covered at the same scale value (or the same procedure) for a lower job level in the ladder; [b] an objective to be covered at the same scale value (or the same procedure) for a higher job level in the ladder; [c] an objective whose skill or knowledge content is covered at a lower scale value for a lower-level job; [d] an objective whose skill or knowledge content is covered at a higher scale value for a higher-level job. These four references make possible the provision of non-redundant training and education.

Another cross-reference that will be used, [e], will indicate to the user that a task activity which appears in this objective also appears in other objectives in connection with different skills or knowledges. This cross-reference is provided as a guide to program design and instructional planning. The annotated task descriptions and the raw material files are the source of this cross-referencing.

Footnotes will tell the user the number(s) of the objective(s) being referred to. The information for this cross-referencing comes from the Matrix arrays for upper and/or lower job levels. The footnotes can be developed as the work progresses up the ladder and as the work expands to other areas.

At this stage the raw materials are arranged into groupings so that each contains the task information needed to write a single curriculum objective and so that the following identification information can be included:

1. All the tasks to which the objective applies.
2. The job (educational) level.
3. The factor.
4. The skill or knowledge category and scale value, or the fact that it is a procedural objective.
5. The appropriate cross-referencing notes for the curriculum objective and the letter symbol(s) to be used.[15]

The order of presentation of the curriculum objectives for any given occupational level will be as follows:

1. The order will apply first to skill, knowledge, and procedural objectives regardless of factor, but the factor reference will be retained.
2. Skill Objectives will appear first, in order of their HSMS scale number. Within each set for a skill the objectives will appear in rising order of their scale values.

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[15] Code numbers will be assigned to each curriculum objective after they are approved. In the final document an index will list the objectives by number and page.

If there is more than one objective for a scale value for a given skill (resulting from its appearance on more than one factor), the objectives will be presented in order of the importance of the factor's tasks to the characteristics of the occupation. The last listed will be the objective stemming from the isolet tasks.[16]

3. The Knowledge Objectives will appear after the Skill Objectives, in rising order of their Knowledge Classification System code numbers. Within each set for a knowledge category the objectives will appear in rising order of their scale values.

   Within each set for a scale value (if there are more than one) the objectives will be presented in order of the importance of the factor, as described above.

   Within each set for a scale value on a factor (if there are more than one) the objectives will be arranged in an order logical to the nature of the detailed information involved.

4. The Procedural Objectives will appear after the Knowledge Objectives. These will be presented in the order of importance of the factor, as described above, and within each factor in an order logical to the nature of the procedural information involved.

WRITING CURRICULUM OBJECTIVES

This section first presents the reader with an idea of how the curriculum objectives will appear in format in the document to be prepared. It next presents a guide to a coding format for use in a data retrieval system. Finally, the major portion of this section will describe the prototypes. A prototype for each type of curriculum objective has been developed which utilizes the HSMS taxonomy and scales and the task description modified to suit the needs of each objective, so that

16 The objectives are presented separated by factor to provide program designers with the option of combining all those for a given skill at a given scale value or treating them separately for each factor.

the actual writing of each curriculum objective can be done with maximum consistency and objectivity of language.

Format and Coding

We have selected a format for the curriculum objectives that retains all of the information needed for referencing without recourse to many other indexes. All the information needed for key-punch coding will be found in the format to be presented in the guidelines document.

The format for the document appears in Figure 3.2. Instructions for filling out the format are as follows:

1. Type of Objective. Enter one of three words: Skill, Knowledge, Procedure.

2. Factor. Enter the number of the factor and a brief name for its characteristics. Enter the word "isolet" if this applies.

3. No. This is the unique number assigned to this given curriculum objective. We expect to use seven digits, beginning from 0000001, and continuing numerically as we write the objectives.

4. Skill or Knowledge. This is filled out only if the objective refers to a skill or knowledge. If it is a procedure, then item 1, above, is sufficient. Fill in the 8-letter code for a skill, or the 8-digit code for the knowledge category, and a brief name for the category.

5. Scale Value. If a skill or knowledge category has been entered in item 4, above, enter the scale value represented.

6. Occupation. Fill in the job title to which the objective applies.

7. Level. Fill in the academic level to which the objective applies.

Figure 3.2. MODEL LAYOUT FOR CURRICULUM OBJECTIVES

Type of Objective________________ Factor________________ No.______
Skill or Knowledge________________________________ Scale Value______
Occupation________________________________ Level______
Relates to Tasks:________________________________
____
____
Insert Cross Reference Letter(s) and
Footnotes If Appropriate:________________________________

Content A graduate of the program at this educational level must be able to:

Standard(s)

Footnotes

8. Relates to Tasks. Fill in the code number and a brief title of all the tasks at this level for which this objective is preparation.

9. Insert Cross Reference Letter(s). Choose any letters [a], [b], [c], [d], [e] as appropriate for cross-referencing. The letter symbols will be explained in the text as follows:

   [a] This skill or knowledge category at this scale value, or this procedure, is also covered in the curriculum guidelines for a lower level in this job ladder. If a footnote number appears next to this letter [a], the footnote refers to the number(s) of the curriculum objectives referred to.

   [b] This skill or knowledge category at this scale value, or this procedure, is also covered in the curriculum for a higher level in this job ladder. If a footnote number appears next to this letter [b], the footnote refers to the number(s) of the curriculum objectives referred to.

   [c] This skill or knowledge category is covered at a lower scale value in the curriculum guidelines for a lower level in this job ladder. If a footnote number appears next to this letter [c], the footnote refers to the number(s) of the curriculum objectives referred to.

   [d] This skill or knowledge category is covered at a higher scale value in the curriculum guidelines for a higher level in this job ladder. If a footnote number appears next to this letter [d], the footnote refers to the number(s) of the curriculum objectives referred to.

   [e] All or some of the task activity referred to in this curriculum objective is also referred to in other curriculum objectives, but in relation to different skills, knowledges, or procedures. If a footnote number appears next to this letter [e], the footnote refers to the numbers of the curriculum objectives referred to.

10. Footnotes If Appropriate. If the cross-reference is to include the numbers of the curriculum objectives referred to, insert a footnote number next to each letter symbol chosen. Insert the same footnote number and the numbers of the curriculum objectives involved at the bottom of the page.

11. Content. Enter the actual curriculum objective in the appropriate prototypical form. (See next section.) Note that all of the curriculum objectives will share a common introductory sentence.

12. Standards. This will be blank for the time being. There will be implicit standards in the content section. However, objective standards for testing performance will eventually be collected and presented by HSMS, or the user will develop his or her own. We hope that standards can be written which reflect the quality of task outputs.

13. Footnotes. See 10, above. This is where the objectives' numbers are cited.

Information retrieval needs are the determining criteria for inclusion of data in a coding manual. Figure 3.3 presents our suggestions for the arrangement of an 80-column punch card.

As in the case of tasks, the curriculum objectives will be numbered for identification purposes, but the number will carry no other special significance. We decided to maintain the same coding for the Knowledge Categories (8 digits) and the skills (8 letters) as is used in the task analysis coding, and add only one more letter code to refer to all procedural information. We decided to retain the scale value and job level information. Since the factor can be reconstructed from the Matrix array, coding for the factor is not needed. The code number of each task to which a given objective applies is most important. Since the number of tasks will vary, the format permits any number to be entered. A special computer program will be needed to obtain a list of the code numbers of all the objectives associated with a given task when the task's code number is read into the computer.

Figure 3.3. CODING MODEL FOR CURRICULUM OBJECTIVES
p. 1 of 2

Columns	Content	Code
1-3	Designates the card number for a given curriculum objective. The number of cards needed is determined by how many tasks for which the objective is preparation. Each card holds room for 7 tasks.	C01-C99
1	The letter "C" differentiates curriculum objectives from "T" task cards.	C
2-3	The number of the card for the objective.	01-99
4	Blank	
5-11	Curriculum objective identification number. Number consecutively.	0000001-9999999
12	Blank	
13-20	Eight letters for skills, or eight-digit code for knowledge category, or designation for procedural objective: PROCEDUR	See Content
21	Blank	
22-24	Scale value. Blank if columns 13-20 are PROCEDUR.	1.0-9.0
25	Blank	
26-27	Educational level (tentative):	
	Pre-college; on-the-job training; aide; unskilled	01
	College credits; assistant; semi-skilled	02
	College year; technician; skilled	03
	Associate degree; technologist; semi-professional	04
	Associate degree plus; Sr. technologist; semi-professional	05
	Baccalaureate degree; professional	06
	Masters degree or equivalent; specialized professional	07
	Doctoral degree or equivalent; specialized advanced professional	08
	Specialist professional beyond doctoral level	09
28	Blank	

Figure 3.3. CODING MODEL FOR CURRICULUM OBJECTIVES (continued)
p. 2 of 2

Columns	Content	Code
29-34 36-41 43-48 50-55 57-62 64-69 71-76	Enter the 6-digit code for each of the tasks for which the objective is preparation at this level.	000001-999999
35,42,49, 56,63,70, 77,78	Blank	
79-80	Enter the number of cards to follow; if none, enter two zeros. Determined by need for more tasks beyond those entered on the first card.	00-99
1, 4-28	Same for each card for a given curriculum objective.	

Prototypes for Skill Objectives

The prototype formats for the Skill Objectives have been designed so that the user will be able to understand from the language those aspects of each skill that must be consciously taught and consciously learned, and will not have to learn the HSMS skill scales.

We assume that when a skill is taught and learned, that which is transferable is the attributes of the skill as described in the scale. This is independent of substantive content. However, while skills can be taught and learned regardless of which specific procedures or knowledges are used to constitute the substantive content when the skill is applied, no skill can be learned without some substantive content. The implication is that what must be taught in each new situation are the knowledges and procedures of the situation. The skill, once learned at a given scale value, is available to the learner for use at that level in another context. We assume that, all other things being equal, a student who has been been able to master Task A, using scale value 3.5 for a given skill, has less to learn for Task B, which also requires scale value 3.5 for the skill, than someone who has never learned to perform at level 3.5 for the skill in any context.

For this reason we present only one skill objective for a given skill scale value within any given level and factor, regardless of the varieties of task contexts. However, the curriculum objective will include all the circumstances covered or the activities involved, because these are the obvious substantive contents which should be used to teach the skills.

The prototypes for the 16 skills follow. Instructions to the user are in brackets. The phrase, "insert the language of the tasks" is not meant literally, since the language will be adapted as appropriate. Comments to the reader are in parentheses.

Locomotion Prototype

A graduate of the program at this educational level must be able to coordinate his or her movements of body, torso, or limbs through space to achieve the standards set for body movement or position in the following activities:

[Insert the language of the task(s).] (No reference need be made to the scale value, since the movements themselves define the level.)

...To accomplish this, the student must be able to state what standards of motion or position must be achieved for each activity, and must be able to exercise the degree of coordination necessary to achieve the standards.

Object Manipulation Prototype

A graduate of the program at this educational level must be able to achieve the degree of control and precision in the manipulation of objects with the fingers, hands, or limbs with the fineness of motion appropriate to achieving the standards set for the manipulation of the objects involved in the following activities:

[Insert the language of the task(s).] (No reference need be made to the scale value, since the manipulations themselves define the level.)

...To accomplish this, the student must be able to state what standards of precision must be achieved for each activity, and must be able to exercise the degree of control and precision necessary to achieve the standards.

Guiding or Steering Prototype

A graduate of the program at this educational level must be able to coordinate his or her perception of external stimuli which inform him or her of his or her position, so as to control an object being... [choose A or B.]

A | ...moved over a predetermined pathway in the following activities:

[Insert the language of the task(s).]

B | ...held steady on a moving target in the following activities:

[Insert the language of the task(s).]

so as to achieve the degree of precision necessary to accomplish the objective within an acceptable margin of error. (No reference need be made to the scale value, since the set of stimuli and the error margin for the activities themselves define the level.)

...To accomplish this, the student must be able to state what external stimuli must be attended to, what coordination is required and what margin of error is allowable in the movement of the object (or holding on the moving target) to achieve the standards.

Human Interaction Prototype

A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characteristics or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. . These activities include:

[Insert the language of the task(s); add other needed indicators.] (No reference need be made to the scale value, since the sensitivity, perception and subtlety of the feedback in the interaction situations themselves define the level.)

...To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characteristics are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior, to accomplish the activities which engendered the interaction and at the quality standard set.

<u>Instructional Suggestion:</u> Role playing; class discussion; sensitivity training.

Leadership Prototype[17]

A graduate of the program at this educational level must be able to indicate the extent to which he or she is called on to provide leadership to subordinates (in line relation or de facto) so as to influence their work behavior, in order to accomplish work objectives such as the following:

[Insert the language or name of the task(s)] (No constant scale value can apply, since the conditions of a given institution determine the degree of leadership needed.)

...To accomplish this, the student must be able to state what power he or she has over the subordinates' conditions of employment (hiring, firing, promotions, raises, transfers, overtime, special privileges), indicate how less leadership is needed the greater the power, and state what can be done to reduce or increase the need for leadership.

The student must be able to state what channels of communication exist for giving orders, for receiving or giving information, for the evaluation of, and for exercising discipline over the subordinates, indicate how less leadership is needed the more precisely known and formalized these channels are, and state what can be done to reduce or increase the need for leadership.

The student must be able to state the degree to which the tasks of subordinates which are to be accomplished are clearly defined and understood by the subordinates, indicate how less leadership is needed the clearer the subordinates' own tasks are to them, and state what can be done to reduce or increase the need for leadership.

Oral Use of a Relevant Language Prototype

A graduate of the program at this educational level must be able to communicate orally (in an appropriate language) and comprehend what is said in that language with a sufficient degree of precision to be able to accomplish the following activities, by expressing or comprehending meaning with the degree of precision needed.

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17 This is the one skill scale where the scale value may vary from institution to institution, since the conditions which require various degrees and styles of leadership are independent in many cases from the nature of the tasks themselves. We therefore stress analysis of and effect on Leadership requirements. See [24].

[Insert the language of the task(s).] (No reference need be made to the scale value, since the degree of precision and the type of language likely to be encountered in the activities themselves define the level.)

...To accomplish this,the student must be able to deal with the nuances of oral language with sufficient precision to use the words needed correctly in context, or to grasp the meaning (or question a speaker about intended meaning) so that the activities involved can be accomplished satisfactorily.

Reading Use of a Relevant Language Prototype

A graduate of the program at this educational level must be able to read and comprehend the meaning of any printed or written material (in an appropriate language) with a sufficient degree of precision to be able to accomplish the following activities, based on the preciseness of comprehension of the materials read:

[Insert the language of the task(s), specifying the type of document read.] (No reference need be made to the scale value, since the degree of comprehension required and the complexity of the language to be read in the activities themselves define the level.)

Written Use of a Relevant Language Prototype

A graduate of the program at this educational level must be able to convey meaning by writing or dictating (in an appropriate language) with a sufficient degree of precision in the words, sentences, and/or paragraphs formed to be able to accomplish the following activities, based on the clarity of meaning conveyed in the materials written or dictated:

[Insert the language of the task(s).] (No reference need be made to the scale value, since the degree of precision required and the complexity of the language and form in which the meaning is to be conveyed in the activities themselves define the level.)

Decision Making on Methods Prototype

A graduate of the program at this educational level must be able to carry out the responsibility of exercising a choice over how to carry out the following task activities by choosing the appropriate option regarding what to do, what to use, or how to do the activities,as appropriate to the instances of the tasks as they present themselves, and within the guidelines provided for making the choice(s). The tasks or activities in which this skill must be exercised are as follows:

[Insert the language of the task(s) and/or indicate what decisions are involved in the task(s) to be covered.] (No reference need be made to the scale value, since the variety of instances of the task which call upon the performer to make choices, and the degree of specificity of the guidelines for the choices in the tasks or activities themselves define the level.)

...To accomplish appropriate decision making on methods the student must be able to indicate the variety of situations likely to occur which would require making the choices, must be able to specify the choices available, and must be able to state what appropriate guidelines there are [or how, at scale point 9.0, he or she will develop his or her own guidelines] in order to accomplish the tasks successfully. The student thus should be able to list the choices, their indications for use and their contraindications, and must be able to provide justifications for the choices.

Decision Making on Quality Prototype

A graduate of the program at this educational level must be able to carry out the responsibility of exercising control over the quality of his or her task performance in the area of latitude provided between minimum standards and the highest possible quality that can be achieved. The task(s) in which this skill must be exercised are as follows:

[Insert the language of the task(s), the task name(s), or indicate the chief area(s) in which the decisions on quality are exercised.] (No reference need be made to the scale value, since the degree of effect on quality above minimum standards which can be exercised by the performer, and whether or not the output is subject to review before it is used themselves define the level.)

...To accomplish appropriate decision making on quality the student must be able to indicate the minimum standards for acceptable performance of the task(s) or for the output(s) of the task(s), must be able to indicate what latitude above the minimum standards is available to the performer to improve the quality, and must be able to indicate what priorities should be used to exercise choice on when and where to exercise judgment to exceed minimum standards of quality.

Instructional Suggestion: The student should be involved in discussions on the relationship between exercise of choice in quality, effects on oneself, patients, institutions, and should be encouraged to deal with questions such as institutional and social objectives in relation to the exercise of this skill.

Figural Skills Prototype

A graduate of the program at this educational level must be able to mentally manipulate (with or without physically manipulating) the figural aspects of objects in terms of size, shape, form, density, arrangement in space, in static array or in motion, so as to achieve the predetermined figural standards or objectives of size, shape, form, density or arrangement in the following activities:

[Insert the language of the task(s).] (No reference need be made to the scale value, since the complexity of the figural relationships and the complexity of the figural standards in the activities themselves define the level.)

...To accomplish this, the student must be able to state what figural standards must be achieved for each activity, and must be able to exercise the degree of figural mental precision necessary to achieve the standards.

Symbolic Skills Prototype

A graduate of the program at this educational level must be able to mentally manipulate and/or use symbols which are part of an abstract, non-representational system of notation where the symbols stand for properties, relationships, or operations in the following activities:

[Insert the language of the task(s).] (No reference need be made to the scale value, since the complexity of the symbolic properties to which the symbols refer and the complexity of the manipulations in the activities themselves define the level.)

...To accomplish this, the student must be able to indicate what each symbol represents, must be able to manipulate them as required, and be sufficiently accurate to meet the standards for the activities.

Taxonomic Skills Prototype

A graduate of the program at this educational level must be able to consciously apply or create conceptual classifying or organizing principles to suit the needs of the following activities:

[Choose "apply" and/or "create," as appropriate to the activities and one or both of the paragraphs presented below depending on whether the task activities require applying principles (A) or creating principles (B).]

[Insert the language of the task(s) and separate by virtue of application or creation of principles.] (No reference need be made to the scale value, since the complexity of the conceptual principles of classification or organization which must be applied, or the complexity of the needs of the task situation for which the principles must be created themselves define the level.)

A ...To accomplish this, the student must be able to indicate what existing principles of classification or organization are appropriate to the situation(s) of the task(s), and must indicate how they must be applied to suit the needs of the situation(s) acceptably.

B ...To accomplish this, the student must be able to indicate what the needs of the task situation(s) require as criteria for the creation of classifying or organizing principles, and must indicate how this should be accomplished in the situation(s) for successful performance.

Implicative Skills Prototype

A graduate of the program at this educational level must be able to come to conclusions, draw implications, or foresee consequences based on information in order to carry out the following activities:

[Insert the language of the task(s) and/or indicate the nature of the implication drawing activity. If possible, indicate the nature of the information used in a phrase beginning "...based on...".] (No reference need be made to the scale value, since the complexity of the information which must be considered and the extent to which the types of information which must be utilized vary from one situation to another in the activities themselves define the level.)

...To accomplish this, the student must be able to indicate the types of information from which he or she must draw in the various instances of the activity which may arise, and must be able to indicate what inferences, consequences, or conclusions are implied by various possible combinations of information as appropriate for the situations. The student should be able to defend the implications drawn using appropriate criteria.

Instructional Suggestion: The student should have practice coming to conclusions, being faced with perplexing arrays of information, and should be taught what areas are open to controversy and require personal, practiced judgment.

Financial Consequences of Error Prototype

A graduate of the program at this educational level must be able to display an appropriate awareness of the financial consequences which can result from errors, even after proper training, in the performance of the following task(s):

[Insert the name(s) of the task(s) and indicate the most serious likely error that was identified.]

...To accomplish this, the student must be able to indicate the financial value of the output, equipment, materials or time involved in the task(s). The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the financial consequences would be, and should be able to state what should be done to avoid the error(s), and should be able to carry this out.

Instructional Suggestion: The scale value is determined by the most serious likely error's financial consequence, but emphasis should be placed on avoidance of all error.

Consequences of Error to Humans

A graduate of the program at this educational level must be able to display an appropriate awareness of what harm can be done to self, patients, co-workers, or society as a whole, as a result of errors, even after proper training, in the performance of the following task(s):

[Insert the name(s) of the task(s) and indicate the most serious likely error that was identified.]

...To accomplish this, the student must be able to indicate the harm that can be done to humans at every point in the steps of the task(s). The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the consequences for humans would be, and should be able to state what should be done to avoid error(s), and should be able to carry this out.

Instructional Suggestion: The scale value is determined by the most serious likely error in terms of effects on humans, but emphasis should be placed on avoidance of all error.

Knowledge Objectives

There will be one prototype applicable for use with all the Knowledge Objectives. The prototype has been designed so that the user need not learn the knowledge scale. The scale level will have been determined by the depth of understanding and the breadth of detailed information needed in the discipline named in order to accomplish the task(s). Thus, the task activities themselves embody the concept of level.

The prototype will refer to the knowledge category by its abbreviated name. An appended section will present the full name of the category and any relevant textual explanation of what is covered by the category. The user will find the appended reference by using the identification code of the category (listed at the top of the page for the objective).

There seemed to be no real need for the prototype to do more than list the category and the task activities isolated for the objective. The preliminary work will have divided the task activities requiring the knowledge category at a given scale value into groupings on the basis of the detailed information required in the referent activities. Then these separate areas are translated into separate objectives. The program designer and/or the instructional planner are best qualified to select the detailed information that must be taught to accomplish the individual knowledge objectives.

Knowledge Objective Prototype

A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area:

[Insert the abbreviated name of the knowledge category.]

...at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

[Insert the name and/or language of the task(s) and/or comments.]

...To accomplish these activities the student must have a detailed knowledge of the subject category covering the appropriate technical or special terms, facts, equipment or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Procedural Objectives

The Procedural Objectives refer to information about how to do procedures, which is not additive; the requisite information is learned once, and does not connect to an organized discipline. Therefore, the prototype for Procedural Objectives does not name a subject area. The procedures referred to in the objective are carried out in the task situation, and this represents what must be learned. Because of the immediacy of learning and application it is likely that these objectives come the closest of all to being instructional objectives.

Procedural Objective Prototype

A graduate of the program at this educational level must be able to master the following procedure(s) to a degree of proficiency appropriate to the task situation:

[Insert the language of the task(s) as appropriate. Specify what is done and what is used if possible.]

CHAPTER 4

THE IMPACT OF THE HSMS CURRICULUM GUIDELINES

The impact of the curriculum guidelines designed as we propose here can only be imagined. This is because work has never before been undertaken using this degree of detail in task data and with data drawn from the breadth of occupational levels and functions proposed here. It is also difficult to know the extent of implementation that we can expect. However, this chapter presents a discussion of the applications and impacts which may be expected.

To discuss the impact of the curriculum guidelines means to discuss the impact of educational ladders, because the guidelines are designed to make possible the creation of educational ladders. The first section of this chapter deals with questions related to job and educational ladders.

We also believe that the use of curriculum guidelines as total packages will not be the only way in which our work will be utilized. The HSMS curriculum objectives for individual programs provide data which will make possible the modification of existing curricula. The HSMS objectives will contribute to program design, instruction, and evaluation, and can become direct inputs into changes in credentialing requirements. The HSMS methodology may also facilitate a better accommodation of occupational programs to changing job content and technological requirements, and may be used to improve the flexibility of health care institutions as they relate to the community. These issues are also covered in this chapter.

JOB AND EDUCATIONAL LADDERS

The primary purpose and output of our work is the design of job and educational ladders. Consider as an example the information to be obtained by our working with all tasks, at all levels, in diagnostic radiography, radiotherapy, nuclear medicine and ultrasonics. We will know the extent of task overlap and overlap in terms of curriculum objectives across these fields. This means that we will be able to indicate the extent to which additional preparation actually will be needed to move laterally across these service fields.

We will know the nature of the task sequences in educational terms, regardless of service area. That is, we will know whether tasks related in curriculum content rise in difficulty within the existing service areas or whether the progressions cut across or criss-cross the service areas. Our guidelines will not only present the curriculum content for logical job sequences, but can be used to provide similar information on the educational gaps between any sequences.

Thus, we can not only offer designs for the structuring of tasks into logical job ladders and the educational ladders to go with them, but we can also provide data that can be used to design educational ladders for any other structuring of the tasks into ladders.

The provision of curriculum guidelines for ladders which are based on behavioral curriculum objectives makes possible regularized patterns of upgrading. It makes possible the use of credits or advanced standing to enable persons who have obtained relevant preparation to move from area to area, or level to level, by virtue of prior education and/or experience.

Whether or not we find the need to suggest major changes in the pattern of movement among given service areas, we know that for <u>any</u> area studied we can provide an objective basis on which institutions can cooperate to provide additive, non-redundant education.

The most obvious benefit to be derived from job and educational ladders is that of relieving shortages in higher-level staff, and shortages in educational resources, while providing for the upward mobility of individuals. But there are other benefits as well.

In analyzing the results of our earlier pilot test, we became aware of how important some of the HSMS skills are to some of the task activities, particularly in the area of physical treatment and care, where Consequences of Error for Humans and Object Manipulation are very much involved. This suggests that the gradual rise in level of skill, responsibility, and knowledge, which is reinforced and tested in a job and educational progression, may provide an attractive alternative preparatory route to jobs at upper levels. Currently, students arrive at the medical professions with purely educational experiences and without the mutually reinforcing benefits of education and practice gained in work. The fact that some clinical training is an acknowledged part of approved programs in health occupations suggests the value of practice. The experience of the job itself, in connection with release-time training for the next higher level, may be an attractive avenue for employers and employees.

The benefits of job ladders include the benefits which derive to an institution that has a program of upgrading. Not only are the costs of training minimized when persons in related work activities are selected as trainees, but, if the criterion of successful performance in the lower-level job is one of the selection criteria, the effect produced by such an incentive can be improved patient care and general performance.

Job ladders which provide exit points along the way for practice reinforce learning as the individual rises and add additional competencies. However, this presupposes that the educational methods to be used will emphasize and amplify the additive nature of the learning and will not provide the training in discrete, disconnected units. Our curriculum guidelines provide the basis for this kind of preparation.

The benefits of job and educational ladders in an upgrading program include the fact that employees share and continually maintain an orientation to the goals of the institution as they rise. Introduction to the institution and its practices need not be repeated at each level, while the individual has available a tangible reward for fulfilling standards of excellence. There is less danger that, at the top, employees will consider themselves separate or independent of the institution's goals or unrelated to them.

In addition, having known the details of functioning at one level, the performer is better able to relate to those details at the next level. This includes knowing what goes wrong at that level--in a way outsiders can never know--and compensating for this.

CURRICULUM ANALYSIS

While the ideal use of the HSMS curriculum guidelines would be their full implementation in educational ladders, we recognize that most institutions will be able to make only partial use of the guidelines. The difficulties present in the "real world," where new curricula face difficult institutional hurdles, and where making changes in existing curricula is an easier though still difficult task (see Appendix B), suggest to us that the curriculum objectives themselves may be more frequently utilized than the complete curriculum guidelines.

The institutions which employ and/or prepare students for health occupations are, for the most part, already tied to existing curricula and programs. It will not be easy to implement totally new programs. However, the curriculum objectives can be used to assist the institutions in creating ladders through the modification of existing programs. The HSMS curriculum objectives will be usable for the analysis needed to link existing programs because they will be objective and clear statements.

The HSMS curriculum objectives can make possible the analysis of overlap in existing programs and the articulation of programs through the provision of credits, advanced standing and/or exemptions for students who move from one program to another. The HSMS curriculum objectives can also be used for critical evaluation of current curriculum offerings, and can be used, as well, in the development of core curricula. In all of these undertakings the curriculum objectives provide a framework against which existing curriculum content can be compared. The following sections discuss each of these types of analysis.

Analysis of Overlap

Curriculum overlap may exist across related programs at similar levels, and may exist between higher- and lower-level programs. The curriculum overlap may be due to the fact that there is an overlap of the tasks performed in the occupations for which the programs are preparation, or the curriculum overlap may be due to the fact that the same skills or knowledges are considered to be necessary for more than one program. The overlap may exist between programs in a given institution or between programs which prepare students for various degree levels and/or between hospital-based and degree-granting programs. The first prerequisite for the articulation of programs is the willingness of the institutions to engage in analysis of curriculum offerings. The second is a common frame of reference. The third is willingness to discuss how any demonstrated overlaps will be treated by the institutions so as to offer maximum mobility and least redundancy of preparation for the students who wish to move from one program to another.

For full cooperation to be possible it may be necessary to convince an institution offering higher-level preparation that it is not lowering its standards by acknowledging that course work in its own domain is already duplicated in another, lower-level program or institution. An objective set of curriculum objectives can become the basis for providing adequate information on the extent to which true overlap (in terms of depth as well as breadth of content) exists. It may or may not be found that a program at a lower level has true overlap with respect to specific curriculum content when judged in terms of the degree of comprehension required. The lower-level program may be found to exclude much work in the judgmental areas of knowledge application. Even if this were the case, the articulation of programs is still possible, since the option would exist for the redesign of lower-level offerings so that graduates could, indeed, earn advanced standing in higher-level programs. When actual overlap is in fact definitively substantiated, arrangements can be made to allow for the efficient movement of students from one program to another by crediting the overlap.

We suggest that a cooperative effort among programs can begin with a list of HSMS curriculum objectives for one or more related educational levels. This group of objectives can provide the basis for a questionnaire to be submitted to all cooperating administrators of programs. Each would read all of the curriculum objectives and check off those objectives covered in his program. The results would relate the offerings to each other. Figure 4.1 presents a model instruction sheet that would be attached to a listing of objectives (arranged randomly without regard to level, and with a place to check off the proper response).

We are aware that what is not covered in this survey would be curriculum content covered by the program but not by the HSMS curriculum objectives. This gap can be filled by asking the respondents to add to the list in a prior stage. There is the possibility that, having read

Figure 4.1 CURRICULUM ANALYSIS INSTRUMENT

GENERAL INSTRUCTIONS

You are being asked to participate in a study of curriculum objectives for specific occupations. You have been asked to represent the curriculum content in the following program (or part of a program):

____

Respondent's Name ________________________ Title ________________________

On the following pages are curriculum objectives required for a variety of occupations. Please read each and consider it in relation to the program (or part of a program) you represent, as listed above.

Your curriculum may include preparation for any or all of the procedural activities described and/or may prepare for the skill or subject matter which must be learned and applied,or the curriculum objective may be unrelated to your curriculum. In considering your curriculum, please assume that the content offered is successfully mastered. Do not be concerned with elementary instruction in reading or writing, if recording or reading written orders are involved in a task.

For each curriculum objective, please choose from the items listed below the one which best describes the relationship between the curriculum you represent and the content of the objective. Then check off the letter that best describes that relationship in the space provided below each curriculum objective. (This page should be used as your reference for what each lettered item refers to.)

There is an item with which to indicate that you do not know whether the content of an objective is accounted for in the curriculum you represent. Please use this option only when necessary.

CHOOSE ONE ITEM FOR EACH OBJECTIVE

a. My curriculum covers all or most of the specific activities and procedures listed,and all or most of the skill or subject matter referred to in the curriculum objective.

b. My curriculum covers all or most of the subject matter referred to in the curriculum objective,but not the activities referred to in the curriculum objective.

c. My curriculum covers all or most of the specific activities and procedures listed,but not the skill or subject matter referred to in the curriculum objective.

d. My curriculum covers a small amount or none of the specific activities and procedures listed and a small amount or none of the skill or subject matter referred to in the curriculum objective.

e. The content of the curriculum objective must have been mastered before the student is permitted to enroll in my program.

f. I do not know the relationship between my program and the curriculum objective.

the HSMS list, the respondents would, by virtue of the examples, be able to convert their own remaining course work into similar statements.

When the data in Figure 4.1 are collected, they can be sorted by means of a form which would list each objective and the programs in which it was found (having been rated with letters a, b or c). Then the sum of overlap objectives between any two programs could be used as a basis for negotiating what advanced standing or exemptions would be provided for the student in moving from one program to another, or other modifications. The analysis would first determine the following:

1. The curriculum objectives that are essentially exact duplicates in the two programs. (They refer to the same content and the same demonstration of mastery.)

2. The curriculum objectives that are related but are differently presented because they refer to the same skill or subject content, but substantially different or nonexistent work activities are involved.

3. The curriculum objectives that are related but are differently presented because they refer to the same work activities, but the skill or subject content is substantially different or nonexistent in one of the programs.

With this analysis completed, the negotiating parties are now in a position to make the following statements about given objectives:

1. No evidence of actual or potential overlap exists.

2. There is evidence of partial overlap; if one of the programs were modified to include work activities and/or skill or subject matter content there would be full overlap.

3. There is evidence of actual total overlap.

In the case of partial overlap (2), it will probably be found that curriculum content taught at a lower level is being handled as a series of procedures, while at the higher level it is being handled in conjunction with the teaching of disciplines. It would be well worth the consideration of the lower-level program to revise its educational program with the collaboration of the higher-level program or institution so that the overlap could be acknowledged and credited.

Partial overlap could occur in a situation where the lower-level program is in a health care institution's own training department. If it was not approved to grant academic credits, there would be a strong argument that funds spent for in-house, uncredentialed, non-transferable training be diverted to the purchase of credentialed, transferable training from an educational institution which could supply credits applicable towards degrees.

If there were to be articulation of the programs, the parties would agree on what units (credits, course exemptions, advanced standing) would be provided to students moving from one program to another. The negotiators could consider these alternatives with regard to the totality of the overlap areas:

1. The section of curriculum A represented amounts to several courses or more in the program of B.
2. The section of curriculum A represented amounts to an entire course or major portions of several courses in the program of B.
3. The section of curriculum A represented amounts to a major portion of a course or minor portions of several courses in the program of B.

4. The section of curriculum represented amounts to <u>a minor or negligable portion of a course</u> in the program of B.

In the case of actual overlap in the degree represented in 1, 2,or 3,there would be strong evidence to persuade the higher-level institution or program to grant credits and advanced standing for graduates of the lower-level program.

The case of actual overlap could occur in a situation where the lower-level program is in the health care institution's own training department. If it was not authorized to grant credits, there would then be strong evidence to support the request that the institution's training department be authorized to grant credits. (The graduates would still require the same negotiations to avoid duplication of requirements at the next educational level.)

Analysis of overlap <u>within</u> a program, such as mentioned in Chapter 1, would involve a comparison of the HSMS curriculum guidelines covering, for example, the disciplines in physics, with the program offering in required "liberal arts" physics and the physics in the occupational preparation section of the institution's program. The negotiations here should result in a merging of the physics required so that the curriculum satisfies academic and occupational needs and requires less time than the prior condition where the double requirements existed.

<u>Curriculum Justification</u>

The critical review of existing curricula has two aspects. On one hand, curricula can be subjected to a review of offerings on the basis of relevancy for the occupation for which preparation is being provided. Elimination of irrelevant curriculum content can, by shortening the preparation time required, enhance upward mobility. When applied to entry requirements, elimination of irrelevant requirements can enhance the mobility of students across programs.

On the other hand, curricula can be found lacking in the content needed for adequate preparation. This can be due to an absence of preparation in the use of the best procedures in a field or with the current technical equipment. Inadequacies may also stem from lack of direct tie-ins to the tasks of the occupation, or from the absence of those subject matters necessary for the attainment of educational objectives such as sensitive treatment of patients, patient safety, or other such goals.

Thus, "curriculum justification" or the critical review of program offerings can be used to make existing programs more efficient by eliminating that which is not needed, and more effective by pointing out areas for improvement.

We believe that the HSMS curriculum objectives for any given program can be used to facilitate the process of curriculum justification by providing a check list against which educators may compare their own offerings.

In a justification review the institution would have to be able to specify its educational objectives. These could be compared with those in the HSMS guidelines. Where these coincided, the HSMS curriculum guidelines would provide, by definition, a listing of relevant curriculum objectives which, in addition, would reflect the content needed to meet the educational objectives. Differences in educational objectives would be amenable to analysis and could be accounted for.

At this point a set of criteria could be established for the process of evaluating curriculum requirements at the institution. These would include correspondence with HSMS curriculum objectives, relevance to the work activities of the occupation not otherwise accounted for, knowledge and skills required for the work activities, relevance to the educational objectives, instrumental con.ent (to facilitate learning), and the requirements set by outside age--ies or bodies. (These latter, in turn, could be subjected to critical review.)

Criteria such as "personal enhancement," assumptions of "possible usefulness," "broadening of the student," or inclusion by virtue of tradition would also be included. The criteria could be used to separate out content whose inclusion is required for questionable reasons.

The review process would involve the program administrator in accounting for all current requirements and offerings by checking offerings against the HSMS curriculum objectives for the program. The part of the institution's offerings which were not accounted for by the check list would have to be "justified" by being referred to the list of criteria for inclusion. The HSMS curriculum objectives not checked off would require a similar, reverse explanation about why they were absent.

With regard to requirements justified in terms of personal or general enrichment, or imposed for reasons of traditional inclusion, or in the hope of good effect, we suggest the following. If no direct link can be made to the work to be done or the contingencies to be faced, the inclusion cannot be supported, and the curriculum content involved should not be imposed as a precondition to entry into the occupation. Such content should be optional for the individual and available when desired for its own sake.

With regard to content absent from current offerings which relate to educational objectives, we suggest the following. Educational objectives which are not reflected in curriculum requirements are not being met. Too often it is hoped that desired attitudes towards standards of occupational performance will be promoted by the process of screening students for admission and in the hope that the values will be transmitted through the atmosphere. In point of fact, the only way to guarantee that educational objectives are met is to teach what is needed to bring them about.

Core Curriculum

The concept of core curriculum has been popular recently in educational planning for health occupations. The term appears to have been used in a variety of ways, however. To many, it has been thought of as a way of designing educational ladders. By providing the same curriculum content to students preparing for many different occupations it has been considered a way to reduce overlap. That is, by designing overlap into various programs' requirements, repetition of the same offering would not be needed for persons moving across the various programs. This approach does not require that all students receive their core training before they take other work; it only specifies common areas. The only limitation on this approach is when it is applied without critical review of the relevance of the material. The assumption that specific subject areas should be taught in the same way and cover the same material for varying occupations is sometimes made from an armchair distance, and has sometimes led to core offerings which, in fact, were useless to most of those concerned.

Another approach to core curriculum has been to provide a set of basic orientation and general courses to be taken in common in the first semesters or first stages of education by all students in health related programs, with specialization for the various individual programs following. This approach provides a common setting for all beginning students, but is justifiable only if it can be shown that the courses in the core are useful for all the occupations, can be taught in the same classroom to students preparing for varying occupations, and do not have to be repeated later in their specific applications.

The HSMS curriculum objectives can provide the basis for the development of job-relevant core offerings appropriate to the job levels involved. The reader will recall that the HSMS curriculum guidelines retain the distinctions among factors. The likelihood of finding content appropriate for core offerings would arise in the curriculum objectives reflecting secondary factors and isolet tasks. For example, the key factor in radiography will probably deal with the specialized knowledges involved directly with the x-ray equipment and the interpretation of the radiographs. It is likely that a secondary factor will emerge involving more broadly applicable nursing knowledges and/or administrative skills. (Housekeeping tasks will probably appear as isolets, but more likely the isolet tasks will show links to factors not as yet uncovered.)

Once several service areas have been studied, analysis of the HSMS curriculum objectives will show whether radiologic technologists should share "core" by taking nursing-type training with nursing program students; it will be clear whether all students at a given level should be trained in administrative skills in a common "core;" and it will be clear whether preparation for given isolet tasks should be taken from another program's offerings.

We are suggesting that overlap tasks and overlap knowledges and skills can be systematically identified at their proper levels and be offered as core only when their educational levels and job-related content are objectively demonstrated. When this kind of information is available, it will be possible to plan for the instruction required. Some "core" will have to retain reference to the tasks in specific occupations to be properly learned. Others will be sufficiently generic to be broadly taught. The HSMS curriculum objectives are designed to make this type of analysis possible.

THE PROCESSES OF EDUCATION

Curriculum

We hope that this document will itself make a contribution to the processes of education in the health occupations. We believe that our theoretical work elaborating the stages of education can highlight the importance of specifying educational objectives and detailing curriculum objectives. We believe that this theoretical statement may be able to assist educators who seek a handle with which to approach the entire process of curriculum evaluation and review.

We already know through conversations with our task reviewers that the process of reading task descriptions, referring these to skills and knowledge requirements, and identifying standards for the resulting outputs sharpens up the mind of the reviewer and acts as a stimulus to self-motivated review of current program offerings.

Program Design

The HSMS curriculum objectives are in units that are appropriate for use by the program designer. The objectives are referenced to relatively small units of content, are cross-referenced to related units of content, and are identified by the level of competency required. A program designer could identify a set of curriculum objectives related to a given discipline and sequence them according to the scale values involved.

An even more attractive approach would be to combine the skill, knowledge, and procedural objectives around related task activities and provide enabling (or instrumental) preparation prior to this grouping, focusing on the disciplines. Then laboratory simulation and clinical practice would be presented in subsequent stages.

This latter approach is most valuable for program designers who are preparing modular program structures. Sets of HSMS curriculum objectives could be organized into a sequence of three or four modules which would cover, in sequential fashion, the general academic, laboratory, and clinical content needed to master a particular group of task activities.[18]

The benefit of this type of task-centered program design is that it would be possible to provide the student with an immediate awareness of how the various disciplines are combined in the clinical situation. The integration of the academic and clinical experience has already been commented on as a desirable end for medical students [102, p. 69]. We have observed that the texts available for many of the occupations present the disciplines in a vacuum and provide no practical focus for the student.

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[18] Modular course structure is often linked with what has come to be known as "competency-based" education. The basic premise is that students should be allowed to learn at their own pace, should be required to study only the content they have not already mastered in previous educational or work experiences, and should be granted a degree or certificate on the basis of demonstrated mastery of the subject matter covered by the program, rather than on the basis of a prescribed minimum number of credits acquired during a prescribed period of time.

A module for a related set of tasks may be difficult to translate into academic credits comparable to those assigned to traditionally designed courses listed by discipline. However, we suggest that the educational benefits to be derived from such a modular approach may be well worth the effort needed to add up the fragmented areas of a discipline divided among task-oriented modules in order to grant those coveted credits for course work in the disciplines.

Instruction

We are already encouraged that we will be providing much needed inputs into instructional planning. The mere existence of the task descriptions offers materials that are lacking in certain fields. For example, we have rarely found existing texts which describe clinical procedures in a consistent format, in appropriate sequences, and with a reference to contingencies. In some fields, particularly at the residency level, we discovered that the texts refer to theory but not always to procedures. We may therefore be providing much needed textual material.

We also have strong evidence from the literature that, when students have the objectives that they are to accomplish described to them, they are better able to meet those objectives [29, p. 30]. The form in which our curriculum objectives are stated not only takes advantage of this stimulus to learning, but, by making it possible for the instructor to combine the teaching of subject areas related by the same task activities, we may be providing further possibilities for efficient teaching approaches.

The direct teaching of skills and the link of educational objectives to skills and task activities may make it possible to provide students with the quality training needed to improve the health care delivered to the patients served by the occupations. Direct skill training may provide, finally, for the conscious attention to the general intellectual skills suggested by pioneers in the field such as J. P. Guilford [36].

Evaluation

It will be obvious to the reader how closely geared the HSMS curriculum guidelines are to the needs of individualized instruction and to performance-related evaluation. Both individualized instruction (which permits students to move from one curriculum "module" to the next when appropriate mastery is displayed, or to be exempted from work on the evidence of mastery) and criterion-referenced evaluation (tests of performance) require objective test materials which cover what must be demonstrated by the student before the student can be said to have mastered a curriculum area (or area of instruction).[19]

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19 "Competency-based" education utilizes a series of pre- and post-tests for each module in a program. The tests are directly related to what is covered in the module and are equivalent in difficulty and range. Before beginning a module each student takes the pre-test. If he meets the criterion for success, the student is given credit for the module and goes on to the next unit. If not, the student takes the module, and after completing the work, is allowed to take the post-test. Not until an individual has met the criterion for success is he given credit for the module and allowed to move on.

At the curriculum stage the HSMS curriculum objectives are only one step away from becoming performance evaluation instruments. Performance evaluation implies criterion-referenced evaluation.

The term "criterion-referenced" covers a type of testing in which test items are judged for the validity with which the items measure the student's mastery of intended learning outcomes. In contrast, the term "norm-referenced" covers a type of testing in which test items are judged for the success with which the items differentiate among the persons tested as relatively better or poorer students.

The I.Q. test is a "norm-referenced" test; norm-referenced tests, such as aptitude tests, are used to predict relative success in later undertakings. The test population is arranged in a linear scale from the best to the worst. Test items are discarded if all students can pass them. Most items retained cover a range of difficulty such that between 40 to 60 percent of test populations will not get the right answer. Thus, such tests cannot answer the question of what students have learned, and cannot, in the case of occupational preparation, require that,for critical items of professional practice,every student must "get the right answer."

The HSMS curriculum guidelines offer a basis for the creation of performance evaluation instruments. These would utilize the curriculum objectives to provide objective work performance criteria for use in evaluating the work performance of job incumbents and/or graduates of, or students in, occupational programs.

The standards which would complete the statements of our curriculum objectives can be the same standards which must be applied to evaluate the output of a task or the performance of a task. The use of the curriculum objectives to test student achievement is a fairly obvious usage. In addition, performance evaluation tied to actual task performance is appropriate for the following uses:

1. To enable an institution to evaluate the quality of its own instruction. If curriculum objectives are derived from task activities, the adequacy of individual programs can be ascertained by reference to the performance of students in tests relating to actual work situations.

2. To determine when students have successfully reached standards of completion of program requirements in laboratory or clinical work independent of time requirements. If performance evaluation were used to determine student readiness to pass from laboratory to clinical work, or to ascertain when clinical work was successfully completed, there might be greater safety to the patients who are involved in the clinical practice. Performance evaluation would make it possible to save on laboratory and/or clinical training time when not needed by proficient students or to prescribe additional training for students performing below par.

3. To be used alone or in conjunction with proficiency or equivalency examinations[20] to evaluate an individual's readiness to be accepted with advanced standing into existing programs, to be accepted into job titles, or be permitted to sit for licensure or certification examinations.

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[20] Equivalency tests attempt to measure the individual's mastery of academic subject matter. Proficiency tests attempt to measure the individual's mastery of work content. Performance evaluation attempts to rate the individual on actual performance in the job. Proficiency tests may be norm-referenced or criterion-referenced.

4. To be used to validate test items in proficiency examinations. Currently, incumbents' scores on proficiency test items are used to validate test items, but the items are not tested for job relevance. Performance evaluation instruments can be used to validate test items, to thus provide for job-relevant test items, i.e. criterion-referenced items.[21]

5. To compare groups of employees. For example, the success of an educational ladder paralleling a job ladder can be measured by applying performance evaluation instruments to incumbents trained in conventional programs and to newly placed incumbents trained in the new programs. A comparison can then be made between the two groups.

CREDENTIALS

There are two aspects of current criteria for accreditation of occupational programs in health that may be open to change when the HSMS curriculum guidelines are produced. One is the questionable use of inflexible time requirements, and the other is the use of topic-outline syllabus requirements. The problems relate both to accreditation by professional organizations and to accreditation or approval by state regulatory bodies.

Time Requirements

Formal requirements which pose a fixed amount of time which must be spent in approved or accredited programs before the individual may enter into an occupation (or sit for a licensure or certification

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21 Proficiency tests that are designed to be administered as paper and pencil tests on a national basis are potentially usable for placing individuals into existing or future educational programs with advanced standing and/or into job titles. However, the validity of such tests could be in question unless the test items were validated against relevant work performance criteria. Norm-referencing is still common.

examination) make the implicit assumption that time equals adequacy of preparation. But the arbitrary assignment of time requirements is no guarantee that students will be adequately trained; the increase of time requirements is no guarantee that student performance will be improved.

Unless curriculum requirements reflect task requirements and educational objectives, the mere establishment of time requirements will not provide proper preparation. No arbitrary establishment of time requirements will guarantee that inadequate students will become successful students; while the same time requirement is a penalty against talented students. Particularly when clinical training is an important proportion of the curriculum, the only proper kind of requirement should be successful mastery of intended learning outcomes; i.e., competency-based education and criterion-referenced testing.

The use of time requirements is especially pernicious in a situation where, for example, a two-year licensure program prohibits all work activity in an area until the license is obtained, while jobs could be designed that would require only half the current preparation now required. This in itself inhibits the creation of job ladders.

The HSMS job ladders may uncover several ideal job progressions in which the first step would require no more than the equivalent of half the preparation now required for licensure or certification for the field. We might find that there is a job level that corresponds to current requirements, but for the second step in the ladder. If this were the case, we would suggest the creation of a lower-level program and a prior-level license or certification.

The opposition to such an approach is apparently based on the fear that the new, lower-level curriculum would not be adequate, and/or that the lower-level credentials would be abused by institutions that would permit individuals holding them to function in higher-level activities. Our answer to this is that curriculum requirements such as the HSMS guidelines would account for all the preparation needed to meet educational objectives at the lower level, and that enforcement of two sets of licensure requirements need not be more difficult than for one.

The advantage would be that individuals would be able to earn income earlier; individuals not able to master higher levels but competent at lower levels would be employable; and manpower costs might be reduced by virtue of the existence of lower-level jobs.

Criterion-referenced testing in schools and for certification is a better protection of the public than arbitrary time requirements and norm-referenced testing. Talented students who can master the preparation and clinical practice quickly will be able to enter shortage markets more rapidly, and will be earning more quickly. Students with learning difficulties will be less likely to be practicing, and will be identifiable for diagnostic and remedial educational services.

Topic Outline Requirements

We have been encouraged to believe by several credentialing organizations that behaviorally stated objectives are very much desired as a substitute to current topic outline requirements. For example, it is possible that we may be able to make direct inputs into the committees that design the AMA-approved Essentials.

If our curriculum guidelines are accepted by such accrediting bodies there is likely to be an effect in a large number of educational institutions. Even if our guidelines are not adopted, however, there is a strong indication that programs geared to HSMS curriculum guidelines may be accepted for accreditation as having provided acceptable alternatives to the requirements of the Essentials. This alone will encourage experimentation with the approach offered here.[22]

If we make no other contribution, we will be able to provide objective information usable by the accreditation bodies for their own analysis.

ACCOMMODATION TO CHANGE

Externally Imposed Change

Educational programs are under pressure to reflect two types of

[22] Needless to say, the extent to which experimentation will be possible is partially determined by the extent of funding available for such efforts and the institutional obstacles to change. Appendix B provides information on the institutional obstacles to change. It deals with the processes related to program implementation.

changes which have been and are being externally imposed on the occupations for which they prepare students. The first of these is changes imposed on procedures and services due to changing technologies and related medical knowledge. The second type of change is that imposed on the nature of the delivery system as social pressures achieve new health services objectives and institutional structures change.

Both of these types of changes must be reflected in curriculum if the graduates of occupational programs are to perform appropriately in the institutions which hire them.

The HSMS methodologies for job analysis, job ladder design, and curriculum design make possible an ongoing accommodation to such changes in program curricula.

Regardless of whether an occupation changes to accommodate socially engendered requirements such as team practice, out-patient care, preventive medicine, health maintenance and/or multiphasic screening, or whether it changes to accommodate new technologies such as electronic thermometers, ultrasonic scanning, remote telemetry, and/or organ transplanting, the results can be translated into:

1. Changes in task descriptions.
2. Elimination of obsolete tasks.
3. Creation of new tasks.
4. Changes in the skills and/or knowledges required for task performance.

The HSMS methodology makes it possible to incorporate any such changes into the task data base. This means that the new or changed tasks can immediately be located in their positions on factors and in task hierarchies through inspection or statistical analysis.

This, in turn, means that new or changed tasks can be assigned to the jobs or occupations where the additional preparation required to teach their performance would be at a minimum.

The new tasks can be readily incorporated into the curriculum guidelines, including, if appropriate, the specification of new educational objectives. All that is needed by the institution is access to the methodologies. Short of following all the technical procedures, the structure of the HSMS task and curriculum objective data is so apparent that a common-sense simulation of the methodology could be adequate to accommodate the needed changes in curriculum.

A similar approach can be taken to remove from curricula the objectives associated with obsolete tasks.

Initiating Change

The layman may not be aware of the widespread sentiment for change existing among health occupation practitioners at every level, and among health educators and administrators. There are strong sentiments to provide the changes necessary to facilitate upward mobility, provide competency-based education, and criterion-referenced credentialing, to provide quality, patient-oriented health services, and to provide adequate health protection to the population as a whole.

Our experience has indicated to us that there are innovators working in all the types of institutions related to the health services delivery system. They are attempting to reach these goals by trying to bring about institutional changes. They include hospital administrators, practitioners, educators, trade unions, regulatory bodies, and professional associations.

We have also been aware of the fact that the difficulties facing these innovators include the relative isolation of the institutions from each of the others.

For example, if employers would make known their needs to educational institutions, educational institutions could, in turn, develop the required programs in educational ladders. If a junior college could design a program in collaboration with a senior college, associate degree holders could enter baccalaureate programs with their prior preparation fully accepted. There could be agreement about credit for overlaps in existing programs. The medical schools could discuss entry with advanced standing for students emerging from new graduate programs, and could even design their own programs with exit points before the MD. It would be necessary to establish relationships among the educational institutions, the employers, and the employees to deal with issues such as release-time training and the scheduling of educational programs to accommodate working students.

We believe that through working with the institutions involved with employment, education, and credentialing, we may be able to foster the communications needed among the various parties to bring about the objectives to which most already subscribe.

We also believe that HSMS can contribute a series of methodologies and outputs which can help accomplish the changes desired.

In addition to the contributions already described in this chapter, we believe that we can be involved in the design of education to meet community needs. The institutions providing health care and the institutions providing the education for the manpower involved can embark with the community on a joint venture to determine what type of care is wanted, how it is to be delivered, and the quality of attitude and approach to be demanded of the practitioners. From these discussions can emerge a set of goals and priorities. These, in turn, can be translated into two sets of very specific statements:

1. Statement of the health services to be delivered and health care objectives.
2. Statement of the educational objectives to be achieved in preparing manpower to deliver the services.

The statement of health services to be delivered can be translated into normative task descriptions in which activities not yet in existence can be expressed according to the HSMS definitional requirements.

From this point on, the processes involved would follow the various analytical stages already described in this document.

We believe that we will be able to contribute to the processes of social change by providing the types of analysis appropriate to the needs of institutions and society, and the types of job and curriculum guidelines that are most appropriate to the implementation of those socially desired objectives.

APPENDIX A

SUMMARY OF THE TASK ANALYSIS AND JOB LADDER METHODOLOGY OF THE HEALTH SERVICES MOBILITY STUDY

THE TASK

In the HSMS method, tasks found in jobs are the basic units of analysis. Our definition of a task is designed to result in the identification of a unit of work which can be moved from one job to another without disrupting other activities. The task is thus a unit of work which is smaller than that of a job as a whole or, in most cases, than that needed to produce an entire product, such as a health service or a manufactured item. The task may refer to individual work activities which are steps leading to, or assisting in, the production of a final product. The task definition is geared to the performer's output rather than the institution's product. (Products are the units which are purchased or contracted for.)

The task is composed of <u>elements</u>. The element is smaller than the task and is involved in describing the task. The elements of a task are the smallest possible meaningful units of work requiring physical and/or mental activity. Unlike the task, an element does not have an identifiable, usable output which can be independently consumed or used, or which can serve as an input in a further stage of production by an individual other than the performer.

The HSMS Definition of a Task

<u>A task is a series or set of work activities (elements) that are needed to produce an identifiable output that can be independently consumed or used, or that can be used as an input in a further stage of</u>

production by an individual who may or may not be the performer of the task. The definition is further elaborated as follows:

1. In principle, someone other than the performer of the task must be able to use or consume the output of the task.

2. Theoretically, it should be possible for there to be an elapse of time between tasks.

3. A task includes all the possible conditions or circumstances which a single performer is expected to deal with in connection with a single production stage.

4. A task includes all the elements that require continuous judgment or assessment by the same performer in order to assure the quality of the output.

5. A task includes all of the elements needed to produce an output which can be independently used or acted upon without special explanations to the next performer in the next stage of production.

6. A task includes all the elements needed to complete an output to a point at which another performer (who would continue with the next production sequence) would not have to redo any elements in order to continue.

7. A task includes all the elements needed to complete an output to a point at which another performer, in order to continue with the next stage of production, need not perform extra steps.

8. The task must not require that, for another performer to continue with the next stage in a production sequence, current institutional arrangements would have to be changed.

9. A task must be sufficiently broad in statement that it can be rated on its frequency of occurrence.

A task is uniquely identified in terms of its output, what is used, and the kind of recipients, respondents or co-workers to which its performance is restricted. These terms are used as follows:

1. The "output" of a task is the result of an independent stage in a larger process of production in an institution, assuming the current organization of work activities.

2. "What is used" in a task includes all the things which the performer is expected to be able to use or choose from to produce the identified output.

3. The "recipient, respondent or co-worker" involved in a task reflects the special characteristics or condition of the people with which the performer must be trained to deal.

Two tasks are the same if their elements result in the same output, require the same things to be used (including the alternative materials or equipment to be chosen among), and if the kind of recipient, respondent or co-worker involved is the same, in terms of what the performer needs to know in order to deal with the person. Two tasks which are the same are called overlaps if they occur in different job titles. Overlap tasks must meet the condition that they require the same skills and knowledge (described below) at the same scale levels.

The HSMS task definition permits the acknowledgment that many professional-level assignments include or cover emergency or contingency situations which must be reflected in task identifications. Since the definition also permits the identification of tasks in which the performer does not handle emergencies but notifies a higher-level performer of any emergency signs, the task definition helps prevent incorrect conclusions about the existence of task overlaps across titles.

Task Descriptions

The HSMS method does not merely collect lists of tasks. It requires the collection of task descriptions. These provide a good deal of inf[illegible]tion about the work as it is done. Each task is described on [illegible]ification Summary Sheet (Figure A.1). The "Name of the Task," [illegible]vides a brief but full summary of the task.

The major characteristics of the task, used for identifying overlaps, are found on the left-hand side of the Task Identification Summary Sheet. Items 1, 2, 3 and 4 cover the output, what is used, and the recipient, respondent or co-workers involved in the task. Two tasks that are overlaps have the same code number. The task's code number appears in the upper left of the Task Identification Summary Sheet.

"The List of Elements" is found in the right-hand column. The elements describe the procedural steps of the task in detail in the sequence in which they are performed. In a complicated or high-level task, the List of Elements may be long and is continued on additional pages. (Figure A.1 requires two pages.) The elements include initiating and terminating actions, contingencies which must be dealt with, and any decisions, record keeping, or delegation of duties which are part of the task. When there are choices, all the alternatives are specified.

These procedural descriptions provide the basis for the behavioral statements to be incorporated into our curriculum guidelines and

Figure A.1. SAMPLE TASK IDENTIFICATION SUMMARY SHEET

This is task 1 of 18 for this performer.
This is page 1 of 2 for this task.

Code 328

Performer's Name ________ Analyst(s) ________ Dept Diag.x-ray
Job Title ________ Institution ________ Date 3/73

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Decision made on whether to order lymphangiography and/or alternative study; recommendations made on technique; record entered and placed for scheduling.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

X-ray requisition form and patient's chart; relevant radiographic materials; telephone; view boxes

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Physician requesting lymphangiography; clinician; secretary or clerk

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Deciding whether to order lymphangiography of any patient or alternative studies and recommending technique, in consultation with referring physician, by reviewing case history and relevant materials; discussing, recommending studies to be done and technique; recording; arranging for scheduling.

List Elements Fully

Performer decides whether to schedule lymphangiography (or lymphography: radiographic evaluation of lymphatic vessels and nodes) and/or alternative studies upon receiving an x-ray requisition form or a request by phone or in person from a referring physician. Request may be for use in initial diagnosis or after an earlier procedure has uncovered a suspected pathological condition.

1. Performer reads the x-ray requisition form and the patient's history to learn the nature of the problem and the reason for the request.
   a. If the condition or the nature of the request warrants, performer discusses request with patient's attending physician.
   b. Performer studies any radiographic materials resulting from procedures already carried out, current, or on file, and/or interpretations already available relating to the radiographs. (Performer views radiographs on view boxes.)
   c. If the performer finds that the information provided is inadequate, performer arranges to have other materials sent or discusses with relevant physician.
   d. Performer decides whether there are contraindications to the procedure requested such as adverse

OK - RP;RR

6. Check here if this is a master sheet..(X)

Figure A.1. SAMPLE TASK IDENTIFICATION SUMMARY SHEET (continued)

This is task 1 of 18 for this performer.
This is page 2 of 2 for this task.

Performer's Name ______ Analyst(s) ______ Dept. Diag. x-ray
Job Title ______ Institution ______ Date 3/73

List Elements Fully	List Elements Fully
reactions to prior studies or allergies, and considers these in relation to the request. 2. Performer decides whether to approve request, order additional or alternative studies, reorder earlier studies or recommend no radiography, based on the information obtained. 3. If performer recommends against all radiography, discusses with ordering physician and writes reasons on patient's chart. 4. If performer and physician agree on initial request or on additional or alternative studies, performer writes what was decided on the patient's chart. 5. If radiography is to be ordered, performer decides on what type of study to recommend, and technique, if appropriate, such as entry site for contrast medium, anesthetic, and area to be radiographed. Performer writes orders and recommendations in patient's chart explicitly so that nurses, technologists, residents and other personnel can prepare patient or be scheduled for work. 6. Performer gives information to secretary for scheduling. Signs requisition sheet if appropriate.	

account for the types of knowledge (to be described below) which are not represented in our Knowledge System but must be included in curricula.

SKILLS, KNOWLEDGE AND SCALES

Each task requires that its performer utilize skills and knowledge at particular levels of achievement in order to carry it out. The HSMS methodology includes a taxonomy of skills and a taxonomy of knowledge categories which provide a set of variables for describing task requirements. Each skill or knowledge category can be identified for any task, and, thus, common requirements can be identified. In addition, each skill or knowledge category is expressed as a scale. The scales permit tasks to be compared to one another in terms of levels of the skills and knowledges required. (The scales also permit sophisticated types of statistical analysis, such as factor analysis.) The skills and knowledge categories have the property of being learnable (unlike aptitudes), so that all the rungs on the job ladders to be created can be reached through training and education.

A skill, as defined in the HSMS method, is displayed in a tion, in the carrying out of a mental or physical activity; it can be evaluated in terms of its degree or its level. Knowing how or why things function or what to do to things to make them work is knowledge. Using the knowledge requires skills. That is, one may know how something works, the principles of why it works, or what to do to it to make it work, but one needs skills in the act of applying the knowledge in a job task.

The critical distinction between skill and knowledge, given that they are both treated as learnable, is that skills require practice if they are to be learned. Knowledge is learned primarily through didactic means. Skills may sometimes be introduced in an instructional setting, such as in a classroom or lecture room, but actual learning does not take place until there is practice.

Each scale used in the HSMS method has a name, an overall statement of its content, and an indication of the criteria (scaling principles) which are to be used to differentiate each of its various numerical levels. Each numerical scale value (which can range from 0.0 to 9.0) is accompanied by a statement (descriptor) which indicates the behavior warranting that descriptor's scale value. The descriptors are arranged in rising combinations of the scaling principles. They use generic language, so they can be used for any task.

The first descriptor for each scale is at the zero point. This descriptor contains more than the simple statement that the particular skill is not involved. Each defines the minimum condition which must be met before a task can be rated above zero on the scale. The minimum conditions for non-zero levels of the skill scales describe levels above expected, common behavior, attainable with maturation. This is true for each zero point descriptor on each scale. Thus, the zero point descriptor assures that non-zero values on the scales represent learnable attributes that are needed at levels sufficient to require inclusion in a curriculum.

HSMS Skill Scales

The HSMS method identifies sixteen learnable skills, each represented by a scale. Of these, three are manual; two are interpersonal; three relate to precision in the use of language; two deal with decision making; four cover general intellectual skills; and two are responsibility skills which relate to the recognition of the consequences of error in task performance. The job analysts rate each task on each of the sixteen skill scales.

The HSMS method identifies three manual skills which appear to be learnable through practice. They each deal with precision and coordination in the use of the body or its parts, and are essentially psychomotor skills. Locomotion deals with the body's movement through space; Object Manipulation deals with the movement, control, and placement of objects; and Guiding or Steering deals with the control of objects moving in space in relation to external stimuli.

The HSMS method includes two interpersonal skills. One deals with Human Interaction (See Figure A.2). It is exercised whenever a task requires the performer to come into contact with or interact with other persons. The second deals with Leadership, and is exercised whenever a task requires the performer to relate to subordinates so as to

Figure A.2. THE HUMAN INTERACTION SKILL SCALE

This skill refers to the degree of sensitivity to others required of the performer in the task being scaled. The skill involves the performer's perception of the relevant characteristics or state of being of the other person(s), the performer's attention to feedback as the interaction occurs, and the performer's appropriate modification of his behavior so as to accomplish the task. The skill is involved if the task requires any personal contact or interaction with others.

The level of the skill rises as the degree of perceptiveness and sensitivity required of the performer rises, and as the subtlety of the feedback to which he or she must respond increases. The scale level is not determined by the level of knowledge required.

SCALE VALUE	DESCRIPTIVE STATEMENT
0	The task does not require the performer to be in contact with or to interact with other people.
1	The task requires the performer to be in only general contact with other people. Very little sensitivity to or perception of the other person(s)' relevant general characteristics or state of being is required, and little awareness of very obvious feedback is required for the performer to adjust his behavior to perform the task.
-	
3	The task requires the performer to interact with others in the performance of the task. The performer is required to be somewhat sensitive to or perceptive of the other person(s)' relevant general characteristics or state of being, and to be aware of very obvious feedback so as to adjust his behavior accordingly.
-	
5	The task requires the performer to interact with others in the performance of the task. The performer is required to be quite sensitive to or perceptive of the other person(s)' relevant characteristics or state of being, and to be aware of fairly obvious feedback so as to adjust his behavior accordingly.
-	
7	The task requires the performer to interact with others in the performance of the task. The performer is required to be keenly sensitive to or perceptive of the other person(s)' relevant characteristics or state of being, and to be aware of fairly subtle or complex feedback so as to adjust his behavior accordingly.
-	
9	The task requires the performer to interact with others in the performance of the task. The performer is required to be keenly sensitive to or perceptive of the other person(s)' relevant characteristics or state of being, and to be aware of very subtle or very complex feedback so as to adjust his behavior accordingly.

influence their work behavior. Both of these scales have scaling principles which describe the circumstances under which the skills must be exercised, rather than the nature of the skills. This is because interpersonal skills may be exercised in ways which are unique to the performer and reflect his individual personality. (The skills can be taught independently of individual differences by emphasizing the circumstances that require them.)

There are three HSMS language skills: Oral Use of a Relevant Language, Reading Use of a Relevant Language, and Written Use of a Relevant Language. The language skills refer to the precision with which language of varying complexity must be used or understood to convey or comprehend meaning. The skills are rated independently of the knowledge of technical vocabulary; they do not refer to the precision with which directions must be followed, but rather the precision needed in the understanding of language and the communication of meaning.

The HSMS method includes two decision-making skills which relate to a performer's degree of latitude in how to carry out a task and degree of latitude in the quality of the task performance. Decision Making on Methods applies if the performer has any choice about how to do a task or what to use. Decision Making on Quality applies if the performer can choose to and can affect the quality of the task's output above minimum standards for correct performance.

The HSMS method includes four general intellectual skills. They deal with (1) the mental manipulation of the size, shape or form of things to achieve a figural standard: Figural Skills; (2) the mental manipulation of abstract symbols which are parts of systems of notation: Symbolic Skills; (3) the conscious application of, or creation of, conceptual classifying or organizing principles: Taxonomic Skills; and, (4) the drawing of non-obvious conclusions or inferences from information: Implicative Skills. Since general intellectual skills are usually learned and exercised in the application of knowledge, they may be confused with knowledge. Actually, the knowledge serves as a vehicle through which the skills are practiced. Tasks which require different knowledge or subject matter may have some of the general intellectual skills in common.

A performer may make errors in carrying out a task. The awareness of the seriousness of possible errors serves to keep the performer alert in the performance of the task. This sense of responsibility is learnable, and, as such, is treated as a skill. The HSMS method includes two such skills. One is Financial Consequences of Error; the second is Consequences of Error to Humans. Both scales describe levels of seriousness of the consequences of error. Each scale is applied separately for each task. In the procedure used for scaling a task for each of the two error consequences skills, the analysts establish for each the most serious error (including omission) which it is likely that a qualified performer could commit. The consequence of the error is rated on the respective scale.

The Knowledge Classification System

The HSMS Knowledge Classification System and its Knowledge Scale treat knowledge categories as variables which can be identified as required in task performance and which can be scaled in a manner similar to that of scaling tasks for skills.

While "knowledge" in general can be considered to include all types of information, the HSMS Knowledge Classification System has a more limited approach. It is a specialized taxonomy of knowledge categories.

Each category represents a subject area which can be conceived of in <u>incremental</u>, transferable units, so that the application of the category in a task can be <u>scaled</u> with the Knowledge Scale according to specified scaling principles. The categories (at any scale level) require a sufficient learning effort for them to be accounted for in the design of curriculum and include only subject areas which may be required for use in work situations.

The Knowledge Classification System does not cover all possible areas of knowledge. Excluded as categories are procedures which are statements of "first you do this and then you do that" without links to broader bodies of learning. Also excluded as categories are procedures unique to an institution (orientation knowledge). These types of knowledge are either represented at particular scale levels in broader categories, or are not scalable and are therefore not included at all. Though all must be accounted for in a curriculum, only scalable knowledge categories are usable as variables for the clustering of tasks into ladders. The task descriptions (List of Elements) record the non-scalable knowledge which must be reflected in curricula.

The categories found in the Knowledge Classification System are arranged in outline form, with each category assigned an eight-digit code which reflects the category's degree of indentation in the outline. (See Figure A.3.) Categories are arranged in relevant contexts in the outline, and each category appears in only one location in the System, even if it is appropriate in more than one part of the outline.

Only those categories which have a number sign (#) or are underlined (or both) are used for identification purposes. (The reason is related to the statistical need to turn categories into variables for clustering tasks.) The categories with number signs are called fine level categories; those that are underlined are broad level categories.

In the HSMS method, knowledge identification is the assignment to each task of all the categories from the Knowledge System that are actually required for the performance of the task (at a scale value above zero in the Knowledge Scale).

Figure A.3. SAMPLE PAGE FROM THE KNOWLEDGE CLASSIFICATION SYSTEM

	1 2 3 4 5 6 7 8
10000000	NATURAL SCIENCES
11000000	BIOLOGICAL SCIENCES
11100000	# History of the biological sciences*
11200000	# Genetics (For molecular and microbial genetics see Molecular biology.)*
11300000	# Evolution*
11400000	# Biogeography*
11500000	# Ecology (Includes ecosystems and conservation.) (For the physical aspects of air polution see GEOSCIENCES, CHEMISTRY, PHYSICS, and ENGINEERING AND TECHNOLOGY; for the health aspects of pollution see Community health and preventive medicine and Epidemiology.)
11600000	# Botany*
11700000	Zoology
11710000	# Invertebrate zoology*
11720000	# Vertebrate zoology (through mammalia, but excluding humans)*
11730000	Human zoology
11731000	Normal structure and function (The categories listed below include both anatomy and physiology except where otherwise specified.)
11731100	# Regional anatomy (Includes head and neck, thorax (back) and abdomen, pelvis and perineum, lower and upper limbs, and skeleton.)
11731200	# Topographic anatomy (relation of external manifestations to internal structure and function, e.g., location of pressure points, surface appearance of joints, muscles and bones.)
11731300	# Hematopoietic system (Includes blood, red and white blood cells, platelets, and bone marrow, liver and spleen in their blood-forming function.)

The Knowledge Scale

The HSMS method uses a single scale for measuring the levels of all knowledge categories in the System. It is similar in concept to the skill scales.

The minimum condition needed for a category to be identified for a task at a non-zero level on the Knowledge Scale is that the knowledge in the subject category must be consciously applied in the task and must represent a sufficient learning effort to be considered for curriculum purposes. What is meant by "consciously applied" is that the performer must be able to explain how the knowledge in the category is used in the task. However, this need not mean that the performer must think about the use of the knowledge each time the task is done. He may normally apply the knowledge automatically because of practice, but he must be able to articulate the use of the knowledge in the task.

There are two scaling principles for the Knowledge Scale. These are: (1) breadth of knowledge and (2) depth of understanding. Breadth of knowledge refers to the amount of detailed knowledge the performer must know about the category. This covers the varieties of discrete information which are organized within the category, such as facts, terms, definitions, special procedures, and the use of special equipment. Depth of understanding, the second principle, refers to knowledge of the conceptual structure of the category named. The nature of the category determines the way depth of understanding is manifested, but depth of understanding always refers to the comprehension of the "hows," "whys," and "for whats" of the detailed information covered by the category.

In the HSMS method, the analysts assign a scale value to each knowledge category identified for a task at the level required for acceptable task performance.

COLLECTION OF DATA

The HSMS methodology is designed to be usable by persons who are not themselves incumbents in the occupations to be studied. This makes it possible for the analysts to study any type of job. The design requires that the analysts be trained in the needs of the methodology and its definitions, and in interview techniques (knowing how to question the performer to obtain the information needed). We collect a library of documents describing the work, terminology, and disciplines relevant to the jobs to be studied. This literature is used to familiarize the analysts with the fields to be covered prior to their entry into the institution. Teams are then able to deal intelligently with the material that they encounter. (A team must consist of two or more analysts to ensure reliable and accurate data. The data's reliability is ensured because the analysts on a team are expected to agree on the data they submit.)

Steps in Collecting Task Data

In the first series of interviews the analysts find out about all the work covered by the performer. After each interview, they attempt to divide the activities into discrete tasks. The analysts write their task descriptions on the Task Identification Summary Sheets. They are encouraged to refer to models of similar tasks already developed whenever possible. This helps ensure that all relevant information will be included.

When all the tasks have been identified for the performer and written up, the Task Identification Summary Sheets go to the HSMS Director. The Director reviews the tasks for conformity to the HSMS definitions and for clarity of presentation. She indicates areas needing expansion or more information. At the current time, the Director also determines whether the new tasks overlap with tasks already on file. (A table using brief task names and task code numbers serves as a reference for this.) The same code number is assigned to overlap tasks. New tasks receive new code numbers.

After the analysts get complete information for the tasks and they are approved by the Director, the tasks are submitted to the appropriate "resource person" at the institution. The tasks are reviewed for correct use of terminology and presentation of procedures, for the correctness of sequences, and for omission of activities.

After the resource person's corrections (or questions) are accounted for, the analysts return to the performer. Before the analysts collect the next set of information, the tasks are reviewed by the performer for accuracy in regard to his or her actual experience in the tasks.

The analysts then scale each task on each of the skill scales; they identify the Knowledge Classification System categories needed to perform each task and assign a scale value to each category using the Knowledge Scale. This process continues for each of the performers to be studied. In cases where the same tasks appear for more than one performer, the tasks are treated independently and separate data are collected. The overlap data make it possible to refine the task descriptions and to provide reliable skill and knowledge data, since the data sheets are compared and discrepancies can be investigated.

NORMATIVE REVIEW - THE WORK OF THE RESOURCE RESPONDENTS

The task data at this point represent how the work is being done. We do not assume that the procedures are optimal or even acceptable. The next stage involves review and revision of the task data so that they describe procedures acceptable for the purposes of education and performance evaluation. For this stage of the work we enlist the help of experts in the service areas being covered, primarily educators with "hands-on" work experience. We generally enlist experts from institutions that are interested in utilizing the curriculum guidelines that we are in the process of developing. We consider it important also to involve individuals who are involved with accreditation.

The task data are submitted to their appropriate resource respondent in three stages. First, the task descriptions are submitted for review of the appropriateness of the descriptions. Tasks are evaluated for whether they represent acceptable procedures. Suggested corrections are reviewed by HSMS and incorporated into approved "normative tasks." The resource respondents are encouraged to suggest any activities which seem to have been omitted from tasks or, at the end of the work, any tasks which have been omitted from the data base.

After the task descriptions have been revised by HSMS, they are returned to the reviewers for reference, and the skill scale data are evaluated. The skill scale values assigned to the tasks are reviewed for whether they represent acceptable, normative scale levels. (The reviewers are provided with our skill scales and instructions for their use.) Suggested corrections are reviewed and incorporated into approved, normative-task skill scale values.

The task descriptions are again returned, this time with the knowledge category and scale data included. The knowledge categories and scale values that were assigned to the tasks are reviewed for whether they represent appropriate, normative knowledge requirements and scale levels. (The reviewers are provided with our Knowledge Classification System and Knowledge Scale, and instructions for their use.)

Suggested deletions, additions, and corrections are reviewed and incorporated into approved, normative-task knowledge identifications and scale values.

The final product at this stage is a set of normative task data. For a given set of tasks, there will be scale value data on 16 skill variables and on an unknown number of knowledge category variables (equal to the number of categories identified for the entire set of tasks).

These data become inputs in the construction of job ladders; they are also usable for instructional purposes and curriculum design.

DESIGN OF JOB LADDERS

Factor Analysis

The HSMS uses factor analysis for clustering the tasks. It treats the tasks as units of analysis (observations) and the skills and knowledges as statistical variables. The first stage of the factor analysis creates "variable factors." These are determined by those skills and knowledges which tend to be interrelated and therefore can be expected to rise and fall together. (This means that, for the purpose of instruction, variables which factor together should ideally be taught together, since they are usually needed for interrelated activities.)

Every variable has a "loading" or value on every factor. Variables can load on factors within the range of ± .99. Variables which are positively interrelated on a factor will have the same sign. (The + or - has no other special meaning.) What determines a "variable factor" are those variables which "load high" on the factor.

An acceptable "factor solution" has an optimum number of factors for the purposes involved and, preferably, many fewer than the original number of variables. Two criteria for choosing a factor solution are that most of the variables in the data base have high loadings on only one factor, and that each factor has several variables which load high on it. Another criterion is that the factors chosen show stability in their high-loading variables across several factor solutions. The most important criterion, however, is that the factors make sense in terms of content. The "factor solution" determines the number of factors for the second stage.

The second stage of the factor analysis creates "task factors." The decision regarding the number of factors in the factoring of the variables determines the number of factors for the tasks. In fact, it is the interrelationships among the variables on a variable factor that determine a task's loadings on the "task factors." The second stage results in the assignment to each task of its "loading" on each task factor.

The loadings of the tasks on factors can be interpreted as follows. A task's loading on a factor is determined by the combination of the variables required for the task, the loading of the variables on the corresponding "variable factor," and the scale values assigned to the variables for the given task. A task has a loading on every factor, but, since different variables determine different factors, it is possible to observe on which factor a task has its highest relative loading. Some high-level tasks may load high on several factors, while most low-level tasks load relatively low on all factors, since they require few variables and require them at low levels.

A task is assigned to the factor where it has its highest loading, and to more than one factor if it loads high on more than one factor and makes sense in each. However, most tasks are clearly assignable to only one factor. (The assignment of tasks to more than one factor provides a basis for constructing job lattices at a later stage.)

Once tasks are assigned to factors, the tasks of each factor are arranged in rank order according to their factor loadings on the factor. The results are sets of task hierarchies (rank-ordered tasks for each factor). We arrange the tasks into hierarchies by factor in order to allocate them to job levels and educational sequences.

A task's loading on a factor determines its rank order on the factor; but the task may require a good many other skills and knowledge categories beyond those determining the factor. Therefore, tasks in each rank ordering are inspected to see if any tasks should not be on the factor by virtue of requiring too many skills or knowledge categories not required by the other tasks in the factor. As a result of this inspection, the number of tasks assigned to individual factors may be somewhat reduced. (All tasks are assigned to a factor or are "isolets.")

Assignment of Tasks to Job and Educational Levels by Factor

Although the factor loadings for the tasks permit easy assignment of tasks to factors, the meaning of a difference between loadings of, for example, .83 and .44 is hard to judge in educational terms. Since the objective is to identify rungs on a ladder, stages in a sequence, or comparable levels for tasks -- all of these being interchangeable concepts -- it is necessary to do one further type of analysis.

The tasks of a factor are laid out in the rank order of their loadings on the factor, from low to high; and the skills and knowledges are laid out in the order of when they appear, given the arrangement of the tasks. This "Matrix" permits identification of the major cut-off points between tasks. Cut-offs are chosen where there are marked increases in scale levels and/or the addition of large blocks of new knowledge categories. This information is used to determine which tasks within a factor are at the same relative level. The task level groupings across factors correspond to broad educational levels.

Idealized Jobs and Job Ladder Recommendations

The tasks assigned to any given level within a factor will be representative of the central tasks of a job. Naturally, any job will also include certain peripheral tasks (not on the factor) which reflect institutional idiosyncrasies and tasks covering paper work, conferences, etc., usually associated with any job. For the purposes of a job or educational ladder, however, the tasks at a given level within a factor suggest the most rational assignment of major duties, since they represent the maximum application of a given educational investment.

At this stage, HSMS will produce recommendations with respect to the allocation of tasks to jobs in a given ladder. (The job ladders will also suggest lattice relationships. Job lattices allow for linkages across ladders both horizontally and diagonally.) Each job on a ladder will be related to its higher and lower level rungs through the variables which determined the task factor.

The job ladder proposals will be presented to major employers, relevant trade unions, and the professional associations for evaluation. We will be asking the questions: Do the job structures presented make sense to you as viable slots in a job market? Would you redesign current jobs to reflect these suggestions? Would you hire people to serve in such functions? Are these practical suggestions?

The approved job ladder recommendations become the basis for preparing curriculum guidelines for educational ladders.

APPENDIX B

INSTITUTIONAL PROCEDURES

FOR CURRICULUM APPROVAL

INTRODUCTION

The Health Services Mobility Study aims to develop curriculum guidelines that can be utilized and implemented by educational institutions to prepare students for health occupations. We are aware that the apparent logic of a curriculum design is not sufficient for its implementation, and that the apparent sense of a proposed curriculum change is not sufficient for its adoption. Between "good sense" and actuality lie the procedural hurdles which must be gone through or over for approval to be given to a proposed new program or curriculum change.

This appendix represents the results of an HSMS effort to explore the nature and sequence of procedures which must be gone through when there is an attempt to implement HSMS proposals. The information is presented as a guide to the layman who may underestimate the complexities involved, and to educators, to share with them any insights we may have gained.

The Institutions Covered

This appendix is not meant to be a definitive report on all institutions that offer educational programs. We limited our investigations in three ways. First, we were concerned only with institutions which prepare students for health occupations.

Second, we were not able to do a survey of institutions across the nation. We decided to investigate those institutions in New York City that were most likely to be interested in implementing our suggestions, or whom we would be most likely to approach to develop linkages from one academic level to another. The detailed information we collected came from community colleges and senior colleges within the City University of New York (a public institution) and two medical schools. However, the nature of the procedures which we found is such that we are able to generalize to comparable private colleges in the State of New York. We have reason to believe that the generalizations we make are also applicable across the nation. Our third limitation was that we made detailed inquiries at educational institutions which, by virtue of their being academic structures, include such entities as faculty senates, academic deans or vice presidents, faculty committees and program review bodies. Hospital-based schools and programs are covered in our review primarily with respect to state approval and professional accreditation.*

We believe that educational institutions can offer the more viable opportunities for upward mobility to the student. While additive and transferable preparation is obtainable from hospital-based training, the recognition of academic credits and/or degrees remains part of the health system at present and in the foreseeable future. This would suggest that hospital-based programs that are already functioning at quality

* In 1970-71 only 15 percent of AMA-accredited programs in allied health fields were located in educational institutions (as opposed to hospitals and laboratories). However, the average number of graduates of college and university programs was 13.2 students compared with 4.6 graduates for all the programs. These figures were derived from [87, Part II, pp. H-4 and H-10].

educational levels should be afforded the right to grant credits or degrees.

The most logical arrangement to accomplish this would be through the affiliation of the hospital school or program with an academic institution. The hospital-based program can provide the hospital affiliation for the academic institution, or the academic institution can provide the didactic preparation for students in hospital programs. Such arrangements will require a transformation of the hospital's educational structure and would exceed in scope the steps needed to institute new programs or changing existing curricula per se; therefore, they are not discussed in this appendix.

We not only consider that educational institutions offer the more viable pathways for upward mobility, we also believe that public educational institutions should carry the chief responsibility for making this possible. At the same time, we know that it is likely that the most radical source of change will come from those institutions, regardless of type, that are inspired by individuals who want change, understand the procedures necessary to bring it about, and can convince the institutions involved that it is in their own interests to do so.

Source and Nature of Change

The HSMS approach to curriculum design and the concept of educational ladders are likely to be more attractive to individuals than to institutions as such. That is, the ideas will or will not be grasped as exciting, logical, or relevant to institutional needs; persons with such perceptions may be any of the following people:

1. Hospital administrators wishing to combine efforts with academic institutions.
2. Academic administrators such as college presidents, deans, or directors of programs.
3. Educators who teach in given programs.
4. Persons in government agencies who wish to see specific types of policies implemented.
5. Members of consortia or specialists in curriculum.

While any such individuals may wish to see new programs instituted or existing curricula modified in order to implement educational ladders and/or HSMS curriculum objectives, all proposals to institute such change must follow a specific set of procedures. Each type of institution has a set of conditions placed upon it which relate to its internal procedures, procedures relating to the other institutions with which it is linked, and procedures set by state agencies and professional associations. This appendix suggests, therefore, that the initiator of change must know what each of the steps must be, what lead time is required for approval, and what informal circumstances are necessary to facilitate approval. This appendix lists the procedures for the types of institutions involved and offers whatever insights we have gained about the best ways to go about the procedures.

This appendix assumes that the new programs to be proposed and the curriculum changes to be requested flow from the HSMS curriculum guidelines and curriculum objectives. Therefore, we assume that the program design work and/or the procedures of curriculum analysis for overlap or justification review will have been done in manners similar to those proposed in Chapter 4. The appendix does not describe the preliminary analysis needed for changes originating from other sources and for other reasons than those covered in this document.

The initiator of change (regardless of personal role) will be making a formal request either to institute a new program for a health occupation or to modify an existing program, based on HSMS curriculum objectives or guidelines, with or without linkage to higher or lower educational levels. A new program request is presented to a specific set of institutions and bodies in a specific sequence. A request to change an existing program may cover modification of course structures (descriptions), prerequisites, admission requirements, allocation of hours, change to modular and/or individualized instruction, etc. The set of procedures to be followed to win approval for routine changes are simpler and involve fewer levels of authority than do changes which involve policy and/or new program approval.*

* For the purpose of creating an entirely new institution founded on concepts and approaches which include use of HSMS curriculum guidelines, the institution as a whole may require approval and accreditation. However, each of the programs would require separate approval, and the procedures would be similar to those for all new programs (although "starting from scratch" may minimize the barriers offered by entrenched interests involved).

Summary of Conclusions on Procedures

We have come to several conclusions about the relationship between the formal, institutional requirements and the informal conditions existing in the climate of the institutions involved. These are presented here for the reader to bear in mind as the formal procedures are presented.

1. The higher the academic level of the institution, the fewer the levels of authority from which approval must be obtained. Thus, medical schools have the most autonomy regarding curriculum decisions, while community colleges have the least autonomy and the most numerous sets of conditions to meet.

2. The proclivity for changes in curriculum or the institution of new and/or experimental approaches bears no relationship to the degree of autonomy of the institution or the complexity of the procedures involved. Medical schools display no strong evidence of interest in educational ladders.

3. The "political" interests involved in departmental budgets, program control,and other manifestations of power over resources, policy, faculty, and enrollments are the most decisive factors in determining whether new programs will be approved and how long the approval processes will take. For changes to be accomplished these issues must be investigated and accounted for before actual proposals are presented.

4. There cannot be successful implementation of curriculum change or the institution of new programs unless those at levels of control analogous to the "management" of an institution are committed to the concepts involved and are willing to provide the follow-up and support necessary to defend the proposal at all levels.

5. There cannot be successful implementation of new programs, curriculum change, or the realization of new educational objectives unless those at the level of implementation analogous to the "first line supervisors" (the teachers) understand the changes, are committed to them,and are willing to make the effort needed to carry these through in the classroom, laboratory and clinical location.

THE STRUCTURAL HIERARCHY

In order to help the reader comprehend the nature and purpose of the individual steps involved in the process of obtaining approval for new programs or curriculum change in a specific institution, we first present a discussion of the various types of bodies and agencies involved. It is as if we were first presenting the arrangement of stations and tracks in a railroad before discussing train routes.

First, one must differentiate among accreditation, licensure, and certification or registration:

> Accreditation -- The process by which an agency or organization evaluates and recognizes an institution or program of study as meeting certain predetermined criteria or standards.
>
> Licensure -- The process by which an agency of government grants permission to persons to engage in a given profession or occupation by certifying that those licensed have attained the minimal degree of competency necessary to ensure that the public health, safety, and welfare will be reasonably well protected.
>
> Certification or registration -- The process by which a nongovernmental agency or association grants recognition to an individual who has met certain predetermined qualifications specified by that agency or association. Such qualifications may include: (a) graduation from an accredited or approved program; (b) acceptable performance on a qualifying examination or series of examinations; and/or (c) completion of a given amount of work experience [75, p. 7].
>
> Accreditation is a form of regulation or control that is exercised over educational institutions and/or programs by external organizations or agencies. It developed in this country as a procedure of voluntary self-regulation by peer groups of educators and members of the respective profession, in contrast to review and regulation of educational institutions as a governmental activity in other

countries. The initial focus was on colleges and universities to meet the needs of educators, educational institutions, programs, and professional groups and subgroups within our society; only later, was there concern for the public interest.

> The U. S. Office of Education defines accrediting as the process whereby an association or agency grants public recognition to a school, institute, college, university, or specialized program of study having met certain established qualifications [or] standards as determined through initial and periodic evaluations [75, p. 9].

Since we are dealing with educational institutions which offer occupational programs, and occupational programs which are offered in educational institutions,it is important to comprehend the difference between <u>institutional accreditation</u> and <u>specialized program accreditation</u>:

> Institutional accreditation applies to the total institution and indicates that the institution as a whole is achieving its own validated and specified objectives in a satisfactory manner. Specialized program accreditation is aimed at protecting the public against professional incompetence. Whereas the eligibility criteria, basic policies, and levels of expectation are similar among institutional accrediting associations, the criteria for accreditation, definitions of eligibility, and operating procedures of the specialized program accrediting agencies vary considerably.
>
> Due to the differing emphases of the two types of accreditation, accreditation of the institution as a whole by the institutional accrediting associations should not be interpreted as being equivalent to specialized accreditation of each of the several parts or programs of an institution. Institutional accreditation does not validate a specialized program in the same manner and to the same extent as specialized accreditation [75, p. 10].

Reflecting the differences in the two types of accreditation, one finds that there are organizations which are concerned with the accreditation of institutions; these are generally academic and include the Association of American Medical Colleges (AAMC). One finds that professional organizations are concerned with the accreditation of occupational programs.

In the United States the broadest level of accreditation responsibility is not the Federal Government.

> Unlike most other countries, the United States has no ministry of education or other centralized authority that exercises control over educational institutions. The States, and in many cases, counties and cities, assume varying degrees of control but permit institutions of higher education to operate with [considerable] autonomy. As a consequence, institutions vary widely in the character and quality of their programs. Private (nongovernmental) educational associations of regional or national scope have established criteria to evaluate institutions or programs, with the intent of determining whether or not they are operating at basic levels of quality [75, p. 10].

What the Institutional Associations and Professional Organizations Do

The closest approximation to national standards of accreditation comes from the existence of institutional accrediting associations and specialized program accrediting agencies. These bodies can exercise influence over the extent to which new programs will be introduced, because the accreditation procedures include a review of curriculum. The bodies can exercise influence over the extent to which curriculum changes will be instituted, because the accreditation procedures include periodic review. The accrediting procedure usually follows a pattern of five basic steps:

1. The accrediting agency, in collaboration with professional groups and educational institutions, establishes standards.*

2. The institution or program desiring accreditation prepares a self-evaluation study that provides a framework for measuring its performance against the standards established by the accrediting agency.

3. A team selected by the accrediting agency visits the institution or program to determine first-hand if the applicant meets the established standards.

4. Upon being satisfied through the information obtained from the self-evaluation and the site visit that the applicant meets its standards, the accrediting agency lists the institution or program in an official publication with other similarly accredited institutions or programs.

5. The accrediting agency periodically re-evaluates the institutions or programs that it lists to ascertain that the standards are being met [75, pp. 9 and 10].

What The State Does

In New York State, the State Education Department approves programs for professional and higher education (found in colleges, junior colleges, universities, professional and technical schools) and specialized courses requiring less than high school graduation for admission.

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* The AMA Essentials for allied health occupations specify curriculum content in broad terms. The AAMC does not provide Essentials which specify curriculum content for medical schools; rather, the AAMC uses comparison with current national norms in already accredited medical schools.

Thus, approval of programs leading to licensed occupations, aside from the fact that requirements are legislated, is essentially similar to the steps needed for approval of all other types of programs.

The State Education Department handles the review and approval of programs based on formal applications. Standing committees reflect the division of requirements and functions covering liberal arts degrees, professional degrees and diplomas, and licensure. When the Department does not itself include the agency dealing with technical competence, it includes the appropriate agency (such as the Bureau of Radiologic Technology in the Department of Health) as a consultant.

The programs are registered with the Regents of the University of the State of New York after preliminary approval is given, graduating classes have emerged, and site visits have occurred (unless site visits by an accrediting agency are accepted in lieu of State visits). Where appropriate, the success of graduates on State Board or licensure examinations is considered for initial approval and continued approval of programs.

The State reviews a program's resources, laboratories, library, faculty, course of study (including time), and requirements for admissions and graduation (including semester hours). For medical schools and other health occupations programs the availability of adequate hospital and clinical facilities are also reviewed.

The submitting institutuion (which must be incorporated) offers programs for approval whether or not it offers a degree. The institution as a whole is not approved or registered unless it offers a single program. If the submitting institution also wishes to obtain accreditation for a program from nongovernmental agencies it can find itself fulfilling two sets of standards and hosting two sets of accreditation teams on site visits, unless joint arrangements have been made between the State and the professional program accrediting agency involved.

At the State level the appropriate review committee is concerned, not only with the quality of the education to be offered, but, especially in the case of occupational programs, it is concerned with the distribution of programs across the State and the expected job market for the graduates. State level policies are also made known to the potential offerers. For example, the Bureau of Radiologic Technology issues curriculum guides for individual subjects and concerns itself with issues of advanced standing in college programs for graduates of hospital schools of radiologic technology. It is known to strictly enforce regulations concerning clinical hours and curriculum content.

Community colleges of the State University of New York (SUNY) and the City University of New York (CUNY) are further regulated at the State level; they fall under the jurisdiction of the SUNY Vice-Chancellor for Community Colleges and Provost for Vocational and Technical Education. In the case of occupational programs the same inputs and review apply, but there can be additional requirements as well. For example, the State Education Department and Board of Regents established, in 1953, distinctions between the Associate in Arts (AA), Associate in Applied Science (AAS) and Associate in Science (AS). In a statement of overall policy, the following is included:

> All degree curricula, as distinct from non-degree programs, must contain a minimum of bona fide liberal arts and science courses which go beyond particular occupational or professional objectives. It is this segment of the curriculum that makes for a collegiate education. An institution should strive to exceed the stated minima in liberal arts courses and should attempt to achieve balance among the three major disciplines, the humanities, the natural sciences and mathematics, and the social sciences. In keeping with its mandated role, the State Education Department will exercise its discretion to insure that curricular patterns are consistent with the enlightened consensus of academic opinion [From a Memorandum dated August 22, 1972].*

The implication of this passage is the assumption that occupational preparation is different from the corresponding liberal arts and science courses. The submitting institution could thereby be constrained to offer some overlapping requirements. (We would hope that it could consolidate requirements as described in Chapter 4.)

The following is a condensed outline for the supporting information which a community college must submit in proposing a new occupational and/or degree program. It includes the subject matter required by most bodies involved in approval. This particular outline applies to proposals sent

* The AAS as now constituted is transferable to specialized occupational baccalaureate programs, but not to the BA or BS program. Since 1971, a program leading to specific occupational preparation has existed that does not require or credit liberal arts or sciences courses and is therefore terminal in nature. It is the Associate in Occupational Studies (AOS).

to the Office of the Vice Chancellor for Community Colleges, but it is similar to those sent to the State Department of Education for programs requiring registration with the State, and further duplicates the requirements for the New York City Board of Higher Education.

1. Purpose of the Curriculum. Degree if any; whether for transfer to upper division; title of occupation or nature of employment involved; industries served; day or evening.

2. Need for Curriculum. College's service area; results of survey; letters of support from business, government, industry, labor. Plans or agreements for transfer of students re: senior colleges if AA or AS.

3. Potential Enrollment. Student interest, survey results; expected placement possibilities; projection to five years or more.

4. Possible Conflicts With Existing Curriculums. Listing and description of similar offerings within commuting radius of college; justification of duplication. Relationship to open enrollment, counseling services, availability to veterans.

5. Ability To Provide For the Curriculum. Indication of proper scope of college coverage and within capabilities; faculty vitae; existing classroom, laboratory and/or shop facilities, and/or clinical facilities.

6. Necessary Additions to Faculty. Number needed; titles, work load; qualifications sought.

7. Necessary Additional Instructional Materials. Needed equipment and materials; costs; installation; library holdings available or needed.

8. Necessary Additional Building Space. If needed, details on rental and/or other availabilities or construction; costs, location, etc.

9. Analysis of Costs and Income. Budget for program and projection of costs. Anticipated income: tuition, local sponsor, State, gifts, part-time classes, etc.

10. Curriculum Outline (Tentative). Course of study outline including subjects, lab hours, class hours, [clinical hours], course descriptions.

11. Local Resolutions. Approvals and resolutions from local levels such as local college boards, civic bodies, professional organizations, faculty committees, advisory committees.

The reader will note that the procedures for curriculum analysis described in Chapter 4, and the HSMS curriculum objectives, described in Chapter 3, provide inputs to items 1, 2, 4, and 10, above.

The State is not normally concerned with requests to modify existing curricula except to the extent that local bodies consider that a proposal for change implies a policy problem, or if continued State approval may be jeopardized.

What Institutions at the Local Level Do

The situation in New York City public educational institutions with respect to the approval of new programs and the approval of curriculum changes may be more complex than for other cities or for private institutions of higher learning. With respect to health occupations the situation is further complicated by University-wide committees.

Any member institution of the City University of New York (i.e. community colleges, senior colleges and graduate divisions) may request approval of new degrees or programs. The highest level of local authority is the University Committee on the Academic Program and the Board of Higher Education. A joint action is required including prior approval by a Board Screening Committee. Once an institution receives the approval of the Screening Committee,the Committee on the Academic Program and the Board of Higher Education meet and act on its recommendations.

New graduate-level programs require prior approval "in principle"by the Committee on the Academic Program, and only after that is a curriculum submitted. New Masters-level programs have a step prior to submission to the Screening Committee. They are submitted to the Graduate Advisory Committee. Doctoral programs require prior approval by the Graduate Faculty Council. After initial approval, graduate programs are subject to review after two years and five years.

In all cases of new program approval an outline is prepared with the same information included as for the one presented above in this appendix. An additional item includes a timetable, with a schedule of dates, by semester at least, for the initiation and completion of steps leading to full operation.

When health occupations programs are involved, however, an additional set of procedures is involved. Prior to submission to the Committee on the Academic Program and the Board of Higher Education, proposals for new programs in the health sciences are reviewed by the CUNY Health Affairs Committee. This University Health Affairs Committee reviews recommendations of its sub-committees periodically. One of these is the Sub-Committee for the Review of New Health Career Curricula.

All curricular proposals in the health occupations go to the Office of Academic Affairs which, in turn, distributes them to the Office of the Dean for Health Affairs. They then go to the Sub-committee, whose recommendations go to the Health Affairs Committee and to the Committee on the Academic Program.

The City University Health Affairs Committee, especially its Health Careers Sub-Committee,

> ...has as one of its objectives the development of curriculum that would provide students with a broad enough education to allow for career mobility, while of course providing a sound preparation for a health career.
>
> The Sub-committee for Review of New Health Curricula has...recommended that...proposals contain a section spelling out the articulation of the proposed program with existing higher-level degree programs. [From a letter from the Staff Coordinator, Office of the University Dean for Health Affairs.]

Proposals for changes in curricula are termed "routine changes." These are submitted for review by the Screening Committee, and are reported to rather than approved by, the Committee on the Academic Program and the Board of Higher Education.

Curriculum Procedures Within the Institution

The individual college or medical school is the usual source of proposals for new programs or curriculum change. Each individual institution has its own procedures, but these can be described in general terms.

In the two medical schools where we interviewed we found that requests for curriculum change are initiated at the department level. The departments are structured to reflect pre-clinical and clinical courses, with multidisciplinary committees also in existence. Proposals are reviewed or initiated by curriculum committees or offices of education. Proposals then go to administrative and/or planning committees, and sometimes students are involved. Faculty senate approval is required for new curricula, as well as approval from administrative officers such as Dean or President.

There are no clear curriculum guidelines to use as criteria, and a cleavage exists between pre-clinical and clinical education. Curriculum review is not a factor in continued accreditation or State registration, while failure of graduates to pass Board certification is a more likely goad to improvement of curricula.

In the senior colleges proposals for new programs may come from departmental curriculum committees or specialized institutes (such as for Health Sciences). Proposals for changes in curricula can arise from program curriculum committees or departments. Undergraduate and graduate curriculum committees review proposals which must then be approved by the faculty of an institute or department. There is usually college-wide or graduate-level-wide review leading to submission to a college senate. The offices of the appropriate deans may be involved.

At the departmental and college-wide levels the program proposals or proposed changes are reviewed in terms of appropriateness, overlap of interest, and other internal matters, while attention is given to inclusion of information required for later stages. Budgetary problems and articulation with other programs are also reviewed. At the community college there are departmental and/or divisional curriculum committees which first review proposals; then a college-wide curriculum committee and a college council reviews the proposals. The President is involved in approving new programs.*

FOLLOWING THE STEPS

This section offers a review of the steps for instituting new programs or changing existing curricula presented from the point of view of the initiator of the proposal. Table B.1 describes 16 steps which can be generalized with regard to programs in New York State, and shows which steps are relevant to each of five types of institutions, including medical schools, City University institutions, and hospital programs or schools.

As indicated in Table B.1, the steps for approval of new programs include a subset (without asterisks) which are those needed to approve requests to change curricula. This latter set of steps ends at the local level.

The purpose of this section is to share with the reader our informal impressions about the processes at work at each of the steps.

Initiation

The initiation of a proposal begins with an informal exploration of ideas and exchange of opinion among the parties. However, this is the stage which is the most crucial and during which the most careful planning should take place.

* The Presidents of all the institutions are responsible, *ex officio*, for guiding the proposals to completion.

Table B.1

GENERAL MODEL FOR INSTITUTING
NEW PROGRAMS BY INSTITUTION TYPE

Procedures For New Program Approval	Health Occupation Program Found In: Medical School	CUNY Graduate Program	CUNY Senior College	CUNY Community College	Hospital Program
16. Accreditation After Initial Period*	X	X	X	X	X
15. Approval, Registry By State After Initial Period*	X	X	X	X	X
14. Initial State Approval*	X	X	X	X	X
13. Review by State Ed. Dept.*	X	X	X	X	X
12. Review by SUNY*				X	
11. Local BHE Approval*		X	X	X	
10. Comm. on Academic Program*		X	X	X	
9. Board Screening Committee		X	X	X	
8. University Graduate Faculty or Council		X			
7. Health Affairs Committee[a]		X	X	X	
6. Sub-Committee on New Health Curricula[a]		X	X	X	
5. Early Warning Notification: Health Affairs Comm., SUNY[a]				X	
4. Institution-wide Senate or Faculty	X	X	X	X	
3. Institution's Relevant Curriculum Body	X	X	X	X	
2. Departmental or Program Curriculum Body	X	X	X	X	X
1. Initiation	X	X	X	X	X

* Step eliminated for approval of curriculum change.
a Unclear whether included for approval of curriculum change.

Unless all the possible conflicts with colleagues, departments, rival institutions, government agencies and accreditation agencies are anticipated and dealt with, the proposal can be held up or killed at any stage along the way, thus wasting time and effort, and harming the chances for any similar proposals being approved.

Unless the initiators understand the processes involved and the key individuals who may be involved, they will not be able to offer appropriate, coherent justifications for their programs. It is also important for the initiators to know the crucial submission date deadlines.

It may be obvious that the initiators should know about the processes, forms, state approval requirements, and accreditation requirements, but we have discovered that in new institutions, or when faculty members attempt to initiate, such information is not forthcoming without being sought. There is the tendency for informants to say "everything is politics." However, when everything is politics, meticulous adherence to procedural requirements cuts down the range within which politics can be used to destroy a proposal.

One of the advantages of the HSMS curriculum guidelines is that they lend themselves to precise references in the area of curriculum descriptions and can be useful for analyzing overlap and articulation possibilities. In our opinion, the possibility of assessing the job market for occupational programs in health is also enhanced by virtue of the guidelines being a reflection of job ladder designs that have been discussed with potential employers.

Before formal action is initiated, the most logical procedures involve notification of relevant committees, departments, and agencies, discussion of the proposal, and collection of materials on the issues or requirements involved, the specific points to stress, or the modifications likely to be required. Since the supporting information required for proposals is similar at all levels, it is wise to describe the proposals initially so that the most complete set of support information is presented, rather than adding information as called for.

Within the Institution

Steps 2 through 4 in Table B.1 refer to steps taken within the institution to obtain formal approval. We have the impression that it is important to have the support of the department or divisional chairman for getting a proposal through within the institution and its committee structures.

The critical review step is the institution's curriculum review body (step 3). It is at this level that the conflicting interests across departments and programs must be met. Unfortunately, the concern with overlap does not usually flow from the desire to eliminate redundancy, but from the jealousies aroused by jurisdictional and budgetary considerations. However, it is in the interests of the initiators to utilize existing course offerings or to arrange for collaboration across departments in the provision of new course offerings because this enlists allies.

We have found that, in institutions that are conservative in structure and where programs are established in such a way that they compete for budget, the faculty are forced into a narrow defense of their own interests. A possible source of conflict appears to involve credit distribution for majors, minors, electives, and core curriculum (if core exists). There appears to be little flexibility in following established guidelines, since these represent school policy and are carefully checked by the curriculum committees. Such guidelines reflect the interests of the various departments and each is carefully guarded.

However, in innovative schools it is possible to find departments closely cooperating and attempting to coordinate the curriculum proposals from their respective departments, in deciding on prerequisites, co-requisities and sequencing on the basis of their logical relationship to occupational requirements. While special interests regarding requirements can be overriding, it is also possible to have the criterion for review be educational soundness.

Approval by the institution's faculty or senate is normally a routine activity once a proposal has passed the curriculum committee, since the committee serves the function of screening and working out any "problems" prior to final senate review.

<u>Local Level Steps</u>

While at the institutional level the chairmen of departments usually present and defend proposals, the Presidents or Deans usually represent these proposals when seeking university-wide and Board of

Higher Education approval. Steps 5 through 11 in Table B.1 cover the local-level steps. (Step 5 also relates to the State.)*

At the local level the jurisdictional conflicts and political considerations shift to inter-institutional balances of power and possible duplication or competition among programs in separate institutions or among academic levels (such as community college vs. senior college, or senior college vs. graduate school). Essentially, the same kind of screening and negotiation represented in the institution is repeated here, but across a wider front.

The major difficulty in any specialized review body arises when and if it is not truly functional, when members and officers are not fully involved. In the absence of strong, principled, informed leadership, the screening processes can resolve themselves into considerations of individual institutions and budgetary ramifications, with issues of actual curriculum content being obscured.

At the Board of Higher Education the critical body is the Board Screening Committee, which serves a function analogous to an institutional curriculum committee. Questions of budget, inter-institutional jurisdiction, competition, articulation and employment opportunities for graduates

* If a new program is being proposed, the President of a community college discusses it in person or by letter with the Office of the Vice Chancellor for Community Colleges and the Provost for Vocational and Technical Education. The same "Early Warning," but in written form, is forwarded to the Dean for the Academic Program, and the University Dean for Health affairs, whereupon it goes to the Subcommittee for Review of New Health Curricula.

offered by one program will invariably be weighed against those offered by programs in other segments of the University or against the plans of the University itself. A program's approval may depend as much on the strength of support it receives from its proponents as on its inherent merits. Proposals such as the HSMS curriculum guidelines for educational ladders may be useful in bringing together the interests of varying institutions which may all be concerned with one level of a ladder or another.

Our impression is that the medical schools are more likely to be relied on to provide specialized instruction in special programs for allied health manpower than for initiation of modifications of their medical curricula, especially the design of medical programs to include exit points or provide advanced standing.

Articulation of graduate programs with medical schools will be a major problem. Until the unwritten requirement that only young people be admitted to medical schools is shaken, the proposal that students with graduate-level preparation for, and experience in, health occupations be admitted with advanced standing into medical schools will be resisted. Yet, such a proposal can, if implemented, conserve on the limited resources available in medical education.

State Approval and Accreditation

State approval of new programs is provisional, pending graduation of the program's first class. After one or more years of operation, the new program is reviewed, and final approval can be granted. At that time the institution seeks accreditation for the program from the appropriate agency. After a program has been approved in principle, further modifications of the program can be made. Provisional State approval and accreditation would be sought early in the life of a program in order that the first class not suffer the disadvantages of graduating from an unaccredited program (since program accreditation is often a prerequisite to individual certification and/or licensure examinations). The results of certification or licensure examinations are also used as criteria for final approval and accreditation.

The consensus among representatives of accredited and State-approved programs with whom we talked is that professional and State requirements are observed in accordance with the rigor with which they are enforced. It was generally agreed that it would be disastrous to fail to meet rigidly enforced standards. On the other hand, programs which are demonstrated to be effective for occupational preparation (such as success of graduates in examinations) often are given some leeway by accrediting bodies to deviate from standards set forth in the specific Essentials or guidelines for approved programs. This provision allows for some innovation and experimentation in curriculum design, and allows the institution to incorporate educational objectives that reflect technological change and social pressures, which often change at a faster pace than the Essentials or guidelines can be expected to change. This allowance for deviation will most likely allow the development and implementation of programs based on HSMS curriculum guidelines. Since periodic review means that program changes are also open to scrutiny, similar comments apply to the modification of existing occupational programs.

Time Considerations

There are two aspects related to the time it takes to reach approval of a new program or a curriculum change. One is strictly mechanical; and for this knowledge is essential. The other is political; and for this finesse is essential.

The mechanical aspects of time requirements involve the deadlines for submission to official bodies which meet periodically. For example, to have a proposal pass a faculty senate, or a Health Affairs Committee, or a Board of Higher Education, the initiator must know how much in advance of the meetings the proposal must be submitted to the relevant review committee. It is also important to know what the lead time must be between final provisional approval at all levels and inclusion in a school catalogue for a given semester's offerings. The community colleges are required to submit advance notice two-to-three months before initiation of regular procedures.

These mechanical requirements provide minimum time restraints, which can mean that as much as a year can probably elapse between initial preparation and classroom functioning. The City University institutions live with such complicated lead and lag time restraints. On the other hand, medical schools, which operate with fewer constraints, can process changes in weeks or months.

In our opinion, there is a purpose for lead time which can be seen as an investment. It is the time used for preparing the proposal as described above. Time invested at this stage can eliminate later hold-ups which can accumulate and mean missed semester deadlines.

The second set of time considerations are more difficult to deal with, since they are inexorably linked with political considerations, the quality of the initial proposal, and the relative strengths of supporters and opponents.

The normal time expectation for overall approval from source to State Education Department for CUNY programs is one to two years. However, this is a variable expectation because of the fact that matters which call for major policy decisions can be and are held up for weeks or months at each stage of the approval process while negotiations and politically motivated tactics take place and while revisions are made.

Without intelligent, informed, and powerful support a proposal can remain neglected in the "IN" boxes of a whole series of offices before it is put on the agendas of the respective committees. But, if it is being followed through step by step by a strong supporter, it is far more likely to be dealt with in a timely manner. Finally, the extent to which the program is free of weak points will protect it from the objections that may be used to delay approval for legitimate or political reasons.

Comments

We are able to conclude that HSMS proposals for new programs or curriculum modification must be championed by adherents who understand the administrative procedures and can deal with conflicting interests. We are convinced that there is no substitute for preparing the way beforehand on the political front and preparing solid proposals on the technical front. Thus, in the last analysis, the urgency of the issues must be grasped by the proponents, but they must be informed, articulate, and willing to see a proposal through to the final stages.

Having done all this and won approval, the process must begin all over again within the institution so that the new or modified program is successfully implemented at the classroom level.

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