CRUCIAL REQUIREMENTS IN NURSING FOR THE SCIENCES OF ANATOMY AND PHYSIOLOGY

A DISSERTATION

SUBMITTED TO THE GRADUATE COUNCIL OF WAYNE UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF DOCTOR OF EDUCATION IN
THE DEPARTMENT OF EDUCATION
WITH A MAJOR IN EVALUATION AND RESEARCH

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Wilhelmine L. Haley

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APPROVED BY DATE

Wm. Reid 5/10/1954
Adviser

C L Boyd

W Ray Smith

Katherine Faith

PREFACE

It has been said that the fundamental method of progress is cooperation. The pages to follow are the result of a cooperative venture.

Grateful acknowledgement is made to Dr. William Reitz, College of Education, who, as chairman of the writer's Doctoral Committee, gave excellent counsel and guidance throughout the period of research and the preparation of this paper.

Sincere thanks are extended to the members of the Doctoral Committee, Dean Katherine Faville, College of Nursing; Dr. Charles L. Boye and Dr. W. Ray Smittle, College of Education, for their encouragement and helpful suggestions.

To the students and faculty members of the College of Nursing, whose participation made this study possible, special thanks are offered.

Although not directly concerned with the study, this opportunity is taken to thank Dr. Charles W. Creaser, Chairman of the Biology Department, College of Liberal Arts, for his constant support and interest.

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W. L. H.

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CHAPTER I

INTRODUCTION

The objectives of this study are the determination of the crucial requirements of professional nursing for the sciences of human anatomy and physiology, and the revision of the present course content in anatomy and physiology, based upon these requirements. The specific course investigated is offered by the Biology Department of the College of Liberal Arts to students enrolled in the basic collegiate program of the College of Nursing at Wayne University. The course is prerequisite to professional courses in nursing.

The method of research employed is the recently designed critical incidents technique, developed by Dr. John C. Flanagan, Director of the American Institute for Research, located in Pittsburgh, Pennsylvania.

In developing the setting for this study, it is necessary to define the types of programs in nursing, and to discuss basic collegiate programs leading to the Baccalaureate Degree. It is with the latter type of program that the study is concerned. These factors and the consideration of the professional status of nursing are presented in Chapter II.

The history and development of the nursing curriculum are reviewed in Chapter III, for the purpose of contrasting the methods of approach used in curricular studies related to nursing, with the methodological aspects of this study. In reviewing the current literature related to research in nursing and to the critical incidents technique, there is no

indication that the technique has previously been applied to nursing studies.

An analysis of the findings of the study are presented in Chapter IV. Based upon these findings, and using the present course content as a foundation, the proposed revision of the course is presented. A detailed course outline is developed in order to incorporate the findings more specifically.

The study is summarized in Chapter V. Conclusions related to course content and conclusions related to methodology are stated. Some recommendations for the future extension of the course in anatomy and physiology, as well as recommendations for further application of the critical incidents technique to nursing education research, are made.

In the appendices are included a sample of the form used by observers to record incidents and examples of incidents reported by the various observers.

CHAPTER II

THE DEVELOPMENT OF COLLEGIATE PROGRAMS IN NURSING

Types of Programs in Nursing Education

In nursing education there are two general types of programs, the basic and the advanced. The advanced program is designed for graduates of basic programs who wish to secure some specialized type of professional work, such as teaching, supervision, public health or administration.[1] Basic nursing education refers to the pre-service education of nurses and includes those programs through which a student prepares to enter the field of nursing.[2] There are two types of basic professional curricula. One is the diploma program, a three year course of study, usually conducted by a hospital school of nursing. Successful completion of such a course, followed by state licensure, entitles these students to affix the letters R.N. after their signatures.[3] The second type of program is the basic professional degree program. The degree granted may be the regular academic degree, the B.A. or the B.S., or it may be a professional degree such as the B.S. in Nursing.[4] The student

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[1]Loretto E. Heidgerken, Patterns of Basic Professional Curricula Leading to Degrees in Nursing, Proceedings of the Workshop on Administration of College Programs in Nursing, The Catholic University of America (Washington: 1944), p. 45.

[2]Jean A. Curran and Helen L. Bunge, Better Nursing, A Study of Nursing Care and Education in Washington (Seattle, Washington: University of Washington Press, 1951), p. 81.

[3]Loc. cit.

[4]Heidgerken, op. cit., p. 46.

who earns a degree must also be licensed by the state before being permitted to practice professionally.

The basic degree program is conducted under the auspices of an institution of higher education and combines a general education or a liberal arts education with a professional education. The general or liberal arts education of students of nursing is usually referred to as the pre-professional or pre-clinical phase of educational experience, while professional education is termed the clinical phase of supervised educational experience.[1]

This study is concerned with one aspect of the pre-professional educational experience in the basic professional degree program leading to the degree of Bachelor of Science in Nursing, under the auspices of the College of Nursing at Wayne University located in Detroit, Michigan.

The Association of Collegiate Schools of Nursing

The Association of Collegiate Schools of Nursing was established in 1933 by a number of collegiate schools that had come into existence prior to this time. The purpose of this association was "to develop nursing education on a professional and collegiate level, to promote and strengthen relationships between schools of nursing and institutions of higher education, and to promote study and experimentation in nursing service and nursing education."[2] In stating its requirements for active

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[1]Curran and Bunge, loc. cit.

[2]Nellie X. Hawkinson, Problems of Collegiate Schools of Nursing Offering Basic Professional Programs, prepared by the Committee on Educational Problems in Wartime (New York: National League of Nursing Education, 1790 Broadway, 1945), p. 3.

membership in the Association of Collegiate Schools of Nursing, the organization indicated the essential characteristics of collegiate schools. Such schools, whether they offer programs on the basic or advanced levels, are owned and controlled by or closely associated with a college or university. Their faculties have the same status as other faculty members in the college or university, and their curricula are approved and directed by the educational institution, leading usually to a degree of the college or university.[1]

The Effects of World War II Upon Nursing Education

During World War II demands for nursing personnel increased, not only for military service and for regular service to the civilian population, but most critically for qualified teaching personnel to prepare larger classes of students of nursing. From 1941 to 1943 student admissions to schools of nursing rose from 38,113 to 49,169, an increase of thirty per cent. The total number of students in 1,304 state approved schools on January 1, 1943 was 100,486 as compared with 87,588 on January 1, 1941.[2]

In June of 1943, the Congress of the United States passed legislation, creating the Cadet Nurse Corps, which stimulated the recruitment of students of nursing and assisted students and schools of nursing financially.[3]

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[1] Ibid., p. 18.

[2] Isabel M. Stewart, R.N., A.M., The Education of Nurses (New York: The Macmillan Co., 1943), p. 289.

[3] Loc. cit.

It was also during these war years that the trend toward collegiate schools of nursing was markedly accelerated. One factor which increased the trend was the decreased enrollment in many colleges and universities. These institutions were interested in enlarging enrollments as well as in making an active contribution to war service.[1] As the recruitment program progressed, it became increasingly evident that applicants and their parents were indicating a preference for schools of nursing which could offer the advantages of a college education.[2]

Although the number of collegiate schools of nursing increased during World War II, this was not the first time such schools had been proposed, nor were they the first collegiate programs in nursing. Among the earliest programs to become associated in some way with institutions of higher learning were those established at the University of Texas, 1897; Teachers College, Columbia University, 1899; the University of Minnesota, 1909; and the University of Cincinnati, 1916.[3] In 1923 nursing education had been evaluated by Josephine Goldmark in Nursing and Nursing Education in the United States. This report stated that the first fundamental to better nursing education was the development and strengthening of university schools of nursing.[4]

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[1] Ibid., p. 290.

[2] Loc. cit.

[3] Gladys Sellew and C. J. Nuesse, A History of Nursing (St. Louis: The C. V. Mosby Co., 1951), pp. 294-295.

[4] National Committee for the Improvement of Nursing Services, Nursing Schools at the Mid-Century (New York: 1790 Broadway, 1950), p. xiii.

With the accentuated interest in collegiate programs, the impetus given to recruitment by the Cadet Nurse Corps, and the shortage of qualified nurse teachers, many schools of nursing sought aid from universities, colleges and junior colleges in an effort to release their instructors from the teaching of the natural and social sciences. The Committee on Curriculum for the National League of Nursing Education, in considering the problems of nursing education, stated in 1944: "We can use lay science teachers to teach the natural and social sciences."[1] This idea was reiterated by Ruth P. Kuehn in 1951, with the statement: "Every effort must be made to utilize non-nurse instructors in all types of nursing schools to supplement nurse teachers."[2]

The Role of the Natural Sciences in Nursing Education

In nursing education the natural sciences are usually referred to as the basic sciences. These include anatomy, physiology, physics, chemistry and microbiology. The term "basic" is used because these sciences supply much of the functional information the student of nursing must have about the human body and its physical environment, prior to beginning professional courses.[3] The chief emphasis is on the understanding of the fundamental facts and principles of these sciences as they relate to

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[1]National League of Nursing Education, "Problems of Acceleration," Fiftieth Annual Report (New York: 1790 Broadway, 1944), p. 166.

[2]Ruth P. Kuehn, R.N., "Nurse Power in Mobilization," The American Journal of Nursing, Vol. 51, No. 6 (June, 1951), p. 397.

[3]International Council of Nurses, Basic Education of the Professional Nurse, prepared by the Committee on Education (London: 19 Queen's Gate, 1949), p. 33.

normal conditions of health in the human being.[1] If students are to become able professional nurses, this foundation in the basic sciences is necessary in order to perform intelligently and effectively in caring for patients.[2]

In the area of the basic sciences of anatomy and physiology, the problem for the science instructor who is not oriented to the professional phases of nursing education, becomes one of determining the "fundamental facts and principles of these sciences" most essential to students of nursing. The Committee on Educational Problems in Wartime, of the National League of Nursing Education, stated, in 1945: "It has become more and more apparent that sound and satisfactory progress can be made only as all groups concerned have an understanding of the purposes of this type of professional education, of the conditions under which it can best be developed, and of the problems involved."[3]

Dr. Margaret Bridgman in her recent publication, Collegiate Education for Nursing, also emphasizes that not only must nurse instructors be well informed about the specific knowledge students are expected to have, but academic faculty also are better able to contribute to nursing education if the aims and methods of the professional program are understood.[4]

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[1] Loc. cit.

[2] Margaret Bridgman, Collegiate Education for Nursing (New York: Russell Sage Foundation, 1953), pp. 29-30.

[3] Hawkinson, op. cit., p. v.

[4] Bridgman, op. cit., p. 138.

Nursing As A Profession--Aims and Methods of Education

Reports submitted about nursing education since 1945 indicate that collegiate programs are being recommended even more strongly for nursing. During 1948 two significant reports were published. They both reviewed the situation in nursing from the standpoint of the inadequate number of nurses in proportion to the ever increasing demands on the part of the public for nursing services. The Murdock report and the Brown report emphasized the growing need for nurses with better educational preparation as medical sciences continue to be developed and as health facilities for the people of the United States continue to be increased. Both reports defined the "professional nurse" and recommended policies for the future education of students of nursing.

The Murdock Report is the work of a special committee of five physicians headed by Dr. T. P. Murdock, appointed by the president of the American Medical Association to study the nursing problem in the United States. In June, 1948, the committee reported to the American Medical Association House of Delegates. Statistics were quoted from the United States Department of Labor, which indicated that 550,000 nurses would be required to care for the people of this country in 1960, if standards of nursing were to be maintained. It was estimated that there was a shortage of 200,000 nurses at the time the report was made.[1]

Under the heading which related to the proposed education for nurses in the future, the Murdock committee stated: "We recommend two main

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[1]T. P. Murdock, Report of Special Committee on Nursing to the American Medical Association House of Delegates (Chicago: June, 1948), p. 1. (Reprint of report on file)

classes of nurses, (A) professional nurses and (B) trained practical nurses." The committee defined these classes as follows:

(A) Professional Nurses

> This group is to be divided into (a) nurse educators; (b) clinical nurses. (a) Nurse educators are to be those with collegiate training and others who have shown aptitude for teaching, administration and supervisory positions. The training of these nurses should be collegiate training before entering the nursing field, or combined collegiate and nursing training. (b) The clinical nurse is to be comparable to the present day general duty or private duty nurse. Selected clinical nurses with an aptitude and ability for teaching may well be considered for some subordinate teaching positions.[1]

(B) Trained Practical Nurses

> Your committee feels that this group of trained practical nurses (one year of training made up of three months theoretical and nine months practical training), under proper supervision of professional nurses and medical staff, will be able to do much of the routine bedside nursing now being done by professional nurses, but that the more delicate and intricate duties must be left to the professional nurse.[2]

The Brown Report, entitled Nursing for the Future, prepared by Dr. Esther Lucile Brown, Director of the Department of Studies in the Professions, Russell Sage Foundation, states:

> The basic appeal of nursing to women has until recently served the needs of the United States well; it is still serving them to a surprising degree. It is not, however, capable of producing the large numbers of nurses demanded, and large reliance can scarcely be placed in it for the future, with opportunity elsewhere so greatly expanded, unless both nursing practice and nursing education are profoundly reconstituted.[3]

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[1] Ibid., p. 2.

[2] Ibid., p. 3.

[3] Esther Lucile Brown, Nursing for the Future, A Report Prepared for the National Nursing Council (New York: Russell Sage Foundation, 1948), p. 54.

It is recommended by the Brown Report that the term "professional," when applied to nursing education, be restricted to schools that are able to furnish professional education. Professional schools in most other fields have already come within degree-conferring institutions to such an extent, that possession of a degree is fast becoming a criterion of an individual's having received a professional education as contrasted with having received a vocational training. Schools which can meet certain defined standards should be designated as "accredited professional schools."[1]

In the Fifty-fifth Annual Report published by the National League of Nursing Education in 1949, the following statement affirms Dr. Brown's belief:

> To raise nursing to a higher peak in professionalism, we need to strengthen the academic structure of our schools. We should like to see more basic nursing schools set up as autonomous departments in universities. . .but we do not have enough well qualified faculty to staff such schools.[2]

Dr. Brown recommended further that the term "professional," when applied to nurses, be restricted to those who have been graduated from schools designated as professional; or whose right to be thus considered has been demonstrated through some system of examination; achievement that has been evaluated objectively, such as marked excellence in clinical practice; supervision, administration, teaching or scientific

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[1] Ibid., p. 77.

[2] Helen C. Goodale, R.N., Secretary for the National Committee for the Improvement of Nursing Services, "National Planning for Nursing," Fifty-fifth Annual Report (New York: National League of Nursing Education, 1790 Broadway, 1949), p. 227.

research and writing; admission to fellowship in an academy of nurses; or by means of other plans devised to raise the status of nursing.[1]

In 1950, the National Committee for the Improvement of Nursing Services, studied schools of nursing in the United States and in its published report, Nursing Schools at the Mid-Century, stated that if nursing services were to be improved, the improvement of nursing education was an essential to better nursing services. The committee further agreed that improvement in nursing education could be secured only with the cooperation of health professions and allied lay groups.[2]

In 1951 additional surveys were made of the status of nursing education and nursing services. One report stated that "the most serious shortages exist in the administrative, teaching and supervisory positions which require collegiate education--both general and professional."[3] It was estimated that by 1954 the civilian population would reach 155,000,000, an increase of 5,000,000 over the census figure for 1950. To care for this population increase alone, ten thousand more nurses would be needed in 1954 than in 1950. As of 1951, it was estimated that there would be a total deficit of 49,500 nurses by 1954, unless admissions to schools of nursing could be increased.[4]

That the enrollments in collegiate programs have grown is indicated by an increase in the number of students from 5,475 in 1947 to 10,921 in

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[1]Brown, op. cit., p. 77.

[2]National Committee for the Improvement of Nursing Services, op. cit., p. xv.

[3]Kuehn, op. cit., p. 396.

[4]Ibid., p. 397.

1952; or from 5.1 per cent in 1947 to 10.7 per cent in 1952.[1] Latest available figures for the 1953 enrollments in programs leading to the Baccalaureate Degree show a total of 12,549 students or 12.3 per cent of the total number of students enrolled in basic programs.[2]

In an article published by Nursing Outlook in November, 1953, Lucile Petry Leone reemphasizes that an increase in enrollment of students of nursing should be greater in the basic degree programs for two reasons:

> 1. There is a need for more nurses who have a scientific background, particularly in the social sciences, to care for patients whose treatment comes under the expanding concepts of modern medicine.
>
> 2. The basic degree program offers a better basis for graduate education.[3]

A review of nationally accredited nursing programs made by the National Nursing Accrediting Service, which was organized in 1949, and which in 1952 became the Accrediting Service of the National League for Nursing, indicates that there has been an increase in nationally accredited basic diploma programs from 123 in 1949 to 176 in November of 1953. There was an increase of fully accredited basic collegiate programs from thirty in 1949 to fifty-three in November of 1953. Of the basic diploma programs in 1953, seventeen were under the control of a college or university.[4]

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[1]American Nurses' Association, Facts About Nursing--A Statistical Summary (New York: 2 Park Avenue, 1952), p. 49.

[2]National League for Nursing, "Student Enrollment in 1953," Nursing Outlook, Vol. 1, No. 11 (November, 1953), p. 636.

[3]Lucile Petry Leone, "National Nursing Needs--A Challenge to Education," Nursing Outlook, Vol. 1, No. 11 (November, 1953), p. 617.

[4]Accrediting Service of National League for Nursing, Executive Committee on Accreditation Policies, Development in Accrediting Service Since 1949, Committee Report (New York: National League for Nursing, 2 Park Avenue, 1953), pp. 1-3.

For an effective educational program in which continuity and sequence of learning experiences are essential, it is imperative that the experiences of students in the pre-clinical sciences provide them with the necessary facts, principles and concepts which can then be broadened and deepened in their application to patient care.

Members of departments of the physical and biological sciences as well as members of departments of sociology and psychology will need to learn from professional nurses the nature of the nurse's responsibility in patient care, to have some understanding of the hospital situation in which students practice, in order to understand more fully what their role is in the education of students of nursing.[1]

This study explores the area of anatomy and physiology from this point of view, with the assumption that the course content at the present time does not meet the needs of students of nursing. If the assumption is true, it is expected that this study will indicate the changes which must be made in order to strengthen the course for the purposes of nursing. Evaluations such as this have frequently been stressed for the content of nursing courses. This idea is well summarized by the following statements:

> Every faculty member should study her own course or courses in relation to content and method of teaching. Non-essential content should be eliminated. Subject matter should be modified to meet existing needs; in some instances this may mean the addition of material. The pre-clinical term is the keystone of the entire program of the basic nursing curriculum.[2]

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[1]Bridgman, op. cit., p. 138.

[2]Nellie X. Hawkinson, Chairman, Committee on Educational Problems in Wartime, More About Curriculum Acceleration, Bulletin No. 3 (New York: National League of Nursing Education, 1790 Broadway, 1943), p. 1.

Wayne University College of Nursing

This study has been made with the encouragement of the Dean of the College of Nursing of Wayne University, the cooperation of the faculty of the College and the students enrolled in the basic professional program. The College of Nursing was established as an autonomous unit of Wayne University by the Detroit Board of Education in October, 1944. The College began to function as such during the spring semester of 1945. The College of Nursing is the culminating result of a program of study originally developed in the Nursing Department of the College of Liberal Arts. This department was formed in 1931 as the result of a request made in 1930 by the Detroit Council on Community Nursing to the Board of Education. Two member agencies of the Detroit Council on Community Nursing, the Bureau of Nursing of the Detroit Health Department and the Visiting Nurse Association had developed in-service educational programs for their staff nurses. The Council requested that Wayne University conduct these programs of education in order to make them available to all nurses employed in the Detroit area. The College of Liberal Arts recognized the program as a professional major and established the degree of Bachelor of Science in Nursing.

In 1932 a five-year program was developed for beginning students of nursing, in cooperation with two of the local hospital schools of nursing. Students studied for two years on the Wayne University campus, preparing to enter clinical practice. The three following years were spent in one of the two hospitals affiliated with the program as students engaged in clinical practice. During World War II the program was accelerated to

forty-eight months and continued to follow this plan until 1947 when the University became responsible for the entire program.

At the further request of the Detroit Council on Community Nursing and the College of Liberal Arts, the Board of Education authorized a reorganization of the Department of Nursing as a separate College of the University. This change was made in 1945. The advanced program in nursing has continued and has expanded since that time. The basic degree program has come to be entirely controlled by the College of Nursing since 1947. Facilities of other colleges of the university are utilized for academic subjects, while the professional subjects are taught by members of the College of Nursing faculty. Arrangements have been made with selected hospitals and health agencies for clinical practice fields under the supervision of the College of Nursing staff members. The total time now required for completion of the program is forty-four months. The basic program, leading to the degree of Bachelor of Science in Nursing is nationally accredited by the Accrediting Service of the National League for Nursing.[1]

Statement of the Problem

This study is made by a science instructor in the Biology Department of the College of Liberal Arts, Wayne University. The instructor is responsible for teaching anatomy and physiology as a combined course, to students enrolled in the basic professional nursing program.

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[1]Historical Account of the College of Nursing at Wayne University, published by the authority of the Board of Education, Detroit, Michigan, from the Wayne University Bulletin, College of Nursing Catalog, Vol. 31, No. 8 (April 15, 1953), pp. 12-14, and from James Ross Irwin, Wayne University--A History (Detroit: College of Education, Wayne University, 1951), pp. 338-339. (Unpublished Ed.D. Dissertation)

It is contended that while the present content of this course meets some of the needs of these students, there are certain areas which require more emphasis, some which possibly require less emphasis, and some areas now omitted which should be included. Since the science instructor is not oriented to clinical practices in nursing, this study investigates the clinical practice area for the purpose of determining the application of the science of anatomy and physiology in patient care.

This study, in revealing the uses of anatomy and physiology in the clinical situation, determines the basis for a revision of the content of the course, in order that the principles, concepts and functional information of the course may be applied more effectively by students of nursing in supervised professional practice.

CHAPTER III

HISTORY OF THE DEVELOPMENT OF THE NURSING CURRICULUM

Studies concerned with nursing education and the curriculum for nursing education have been made from time to time during the years nursing has been in the process of becoming a recognized profession in the United States.

Periods of Development

A span of eighty years, since schools of nursing were first established in the United States, may be divided into four periods, each consisting approximately of twenty years in duration. The first period from 1873 to 1893 was a period of pioneering.[1] Although sporadic attempts to establish schools reflected the spread of nursing prior to this time, largely through the influence of the Civil War, the feminist movement of the nineteenth century and the influence of the Quakers, progress was slow. It was not until after the Civil War that schools were established which could train nurses in sufficient numbers to be of significance in health and welfare programs.[2] The schools founded during this period were organized in municipal, voluntary and charitable hospitals.[3] While

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[1]Isabel M. Stewart, Chairman, Committee on Curriculum, A Curriculum Guide for Schools of Nursing, 2nd Rev. of 1st Edit. (New York: National League of Nursing Education, 1790 Broadway, 1937), p. 3.

[2]Gladys Sellew and C. J. Nuesse, A History of Nursing, 2nd Edit. (St. Louis, Missouri: The C. V. Mosby Co., 1951), p. 282.

[3]Isabel M. Stewart, "An Essential Step in the Reconstruction of Nursing Education," American Journal of Nursing, Vol. 35, No. 1 (January, 1935), p. 58.

the educational structure for nursing service was not systematic, at this time, it was during this early stage of development that there gradually was recognized the need for a more organized program of instruction.[1]

During the second stage of development of nursing in the United States, from 1893 to 1913, hospital facilities expanded at a rapid rate as more hospitals were built. Schools of nursing also increased in number since most of these hospitals developed and controlled their own schools.[2] The great issue of the period became one of attempting to standardize admission policies and programs of instruction. Because of the wide divergence in schools and the exploitation of student nurses, nursing leaders of the period organized to set up some legal controls to support educational standards.[3]

In 1893, forty superintendents of nurses representing leading schools in the United States and Canada, formed "The American Society of Superintendents of Training Schools for Nurses." The major purpose of this organization, which in 1912 was renamed "The National League of Nursing Education," was to establish and maintain a universal standard of training.[4] Another organization, "The Nurses' Associated Alumnae of the United States and Canada," formed in 1896, and later in 1911, renamed

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[1]Isabel M. Stewart, Chairman, Committee on Curriculum, A Curriculum Guide for Schools of Nursing, 2nd Rev. of 1st Edit. (New York: National League of Nursing Education, 1790 Broadway, 1937), p. 3.

[2]Ibid., p. 4.

[3]Isabel M. Stewart, The Education of Nurses (New York: The Macmillan Co., 1944), p. 129.

[4]Ibid., pp. 139, 147.

"The American Nurses' Association," was influential in these early efforts to regulate the standards of nursing schools.[1] Canadian members in both of these organizations withdrew to form their own organizations shortly after the beginning of the twentieth century.[2] A third organization which directed its efforts toward the elevation of standards for the profession of nursing was "The National Organization of Public Health Nurses," founded in 1912.[3]

Some improvements were made under the influence of nursing organizations and their leaders, through the inauguration of state nursing-practice legislation. Legal controls began in 1903 and by 1913 twenty states had enacted laws governing the education of nurses and the practice of nursing.[4]

Although many improvements were seen by the end of this second period in the development of nursing in the United States, such as: changes in admission standards; lengthening of the course of study; improvements in programs of instruction; improvements in teaching personnel and methods of teaching; and improvements in facilities for teaching; neither schools of nursing nor the nursing group as a whole had reached a secure professional status.[5]

Between 1913 and 1933, the period regarded as the third phase of development of nursing in the United States, it became evident that if

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[1] Loc. cit.

[2] Sellew and Nuesse, op. cit., p. 297.

[3] Loc. cit.

[4] Stewart, The Education of Nurses, op. cit., p. 140.

[5] Ibid., p. 184.

nursing were truly to become a profession, it would be necessary to raise the standard of educational experience for students of nursing to the plane of other recognized systems of professional education. A start in the direction of formulating desirable objectives, standards and content of nursing education was made in 1914 by the Education Committee of the National League of Nursing Education, with the construction of The Standard Curriculum for Nursing Schools, published in 1917.[1]

The purpose of the study was to overcome the wide diversity of standards then existing in schools of nursing, through bringing about greater uniformity in programs, the content and quality of teaching. Curricula of the more outstanding, registered schools of nursing were reviewed. This survey showed that there was practically no uniformity in curricula even among the better schools. The Education Committee decided to develop an optimum curriculum for schools that were ready to improve their programs on a voluntary basis. Optimum standards were interpreted as meaning the best that could be reached under existing conditions in those schools having reasonably good facilities. Standards were also considered in terms of the best current nursing practices and the qualities and preparation required to meet local and national demands for nursing service.[2]

The Standard Curriculum for Nursing Schools was influential in bringing about greater uniformity and better balance in nursing curricula. In spite of the fact that the Education Committee intended that the

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[1]Stewart, A Curriculum Guide for Schools of Nursing, op. cit., p. 4.

[2]Stewart, The Education of Nurses, op. cit., pp. 221-222.

volume serve only as a guide, schools generally interpreted the word "standard" as meaning "required," and looked upon the Curriculum as a model to be copied rigorously.[1]

Within a few years after the publication of The Standard Curriculum for Nursing Schools, the more progressive schools of nursing were ready to improve their curricula beyond the recommendations made, and in 1927 the revised edition was published. The revision was entitled the Curriculum for Schools of Nursing, the word "standard" being omitted because of previous misinterpretation of the meaning of the word. The curriculum was broadened to include the elements of public health nursing; psychology was included as an essential rather than as a recommended subject; psychiatric and communicable disease nursing were more prominently featured.[2]

Some attempt to approach the revision study scientifically was made at this time, in that a job analysis technique was employed, which outlined the functions and qualifications of a nurse in terms of the job.[3]

The fourth period of nursing in the United States may be considered as having its beginning in 1933, and continuing to the present time. It is during this period that many changes have taken place in the philosophy of nursing education. It became obvious during the unemployment crisis of the years of the depression, as more facilities for public welfare developed, that nursing, along with other professions of a welfare nature,

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[1] Ibid., p. 223.

[2] Loc. cit.

[3] Stewart, The Education of Nurses, op. cit., p. 225.

must redefine its aims. In 1937 the Curriculum for Schools of Nursing was revised for the second time and published under the title, A Curriculum Guide for Schools of Nursing. The Curriculum Committee of the National League of Nursing Education emphasized that the publication was, in essence, a guide, and not a fixed, standardized curriculum schools of nursing were rigidly required to follow.[1] The term "guide" was interpreted to mean a general curriculum plan, the purpose of which was to assist faculties of the various schools of nursing in the construction of their own curricula.[2]

The overall aim of nursing education was defined as being an aim of adjustment. The content of the curriculum was based upon theory and practice which would help students make adjustments to situations they would be expected to meet as graduate nurses. Increased attention was given to the social sciences in order to further the development of this aim.[3]

The work of revision was a cooperative undertaking under the direction of the Curriculum Committee of the National League of Nursing Education. Approximately two hundred nurses, and fifty doctors, as well as librarians, dietitians, social workers and representatives of other professional groups participated in the actual revision. In addition some seven hundred study groups, involving about three thousand members distributed throughout the nation, shared in the discussion and criticism of

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[1]Sellew and Nuesse, op. cit., p. 335.

[2]Stewart, The Education of Nurses, op. cit., p. 257.

[3]Sellew and Nuesse, op. cit., p. 335.

bulletins published during the three-year study of the curriculum for nursing.[1]

It is generally conceded that the approach to the study of the curriculum, which culminated in A Curriculum Guide for Schools of Nursing, was more scientific than the previous studies dealing with curriculum. Before the content outlined by the second revision was suggested several studies were made for the purpose of analyzing the kinds of nursing activities involved in the hospital, home and community; disease conditions; personnel relationships; knowledge, skills, and attitudes essential to nurses for successful adjustment in varied situations. Having defined the objectives of nursing education, content and the methods for achieving the objectives were outlined.[2]

Since 1937 no further revision of the curriculum has been made. Although it was the intention of the Curriculum Committee of the National League of Nursing Education to review the curriculum for nursing education at ten-year intervals, the changes in the status of nursing during and since World War II indicated the inadvisability of revising the guide as of 1947. Leaders in the profession of nursing deemed it wise to study carefully the direction in which nursing must move in order to keep pace with the rapid developments in medical science and the growing number of auxiliary nursing personnel in terms of their supervision by professional nurses who, because of increased health services to the public were represented by insufficient numbers.[3]

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[1]Stewart, The Education of Nurses, op. cit., pp. 256-257.

[2]Ibid., pp. 259-260.

[3]Department of Services to Schools of Nursing, Curriculum Bulletin No. 1, Nursing Organization Curriculum Conference (New York: National League of Nursing Education, 1790 Broadway, 1950), p. 1.

The fact that nursing services have changed quite markedly in the years since the last revision of the curriculum guide was accomplished in 1937, is indicated by Lucile Petry Leone in a recent article published in Nursing Outlook. Besides an increased "quantitative" demand for nursing services there has also been an increased "qualitative" demand for these services. The latter call for a broader educational background for students of nursing. The quality of nursing has changed in view of changes which have occurred in the field of medicine, namely the psychosomatic approach to varied illnesses, the newer concept of the "stress theory" in relation to the adrenal gland, the methods of treating certain pathological conditions which have stemmed from atomic research, the development of new instruments--all requiring nurses to have more scientific knowledge and understanding. Nursing is also broader in its focus as a result of the growing emphasis in the field of human relations, rehabilitation, geriatrics and the increased scope of public health and industrial nursing.[1]

Because of these factors, a group of nursing leaders representing all of the national professional nursing organizations as well as different sections of the United States, was appointed by the National League of Nursing Education to discuss the problems as they related to nursing education and nursing services. The plan of the study consisted of group discussions by the appointed representatives. The chairmen of the committees and sub-committees concerned with the curriculum for nursing education met in conference in December of 1949.[2]

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[1]Leone, op. cit., p. 616.

[2]Department of Services to Schools of Nursing, op. cit., p. 2.

The Planning Committee for the conference suggested that it was not the purpose of the conference to revise the curriculum for nursing education, but rather that of discussing what should be done about nursing education for the future in view of the current problems.[1]

The published report of the conference was based upon reports submitted from the various group discussions dealing with the different phases of nursing. The individuals participating, contributed to the discussions from their experience within their specific situations, and suggested some solutions to the problems confronting nursing education. It was decided by the conference that the work done should be viewed as an initial stage in curriculum revision and not as an actual working stage in curriculum construction.[2]

A second conference, held in 1950, followed the same general procedure for considering changes in the nursing curriculum. The conference recommended that a single detailed, national curriculum guide for all schools not be developed at the time because it would not be the most effective way of meeting the present situation in nursing education. Rather, the group suggested that a series of publications, similar to the report of the second conference, and articles published in professional journals, could serve as guides for the development of the new curriculum for nursing education.[3]

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[1] Ibid., p. 3.

[2] Ibid., p. 114.

[3] Department of Services to Schools of Nursing, Curriculum Bulletin No. 2, Joint Nursing Curriculum Conference (New York: National League of Nursing Education, 2 Park Avenue, 1951), p. 49.

Recent Studies of the Nursing Curriculum

Some recent studies concerned with nursing education have been published in Nursing Research, a new journal first appearing in June, 1952. Judging from the number of abstracts of various studies, and reports of studies in progress, which have been printed, growing interest in the field of research for nursing is indicated. In an editorial entitled "The Time Is Late," which appeared in the February issue of 1953, Helen L. Bunge, Chairman of the Editorial Board for Nursing Research, stated that schools of nursing and other related organizations must develop systematic studies and experimentation if nursing education is to be strengthened, but that in order to accomplish this, it would be necessary to interest greater numbers of nurses in research and to assist them in securing the preparation needed for such research studies.[1]

One area of research considered essential and outlined by Miss Bunge is somewhat pertinent to this study. This area is that of identifying the specific content in nursing and also the identification of the content derived from academic and allied professional fields which may be applied to nursing.[2]

In Collegiate Education for Nursing, Dr. Bridgman suggested that there is no one pattern to be recommended for collegiate schools of nursing, because each institution possesses resources, organization and requirements indigenous to itself. However, it is her belief that general content and arrangement must be determined through the joint action of

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[1] Helen L. Bunge, "The Time Is Late," Editorial, Nursing Research, Vol. 1, No. 3 (February, 1953), p. 3.

[2] Loc. cit.

nursing and academic faculties if the best education for all groups is to be obtained. Thus, conferences or the use of other research methods, in order to promote mutual understanding between the two faculties, must be the basis for determining content.[1]

With interest in research increasing on the part of professional nurses, several research projects are currently in progress, or have recently been completed. Those of special interest in relation to this study are reviewed. Two of the studies are broader than the area of the natural sciences with which this study is concerned. The other two studies reviewed have particular bearing upon the physical and biological sciences. Underlying these studies is the expressed philosophy that the biological and physical sciences are not only fundamental to the practice of nursing, but are also essential for the well educated person of today, if each individual is to understand the world of life in which he lives and to assume the responsibilities of citizenship.[2]

The University of Washington Study

One of the major studies currently in process is being made at the University of Washington, under the direction of Dr. Ole Sand, Associate Professor of Education on leave from Wayne University. The study is a cooperative action research project involving the entire faculty of the school of nursing. The faculty is being assisted by an advisory committee consisting of twelve members representing the medical profession, the

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[1]Margaret Bridgman, Collegiate Education for Nursing (New York: Russell Sage Foundation, 1953), p. 137.

[2]Marie Farrell, Research Reporter, Nursing Research, Vol. 2, No. 2 (October, 1953), p. 93.

nursing profession and the public interest.[1] The study, proposed as a five-year project, is attempting to determine the most effective instructional program in basic nursing education that will prepare the student as a professional nurse in the shortest possible time.[2]

The distinctive features of the University of Washington study concern the definition of objectives of the School of Nursing and the relation of the basic sciences to clinical experiences. In addition to faculty members and the other individuals referred to as participating in the study, students are also participating through student curriculum committees. Research plans include the following:

1. Learning experiences provided for students are being studied to make sure they are meaningful, satisfying, varied and related to the objectives.

2. A study of continuity, sequence and integration of learning experiences is planned, in order to avoid unnecessary duplication.

3. Organization of learning experiences is planned around the patient as a person in order to increase student motivation and understanding.

4. Weaving interpersonal relations as a thread throughout all the courses will be more effective in developing this behavioral change than setting up a separate course in interpersonal relations.

5. An organized in-service education program for clinical faculty members will improve student motivation and learning.

6. The examination of available evaluation devices in terms of the re-defined objectives will result in some useable instruments to be administered periodically in the experimental program.

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[1]Ole Sand, "Research Grant Awarded University of Washington School of Nursing," Nursing Research, Vol. 2, No. 1 (June, 1953), p. 43.

[2]Ole Sand, "Recommendations in Nursing Study Carried Out in Research Program," Washington State Journal of Nursing, Vol. 25, No. 9 (November, 1953), p. 8.

7. The construction of some new evaluation devices including paper-and-pencil tests, observation guide sheets, interview guide forms, questionnaires, faculty and student logs, will result in useable devices for the evaluation of the experimental program.

8. Mental hygiene and public health concepts can be woven throughout all courses.[1]

Some changes in the curriculum plan have already been made. Two such changes are pertinent to this study. One deals with the distribution of the basic sciences over several quarters at the same time students are having clinical nursing experiences. The second change is the development of an integrated course which includes the psychological, physical, sociological, anthropological and economic aspects of human development.[2]

The Boston University Study

A second study of importance to nursing education has been made at the Boston University School of Nursing. Basic sciences have been synthesized into one course entitled "Human Ecology." This course is in the testing stage at this time and was first offered to students in the fall of 1953. In this course the personal and professional growth of students, as well as the general and cultural objectives of science have been taken into consideration. The course is concerned with the function of science in the professional practice of nursing.[3]

The method of research employed for the Boston University School of Nursing study was that of surveying the science courses offered by five

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[1]Sand, op. cit., p. 12.

[2]Sand, op. cit., p. 13.

[3]Farrell, loc. cit.

comparable collegiate schools of nursing to determine a reasonable number of hours for the course; to select and validate content by analyzing the content of various texts pertaining to anatomy and physiology, chemistry, physics, microbiology, medical science and pathology; and to study the content of course outlines in these sciences from various collegiate programs. In addition, an analysis of nursing activities was made for 146 medical, surgical and obstetric patients, based upon nursing procedures, laboratory procedures and medications ordered by physicians. Besides determining content for "Human Ecology," investigation was made, and continues to be made, in relation to the methods and techniques of teaching the course.[1]

The course in "Human Ecology" is designed with the intent of employing the teaching method of problem solving; the problem to be selected from the immediate situation which directly involves health needs. As the course progresses, it is expected that problems will emerge from the environment, the solution of the problems requiring the application and integration of the scientific principles gained from the course.[2]

The Niagara University Study

A third study made at the Niagara University College of Nursing, Niagara Falls, New York, dealt with two problems: (1) a critical analysis of the principles of the biological and physical sciences associated with the functioning of the human body as a whole, and (2) the

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[1]Eleanor Page Bowen, R.N., "Synthesis of the Biological Sciences," Fifty-Seventh Annual Report (New York: National League of Nursing Education, 2 Park Avenue, 1951), pp. 271-275.

[2]Ibid., p. 276.

significance of the relationship existing between these principles and postoperative nursing procedures involved in the care of patients suffering pathologies of the vagina, the uterus, the ovaries or the uterine tubes.[1] The sciences to which the study had reference were anatomy and physiology, principally, and sections of chemistry, cytology, hematology, neurology and physics as they relate to the specific structure and function of the organs mentioned. Nursing activities observed were those relating to: (1) the organization and management of treatments provided for the well-being of the patient; (2) the diagnostic and therapeutic measures in which the nurse assists the physician or carries out procedures directed by him. The hypothesis underlying the Niagara University study was: (1) if principles of the biological and physical sciences could be compiled into a list of generalized statements, and (2) if the actual nursing activities within the clinical field could be determined and listed, then, by critically analyzing the relationships between the principles and the activities investigated, conclusive evidence would be shown as to which principles of these sciences were fundamental to the attainment of the objectives toward which the nursing activities were directed.[2]

The methodology consisted of a tabulation of principles and activities to determine the relationship between these two variables. A checklist of postoperative nursing activity was kept on a woman's surgical

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[1]Sister M. Jerome Kelliher, R.N., "Analysis of the Principles of the Biological and Physical Sciences Based on Nursing Activities," Fifty-Seventh Annual Report (New York: National League of Nursing Education, 2 Park Avenue, 1951), p. 282.

[2]Loc. cit.

unit in a general hospital having a 250 bed capacity, for a two-month period. The actual scientific principles selected and listed were those of anatomy and physiology, classified according to cellular activities, and the circulatory, muscular, respiratory and nervous systems. A list of postoperative activities was classified under the following headings:

(1) A_1 General Nursing Activities--carried on within twenty-four hours following surgery

(2) A_2 General Nursing Activities--carried on during convalescence

(3) B Postoperative Nursing Activities pertinent to the pathology under investigation[1]

The following equation was devised to show the relationship between the two variables:

$NS = N:A_1 :: SP:A_2$ [2]

Where:

NS = Nursing Science
N = Nursing
A_1 = Activities
SP = Scientific Principles
A_2 = Application

It was assumed that a student giving postoperative care to a patient having a specific pathology must know what to do for the patient and why and how it is done, in order to determine which scientific principle formed the basis for the activity and how the activity stemmed from the principle.[3]

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[1] Kelliher, op. cit., p. 283.

[2] Loc. cit.

[3] Kelliher, op. cit., p. 285.

The D'Youville College Study

A similar study was made in connection with the one cited above, at D'Youville College, School of Nursing, Buffalo, New York. The study was concerned with the scientific principles as they relate to the nursing activities performed by student nurses involved in the care of adults recovering from surgical treatment of the gastrointestinal tract. A check-list was developed with regard to the nursing activity and the scientific principles underlying the activity. The data were tabulated similarly to the foregoing study cited.[1]

A scientific principle was defined as "an underlying generalization which has been substantiated by controlled observation and management."[2] The principles were selected from course material pertinent to the science of anatomy and physiology and from textbooks basic to its instruction. The nursing activity check-list was developed from direct observation of the professional tasks performed.[3]

While the abstracts from the two latter studies do not clearly indicate by whom the check-lists were developed, it is assumed that clinical instructors were involved in selecting the scientific principles and in observing student performance. Whether use was made of the "critical incidents" technique developed by Dr. John C. Flanagan in

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[1]Sister Francis Xavier Lynch, R.N., "A Critical Analysis of the Biological and Physical Sciences Based on Postoperative Nursing Activities Concerned with Pathological Conditions of the Gastrointestinal Tract," Fifty-Seventh Annual Report (New York: National League of Nursing Education, 2 Park Avenue, 1951), pp. 285-289.

[2]Ibid., p. 287.

[3]Loc. cit.

reporting student performance is not indicated. Nevertheless, these recent studies imply that professional nurses recognize the need for conducting such content research if the sciences considered basic to nursing are to be taught effectively to students, as well as applied effectively in caring for patients.

A Curriculum Improvement Study

Another study reported in Nursing Research in October of 1952, evaluates and analyzes the general function of nursing in two ways:

The Nurse	The Job
What the nurse "is"	What the nurse "does"
Abilities	Activities
Qualities	Procedures, tasks [1]

Participation in the study was confined to nurses. From a list of one hundred items suggested by nurses as to "what the nurse does," a check-list of nine general abilities or qualities was developed. Questionnaires based upon the check-lists were sent to schools of nursing, in which professional nurses were asked: "Should basic professional programs provide learning experiences tending to develop these qualities?"

Ability 1. Practices throughout the range and within the limitations of nursing responsibility in problems of health care. Uses discriminating judgment in border-line regions between the activities of nurses and those of physicians, social workers and nutritionists.

Ability 2. Uses sound judgment in sharing nursing tasks with others, such as co-workers or family members.

Ability 3. Demonstrates skill in human relationships which is based upon a desire to be helpful and is made

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[1] Mary R. Shields, "A Project for Curriculum Improvement," Nursing Research, Vol. 1, No. 2 (New York: 2 Park Avenue, October, 1952), p. 4.

useful by an understanding of human needs and the ways in which people try to fill them.

Ability 4. Understands the scientific basis of currently accepted nursing principles and carries responsibility for the improvement of nursing care and service. Uses creative imagination enriched by useful knowledge and disciplined by scientific method.

Ability 5. Plans and gives nursing care based upon clinical experience and knowledge directed toward filling patients' needs.

Ability 6. Performs the technical, manipulative aspects of nursing procedures smoothly and skillfully.

Ability 7. Assumes responsibility for the promotion of health and the prevention of disease and accidents. Is a health teacher.

Ability 8. Carries responsibility for contributing to the welfare of the community, including contributions in off-the-job situations.

Ability 9. Behaves in accordance with a satisfying philosophy which includes goals of personal maturity and professional growth.[1]

Conclusions reached as a result of the study suggested that the next step should be the determination of expected levels of proficiency upon completion of the basic professional program and that participation should be broadened--the people who are nursing must work with people who are teaching nursing.[2]

Selection of Course Content of Anatomy and Physiology for the Wayne University College of Nursing

The course content of human anatomy and physiology for the basic collegiate program at Wayne University, was based upon the 1937

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[1] Ibid., p. 24.

[2] Ibid., p. 31.

Curriculum Guide for Schools of Nursing as a result of joint conferences of professional nurse and science instructors. The last joint conference was held in the spring of 1949, at which time the content was reviewed. The major suggestion arising out of this meeting was that more time should be allocated to the study of the autonomic nervous system, but neither the reasons for this nor the specific points of emphasis were clarified.

It is from this conference, the first in which the writer participated, that the idea for this study had its beginning. The thought occurred at the time that if the science instructor were not only made aware of the actual content to be included, but why such content had special significance for nursing and how it was applied in nursing, a much more effective course could be developed. Some attempt was made on the part of the science instructor to evaluate the course from the standpoint of its effectiveness or ineffectiveness, by talking individually with instructors of nursing. Primarily, the approach was that of asking these instructors what the students had not been taught that they then had to teach before being able to proceed with instruction for nursing practice. While some generalized answers to the problem were obtained, it was seen that more specific answers were required if students were to receive as broad a base as possible of the scientific principles involved, in the time allotted for instruction in anatomy and physiology.

Consequently, as the science instructor reviewed the various research techniques which might lend themselves to a study of this problem, the "critical incidents" technique designed and developed by Dr. John C. Flanagan, Director of the American Institute for Research, Pittsburgh,

Pennsylvania, seemed to be a more specific approach to the problem, provided that the technique could be adapted satisfactorily for this purpose.

Review of the Critical Incidents Technique and Its Applications

The critical incidents, critical behavior or critical requirements technique, as it has been variously termed, is relatively new as a development in research. The major feature of the technique centers around the philosophy that the systematic collection and analysis of factual information is a more reliable source of data than that which is based upon impressions, opinions or estimates.[1]

Basically the technique consists of an analysis of descriptions of observed, crucial behavior or performance of individuals on the job or in the area being studied. Dr. Flanagan has defined the critical requirements for an activity as: "those that are crucial in the sense that they have frequently been observed to make the difference between success and failure in that activity."[2]

Critical incidents are descriptions of what people actually do, which are unusually effective or ineffective in accomplishing some task. Such incidents provide objective and specific data, which are less dependent upon the guesses, opinions or general impressions of the observer.[3]

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[1]A. S. Barr, B. A. Davis and P. O. Johnson, Educational Research and Appraisal (Chicago: J. B. Lippincott Co., 1953), pp. 60-61.

[2]John C. Flanagan, Director, American Institute for Research, A Report of Three Years Experience (Pittsburgh: American Institute for Research, 413 Morewood Avenue, September, 1950), p. 3.

[3]Loc. cit.

The experience of those who have adopted the critical incidents technique as a method of research indicates that the following conditions must be satisfied if the results obtained are to be valid results:

1. It is essential that actual observations be made of the on-the-job activity and the product of such activity.

2. The aims and objectives of the activity must be known to the observer if the observer is to identify the success or failure.

3. The basis for the specific judgments to be made by the observer must be clearly defined. The data can be objective only if all observers follow the same rules or criteria.

4. The observer must be qualified to make judgments regarding the activity observed.

5. The reporting must be accurate. The principle problems are those of memory and communication. It is also important that the observer's attention be directed to the essential aspects of the behavior being observed.[1]

The procedure for collecting data consists of asking a group of people who are participating in some specific activity to write the answer to two questions. The questions are framed so as to elicit responses from those individuals reporting, of both successful and unsuccessful behavior in a given situation. The group reporting is usually informed orally about the purpose of the study and the nature of the incident desired.[2]

It is highly essential that an activity be adequately defined to the observers. For this reason the two extremes of behavior (i.e., success

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[1]Barr, Davis and Johnson, op. cit., pp. 61-62.

John C. Flanagan, "Critical Requirements: A New Approach to Employee Evaluation," Personnel Psychology, Vol. 2, No. 4 (Winter, 1949), pp. 421-422.

[2]Flanagan, A Report of Three Years Experience, op. cit., p. 4.

or failure) are chosen as a basis for reporting the behavior. It has been found that those who are to submit reports are more objective in their observations and, therefore, more accurate in their reporting, if incidents describing the two extremes of behavior are recorded.[1] Incidents are determined by an actual study of individuals engaged in the activity. The observers are asked to describe what the person did in terms of successful or effective, unsuccessful or ineffective behavior.[2]

Usually forms are prepared for the observers upon which they write the incidents they are reporting. Dr. Flanagan's experience has shown that the first incidents reported by inexperienced observers, must be examined carefully in order that suggestions about the adequacy of description and selection of the incidents may be made to the observers. Careful guidance at this stage further clarifies what is expected of the observers.[3] It also has been the experience of this writer that early guidance in the writing of incidents for this study resulted in more objective reporting on the part of those concerned with the recording of incidents. Some of the incidents first reported tended to be based more upon personal opinion, rather than upon an accurate description of what actually happened or upon what the person being observed actually did. Once it was clearly understood that an exact description of success or

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[1]John C. Flanagan, "Critical Requirements: A New Approach to Employee Evaluation," op. cit., p. 422.

[2]John C. Flanagan, "Evaluating Individual Effectiveness and Determining Critical Requirements," Educational Record, Vol. 28, (January, 1947), pp. 80-81.

[3]John C. Flanagan, A Report of Three Years Experience, op. cit., p. 4.

failure in the situation was all that was required, reports of incidents submitted were more concise and accurate descriptions of performance.

Dr. Flanagan has found the critical incidents method of reporting data to be effective in obtaining information about performance from supervisors with respect to their subordinates, from subordinates with respect to their supervisors, from participants with respect to co-participants and from individuals concerning their own performance.[1]

For the purpose of this study, three types of observers report incidents related to student performance: (1) the science instructor, making the study, (2) clinical instructors, who teach and supervise students, and (3) students of nursing.

Another device Dr. Flanagan has found to be helpful is the evaluation and classification of incidents at the time of observation. This necessitates an alertness on the part of the observer to determine, at the time of occurrence, what the incident was and whether it involved effective or ineffective performance. A mental note is made of the incident as it occurs and is recorded as soon as it is possible for the observer to do so after it occurs.[2]

As the critical incidents method of research has been applied in varying situations, it has been found that time could be saved through the preparation and use of a complete observational record form which contained practically all of the types of incidents which were likely to

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[1]Flanagan, "Evaluating Individual Effectiveness and Determining Critical Requirements," op. cit., p. 81.

[2]Flanagan, "Critical Requirements: A New Approach to Employee Evaluation," op. cit., p. 423.

be observed. Thus, incidents may be reported by checking the appropriate type in the space provided.[1]

Since it could not be predetermined for this study what incidents might possibly occur, it was not possible to prepare so detailed a form as is suggested by the foregoing. It was possible, however, to prepare a form which all observers could use, and which indicated the clinical areas in which the incident occurred, as well as the particular system of the human body involved in the incident. Space for categorizing the incident as to the effectiveness or ineffectiveness of performance is also provided.

After the incidents are collected each is identified and the data are classified into tentative major categories. Numerous incidents may then be successively reduced to a smaller number of descriptive headings in a system of classification. Identical incidents are generally combined and are considered as separate categories. Closely related incidents of behavior are then grouped into suitable categories and a description of each of these groups is prepared. In basic groups which constitute the actual critical requirements, the effective and ineffective incidents are combined separately. Each critical incident is a brief description of either effective or ineffective behavior. The category heading may then be grouped into "components" which are summarized

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[1]John C. Flanagan, Address at the Annual Meeting of the American Educational Research Association, Educational Record, Vol. 28 (April, 1947), p. 146.

into areas and sub-areas. The area and sub-area headings are designed to cover both effective and ineffective behavior.[1]

It has been found that lengthy and detailed descriptions of behavior are of little value. The data are more useful if each specific incident has been evaluated and classified. Studies which have used the critical incidents technique indicate that the simplest type of summary is the numerical score. The numerical scoring of the data is generally preferred where appropriate. In some instances a profile, summarizing performance in some of the major areas is desirable. For other purposes, detailed records may be preferred. Whatever summary of data is decided upon depends upon the use made of the data.[2]

Some studies have made use of the Chi-square technique for the statistical analysis of data. Chi-square values may be computed for the differences between the number of incidents contributed to each category by the two elements (effective or ineffective behavior) of each independent variable. In some studies the total Chi-square (the sum of Chi-squares computed for all areas and sub-areas) for either the effective or ineffective data of a given variable, which exceeded the one per cent level of confidence, was considered a rejection of the null hypothesis for that variable.[3]

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[1] R. B. Finkle, "A Study of the Critical Requirements of Foremanship," Abstract of A Doctoral Dissertation, University of Pittsburgh Bulletin, Vol. 46, No. 10 (June 5, 1950), p. 4.

[2] John C. Flanagan, "Principles and Procedures in Evaluating Performance," reprinted from Personnel (March, 1952) by permission of the American Management Association, New York (Pittsburgh: American Institute for Research, 1952), p. 384.

[3] Finkle, op. cit., pp. 5-6.

The critical incidents technique has been used successfully in a number of situations. One of its first uses was in establishing critical requirements for United States Air Force officers. It was found that the content of training courses was likely to be much less effective than could reasonably be expected unless it was based upon a systematic analysis of the requirements for which the training was intended to prepare the individual. Most of the defects of training programs were not related to inefficient learning situations, but in training individuals for the wrong tasks. The early study showed that the fundamental basis for determining what should be learned must be based upon a thorough analysis of the requirements of the activity for which the courses were designed to fit the individuals.[1]

The procedure has been used in determining the critical requirements for research workers in scientific laboratories. In this instance, experienced supervisory personnel were asked to provide a description of the incidents.[2] These studies began with a recording of behaviors, the development of a check-list, a test for selecting research personnel, and finally, procedures for the evaluation of research personnel with a performance record of critical incidents.[3]

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[1]John C. Flanagan, "Contribution of Research in the Army Air Forces to Educational Policy," Educational Record, Vol. 28 (January, 1947), p. 86.

[2]Flanagan, "Critical Requirements: A New Approach to Employee Evaluation," op. cit., p. 424.

[3]Mary H. Weislogel, The Development of A Test for Selecting Research Personnel (Pittsburgh: American Institute for Research, January, 1950), pp. 1-31.

The technique has also been applied to hourly wage workers in industry, the incidents being described by foremen from which critical requirements for the job were developed.[1]

Other studies in which the critical requirements of performance have been determined have included transport pilots,[2] airline pilots,[3] air route traffic controllers,[4] private pilots,[5] and air crews.[6]

Under the direction of Gertrude Mauk, a forced-choice supervisory performance report was developed within the Chrysler Corporation, Detroit, Michigan. The purpose of Miss Mauk's study was to develop a valid and reliable forced-choice rating, based upon critical incidents of performance, which could be used to discriminate between effective and ineffective supervisors.[7]

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[1]Finkle, op. cit., pp. 1-7.

[2]Harley O. Preston, Analysis of Civil Aeronautics Records on Airline Transport Pilots, Washington Civil Aeronautics Administration, Division of Research, Report No. 42, 1947.

[3]Thomas Gordon, The Airline Pilot, A Survey of the Critical Requirements of His Job and of Pilot Evaluation and Selection Procedures, Washington Civil Aeronautics Administration, Division of Research, Report No. 73, 1947.

[4]John A. Nagay, The Development of A Procedure for Evaluating the Proficiency of Air Route Traffic Controllers, Washington Civil Aeronautics Administration, Division of Research, Report No. 83, 1949.

[5]John A. Nagay, A Report of Progress on the First Steps in the Development of A Procedure for Measuring the Proficiency of Private Pilots, (Pittsburgh: American Institute for Research, 1950).

[6]Ralph F. Wagner, Development of Standardized Procedures for Defining the Requirements of Air Crew Jobs in Terms of Testable Traits, Washington Civil Aeronautics Administration, Division of Research, Report No. 93, 1950.

[7]Gertrude Mauk, The Development of A Forced Choice Supervisory Performance Report Within A Large Automotive Corporation, Dissertation Abstract (Detroit: College of Education, Wayne University, 1951). Unpublished Ed.D. Dissertation.

Dr. Flanagan believes that the critical incidents technique can be applied in defining the objectives of education. In an address delivered at the annual meeting of the American Educational Research Association in March, 1947, he stated: "The first step in developing educational objectives in a systematic definition of the problem, including a tabulation of the types of adult activities in which educational organizations are attempting to insure successful participation." This step must be followed by the development of crucial requirements for the activities defined.[1]

Besides determining the critical requirements for the activity which are based upon the differences between success and failure, the critical requirements once identified, lead to the preparation of a criterion measure of success in the activities. In addition, if the requirements of an activity can be stated in terms of measurable traits, such as aptitudes and abilities required of the individual in order to achieve successful performance of the activity, the analysis will provide the "immediate basis for the development of measures of proficiency and knowledge for use in determining educational content and methods."[2]

In 1950 Dr. Flanagan again addressed the annual meeting of the American Educational Research Association; discussed the critical requirements approach to educational objectives and reported projects which had made

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[1]John C. Flanagan, From An Address at the Annual Meeting of the American Educational Research Association, op. cit., p. 140.

[2]Ibid., p. 148.

progress, especially with regard to professional education.[1] At that time a study was in progress to determine the critical requirements for instructors in elementary psychology.[2]

While addressing the Seventieth Educational Conference under the auspices of the Educational Records Bureau and the American Council on Education, Dr. Flanagan, in October of 1952, suggested that the critical incidents technique could be applied to determining the teacher's knowledge of individual students, academically and non-academically. Such studies would be centered upon student-teacher observation and records, and upon the analysis of written materials.[3]

A further application of the critical incidents technique as a research method has been made in the field of dentistry. A study completed in 1950 by Ralph F. Wagner, represents a preliminary investigation of the requirements critical to effective participation in the profession of dentistry. Incidents were obtained from patients, dentists and instructors in dental schools, describing effective and ineffective behavior. Conclusions indicated that the requirements for effectiveness in dentistry are complex; that they are not confined alone to the demonstration of

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[1]John C. Flanagan, "The Critical Requirements Approach to Educational Objectives," School and Society, Vol. 71, No. 1849 (May, 1950), pp. 321-324.

[2]Flanagan, "A Report of Three Years Experience, op. cit., p. 10.

[3]Elizabeth K. McCann, "Critical Incidents Technique and Related Procedures," College of Education Models and Designs of Educational Research, (Detroit: Wayne University, 1952). (Report based upon a personal interview with Dr. John C. Flanagan and Richard L. Krumm at the American Institute for Research, 410 Emerson Avenue, Pittsburgh 32, Pennsylvania, 1952, p. 3.)

technical proficiency, but that there are non-technical behaviors dealing with the relationships of patients of particular importance as well.[1]

The critical incidents technique has also been applied by the Educational Testing Service to guide the evaluation of an experiment in medical education. Recently a new General Medical Clinic was established at the Denver General Hospital. Agencies which cooperated in establishing the clinic were the University of Colorado Department of Medicine, the Denver Department of Health and Hospitals, with the aid of the Commonwealth Fund. The purpose of the clinic is to provide medical care for indigent patients and clinical education for third and fourth year medical students. Special emphasis is placed on comprehensive and continuous medical care rather than upon the relief of specific clinical symptoms. The Educational Testing Service was asked to cooperate with the Department of Psychology of the University of Colorado in devising means for evaluating the new program. The principal objective of the program was to produce "good doctors," but it was seen that this was too general to serve as an adequate basis for evaluation.[2]

To answer the questions, "what is a good doctor, what does he do and what does he avoid doing," twenty-four outstanding physicians in Denver were interviewed and were asked to recall specific incidents in the practice of medicine they had strongly approved or condemned. The incidents

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[1]Ralph F. Wagner, "A Study of Critical Requirements for Dentists," Abstract of A Doctoral Dissertation, University of Pittsburgh Bulletin, Vol. 46, No. 10 (June, 1950), pp. 1-9.

[2]Paul B. Diederich, "Critical Incidents Technique Applied to Medicine," ETS Developments (Princeton, N. J.: Educational Testing Service, October, 1952), pp. 1-2. (Mimeographed)

were recorded during the interview. Classification of the incidents yielded six main categories: doctor-patient relationships; relationships with other members of the medical profession; concern for community health problems and use of community resources; relationship of medicine to government; personal ethical behavior; and basic knowledge and technical competence. From these major categories a check-list is being developed upon which any incident of these types, observed in the clinic, can be recorded at the close of the clinical session. The record of effective or ineffective behavior in dealing with patients is the basic criterion against which other measures will be validated.[1]

Procedures of research related to the critical incidents technique have developed from the technique since the founding of the American Institute for Research in 1948. In brief, some of these related procedures may be listed as follows:

1. Test Development Techniques - Systematic procedures for preparing detailed specifications for guidance test items have been developed, in order to measure the various aspects of an activity as defined in terms of the critical requirements for the activity. It is believed that it will be possible to develop hypotheses about the type of test items which will predict success and satisfaction on the specific job being studied.[2]

2. Educational and Training Techniques - Use of the critical incidents technique has been made in studying both educational objectives and instructional behavior. Test development procedures for determining proficiency have specific application to problems of educational measurement.[3]

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[1] Ibid., pp. 3-5.

[2] Flanagan, A Report of Three Years Experience, op. cit., pp. 5-6.

[3] Ibid., p. 6.

3. Techniques for Proficiency Measurement - These techniques refer to the evaluation of performance on a standardized task which is set for the individual for measurement purposes. Several problems are related to proficiency measurement:

   a. The problem of what aspect of the job to measure. The proficiency test should be based on those aspects of the job, which, on the basis of systematic studies, appear crucial.

   b. The problem of remembering and reporting. It is proposed that check-lists be used during the performance of a task rather than after the task has been performed, in order to minimize the unreliability of memory for recording observations.

   c. The problem of objectivity in observing and describing performance. Objectivity can be improved through the use of pictorial and diagrammatic aids, quantitative data and precise descriptions.

   d. The problem of uniformity in standards of performance. Standards should be made the same for everyone by having the items specify the standards to be met.

   e. The problem of defining the task for the person tested. By discussing the test with the examinee the examiner can inform the examinee about the exact points to be covered and how they will be scored.

   f. The problem of acceptability of the procedures to the examinees. Acceptability can be obtained by enabling the examinee to know whether or not he is performing well on the test. Because the procedures are objective, the record of the examination should agree with the observation of the examinee.[1]

4. Performance Evaluation Techniques - The basic principles involved are: definition of the activity based upon observations of incidents, systematic observation of performance, and the evaluation, classification and recording of the observations in terms of effectiveness or ineffectiveness of performance.[2]

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[1] Ibid., pp. 6-8.

[2] Ibid., pp. 8-9.

5. Techniques Regarding Group Activities - The primary development in this area has centered around the development of techniques for defining and evaluating leadership, in terms of obtaining descriptions of leadership activities concerned with specific acts.[1]

Adapting the Critical Incidents Technique for this Study

For the purposes of this study the critical incidents technique has been adapted somewhat differently. Observations of successful or unsuccessful performance are recorded, the crucial requirements of success or failure being based upon the observee's familiarity with the principles of human anatomy and physiology, or their lack of familiarity with these principles.

Students of nursing apply the scientific principles of anatomy and physiology, learned during the pre-professional phase of educational experience, to the clinical situation during the professional phase of educational experience. It is assumed that if students of nursing have an adequate background preparation in the principles of anatomy and physiology, as well as in the other basic sciences essential to nursing, the activities in which they engage in professional practice will be more meaningful and ultimately result in better nursing services for patients. Conversely, it is assumed that if students are not familiar with these principles prior to professional educational experiences, nurse instructors will have to assume the added responsibility of teaching these principles before being able to proceed with teaching the nursing sciences.

While it has previously been indicated that attempts have been made, and are currently being made to integrate or to synthesize the sciences

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[1] Ibid., p. 9.

basic to nursing education, the studies at the University of Washington and Boston University are on a much broader scale than this study. In these two studies all of the basic sciences are included in the research and the cooperative effort of many more individuals is involved. The writer, as the science instructor responsible for teaching human anatomy and physiology to students of nursing enrolled in the basic collegiate program at Wayne University, limited this study to anatomy and physiology, since it is this specific content with which the writer is directly and particularly concerned.

This study was further limited to the principles of anatomy and physiology as they apply to nursing arts, medical and surgical nursing, pediatric nursing and obstetric nursing. It is expected that these areas will yield the critical requirements related to essential preparation in the principles of anatomy and physiology, through the observation of effective or ineffective performance of students based upon their familiarity or unfamiliarity with the principles.

The term "preparation" is limited to the content presented in anatomy and physiology. Several variable factors should be mentioned as having possible relationships to the recording of incidents by clinical instructors, students and the science instructor:

1. The content presented and retained by the student.
2. The content presented but not retained by the student.
3. The ability of the student to apply the content retained.
4. The inability of the student to apply the content retained.

In this connection, the incidents reported are critically analyzed by the science instructor on the basis of content included in the present course

requiring more, or less emphasis, content which could be omitted, and new content to be included in the revision of the course.

Through determining the crucial requirements of nursing for the sciences of anatomy and physiology as they relate to professional practice, it is assumed that the results of this study will contribute to the further development of the curriculum of the Wayne University College of Nursing.

CHAPTER IV

ANALYSIS OF FINDINGS

Course Content of Anatomy and Physiology 1947-1954

Content of the present course in anatomy and physiology is based upon the recommendations made in A Curriculum Guide for Schools of Nursing,[1] with the approval of the Wayne University College of Nursing faculty members, meeting in conference with faculty members of the Biology Department of the College of Liberal Arts. The present course outline was developed in 1947.

The last joint conference was held in the spring of 1949. At this time, the outline was reviewed, but no changes were made. The major suggestion arising from the conference was that of giving greater emphasis to the autonomic nervous system.

The outline of content for the course in anatomy and physiology, in use since the fall semester of 1947, is included in this discussion for two purposes: (1) familiarizing the reader with the subject matter of the course, and (2) making comparisons between the present content and the revised content. The revised outline of content is based upon the findings of this study and is subject to the approval of the Curriculum Committee of Wayne University College of Nursing faculty.

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[1]Isabel M. Stewart, Chairman, Committee on Curriculum, The National League of Nursing Education, A Curriculum Guide for Schools of Nursing (New York: American Book-Stratford Press, Inc., 1937), pp. 143-154.

Currently the content of the course in anatomy and physiology is presented in one semester, the students meeting for two one-hour lecture periods per week, two two-hour laboratory periods per week, and one one-hour quiz period per week. Four hours of university credit are granted for the course.

The following outline of lectures and laboratory assignments lists the major divisions and sub-divisions of the content currently included in the course in anatomy and physiology. This outline is used as the basis for revision of the course.

Outline of Lectures and Laboratory Assignments, 1947

Unit I. The Body As A Whole

A. Definitions of anatomy, physiology, vertebrate plan, body regions, system, organ, tissue, functional unit.

B. Discussion of cell theory, cell structure, physiology and chemistry of protoplasm, metabolism, osmotic equilibria, cell membranes, cell size, diffusion.

C. Kinds of tissues: connective (areolar, adipose, liquid, reticular, elastic and white fibrous) cartiliage, bone (structure, growth, repair).

Unit II. Skeletal System

A. Cartilagenous and membranous bone, ossification, fontanels of the skull, sinuses, growth in length of bone, rickets, joints, bursae, movements of skeleton, sprain, dislocation, fracture.

Unit III. Integration and Control of the Body

A. The Nervous System
The neuron, simple reflex arc, nerve impulse
Definition of nucleus center, ganglion
Spinal cord, spinal nerves, membranes

B. Autonomic nervous system

C. Central nervous system
Functions of parts of brain and spinal cord

D. Physiology and functioning of the nervous system as a whole

E. General and special senses: taste, smell, touch, pressure, proprioceptors, eye, ear

F. Muscles
Microscopic anatomy of striated, smooth, cardiac muscle tissue; physiology of contraction, motor units, all or none law, tonus, incomplete and complete tetanus. Chemistry of muscle contraction, oxygen debt, heat production, symphony of movement, bony levers and muscle attachment.

Unit IV. Maintaining the Metabolism of the Body

A. The Circulatory System

Blood--functions, characteristics, quantity. Description of erythrocytes, hemolysis, count, length of life. Polycythemia, anemias. White cells--type, movement, phagocytes, lymphocytes, origin, action, leucopenia. Blood platelets, composition of blood plasma, blood clotting.

Anatomy of heart--flow of blood through the heart, action of S.A. and A.V. nodes; physiology of heart action, rates, sounds. Cardiac cycle, automaticity, action of vagus and thoracic sympathetic nerves on the heart. Factors affecting rate and strength of beat. Disorders of heart--rheumatic fever.

Discussion of arteries and capillaries, veins--general structure. Vaso-motor nerve center in medulla. Factors in maintenance of blood pressure. Chemical factors and nervous regulation of blood flow and pressure.

B. The Respiratory System

Respiration. Physiology of respiratory membrane. Nasal cavities, pharynx, larynx, vocalization, trachea, bronchi, lungs, pleura. Physiology of respiratory movements, action of thoracic muscles, diaphragm, inter-pleural pressures.

Regulation of respiration. Respiratory center in medulla. Action of phrenic, intercostal and vagus nerves. Effects of carbon dioxide on respiratory center. Reflexes. Capacity of lungs; respiratory rates. Types of respiration. Composition of inspired and expired air. Transport of blood gases.

C. The Digestive System

General description of mouth, tongue, salivery glands, teeth, pharynx, esophagus, stomach, small intestine, colon, caecum, appendix, rectum, liver, portal circulation, functions of liver, gall bladder, pancreas.

Hydrolysis of carbohydrates, fats, proteins. Enzymes. Control of flow of digestive juices.

Nervous, mechanical and chemical factors affecting flow of gastric juice, bile, intestinal juice, pancreatic juice. Movements of alimentary tract. Absorption of food. Selective permeability, cellular work. Cathartics.

D. The Excretory System

Functional unit of kidney. Blood supply of kidney. Formation and composition of urine. Urinary bladder. Micturition.

Skin and its derivatives. Regulation of body temperature.

E. Metabolism

Carbohydrates, fats. Conversion of foods. Caloric values of foods. Basal metabolism.

F. Endocrine System

Structure and function of thyroid, parathyroids, thymus. Structure and function of adrenal cortex and medulla. Pituitary gland, anterior and posterior lobes. Insulin.

Unit V. Reproduction

Structure and function of male reproductive system. Origin and structure of spermatozoa. Male sex hormone.

Structure and function of female reproductive system. Ovulation. Menstruation. Female sex hormones and relation to cyclic phenomena.

Spermatogenesis, oogenesis, fertilization, sex determination, morula, blastula, origin of primitive streak and germ layers (ectoderm, mesoderm, endoderm), derivatives from germ layers. Later development--amnion, chorion, placenta. Parturition.

Laboratory

First Week

Instructions on use and care of microscope
Study of typical cell
Study of selected types of tissues, epithelial, connective
Methods of cell growth

Second and Third Weeks

Study of the structure of bones, cartilage and joints, both gross and microscopic. Demonstrate fresh bones and joints. Preserved materials and slides

Study of the bones of the skeleton, using both disarticulated and articulated bones.

Students are expected to identify the major bones of the cranium, face, trunk, girdles and extremities; the major sutures, ridges, processes, sinuses of the skull should be noted. Foetal skull studied for fontanels.

All major joints, symphyses and articulating surfaces of the skeleton should be studied.

Vertebral column should be analyzed for regions, numbers and types of vertebrae.

Different types and numbers of ribs.

Names of carpal and tarsal bones, except calcaneus and talus, may be omitted.

Fourth and Fifth Weeks

Dissection of brain of sheep
Study of model of human brain with cranial nerves

Microscopic study of cross section of mammalian spinal cord.
Demonstrate reflexes in frog and man
Dissection of beef eye

Sixth to Eighth Weeks

Muscles--microscopic anatomy, striated, smooth, cardiac.

Muscles--gross anatomy. Identify the following muscles, observing their origins, insertions, actions. Locate in cat and find same muscles on human charts and model.

Abdominal muscles--external oblique, internal oblique, rectus abdominus.

Chest muscles--pectoralis major and minor, serratus anterior, intercostals, sterno-cleido-mastoid.

Muscles of mastication--masseter, temporal, digastric.

Muscles of the back--latissimus dorsi, trapezius, rhomboideus, splenius, sacrospinalis.

Muscles of shoulder and upper arm--deltoid, supraspinatus, infraspinatus, subscapularis, teres major, biceps brachii, brachialis, triceps brachii.

Muscles of the lower extremities--gluteus maximus and medius, tensor fascia lata, sartorius, gracilis, biceps femoris, semimembranosus, semitendinosus, quadriceps femoris (rectus femoris, vastus lateralis, medialis and intermedius) adductor longus and femoris, gastrocnemius.

Diaphragm

Ninth and Tenth Weeks

Dissection of the major arteries, veins, hepatic-portal system and heart of cat according to the directions given.

Study of the beef heart--fresh specimen.

Comparison of cat circulation and beef heart with human circulation and heart from charts and models.

Demonstration of circulation in living frog web.

The blood--red cell count, estimation of hemoglobin (Tallquist). White cell count.

Eleventh through Thirteenth Weeks

Respiratory system--dissection of respiratory system of cat and comparison to human models and charts. Microscopic study of lung tissue. Chest measurements and respiratory sounds. Demonstration of bell-jar model of respiratory system.

Digestive system--dissection of digestive system of cat and comparison to human model and charts. Microscopic study--stomach, duodenum, liver, pancreas. Demonstration of digestive action of saliva.

Urinary system--dissection of kidneys, ureters and bladder of cat and comparison to human model and charts. Microscopic study of kidney units.

The skin--microscopic study of section of mammalian skin compared with microscopic study of section of human skin.

Endocrine glands--microscopic study of thyroid, pituitary, adrenal, Islets of Langerhans.

Fourteenth to Sixteenth Weeks

Dissection of female reproductive system of cat and comparison to human model and charts.
Dissection of male reproductive system of cat and comparison to human model and charts.
Microscopic study of testes and ovaries.
Embryology--study of human embryos and foetal forms, preserved.

The writer was not involved in selecting and planning the sequence of content listed in the foregoing outline, having become a member of the staff of the Biology Department (College of Liberal Arts, Wayne University) in 1948, after the outline was developed. Although the writer had questioned the sequence of some of the items included in the content, and

believed that some items of content essential to nursing were being omitted, the question of revision did not arise until after the conference with College of Nursing faculty, held in 1949. In 1950, after having attempted to revise the course, basing the proposed revision upon discussions with individual members of the faculty of the College of Nursing, it was seen that more conclusive research was necessary. The plan of using the critical incidents technique as the method of research developed. This study was designed and formal research was begun in the fall of 1952.

Plan of Procedure for Revision of Content

Planning with Clinical Instructors

In discussing the plan of research to be followed with members of the College of Nursing faculty, it was suggested by this group that the clinical nursing areas of nursing arts, general medical and surgical nursing, pediatric nursing and obstetric nursing be surveyed. By consensus it was thought that all of the functional systems of the human body, studied in anatomy and physiology, would be reviewed in these areas. It was thought unnecessary, by the group, to include the nursing sciences involved with pharmacology, psychiatry or public health, because anything relating to anatomy and physiology in these areas would, in all probability, have been reviewed previously.

Pediatric nursing was included because the review of the nervous system is divided between general medical and surgical nursing and pediatric nursing in the College of Nursing curriculum. In general medical and surgical nursing, the anatomical and physiological review of the

nervous system is focused upon the central nervous system. In pediatric nursing review concentrates upon the autonomic nervous system.

In nursing, the sciences of anatomy and physiology, as well as the other sciences basic to nursing, taught during the pre-professional phase of educational experience, are reinforced through an extension of the teaching and integration of these sciences during the professional phase of educational experience.[1] Review of the structure and function of the various systems usually precedes the introduction of students to nursing practices or procedures related to patient care. For example, at Wayne University, the instructor in nursing arts makes use of a pre-test to determine the amount and kind of review needed, prior to teaching skills or techniques related to caring for patients with pathological disorders connected with the various systems.

For the purpose of this study, the term "clinical instructor" is used to denote the professional nurse, who is a member of the Wayne University College of Nursing faculty, and who teaches the arts, techniques and nursing sciences related to patient care. The clinical instructor also supervises students of nursing as they engage in the practice of caring for patients.

The term "science instructor" is used to identify the writer, who, as an instructor in the Biology Department of the Wayne University College of Liberal Arts, teaches anatomy and physiology to students of nursing during the pre-professional phase of educational experience.

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[1]Stewart, op. cit., p. 144.

The science instructor discussed with the clinical instructors, the general purpose of this study--that of attempting to determine as specifically as possible the most effective course content for anatomy and physiology in order to provide students with a more functional base upon which to build professional nursing experiences.

The method to be employed for the collection of data was explained and the details for recording critical incidents of successful or unsuccessful performance related to students' preparation in, or familiarity with, anatomy and physiology, were discussed. Observations of incidents could be derived from several sources:

1. Classroom performance--Incidents derived from a review of previously acquired information, concepts and understandings of the normal structure and function of the human body, and discussion of their application to pathological conditions requiring nursing care.

2. Nursing care performance--Incidents based upon observation of the students engaged in the actual care of patients, determined by the student's understanding and application of the principles of anatomy and physiology.

3. Case conference performance--Incidents based upon observation of student performance during case conferences in which specific patients are selected for study. Students present a detailed report of the patient, case history, condition, treatment, to which scientific principles are applied.

In connection with patient care, part of the responsibility of the nurse is that of teaching the patient according to the patient's need for instruction. In some cases the nurse must undertake the teaching of

personal hygiene to the patient; in other cases the nurse must instruct the patient or some member of the patient's family in carrying out simple techniques involved in nursing care in the patient's home; in some instances the nurse must interpret the physician's orders for the patient. Frequently, explanations to the patient will center around the principles of the basic sciences, and the nurse must be able to present the material in clear and meaningful terms.[1]

In adapting the critical incidents technique for the purposes of this study, successful or unsuccessful performance is interpreted to mean the student's familiarity or unfamiliarity with the fundamental principles of anatomy and physiology. Familiarity is further defined as the student's possession of functional information, concepts and understandings of the principles related to these sciences. Unfamiliarity is further defined as that content not included in the present course in anatomy and physiology, or that content, which, through lack of emphasis, is not retained by the student.

The clinical instructors who participated in the study were asked to record incidents describing performance of students indicating inadequate preparation in anatomy and physiology; as well as those incidents showing adequate preparation in these sciences.

During the early conferences with the participating clinical instructors, it was explained that in addition to obtaining critical incidents from their observations, students would also participate in the same manner, recording incidents through observance of their own

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[1]Mildred M. Montag and Margaret Filson, Nursing Arts, Second Edition (Philadelphia: W. B. Saunders Co., 1953), pp. 246-251.

individual performance in the classroom, in practice and in case conferences. The science instructor's observations were to be limited to the classroom and case conferences. Lack of orientation to nursing practice made it impossible for the science instructor to discriminate between successful or unsuccessful performance in this area.

Possible Outcomes Suggested

Clinical instructors, in discussing methodology with the science instructor, suggested possible outcomes regarding the occurrence of incidents. The group predicted that the greatest number of incidents would be obtained from nursing arts, for two reasons. In nursing arts students have their first experiences with nursing practice and with applying the principles of the basic sciences, including anatomy and physiology, to pathological conditions. Secondly, review of these sciences is more extensive in nursing arts since basic nursing techniques learned, tend to implicate more of the systems of the human body than other, more specialized areas of nursing.

In medical and surgical nursing, while considerable review transpires, and applications of scientific principles are made, it was assumed that fewer incidents would arise because of previous review in nursing arts.

By the time students have professional experiences in pediatric and obstetric nursing, they have had considerable nursing practice, and are more accustomed to making application of scientific principles. In addition, review of anatomy and physiology is concerned with fewer systems. In pediatric nursing, review is primarily concentrated upon the autonomic nervous system. In obstetric nursing the endocrine and reproductive

systems are stressed. It was assumed, therefore, that fewer incidents would be reported from these two areas of nursing than from nursing arts and medical and surgical nursing.

Other predictions made by the clinical instructors and the science instructor, prior to beginning this study, were that incidents involving the muscle-nervous system and the endocrine system would occur more frequently than incidents involving other systems; and that incidents concerned with the skeletal and digestive systems would occur less frequently than incidents concerned with other systems.

Largely, these assumptions were based upon the previous experience of clinical instructors with students in each of the four clinical areas selected for study. Their statements indicated that it was necessary for them to spend more time in reviewing the muscle-nervous system and the endocrine system than any other systems; and less time in reviewing the skeletal and digestive systems. It was thought that possible factors responsible, might be concerned with actual preparation in anatomy and physiology, but that probably student's inability to recall more complex material might be a more important factor.

The science instructor assumed, prior to beginning the collection of data, that the six clinical instructors would report more incidents than the students. This assumption was based upon the opinion that not only would the clinical instructors be more objective in observing and recording, but that they would also be more aware of critical incidents as these incidents occurred because of previous experience in evaluating and recording student performance.

It was anticipated that the science instructor would record fewer incidents than the clinical instructors and also less than the students. Both the group of clinical instructors and the group of students observed performance in the classroom, in practice and in case conferences, while the science instructor observed performance in the classroom and in case conferences, only.

It was predicted that students, in all probability, would record fewer incidents than the clinical instructors because of their possible unwillingness or hesitance to report some unsatisfactory personal performance, regardless of the fact that such performance arose from inadequate preparation in anatomy and physiology. A second factor predicating the belief that students would report fewer incidents than the clinical instructors, was that students were not accustomed to writing concise and objective reports. Therefore, some of the early reports might be valueless for the purposes of this study. Reference has been made in Chapter III of this study, to the fact that some of the incidents first reported by students were not useable because actual description of the performance involved in the incident was omitted.[1] The possibility of having some of the first incidents reported, rewritten, was not considered because of the amount of time which had elapsed between the students' writing of the incidents and the checking of the incidents by the science

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[1]John C. Flanagan, A Report of Three Years Experience (Pittsburgh: American Institute for Research, 413 Morewood Avenue, September, 1950), p. 4.

instructor. Ideally, incidents should be written as soon after their occurrence as possible.[1]

A further possible outcome was predicted. Clinical instructors and the science instructor assumed that in all probability, more incidents indicative of inadequate preparation in anatomy and physiology, than those incidents showing adequate preparation, would be reported. This opinion was not so much related to the unsubstantiated belief that the course in anatomy and physiology was inadequate for the purposes of nursing, as it was related to the unsubstantiated belief that individuals tend to be more critically observant of negative factors than of positive factors concerned with performance.

The importance of recording incidents in terms of the exact behavior observed, without interpretation, was stressed.[2] The sole judgment required was that of discerning those incidents involving successful or unsuccessful behavior as the behavior reflected students' preparation in anatomy and physiology.

A total of six clinical instructors observed students in the major areas of nursing selected for study. One clinical instructor reported incidents from nursing arts; two reported from general medical and surgical nursing; one reported from pediatric nursing; and two reported from obstetric nursing. Arrangements were made with this group to collect the recorded incidents at the end of students' experience in the

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[1]John C. Flanagan, "Evaluating Individual Effectiveness and Determining Critical Requirements," Educational Record, Vol. 28 (January, 1947), pp. 80-81.

[2]John C. Flanagan, A Report of Three Years Experience, op. cit., p. 3.

specific areas for which each clinical instructor was responsible. It was agreed, however, that incidents would be written as soon after their occurrence as possible.

Planning with Students

Four groups of students, one in nursing arts, consisting of twenty-eight students; one in beginning medical and surgical nursing, composed of twenty-six students; one in pediatric nursing, numbering twelve students; and one in obstetric nursing, numbering thirty-one students, were asked to assist in collecting data for this study. Potential participants from these four groups totalled ninety-seven students.

The general purpose of this study and the method of research were explained in detail to each group of students in the same manner these were explained to the clinical instructors. At no time were students required to record incidents related to their own performance, participation being placed on a voluntary basis. Records of incidents were unsigned because it was assumed that students would be more willing to report incidents of unsuccessful performance if the reports were not signed. It was anticipated that total participation probably would not be achieved. It was thought that requiring student participation would increase the volume of data, but might reduce cooperation to the extent of biasing the data; whereas, accepting voluntary and unsigned contributions would stimulate cooperation on the part of those willing to participate, and although the volume of data might be reduced, less bias would occur.

Until students, who contributed to this study, acquired some skill in the reporting of incidents, the science instructor discussed examples of the observations they had written, in terms of writing "what they

actually did" as an indication of adequate or inadequate preparation in anatomy and physiology. Many of the first incidents collected were of little value because the individuals had not recorded, anecdotally, the actual performance involved in the incident.[1] Recorded observations from students improved in form as this study progressed in each area.

Each group of students participating in this study was in a different stage of professional education, from those with no experience to those with considerable experience. It was assumed that more incidents would be reported by the group of students in nursing arts, in the first stage of experience with nursing.

Sequence of Clinical Experiences

Reference is made to the sequence of professional experiences provided by the Wayne University College of Nursing curriculum.

Instruction in nursing arts follows the pre-professional experiences of students, in Clinical Term I, a period of thirty-two weeks. Nursing arts includes the "basic principles and practice in the arts and skills needed in nursing--demonstration, discussion and initial practice in the classroom, and supervised practice in general nursing of hospitalized patients."[2] Sixteen weeks of Clinical Term I are spent in nursing arts.

General medical and surgical nursing follow nursing arts for the last sixteen weeks of Clinical Term I. Students study the "principles of

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[1]John C. Flanagan, A Report of Three Years Experience, op. cit., p. 4.

[2]Wayne University Bulletin, College of Nursing Catalog Issue, Published by Authority of Board of Education, Detroit, Michigan, Vol. 31, No. 8 (April 15, 1953), p. 48.

nursing patients with general medical or surgical illness."[1] Practice in the nursing of patients with medical and surgical illnesses is supervised.[2]

During Clinical Term II, a period of thirty-four weeks following Clinical Term I, students spend ten weeks in the nursing of children, or pediatric nursing. Pediatric nursing includes "principles of care of sick children, common abnormalities and diseases of infancy and childhood, and supervised practice in the nursing care of infants and children with acute and chronic diseases."[3]

Maternity or obstetric nursing follows, during Clinical Term III, for twelve weeks of a twenty-four week period. Maternity nursing includes "principles of maternity and newborn care, prevention and treatment of accidents and abnormalities that may befall mother and infant, and supervised practice in the nursing care of mothers throughout the maternity cycle, as well as care of newborn and premature infants."[4]

The Role of the Science Instructor

In participating as an observer, the science instructor attended classes in the theory of nursing in the major areas selected for study, as well as case conferences relating to medical and surgical nursing and obstetric nursing. Incidents involving student performance were recorded by the science instructors, several factors being noted in relation to

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[1] Loc. cit.

[2] Op. cit., p. 49.

[3] Loc. cit.

[4] Loc. cit.

the incidents. These factors were: (1) references to principles of anatomy and physiology which had not been included in the course taught by the science instructor; (2) content of particular importance to nursing which could be given greater emphasis in anatomy and physiology; (3) content to which some reference was made in nursing, but which, in anatomy and physiology could receive less emphasis; and (4) content having no specific application to nursing.

Forms for Recording

Forms for recording incidents were devised which could be used by all observers concerned. The form included: the observer reporting, student, clinical instructor and science instructor; the major area of nursing involved in the incident, nursing arts, medical and surgical nursing, pediatric nursing and obstetric nursing; and a list of the systems of the human body related to the incident, skeletal, muscular-nervous,[1] circulatory, respiratory, digestive, excretory, endocrine and reproductive. The form listed these systems chronologically, according to the sequence of presentation in anatomy and physiology.

Observers underlined the appropriate categories: observer, nursing area and system. Space was provided on the form for describing the incident in terms of adequacy or inadequacy of preparation, as follows:

1. Describe the incident which indicated lack of preparation in anatomy and physiology.

2. Describe the incident which indicated adequate preparation in anatomy and physiology.

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[1]The muscular and nervous systems of the human body are combined because of the close anatomical and physiological interrelationship between the two systems.

A sample of this form is included in the appendices of this paper.

In each area of nursing, observations were made and data were collected as follows: obstetric nursing, September through November, 1952; nursing arts, February through April, 1953; medical and surgical nursing and pediatric nursing, June through July, 1953.

Tabulation and Analysis of Data

In using the critical incidents technique, Dr. Flanagan has suggested that numerical scoring of data is generally preferred, where appropriate.[1]

Data collected in this study are tabulated numerically and are arranged in various tables for analytic purposes. A table showing total data, and a table showing total data separated into sections indicating adequate and inadequate preparation in anatomy and physiology, are included.

In addition, incidents are identified, classified and reduced into major categories for each system of the human body. A table for each system is developed, showing the major categories and the number of incidents related to each category.

Table I includes a summary of all incidents reported, indicative of successful and unsuccessful student performance from all sources.

The assumptions that the greatest number of incidents would be reported from the area of nursing arts and that the areas of pediatric

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[1]John C. Flanagan, "Principles and Procedures in Evaluating Performance," reprinted from Personnel (March, 1952) by permission of the American Management Association, 330 W. 42 Street, New York 36, N. Y. (Pittsburgh: American Institute for Research, 410 Amberson Avenue, 1952), p. 384.

TABLE I. TOTAL INCIDENTS REPORTED--ALL SOURCES

Observer	Student				Clinical Instructor				Science Instructor				TOTAL
Area*	NA	MS	P	OB	NA	MS	P	OB	NA	MS	P	OB	
System													
General	0	4	0	1	0	4	0	1	0	0	0	0	10
Skeletal	13	0	0	1	2	2	7	1	1	0	0	1	28
Muscle-Nerve	24	8	12	2	19	6	31	3	21	6	12	3	147
Circulatory	36	4	0	0	35	6	8	2	32	3	0	0	126
Respiratory	16	2	0	0	42	11	0	0	29	2	0	0	102
Digestive	16	3	0	0	5	38	0	0	2	6	0	0	70
Excretory	39	9	0	0	30	14	0	0	25	9	0	0	126
Endocrine	0	35	5	16	0	36	4	12	0	31	2	13	154
Reproductive	19	1	0	26	13	1	0	26	8	0	0	21	115
TOTAL	163	66	17	46	146	118	50	45	125	53	14	35	878
Total by Observers	292				359				227				878

*NA-Nursing Arts, MS-Medical and Surgical Nursing, P-Pediatric Nursing, OB-Obstetric Nursing. These symbols are used in all tables, where applicable.

nursing and obstetric nursing would show the least number of incidents reported, are seen to be valid. Total incidents from the four nursing areas are summarized:

Nursing arts.....	434
Medical and surgical nursing...	237
Pediatric nursing.....	81
Obstetric nursing.....	126
Total.....	878

The assumptions that incidents involving the endocrine system and the muscle-nervous system would occur more frequently than incidents

involving other systems; and that incidents concerned with the skeletal and digestive systems would occur less frequently, are also shown to be valid, based upon figures from Table I:

Endocrine system.....	154
Muscle-nervous system.....	147
Total.....	301
Skeletal system.....	28
Digestive system.....	70
Total.....	98

Incidents involving the muscle-nervous system and the endocrine system represent 34.2 per cent of the total number of incidents recorded. Of this total, incidents arising in connection with the endocrine system represent 17.5 per cent, while incidents concerned with the muscle-nervous system represent 16.7 per cent.

Incidents involving the skeletal and digestive systems represent only 11.2 per cent of the total number of incidents reported, the skeletal system accounting for 3.3 per cent of this figure, and the digestive system, 7.9 per cent.

Total incidents related to all other systems numbered 479 or 54.6 per cent of the total. Represented are the circulatory system (126 incidents) or 14.3 per cent of the total; the respiratory system (102 incidents) or 12.8 per cent of the total; the excretory system (126 incidents) or 14.3 per cent of the total; the reproductive system (115 incidents) or 13.1 per cent of the total; and general incidents (ten) which did not relate to any specific system, but which contributed to over-all preparation, 0.1 per cent of the total.

The assumption that clinical instructors would report more incidents than the science instructor or than students, and that students would report more incidents than the science instructor, is shown to be valid, based upon figures from Table I. Six clinical instructors contributed a total of 359 incidents, or approximately six incidents per person; the ninety-seven students, not all of whom participated, contributed a total of 292 incidents. Because student reports were unsigned, it was impossible to determine an accurate average of incidents per person. The science instructor recorded a total of 227 incidents.

Table II presents total data separated into incidents representing adequate preparation and inadequate preparation in anatomy and physiology.

TABLE II. TOTAL INCIDENTS REPORTED--INDICATING ADEQUATE AND INADEQUATE PREPARATION IN ANATOMY AND PHYSIOLOGY--ALL SOURCES

Preparation	Adequate				Inadequate				TOTAL
Observer*	S	CI	SI	Sub-Total	S	CI	SI	Sub-Total	
System									
General	2	2	0	4	3	3	0	6	10
Skeletal	13	1	0	14	1	11	2	14	28
Muscle-Nerve	11	5	1	17	35	54	41	130	147
Circulatory	4	3	1	8	36	48	34	118	126
Respiratory	3	26	2	31	15	27	29	71	102
Digestive	5	3	2	10	14	40	6	60	70
Excretory	17	8	4	29	31	36	30	97	126
Endocrine	0	0	0	0	56	52	46	154	154
Reproductive	6	5	3	14	40	35	26	101	115
TOTAL	61	53	13	127	231	306	214	751	878

*S-Student, CI-Clinical Instructor, SI-Science Instructor. These symbols are used in all tables where applicable.

It was assumed that the majority of incidents reported would relate to inadequate preparation. That this assumption is valid is evident. Only 127 incidents, or approximately fourteen per cent of the total, show adequate preparation, while 751 incidents, or approximately eighty-six per cent of the total show inadequate preparation.

Incidents of adequacy are, in all probability, too few to be interpreted properly. Whether it is to be assumed from these figures that the present course content is anatomy and physiology is ineffective as far as nursing is concerned, or whether individuals tend to observe and report more negative than positive factors, is a matter for conjecture.

A preponderance of incidents related to adequate preparation involves the respiratory and the excretory systems; while incidents of inadequate preparation occur more frequently in relation to the muscle-nervous and endocrine systems, than for any other systems.

No incidents related to the endocrine system show adequate preparation; however, it will be found from Table X, that the incidents reported are primarily concerned with the adrenal gland, the anterior lobe of the pituitary gland and the gonads. It may be possible to assume, therefore, that because no reference is made to the thyroid gland, the parathyroid glands, the posterior lobe of the pituitary gland, and the Islets of Langerhans, the present content of anatomy and physiology concerned with these glands, requires no revision.

Classification of Similar Incidents Related to Each System

Incidents related to each system of the human body are further categorized, according to the frequency of their occurrence, and whether or

not they showed the content of the course in anatomy and physiology to be adequate or inadequate to the basic preparation of students of nursing in the four areas of nursing studied. Reduction of the number of incidents into suitable categories, where the incidents show identical or highly similar elements, according to Finkle,[1] makes it possible to determine the crucial requirements of the activity from which the incidents, effective or ineffective, have been derived.

The following tables are used in the revised outline of the course as a basis for determining crucial requirements of nursing for anatomy and physiology; new content to be added, and content requiring greater emphasis.

Examples of selected incidents related to selected categories from Tables III through XI are included in the appendices of this study for reference. The categories illustrated in the appendices are those showing greater frequency of incidents.

Certain incidents occurred, as this study progressed, which had not been anticipated. No suitable classification had, therefore, been devised. Although these incidents occurred only ten times out of 878 incidents recorded, they are included and classified as "General Incidents." It is believed that they have some importance to the total content of the course in anatomy and physiology. The incidents do not pertain to any specific system of the human body, but have some relationship to all systems.

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[1]R. B. Finkle, "A Study of the Critical Requirements of Foremanship," Abstract of A Doctoral Dissertation, University of Pittsburgh Bulletin, Vol. 46, No. 10 (June 5, 1950), p. 4.

TABLE III. GENERAL INCIDENTS CLASSIFIED

Preparation Categories	Area	Adequate				Inadequate				TOTAL
		NA	MS	P	OB	NA	MS	P	OB	
1. Understanding roots, prefixes, suffixes of scientific terms	S	0	2	0	0	0	0	0	0	2
	CI	0	2	0	0	0	0	0	0	2
	SI	0	0	0	0	0	0	0	0	0
2. Comparison of size of adult organs with those of infants and children	S	0	0	0	0	0	2	0	1	3
	CI	0	0	0	0	0	2	0	1	3
	SI	0	0	0	0	0	0	0	0	0
TOTAL		0	4	0	0	0	4	0	2	10

As shown in Table III, it has apparently been helpful in nursing, for the science instructor to analyze and define the roots, prefixes and suffixes of scientific terms throughout the presentation of course content. As a result, both students and clinical instructors have stated that students have some ability to analyze and define new scientific terms as they arise in the clinical situation.

The second category shows a need for comparing the size of adult organs with those of infants and children, throughout the presentation of course content. The size of instruments and the methods of treatment used in patient care vary from infancy to adulthood as growth progresses and the systems of the body are altered anatomically and physiologically. Differences in the size of organs can be included as new material in the revision of the course. The six incidents found in this category relate to anatomy.

Five categories relating to the skeletal system are shown in Table IV, all of which are concerned with anatomy. The incidents of these

categories are equally divided between those indicating effective performance and those showing ineffective performance.

TABLE IV. CLASSIFICATION OF INCIDENTS--SKELETAL SYSTEM

Preparation Categories	Area	Adequate				Inadequate				TOTAL
		NA	MS	P	OB	NA	MS	P	OB	
1. Bony projection in sacro-coccygeal region in relation to bed sores	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	1	0	0	0	1
	SI	0	0	0	0	1	0	0	0	1
2. Female pelvis in relation to measuring size of the birth canal	S	0	0	0	1	0	0	0	0	1
	CI	0	0	0	0	0	0	0	1	1
	SI	0	0	0	0	0	0	0	1	1
3. Leverage of bones, body mechanics and muscle origin and insertion	S	13	0	0	0	0	0	0	0	13
	CI	1	0	0	0	0	0	0	0	1
	SI	0	0	0	0	0	0	0	0	0
4. Joints in relation to connective tissue deposit	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	0	7	0	7
	SI	0	0	0	0	0	0	0	0	0
5. Red bone marrow deposits in all areas of cancellous bone	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	2	0	0	2
	SI	0	0	0	0	0	0	0	0	0
TOTAL		14	0	0	0	3	2	7	2	28

Category 3, shows that the present course content is adequate and requires no revision. Students' understanding of the skeletal framework

and the leverage of the human body, as applied to body mechanics is of particular importance in the area of nursing arts.[1] In this area students are taught the role of proper body mechanics as far as their personal postural comfort in patient care is concerned, as well as proper body mechanics related to patient comfort.

Categories 1, 2, 4 and 5 do not occur as a result of omission of content from the present course, but rather result from a lack of specific emphasis.

Category 1 arises from nursing arts. Bony prominences in general are referred to in anatomy and physiology, but no mention is made of the fact that the sacro-coccygeal prominences, lying close to the surface of the body, have special significance for the nurse. Pressure of the bed against such bony projections, in a bed-ridden patient, results in reduction of circulation to the part. The nurse inspects and applies treatment to such parts in order to prevent necrosis.

Information related to Category 2 is of importance to obstetric nursing, since it involves prenatal teaching of expectant mothers. The dimensions of the female pelvis must be determined prior to delivery, so that if abnormalities are found, special plans for the delivery can be made in advance. While reference is made to the major differences between the male and female pelvis in anatomy and physiology, special

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[1]Throughout the explanations of Tables IV - XI, inclusive, information concerned with applications of scientific principles related to anatomy and physiology, has been derived from direct observation or from incidents reported in connection with the method of application to the various nursing areas selected for study.

references can be made to diameters and the bony projections used in determining the dimensions of the female pelvis.

Category 5 arises from pediatric nursing, and concerns students' understanding of the structure of the articular capsule associated with freely-moving joints, and the deposit of connective tissue within the capsule. This information relates to the care of patients with rheumatic fever.

Medical and surgical nursing involvements with the skeletal system are concerned with the distribution of red bone marrow in connection with anemias and leukemias, illustrated by Category 5. Students have an understanding of the location of red bone marrow in the ends of long bones, but apparently insufficient emphasis is given to the location of red bone marrow in other cancellous bone areas, in the present content.

Table V summarizes adequate and inadequate preparation in the anatomy and physiology of the muscular and nervous systems.

TABLE V. CLASSIFICATION OF INCIDENTS--MUSCLE-NERVOUS SYSTEM

Preparation		Adequate				Inadequate				TOTAL
Categories	Area	NA	MS	P	OB	NA	MS	P	OB	
1. Autonomic nervous system structure	S	2	0	0	0	1	1	6	0	10
	CI	0	0	0	0	0	2	12	0	14
	SI	0	0	0	0	5	0	6	0	11
2. Autonomic nervous system function	S	0	0	0	0	7	2	6	0	15
	CI	0	0	0	0	3	1	12	0	16
	SI	0	0	0	0	5	1	6	0	12

TABLE V. (Continued)

Preparation Categories	Area	Adequate NA	Adequate MS	Adequate P	Adequate OB	Inadequate NA	Inadequate MS	Inadequate P	Inadequate OB	TOTAL
3. Central nervous system structure	S	2	0	0	0	0	0	0	0	2
	CI	2	1	0	0	0	0	0	0	3
	SI	0	1	0	0	0	0	0	0	1
4. Central nervous system function	S	1	0	0	0	0	0	0	0	1
	CI	1	0	0	0	0	0	0	0	1
	SI	0	0	0	0	0	1	0	0	1
5. Chemical mediators and nerve impluses	S	0	0	0	0	0	4	0	0	4
	CI	0	0	0	0	0	2	5	0	7
	SI	0	0	0	0	0	2	0	0	2
6. Deltoid, gluteus muscles in relation to underlying nerves and vessels--intramuscular injections	S	0	0	0	0	3	0	0	0	3
	CI	0	0	0	0	5	0	0	0	5
	SI	0	0	0	0	1	0	0	0	1
7. Muscle fiber (skeletal) directions bilaterally opposed related to massage	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	1	0	0	0	1
	SI	0	0	0	0	1	0	0	0	1
8. Muscle groups (skeletal) location, related to massage	S	6	0	0	0	0	0	0	0	6
	CI	1	0	0	0	0	0	0	0	1
	SI	0	0	0	0	0	0	0	0	0
9. Nerve supply reproductive organs, female	S	0	0	0	0	0	0	0	1	1
	CI	0	0	0	0	0	0	0	2	2
	SI	0	0	0	0	0	0	0	1	1

TABLE V. (Continued)

Preparation Categories	Area	Adequate NA	Adequate MS	Adequate P	Adequate OB	Inadequate NA	Inadequate MS	Inadequate P	Inadequate OB	TOTAL
10. Peristaltic movement of smooth muscle gastro-intestinal tract related to defecation	S	0	0	0	0	1	0	0	0	1
	CI	0	0	0	0	2	0	0	0	2
	SI	0	0	0	0	1	0	0	0	1
11. Perineal muscles "pelvic sling" related to pregnancy	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	0	0	0	0
	SI	0	0	0	0	0	0	0	1	1
12. Projection tracts, spinal cord-function	S	0	0	0	0	0	1	0	0	1
	CI	0	0	0	0	0	0	2	0	2
	SI	0	0	0	0	0	1	0	0	1
13. Rectus abdominus, muscle, lines alba in relation to multipara	S	0	0	0	0	0	0	0	1	1
	CI	0	0	0	0	0	0	0	1	1
	SI	0	0	0	0	0	0	0	1	1
14. Reflexes and thermal stimuli, cutaneous areas, associated with visceral areas	S	0	0	0	0	1	0	0	0	1
	CI	0	0	0	0	4	0	0	0	4
	SI	0	0	0	0	8	0	0	0	8
TOTAL		15	2	0	0	49	18	55	8	147

The 147 incidents recorded in Table V divide into fourteen categories dealing with the muscle-nervous system. In these categories thirteen incidents show adequate preparation in anatomy and fifty show inadequate preparation. Only two incidents show adequate preparation in physiology, while eighty-two show a lack of preparation.

Out of a total of fourteen categories, only three show some degree of adequate preparation in anatomy and physiology. These are Categories 3, 4 and 8. Content related to the structure and function of the central nervous system, and the location of specific groups of skeletal muscles, is in no obvious need of revision. This information is applied in nursing to special treatments of disorders of the neuro-muscular mechanism and to massage.

An understanding of the structure and functions of the autonomic nervous system relates to the integration and control of body mechanisms below the level of conscious control. Particularly is the information pertinent to understanding the use of drugs prescribed by the physician in patient treatment.

From an analysis of Table V, it is noted that Categories 1 and 2 occur frequently in three of the major areas of nursing, nursing arts, medical and surgical nursing and pediatric nursing. Closely allied with these categories are Categories 5 and 12, involving chemical mediation of nerve impulses and the transmission of nerve impulses within the spinal cord. The information is important in nursing as it relates to prescribed treatments for neuro-muscular disturbances. Development of understanding in this area is possibly more a matter of teaching method in anatomy and physiology than it is a matter of additional content.

Categories 6, 7, 9, 10 and 11 relate to content presently included, but which requires greater emphasis.

No specific reference is made in the present course in anatomy and physiology to reflexes (Category 14) involving thermal stimuli to

cutaneous areas, nor to the viscera associated with each of these areas. Understanding vasoconstriction and vasodilation is basic to understanding the use of heat and cold as therapeutic agents. This material should be added to the content of anatomy and physiology.

In revising the course content related to the muscular and nervous systems the order of content will be rearranged. Currently, the two systems are presented as separate units. It is believed that through combining the two systems into one unit, it will be possible to develop the concept of the interdependence and interrelationships of the two systems and their relationships to other systems more effectively.

Incidents having reference to the circulatory system are reduced to the eight categories shown in Table VI.

TABLE VI. CLASSIFICATION OF INCIDENTS--CIRCULATORY SYSTEM

Preparation		Adequate				Inadequate				TOTAL
Categories	Area	NA	MS	P	OB	NA	MS	P	OB	
1. Blood, cell-plasma relation, count, sedimentation rate, red cells in anemias	S	0	0	0	0	0	2	0	0	2
	CI	0	0	0	0	3	3	0	0	6
	SI	0	0	0	0	1	1	0	0	2
2. Blood transfusion, "cross-matching" types	S	0	0	0	0	0	1	0	0	1
	CI	0	0	0	0	1	2	0	2	5
	SI	0	0	0	0	2	0	0	0	2
3. Blood, amount of normal constituents per 100 cc.	S	0	0	0	0	20	0	0	0	20
	CI	0	0	0	0	2	0	0	0	2
	SI	0	0	0	0	20	0	0	0	20

TABLE VI. (Continued)

Preparation Categories	Area	Adequate NA	MS	P	OB	Inadequate NA	MS	P	OB	TOTAL
4. Electrolytes, osmosis diffusion water balance	S	3	0	0	0	0	0	0	0	3
	CI	0	0	0	0	0	1	0	0	1
	SI	0	0	0	0	0	0	0	0	0
5. Heart, general structure, physiology	S	0	1	0	0	0	0	0	0	1
	CI	3	0	0	0	0	0	0	0	3
	SI	0	1	0	0	0	0	0	0	1
6. Heart, function of nodes	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	13	0	0	0	13
	SI	0	0	0	0	1	1	0	0	2
7. Heart valves, histological structure	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	0	8	0	8
	SI	0	0	0	0	0	0	0	0	0
8. General vasoconstriction and vasodilation	S	0	0	0	0	13	0	0	0	13
	CI	0	0	0	0	13	0	0	0	13
	SI	0	0	0	0	8	0	0	0	8
TOTAL		6	2	0	0	97	11	8	2	26

Categories 4 and 5 from Table VI, show a degree of adequate preparation. The content involved with Category 4 relates to the nurse's understanding of the importance of maintaining salt and fluid balance, in patients, watching for signs of dehydration or of edema, and taking measures for their prevention. There is only one indication, from a clinical instructor, that students need more complete information about

the electrolytic theory. Electrolytes are mentioned generally in the present course of anatomy and physiology, but in no detail. Content can be included to give more emphasis to electrolytes.

Category 5 shows that the content related to the anatomy and physiology of the heart requires no revision.

Categories 1 and 3 concern the information needed by nurses in assuming their specific responsibilities connected to patient's records or charts, as well as information needed in order to be able to carry out the treatment ordered by the physician, intelligently. Factors involved in Category 1 require greater emphasis in anatomy and physiology, except for blood sedimentation rate which should be added as new content. Content related to Category 3 (the normal constituents of blood in milligrams per 100 cc.) is not included in the present course. Constituents are referred to, but not in specific amounts. This information is essential to nurses who participate in making certain blood tests, the results of which will be used by the physician diagnostically.

Blood typing is generally understood by students as far as compatibility of types for the purpose of transfusion is concerned. "Cross-matching" or cross agglutination principles are not well understood, indicated by Category 2. Greater emphasis is required in anatomy and physiology. The nurse is involved in assisting with the administration of transfusion, following the orders of the physician. Understanding of the scientific principle related to transfusions is essential for the safety of the patient.

Although the present course in anatomy and physiology includes a discussion of the nodal tissues of the heart, (Category 6) it is obvious

that students do not fully understand the operation of the nodes. This understanding is important to nurses in terms of cardiac acceleration, deceleration and the effects of drugs upon the nodes. More emphasis is essential.

The gross anatomy, location and operation of the heart valves are understood, Category 7, however, shows that students do not clearly understand the histology of the valves. This information is useful to nurses in connection with giving care to patients afflicted with valvular disorders, as well as in giving care to rheumatic fever patients. Microscopic study of valvular tissue can be included as new material in the revised content.

Principles of vasoconstriction and vasodilation (Category 8) require more emphasis, in relation to the administration of drugs and other agents which produce these effects.

From Table VI it is found that most of the incidents recorded have reference to physiology (110 lack of preparation and three, adequate preparation), while eight incidents pertaining to anatomy show inadequate preparation. Category 5 shows five incidents related to both anatomy and physiology.

Table VII classifies incidents occurring in connection with the respiratory system. Most of these incidents relate to preparation in physiology, adequate twenty-six and inadequate sixty-nine. Only seven incidents refer to anatomy, five showing adequate preparation and two inadequate preparation.

TABLE VII. CLASSIFICATION OF INCIDENTS--RESPIRATORY SYSTEM

Preparation Categories	Area	Adequate				Inadequate				TOTAL
		NA	MS	P	OB	NA	MS	P	OB	
1. Chemical and nervous factors controlling respiration	S	0	0	0	0	0	0	0	0	0
	CI	24	1	0	0	0	0	0	0	25
	SI	0	1	0	0	0	0	0	0	1
2. Cough reflex	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	2	0	0	2
	SI	0	0	0	0	2	1	0	0	3
3. "Forced breathing"	S	0	0	0	0	15	0	0	0	15
	CI	0	0	0	0	17	0	0	0	17
	SI	0	0	0	0	17	0	0	0	17
4. Movements of the diaphragm	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	2	0	0	2
	SI	0	0	0	0	8	0	0	0	8
5. Pleural pressure, intrathoracic pressure	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	5	0	0	5
	SI	0	0	0	0	0	0	0	0	0
6. Size of lobes of lung, compared to each other	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	1	0	0	1
	SI	0	0	0	0	1	0	0	0	1
7. Structure of respiratory system	S	1	2	0	0	0	0	0	0	3
	CI	1	0	0	0	0	0	0	0	1
	SI	1	0	0	0	0	0	0	0	1
TOTAL		27	4	0	0	60	11	0	0	102

Certain factors regarding students' familiarity with the respiratory system are shown in Categories 1 and 7. Students have an understanding of the chemical and nervous control of respiration, according to the nursing arts instructor. Although only one incident is reported by one of the medical and surgical nursing instructors and one by the science instructor, these incidents tend to support the observation of the nursing arts instructor. These incidents show that present content is adequate and requires no revision.

Categories 2, 4, 5 and 6 indicate a lack of preparation, not from actual omissions in the present content, but rather from lack of specific emphasis. The reports from medical and surgical nursing concerned nursing care of tuberculosis patients. The reports from nursing arts concerned review of the respiratory system in connection with learning techniques related to the care of patients with respiratory illness, with other conditions, such as cardiac involvements, causing disturbances in respiration, and postoperative care of patients. Added emphasis can be given to the content involved in these incidents.

Category 3 is not currently included as a part of the content discussed in anatomy and physiology. Discussion concerned with the muscles involved in forced breathing can be included with the discussion of the muscles normally used in respiration.

Incidents derived from student performance involving the digestive system are reduced to seven categories, shown in Table VIII. The preponderance of incidents relates to physiology, sixty showing inadequate

preparation and five showing adequate preparation. Only five incidents are shown to be concerned with anatomy and indicate adequate preparation.

TABLE VIII. CLASSIFICATION OF INCIDENTS--DIGESTIVE SYSTEM

Preparation		Adequate				Inadequate				TOTAL
Categories	Area	NA	MS	P	OB	NA	MS	P	OB	
1. Bile, manufacture, storage, concentration in gall bladder, use	S	0	0	0	0	1	0	0	0	1
	CI	1	0	0	0	3	3	0	0	7
	SI	0	0	0	0	1	1	0	0	2
2. Constituents of gastric juice	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	6	0	0	6
	SI	0	0	0	0	0	0	0	0	0
3. Contents of the duodenum	S	0	0	0	0	0	0	0	0	0
	CI	0	0	0	0	0	26	0	0	26
	SI	0	0	0	0	0	0	0	0	0
4. Histamine in relation to hydrochloric acid in the stomach	S	0	1	0	0	0	0	0	0	1
	CI	0	2	0	0	0	0	0	0	2
	SI	0	1	0	0	0	0	0	0	1
5. Metabolism of proteins, carbohydrates, fats	S	0	0	0	0	12	1	0	0	13
	CI	0	0	0	0	1	1	0	0	2
	SI	0	0	0	0	0	4	0	0	4
6. Structure of the alimentary tract	S	0	1	0	0	0	0	0	0	1
	CI	0	0	0	0	0	0	0	0	0
	SI	1	0	0	0	0	0	0	0	1
7. Structure of the oral cavity	S	3	0	0	0	0	0	0	0	3
	CI	0	0	0	0	0	0	0	0	0
	SI	0	0	0	0	0	0	0	0	0
TOTAL		5	5	0	0	18	42	0	0	70

Categories 4, 6 and 7 show adequate preparation in anatomy and physiology. Categories 1, 2, 3, 4 and 6 relate to understanding some of the factors involved in the development of gastric or duodenal ulcers and the nursing care of patients being treated for ulcers or other conditions showing an abnormal concentration of hydrochloric acid in the stomach, as well as the care of patients having other disturbances of the gastro-intestinal tract. Techniques, such as, intubation and irrigation, while they may not necessarily involve disease of the gastro-intestinal tract, are based upon an understanding of the structure of the tract.

Category 7 concerns the phases of nursing care related to treatment of pathological conditions of the mouth or to the comfort of the patient in matters of oral hygiene.

The understanding of general nutrition, special diets and the healing of wounds is essentially based upon understanding the principles of the metabolism of proteins, carbohydrates and fats (Category 5). More complete information is needed by students of nursing than is now given in anatomy and physiology, about the physiological processes of metabolism.

Incidents occurring in connection with the excretory system are reduced to suitable categories in Table IX. Most of the incidents relate to physiology, twenty-nine of these showing adequate preparation and thirty-nine showing a lack of preparation. Those related to anatomy show fifty-eight incidents of inadequate preparation.

TABLE IX. CLASSIFICATION OF INCIDENTS--EXCRETORY SYSTEM

Preparation Categories	Area	Adequate NA	Adequate MS	Adequate P	Adequate OB	Inadequate NA	Inadequate MS	Inadequate P	Inadequate OB	TOTAL
1. Formation of casts in urine related to shape of the uriniferous tubules	S	0	0	0	0	7	0	0	0	7
	CI	0	0	0	0	8	0	0	0	8
	SI	0	0	0	0	7	0	0	0	7
2. Location human kidney, ureters bladder	S	0	0	0	0	0	5	0	0	5
	CI	0	0	0	0	0	8	0	0	8
	SI	0	0	0	0	0	6	0	0	6
3. Location, female urethral meatus	S	0	0	0	0	15	0	0	0	15
	CI	0	0	0	0	14	0	0	0	14
	SI	0	0	0	0	10	0	0	0	10
4. Secondary excretory organs skin, lungs, colon, relation to primary organs	S	13	0	0	0	0	0	0	0	13
	CI	2	0	0	0	0	0	0	0	2
	SI	1	0	0	0	0	0	0	0	1
5. Urine consistency and norms	S	0	0	0	0	4	0	0	0	4
	CI	0	0	0	0	6	0	0	0	6
	SI	0	0	0	0	7	0	0	0	7
6. Urine formation	S	0	4	0	0	0	0	0	0	4
	CI	0	6	0	0	0	0	0	0	6
	SI	0	3	0	0	0	0	0	0	3
TOTAL		16	13	0	0	78	19	0	0	126

Table IX shows two areas of adequacy of preparation. Students' understanding of the secondary organs of excretion--skin, lungs and colon (Category 4), and urine formation (Category 6) is sufficient. Content of the present course requires no revision in these two areas.

Content dealing with Category 1 has not been included previously. This information can be added in connection with a study of the microscopic anatomy of the kidney. The information is useful to nurses in terms of understanding diagnostic tests and procedures of treatment related to kidney disorders.

Categories 2, 3 and 5 are apparently the major indications of a lack of preparation. Certain therapeutic measures require exact location of excretory organs. Catheterization technique, for example, is in part dependent upon exact location of the urethral meatus. Category 5 deals with the consistency of urine and the norms of its concentrated substances. Consistency and norms are involved in understanding the findings of urinalysis and the use of prescribed treatments. Greater emphasis is needed for the content related to these incidents.

Table X is developed from a classification of incidents related to the endocrine system. Inadequate anatomical preparation is shown for thirty of the incidents, while inadequate physiological preparation is found for 124 incidents.

TABLE X. CLASSIFICATION OF INCIDENTS--ENDOCRINE SYSTEM

Preparation Categories	Area	Adequate NA	Adequate MS	Adequate P	Adequate OB	Inadequate NA	Inadequate MS	Inadequate P	Inadequate OB	TOTAL
1. Adrenal cortex-hormones, cholesterol in relation to steroids	S	0	0	0	0	0	2	5	0	7
	CI	0	0	0	0	0	5	4	7	16
	SI	0	0	0	0	0	3	2	0	5
2. Ant. Pituitary acidophilic, basophilic, chromophobic, elements--histology	S	0	0	0	0	0	11	0	0	11
	CI	0	0	0	0	0	10	0	0	10
	SI	0	0	0	0	0	9	0	0	9
3. Ant. Pituitary, gonadotropic hormones	S	0	0	0	0	0	0	0	5	5
	CI	0	0	0	0	0	0	0	0	0
	SI	0	0	0	0	0	0	0	6	6
4. Adrenal medulla, Sympathin I, Sympathin II, relation to nervous system	S	0	0	0	0	0	6	0	0	6
	CI	0	0	0	0	0	5	0	0	5
	SI	0	0	0	0	0	4	0	0	4
5. Chemical nature of hormones--steroids, proteins, amino acids	S	0	0	0	0	0	7	0	0	7
	CI	0	0	0	0	0	8	0	0	8
	SI	0	0	0	0	0	7	0	0	7
6. Parenteral administration of insulin, rather than oral administration	S	0	0	0	0	0	9	0	0	9
	CI	0	0	0	0	0	8	0	0	8
	SI	0	0	0	0	0	8	0	0	8
7. Ovarian hormones in relation to menstruation and pregnancy	S	0	0	0	0	0	0	0	11	11
	CI	0	0	0	0	0	0	0	5	5
	SI	0	0	0	0	0	0	0	7	7
TOTAL		0	0	0	0	0	102	11	41	154

Data from Table X indicate that the content to which all incidents have reference is inadequate. Content related to Categories 1, 3, 4 and 7 is included in the present course of anatomy and physiology, but requires greater emphasis. Content related to Categories 2, 5 and 6 is not included at the present time, and should be added.

Within recent years many new discoveries have been made in the field of endocrinology. New hormones have been isolated or fractioned from hormonal products previously discovered; new methods of using these hormones in therapy have been devised, requiring broader understanding of endocrine function if procedures involved in nursing care related to the endocrine glands or to the use of hormones, are to be carried out effectively. The close observation of patients requiring treatment, surgical cases and patients having diagnostic tests, frequently is a part of the nurse's responsibility. Understanding of the endocrine system is particularly essential to the development of technical skill and good judgment.

Because incidents related to the structure and function of the thyroid gland, the parathyroid glands, the adrenal medulla, the Islets of Langerhans in the pancreas, and the posterior portion of the pituitary gland do not appear in these data, it is assumed that the content of the present course is satisfactory.

The categories developed in Table XI are related to the reproductive system, and show eighty-four incidents of inadequate preparation and twelve of adequate preparation in anatomy. Incidents of a physiological nature show only two of adequate preparation while seventeen show a lack of preparation.

TABLE XI. CLASSIFICATION OF INCIDENTS--REPRODUCTIVE SYSTEM

Preparation Categories	Area	Adequate NA	Adequate MS	Adequate P	Adequate OB	Inadequate NA	Inadequate MS	Inadequate P	Inadequate OB	TOTAL
1. Detailed structure of uterine cervix	S	0	0	0	0	0	0	0	1	1
	CI	0	0	0	0	0	0	0	1	1
	SI	0	0	0	0	0	0	0	1	1
2. Development of embryo and foetus	S	0	0	0	0	0	0	0	10	10
	CI	0	0	0	0	0	0	0	11	11
	SI	0	0	0	0	0	0	0	9	9
3. External and internal female genitalia location and relationship	S	0	0	0	0	11	0	0	0	11
	CI	0	0	0	0	8	0	0	0	8
	SI	0	0	0	0	5	0	0	0	5
4. Gross anatomy of male and female reproductive organs	S	0	0	0	1	0	0	0	0	1
	CI	0	0	0	1	0	0	0	0	1
	SI	0	0	0	1	0	0	0	0	1
5. Meiosis	S	0	0	0	0	0	0	0	2	2
	CI	0	0	0	0	0	0	0	1	1
	SI	0	0	0	0	0	0	0	2	2
6. Menstrual phenomena	S	0	1	0	0	0	0	0	0	1
	CI	0	1	0	0	0	0	0	0	1
	SI	0	0	0	0	0	0	0	0	0
7. Pelvic organs of female in relation to other organs	S	0	0	0	0	0	0	0	2	2
	CI	0	0	0	0	0	0	0	1	1
	SI	0	0	0	0	0	0	0	1	1

TABLE XI. (Continued)

Preparation Categories	Area	Adequate NA	Adequate MS	Adequate P	Adequate OB	Inadequate NA	Inadequate MS	Inadequate P	Inadequate OB	TOTAL
8. Secretion of the vaginal tract	S	0	0	0	0	5	0	0	1	6
	CI	0	0	0	0	3	0	0	1	4
	SI	0	0	0	0	2	0	0	0	2
9. Segmentation of the zygote	S	0	0	0	1	0	0	0	0	1
	CI	0	0	0	1	0	0	0	0	1
	SI	0	0	0	1	0	0	0	0	1
10. Size of the normal uterus, and in pregnancy	S	0	0	0	0	0	0	0	3	3
	CI	0	0	0	0	0	0	0	5	5
	SI	0	0	0	0	0	0	0	4	4
11. Structure of the mammary glands	S	0	0	0	0	0	0	0	5	5
	CI	0	0	0	0	0	0	0	4	4
	SI	0	0	0	0	0	0	0	2	2
12. Structure of the vaginal tract	S	3	0	0	0	0	0	0	0	3
	CI	2	0	0	0	0	0	0	0	2
	SI	1	0	0	0	0	0	0	0	1
TOTAL		6	2	0	6	34	0	0	67	115

Based upon Table XI, content involved in Categories 4, 6, 9 and 12 is adequate for the preparation of students of nursing in anatomy and physiology. Category 8 indicates a lack of information, this information being necessary to the technique employed in vaginal irrigations. Content related to Category 8 should be added to the course. Categories 1, 2, 3, 5, 7, 10 and 11 concern the principles basic to understanding the

broad scope of maternity care, both the ante partum and the post partum periods, as well as the care of the new born. While the content of these incidents is now included, more emphasis is required.

Tabulation of Categories from Tables III through XI

In analyzing Tables III through XI, total incidents are reduced to a total of sixty-eight categories, representing all systems of the human body. Of these, eighteen categories reflect adequate preparation, while fifty relate to inadequate preparation in anatomy and physiology. A further analysis shows that of the categories showing inadequate preparation, seventeen categories refer to content to be added to the revised outline, and thirty-three categories refer to present content requiring greater emphasis.

From Tables III through XI, total incidents showing adequate and inadequate preparation have been summarized in Table XII, in order to determine their relationship to anatomy and physiology.

TABLE XII. TOTAL INCIDENTS SHOWING ADEQUATE AND INADEQUATE PREPARATION RELATED TO ANATOMY AND PHYSIOLOGY

System	Anatomy		Physiology		Total
	Adequate	Inadequate	Adequate	Inadequate	
General	*	6	0	0	6
Skeletal	14	14	0	0	28
Muscle-Nerve	15	49	2	81	147
Circulatory**	0	8	3	110	121
Respiratory	5	2	26	69	102
Digestive	5	0	5	60	70
Excretory	0	58	29	39	126
Endocrine	0	30	0	124	154
Reproductive	12	84	2	17	115
Total	51	251	67	500	869***

*Four incidents classified as General do not directly relate to anatomy or physiology (adequate)

**Five incidents relate to both anatomy and physiology (adequate)

***Adding the nine incidents to the total of 869 incidents from Table XII, shows the grand total of incidents to be 878. This figure checks with total incidents shown in Tables I and II.

Figures in Table XII clearly show that the major concern with inadequate preparation (five hundred incidents or thirty-one categories) is related to physiology, rather than to anatomy (251 incidents or nineteen categories). Adequate preparation is distributed fairly equally, anatomy, fifty-one incidents and physiology, sixty-seven incidents.

Proposed Revision of Course Content for Anatomy and Physiology

Based upon the findings of this study, the following outline is proposed. This study has indicated material included in the present course outline which requires added emphasis, and content which should be added as new material. This study does not indicate any material in the present content which can be omitted, nor does it indicate material which could have less emphasis. Content of the proposed outline is arranged somewhat differently than the content of the 1947 outline, the writer believing that the proposed outline has more logical sequence. The outline is developed in detail in order to include content requiring emphasis and new content. Content requiring greater emphasis is indicated by a single asterisk (*). New content is designated by a double asterisk (**) symbol.

Outline of Lectures and Laboratory Assignments (Revised, 1954)

Unit I. General Scientific Principles Relating to the Human Body

I. Incidents involved

A. Anatomy

1. Gross anatomy
2. Microscopic anatomy

a. Cytology
b. Histology

3. Developmental--embryology

B. Physiology
C. Related sciences

1. Hygiene
2. Psychology
3. Pathology

II. Composition of the human body

A. Chemical nature of the human body

1. Inorganic chemistry
2. Organic chemistry
3. Water and its solvent properties

a. Electrolytic theory*
b. Ionization*

(1) Acids
(2) Bases
(3) Neutral salts

c. pH--Hydrogen ion concentration
d. Solids, liquids, gases
e. Crystalloids, colloids
f. Diffusion
g. Osmosis
h. Filtration
i. Isotonicity

B. Cellular nature of the human body

1. Cells

a. Definition
b. Theory
c. Organization of protoplasm
d. Nitosis

2. Tissues

a. Definition
b. Types

(1) Epithelial
(2) Connective

(3) Muscle
(4) Nerve

c. Origin of tissues

(1) Ectoderm
(2) Mesoderm
(3) Endoderm

3. Organs

a. Definition
b. Examples

4. Systems

a. Definition
b. Examples

5. Organism defined

III. Vertebrate plan of human body

A. Major characteristics of vertebrates

1. Backbone
2. Living endo-skeleton
3. Bilateral symmetry

B. Body regions of the vertebrate

1. Planes
2. Surfaces
3. Positions

C. Body cavities of the vertebrate

Laboratory for Unit I

First and Second Weeks

Instructions on use and care of microscope and slides.
Study of typical cells, stained, fresh.
Study of tissues--

Epithelial - simple squamous, simple columnar, ciliated columnar, cuboidal, stratified squamous.

Connective - collagenous, elastic, areolar, reticular, adipose.

Mitosis
Demonstrations of diffusion, osmosis, filtration.

The Erect and Moving Body

Unit II. Skeletal System

I. Functions of the skeleton

A. Supporting framework
B. Leverage for skeletal muscles
C. Protection of organs
D. Manufacture of blood cells

II. Divisions of the skeleton

A. Axial skeleton
B. Appendicular skeleton

III. Formation and development

A. Endochondral bone
B. Membranous bone

IV. Articulations

A. Synarthroses

1. Definition
2. Structure
3. Examples

B. Ampniarthroses

1. Definition
2. Structure
3. Examples

C. Diarthroses

1. Definition
2. Structure
3. Articular capsule

a. Structure
b. Purpose
c. Ligaments

D. Leverage

1. Flexion-extension
2. Adduction-abduction
3. Circumduction
4. Rotation

E. Bursae

V. Parts of bone

A. Projections
B. Depressions

VI. Practical considerations

A. Arthritis
B. Ankylosis
C. Bursitis
D. Sprain
E. Fracture
F. Dislocation
G. Rickets

Laboratory for Unit II

Third through Fifth Weeks

Microscopic study of cartilage as connective tissue.
Microscopic study of bone as connective tissue.

Compact bone.
Cancellous bone.*

Demonstration of fresh bone, using beef knee-joints.

Red bone marrow--related to cancellous bone*
Yellow bone marrow
Periosteum
Articular capsule (effect of rheumatic fever)*

Study of the bones of the human skeleton, articulated, disarticulated--mimeographed lists of axial and appendicular bones, including principal projections, depressions, sutures, girdles to be furnished as laboratory guides.

Study of foetal skeleton, noting fontanels and cartilaginous areas.

Practical considerations relating to patient care.*

Bony prominences of sacro-coccygeal region, heels, elbows, shoulders, vertebral column.

Male and female pelvic formation. Determining dimensions of female pelvis.

Unit III. Muscular and Nervous Systems

I. Structures involved

A. Muscles

1. General purposes
2. Characteristic properties

a. Contractility
b. Extensibility
c. Elasticity
d. Tonus

3. Types of muscle tissue

a. Smooth muscle

(1) Structure
(2) Occurrence
(3) Function

b. Skeletal muscle

(1) Structure
(2) Occurrence
(3) Function
(4) Number
(5) Other systems allied to skeletal muscle
(6) Group action
(7) Arrangement of fibers
(8) Connective tissue
(9) Attachment to bone
(10) Origin and insertion

c. Cardiac muscle

(1) Structure
(2) Occurrence
(3) Function

B. Nervous tissue

1. General purposes
2. Characteristic properties
    a. Irritability
    b. Conductivity
3. Division of nervous system
    a. Central nervous system
        (1) Brain
        (2) Cord
    b. Peripheral nervous system
        (1) Cranial nerves
        (2) Spinal nerves
    c. Autonomic nervous system
        (1) Sympathetic
        (2) Parasympathetic
4. Neuron
    a. Definition
    b. Structural types of neurons
        (1) Unipolar
        (2) Bipolar
        (3) Multipolar
    c. Functional types of neurons
        (1) Afferent or sensory
            (a) Receptors
                Exteroceptors
                Proprioceptors
                Interoceptors
            (b) Types of end organs
        (2) Efferent or motor
            (a) Effectors
                Contraction
                Inhibition
                Acceleration
                Secretory
            (b) Motor end plates

(3) Association

(a) Tautomeric
(b) Commissural
(c) Projection--ascending, descending

5. Nerve fiber

a. Definition
b. Myelin
c. Neurilemma

6. Nerve

a. Definition
b. Arrangement of fibers
c. Connective tissue of peripheral nerves
d. Connective tissue of central nervous system
e. Degeneration and regeneration
f. Mixed nerve
g. Nerve plexus

7. Synapsis

a. Definition
b. Polarity
c. Chemical mediators*

(1) Cholinergic fibers
(2) Adrenergic fibers

8. Nerve impulse

a. Definition
b. Characteristics

(1) Refraction
(2) All or none law

c. Fatigue

II. Stimulation muscle and nervous tissues

A. Types of stimuli

1. Mechanical
2. Chemical
3. Thermal

4. Electrical
5. Maximal-minimal responses

B. Chemistry of muscle contraction
C. Physiology of muscle contraction

1. All or none law
2. Simple twitch
3. Summation
4. Tetanus
5. Treppe
6. Fatigue
7. Oxygen debt

III. Spinal cord

A. Location and protection
B. Parts

1. Shape
2. Regions
3. Gray matter
4. White matter

C. Relation of spinal nerves to cord

1. Number
2. Dorsal root and dorsal root ganglion, sensory neurons
3. Ventral root
4. Location of lower motor neurons
5. Location of association neurons

D. Meninges
E. Functions

1. Center for reflex activity

a. General principles of reflex action
b. Examples of reflexes related to human body

(1) Inherited
(2) Conditioned
(3) Coordinated
(4) Convulsive
(5) Reflexes involving cutaneous areas and their relation to specific organs**

c. Reflex arc
d. Spread of a reflex

2. Center for conduction*

a. Projection tracts

(1) Ascending--sensory
(2) Descending--motor

b. Location and function of specific tracts

(1) Ascending

(a) Fasiculus cuneatus
(b) Fasiculus gracilis
(c) Spinocerebellar
(d) Spinothalamic

(2) Descending

(a) Corticospinal
(b) Rubospinal
(c) Vestibulospinal
(d) Corticobulbar

IV. The brain

A. Hindbrain

1. Medulla oblongata

a. Location and purpose
b. Structures

(1) Fourth ventricle
(2) Decussation of Forel
(3) Vital centers
(4) Nuclei of ninth through twelfth cranial nerves

2. Pons

a. Location and purpose
b. Structure
c. Nuclei of fifth through eighth cranial nerves

3. Cerebellum

a. Location and purpose
b. Structure

(1) Vermis
(2) Peduncles
(3) Cortex--Purkinje cells
(4) Arbor vitae

B. Midbrain

1. Location and purpose
2. Structure

a. Cerebral aqueduct
b. Peduncles
c. Corpora quadrigemina
d. Red nuclei
e. Nuclei of third and fourth cranial nerves

C. Forebrain

1. Cerebral hemispheres

a. Location
b. Structure

(1) Fissures
(2) Convolutions
(3) Lobes
(4) Gray matter
(5) White matter--association, commissural, projection fibers
(6) Corpus callosum
(7) Ventricles

(a) Third
(b) Lateral
(c) Choroid plexus

c. Areas of localization of function

(1) Motor area

(a) Location
(b) Upper motor neurons (Cells of Betz)

(2) Pre-motor area

(a) Location
(b) Extra-pyramidal system

(3) Somesthetic area
(4) Auditory centers
(5) Visual centers
(6) Taste and olfactory centers
(7) Speech centers

2. Structure and function of basal nuclei (ganglia)

a. Thalamus
b. Hypothalamus
c. Corpus striatum
d. Internal capsule

D. Meninges

1. Dura mater
2. Arachnoid membrane
3. Pia mater
4. Sub-arachnoid space
5. Cerebrospinal fluid--formation, circulation
6. Falx cerebri
7. Tentorium cerebelli

E. Cranial nerves

1. Names of the twelve pairs
2. Location of each pair
3. Function of each pair

V. Autonomic nervous system*

A. General purpose
B. Divisions

1. Sympathetic efferent
2. Parasympathetic efferent
3. Visceral afferent
4. Reasons for separation

C. Sympathetic portion of autonomic nervous system

1. Location
2. Structure

a. Pre-ganglionic fibers

(1) Origin
(2) Destination

(a) White ramus communicans
(b) Lateral ganglionic chain

b. Post-ganglionic fibers

(1) Somatic

(a) Gray ramus communicans
(b) Termination

(2) Visceral

(a) Colateral ganglia
(b) Termination

3. Functions

a. Chemical mediators*

(1) Preganglionic sympathetic fibers--acetylcholine
(2) Postganglionic sympathetic fibers

(a) Sympathin I
(b) Sympathin II

b. Examples of sympathetic effects in organs

D. Parasympathetic portion of autonomic nervous system

1. Location
2. Structure

a. Cranial nerves involved
b. Sacral nerves involved

3. Functions

a. Chemical mediator*--acetylcholine
b. Examples of parasympathetic effects in organs

E. Visceral afferent

1. Location
2. Purposes
3. Connections to central nervous system

F. Connections of autonomic nervous system to brain centers

VI. Practical considerations

A. Abnormal types of muscular contraction

1. Fibrillation
2. Spasm

B. Paralysis

1. Lesions of upper motor neurons in general
2. Lesions of lower motor neurons in general
3. Paraplegia
4. Hemiplegia

C. Examples of lesions to:

1. Projection tracts
2. Medulla oblongata
3. Cerebellum
4. Thalamus
5. Hypothalamus
6. Corpus striatum
7. Cranial nerves
8. Areas of localization in cerebrum

VII. Organs of special sense

A. Eye

1. Structure (gross and microscopic anatomy) and function

a. Layers

(1) Sclera--cornea
(2) Choroid

(a) Ciliary body
(b) Iris
(c) Pupil

(3) Retina

(a) Non-optic portion
(b) Optic portion--rods, cones
(c) Macula lutea
(d) Fovea centralis
(e) Optic disc and blind spot
(f) Optic nerve

b. Anterior chamber--aqueous humor
c. Lens and suspensory ligament
d. Posterior chamber and vitreous body

2. Muscles and ligaments of eyeball
3. Lids
4. Lachrymal system
5. Optic pathways

a. Optic chiasma
b. Connections to thalamus
c. Connections to corpora quadrigemina
d. Connections to occipital lobe of cerebrum

6. Practical considerations

a. Emmetropia
b. Hypermetropia
c. Myopia
d. Presbyopia
e. Astigmatism
f. Glaucoma
g. Conjunctivitis
h. Strabismus
i. Cataracts

B. Ear

1. Outer ear

a. Location and parts

(1) Auricle
(2) Auditory meatus
(3) Tympanum

b. Function

2. Middle ear

a. Location and parts

(1) Middle ear cavity
(2) Auditory ossicles
(3) Eustachian tube
(4) Attic portion--mastoid antrum
(5) Vestibular fenestra
(6) Cochlear fenestra

b. Function

3. Inner ear

a. Location
b. Vestibular portion--parts and function

(1) Utricle
(2) Saccule
(3) Sensory receptors for equilibrium
(4) Semicircular canals
(5) Perilymph and endolymph

c. Cochlear portion--parts and function

(1) Spiral canal
(2) Organs of Corti
(3) Perilymph and endolymph

4. Characteristics of sound

a. Intensity
b. Pitch
c. Timbre

5. Auditory nerve
6. Some causes of deafness

Laboratory for Unit III

Fifth through Eighth Weeks

Dissection of major groups of muscles, using cats as specimens, and comparing these muscles to those of man using charts, pictures and model. Special note to be made of paired distribution of muscles and the opposing, bilateral direction of fibers.*

Group 1 - Muscles of the back. Latissimus dorsi, trapezius, rhomboideus major, levator scapulae, splenius, sacrospinalis group.

Group 2 - Muscles of the shoulder and upper arm. Deltoid, supraspinatus, infraspinatus, teres major, subscapularis, triceps brachii, biceps brachii, brachialis.

Group 3 - Muscles of the head and neck. Sternocleidomastoid, masseter, temporal, digastric (external pterygoid).

Group 4 - Muscles of the chest. Pectoralis major, pectoralis minor, serratus anterior, external and internal intercostals, diaphragm after opening abdominal cavity when finished with Group 6.

Group 5 - Muscles of the thigh and leg. Tensor fascia lata, biceps femoris, gluteus maximus, gluteus medius, sartorius, quadriceps femoris (vastus lateralis, rectus femoris, vastus medialis, vastus intermedius), gracilis, adductor brevis, adductor longus, adductor magnus, semimembranosus, semitendinosus, gastrocnemius.

Group 6 - Muscles of the abdominal wall. External oblique, internal oblique, transversus abdominus, rectus abdominus (separation of fibers of rectus abdominus by linea alba)*

NOTE: In connection with deltoid and gluteal muscles, locate nerves and blood vessels underlying these muscles.* From the model, charts and pictures study the arrangement of skeletal muscles forming "pelvic sling" in pelvic region.*

Microscopic study of slides of skeletal, smooth and cardiac muscle.

Demonstration of muscle nerve physiology through use of kymograph, showing simple twitch, summation, tetanus, treppe, fatigue, contracture. (Frog specimen)

Demonstration of spinal cord reflexes, decerebrated frog--mechanical, chemical, thermal and electrical stimuli.

Demonstration of tendon jerks in man.

Demonstration of effects of adrenaline, strychnine, acetylcholine on smooth, skeletal and cardiac muscle, using frog specimens.**

Microscopic study of cross-section of spinal cord of rabbit, upper motor neurons of cerebrum, Purkinje cells of cerebellum.

Dissection of preserved sheep brains, compared to preserved human brains. Comparison of preserved specimens to fresh beef brain.

Dissection of fresh beef eyes, compared to model of human eye. Experimentation with blind-spot, after images, pupil reflexes.

Study of model of human ear

Movie--Nervous System

Maintaining the Metabolism of the Body

Unit IV. Circulatory System

I. The heart

A. General features

1. Pumping organ
2. Location
3. Protection
4. Size and weight
5. Rate

a. Average in males and females
b. Variations
c. Factors influencing rate

6. Properties of heart muscle

a. Contractility
b. Extensibility
c. Elasticity
d. Irritability

e. Conductivity
f. Rhythmicity

B. Structure

1. Syncytium
2. Layers
3. Chambers
4. Valves (histology**)
5. Vessels attached to heart

C. Physiology

1. Course of blood--systole, diastole
2. Valvular action
3. Nodes*--control of heart beat
4. Innervation--connections to brain and cord

a. Pressor fibers--vasoconstriction*
b. Depressor fibers--vasodilation*
c. Accelerator fibers--sympathetic
d. Inhibitor fibers--parasympathetic

5. Mechanics of heart beat--cardiac cycle
6. Heart sounds

D. Practical considerations

1. Angina pectoris
2. Coronary thrombosis
3. Valvular regurgitation
4. Valvular stenosis
5. Aortic aneurysm
6. Fibrillation
7. A.V. block
8. Extra systole
9. Rheumatic fever*

II. Blood vessels

A. Course of blood from and back to heart

1. Arteries
2. Arterioles
3. Capillaries
4. Venules
5. Veins

B. Structure of arteries and veins

1. Tunica interna
2. Tunica media
3. Tunica externa
4. Thickness of walls

    a. Arteries
    b. Veins
    c. Arterioles, venules
    d. Capillaries

5. Vasa vasorum

C. Pulmonary circulation
D. Systemic circulation
E. Innervation

1. Vasoconstriction*
2. Vasodilation*

F. Blood pressure

1. Significance
2. Definition
3. Measurement
4. Systolic pressure
5. Diastolic pressure
6. Mean pressure
7. Pulse pressure
8. Factors responsible for maintaining pressure
9. Changes in pressure levels

    a. Muscular exercise
    b. Hypertension
    c. Hypotension
    d. Drugs and internal secretions

III. Blood

A. Definitions

1. Blood
2. Tissue fluid
3. Lymph

B. Functions
C. Characteristics of blood

1. Form

    a. Plasma

(1) Description and definition
(2) Components

(a) Fluid
(b) Proteins
(c) Organic matter other than protein
(d) Inorganic matter
(e) Respiratory gases
(f) Hormones
(g) Antibodies and immune substances

b. Cells

(1) Erythrocytes
(2) Leucocytes
(3) Thrombocytes

2. Volume

a. Regulation of volume

(1) Hydrostatic pressure
(2) Osmotic pressure

b. Hypovolemia
c. Hypervolemia

3. Average quantity
4. Specific gravity
5. Morphology
6. Reaction

a. pH--Hydrogen ion concentration
b. Factors responsible for maintaining alkalinity

(1) Lungs
(2) Kidneys
(3) Buffering system--electrolytes*

c. Acidosis
d. Alkalosis

7. Normal constituents--milligrams per 100 cc.**

D. Origin of blood cells

1. Foetal
2. Reticulo-endothelial tissue
3. Lymphoid tissue
4. Myeloid tissue

E. Erythrocytes

1. Description
2. Structure
3. Formation and development
4. Numbers per cubic millimeter of blood

    a. Count
    b. Normal variations in number

5. Hemoglobin

    a. Formation
    b. Function
    c. Quantity
    d. Measurement

6. Life cycle
7. Anemias

    a. Related to destruction of red cells
    b. Related to defective blood formation

8. Polycythemia
9. Red cell--plasma relations*

    a. Suspension
    b. Sedimentation rate**

F. Immunity

1. Natural
2. Artificial
3. Antibodies

G. Blood groups

1. Types
2. Compatibility determined

    a. Matching test
    b. Cross-matching test*

3. Rh factor

H. Leucocytes

1. Description and numbers per 100 cc of blood
2. Types

a. Agranular

(1) Formation
(2) Types
(3) Percentage
(4) Function

b. Granular

(1) Formation
(2) Types
(3) Percentage
(4) Function

3. Count
4. Variations in number
5. Leucocytosis
6. Leukemias
7. Leucopenia

J. Thrombocytes

1. Description
2. Number per 100 cc. of blood
3. Origin
4. Function

a. Blood coagulation
b. Essential substances required for coagulation
c. Steps in clot formation

IV. Special considerations

A. Physiological adjustment to hemmorhage
B. Transfusions and infusions

1. Whole blood
2. Plasma
3. Artificial media

C. Hemophilia

V. Lymphatic circulatory system

A. Structure

1. Lymphatic capillaries
2. Lymphatic ducts
3. Lymphoid organs--structure and function

a. Sub-epithelial
b. Nodes
c. Spleen

B. Composition of lymph
C. Movements of lymph
D. Functions

VI. Foetal heart and circulation

Laboratory for Unit IV

Ninth and Tenth Weeks

Dissection of fresh beef heart--compared with human heart model.

Movie--circulatory system.

Dissection of major arteries, veins, hepatic-portal system of cat--compared with charts, model, pictures of human arteries, veins, hepatic portal system.

Demonstration of capillary circulation in frog mesentery.

Microscopic study of valve tissue.**

Microscopic study of stained blood film, noting red cells and different types of white cells.

NOTE: Red cell count is done in Microbiology. Therefore, it is omitted from Anatomy and Physiology.

Unit V. Respiratory System

I. Definition

A. Respiration in general
B. Divisions of respiration

1. External respiration
2. Internal respiration

II. Anatomy

A. Larger air passages

1. Nasal cavity
2. Nasopharynx
3. Oral pharynx
4. Larynx
5. Trachea
6. Primary bronchi

B. Thoracic cavity as a whole

1. Mediastinum
2. Lungs

a. Number of lobes
b. Size of lobes*
c. Roots

3. Pleura

a. Pulmonary
b. Parietal

C. Smaller air passages

1. Secondary bronchi
2. Bronchioles
3. Alveolar ducts
4. Alveolar sacs
5. Alveoli

III. Physiology

A. Respiratory membrane
B. Mechanics

1. Lungs at birth
2. Intrathoracic pressure
3. Negative pressure*

C. Respiratory movements

1. Action of diaphragm and intercostal muscles*

a. Active phase--inhalation
b. Innervation

(1) Respiratory center
(2) Phrenic nerves
(3) Thoracic nerves

c. Passive phase--exhalation

(1) Hering-Breuer reflex
(2) Vagus nerve

D. Transport of blood gases
E. Factors affecting respiratory center

1. Nervous
2. Chemical

IV. Artificial respiration and aids to respiration

A. Schafer prone-pressure method
B. Holger-Neilsen prone-pressure method
C. Drinker respirator
D. Chest respirator
E. Rocking beds
F. Oxygen therapy

V. Lung capacity

A. Tidal air
B. Complimental
C. Supplemental
D. Residual
E. Vital capacity
F. Total capacity
G. Comparison of inspired and expired air

VI. Respiratory rates

A. Variations

1. Age
2. Sex
3. Altitude

B. Modifications

1. Swallowing
2. Laughing—crying
3. Coughing*

4. Sneezing
5. Yawning

VII. Types of respiration

A. Eupnea
B. Hyperpnea
C. Dyspnea
D. Orthopnea
E. Tachypnea
F. Apnea

VIII. Practical considerations

A. Cheyne-Stokes respiration
B. Oxygen want--types of anoxia
C. Cyanosis
D. Adenoids
E. Pneumonias
F. Bronchitis
G. Pulmonary tuberculosis

1. Phrenic crush
2. Pneumothorax
3. Pneumoperitoneum
4. Thoracoplasty
5. Lobectomy

H. Pleurisy
J. Forced breathing**

Laboratory for Unit V

Eleventh Week

Demonstration of action of diaphragm with bell-jar model of thoracic cavity.

Dissection of respiratory passages and lungs of cat--compare to human charts and model.

Demonstration of elasticity of lungs using fresh lamb trachea and lungs.

Microscopic study of lung tissue, slide, stained.

Use of stethescope to determine sounds of respiration.

Movie--Respiratory System

Unit VI. Digestive System

I. Nature of foods and enzymes

A. Definition
B. Chemistry of:

1. Carbohydrates
2. Fats
3. Proteins

C. Vitamins--accessory food factors
D. Enzymes

II. Fundamental organization and processes of the digestive system

A. Oral cavity

1. Structures

a. Cheeks
b. Muscles of mastication
c. Tongue
d. Teeth
e. Salivary glands

2. Saliva

a. Stimulation of flow
b. Composition
c. Functions

(1) Other than digestive
(2) Digestive action of enzymes

(a) Salivary amylase
(b) Salivary maltase

B. Pharynx and esophagus

1. Pharynx

a. Divisions
b. Structure
c. Swallowing reflex--first phase

2. Esophagus

a. Structure
b. Swallowing reflex--second and third phases

c. Peristalsis*
d. Action of cardiac sphincter
e. Disturbances

(1) Stricture
(2) Cardiospasm

3. Innervation of swallowing reflex

C. Gastric digestion

1. Structure and regions of stomach
2. Functions
3. Gastric juice

a. Composition
b. Secretory glands
c. Control of secretion

(1) Vagus nerve
(2) Sympathetic nerves
(3) Psychic phase
(4) Gastric phase
(5) Intestinal phase

d. Enzymatic action

(1) Gastric proteinase (pepsin)
(2) Rennin
(3) Gastric lipase

4. Gastric motility

a. Stimulation
b. Peristalsis*
c. Pyloric valve activity

5. Gastric disturbances

a. Hypomotility
b. Hypermotility
c. Pylorospasm
d. Achlorhydria
e. Histamine, hydrochloric acid and ulcers

D. Small intestine

1. Regions

a. Duodenum
b. Jejunum
c. Ileum

2. Structures involved in each region
3. General function of each region
4. Intestinal juice

a. Composition*
b. Secretory glands
c. Control of secretion
d. Enzymatic action

(1) Enterokinase
(2) Intestinal peptidase (erepsin)
(3) Intestinal maltase
(4) Intestinal sucrase
(5) Intestinal lactase
(6) Intestinal lipase

5. Intestinal motility

a. Peristalsis*
b. Segmentation movements

6. Absorption of end products of food*

a. Glucose
b. Amino acids
c. Fatty acids and glycerol

E. Colon

1. Structure and regions
2. Functions
3. Secretions
4. Motility

a. Anti-peristalsis
b. Periodic peristalsis*

5. Defecation

F. Accessory organs of digestion

1. Liver

a. Location and structure
b. Functions

c. Bile

(1) Formation
(2) Storage
(3) Concentration in gall bladder

(a) Consistency before and after concentration
(b) Role of cholesterol*
(c) Role of cholecystokinin

(4) Ducts leading to duodenum

2. Pancreas

a. Location and structure
b. Dual function

(1) Gland of digestion
(2) Endocrine gland

c. Pancreatic juice

(1) Composition
(2) Control of secretion
(3) Enzymes

(a) Pancreatic proteinase (trypsin)
(b) Pancreatic amylase
(c) Pancreatic lipase

III. Metabolism

A. In general

1. Anabolism
2. Catabolism

B. Fate of:

1. Carbohydrates
2. Proteins
3. Fats

C. Basal metabolism
D. Body temperature

1. Variations
2. Heat production and dissipation

3. Effects of hypothermia
4. Effects of hyperthermia

Laboratory Unit VI

Twelfth Week

Dissection of alimentary tract and accessory organs of digestion in the cat, compared to human system using model and charts.

Microscopic examination of digestive organ tissues--stomach, small intestine, liver, pancreas.

Demonstration of action of saliva, gastric proteinase, rennin, bile.**

Demonstration of peristalsis in frog.**

Movie--The Alimentary Tract.

Unit VII. Excretory System

I. Organs of excretion

A. Secondary organs

1. Lungs
2. Colon
3. Skin

B. Primary organs--the kidneys

II. Kidneys

A. Gross anatomy

1. Location*
2. Regions and parts
3. Blood supply

B. Microscopic anatomy--nephrons

1. Renal corpuscles
2. Uriniferous tubules

C. Functions of kidneys

III. Urine

A. Composition

1. Consistency*
2. Norms

B. Reaction--pH
C. Volume

1. Normal

a. Daily
b. Nycturia

2. Abnormalities

a. Nocturnal enuresis
b. Polyuria
c. Oliguria
d. Nocturia
e. Pyuria
f. Glycosuria
g. Proteinuria
h. Hematuria
j. Cylinduria**

D. Formation

1. Effective filtration pressure
2. Function of uriniferous tubules

a. High-threshold substances
b. Low-threshold substances
c. Non-threshold substances

3. Influences of

a. Pitressin (posterior pituitary gland)
b. Desoxycorticosterone (adrenal gland cortex)

4. Diuresis and diuretics

E. Nephritis

IV. Micturition

A. Structures involved

1. Ureters
2. Urinary bladder

a. Detrussor muscle
b. Trigone muscle
c. Urethral sphincter

(1) In male
(2) In female

d. Capacity of urinary bladder

3. Urethra

a. Length in male and female
b. Urethral meatus

(1) In male
(2) In female*

B. Evacuation

1. Filling of bladder
2. Nerve supply to bladder and sphincter
3. Nerve centers for micturition reflex
4. Emptying bladder
5. Catheterization

Laboratory for Unit VII

Thirteenth Week

Microscopic study of stained slide of human skin.

Dissection of kidneys, ureters, urinary bladder of cat and comparison to human model and charts.

Microscopic study of stained whole mount of kidney--Nephrons.

Movie--Excretory System

Unit VIII. Endocrine System

I. Comparison of exocrine and endocrine glands

A. Exocrine glands

1. Characteristics
2. Examples

B. Endocrine glands

1. Characteristics
2. Examples
3. Methods of study
4. Chemical nature of hormones**

    a. Steroids

        (1) Hormones of the gonads
        (2) Hormones of the adrenal cortex

    b. Proteins

        (1) Hormones of the pituitary
        (2) Hormone of the parathyroids
        (3) Hormone of the Islets of Langerhans

    c. Amino acids

        (1) Hormone of the thyroid

5. Parenteral administration of hormones**

    a. Thyroid hormone and progestin by mouth
    b. Others by injection

II. Pituitary gland

A. General considerations

1. "Master" gland of endocrine secretion
2. Location and size
3. Development

    a. Anterior lobe
    b. Posterior lobe
    c. Pars intermedia

4. Structure

    a. Anterior lobe

        (1) Acidophil cells**
        (2) Basophil cells**
        (3) Chromophobe cells**

    b. Posterior lobe

(1) Pituicytes**
(2) Neuroglial cells**
(3) Hyaline bodies**

c. Intermediate portion
d. Infundibulum
e. Connections to base of cerebrum and hypothalamus

B. Anterior lobe physiology

1. Hormones produced and their functions

a. Growth hormone
b. Thyrotropic (TTH)
c. Adrenocorticotropic (ACTH)
d. Gonadotropic*

(1) Follicular stimulating hormone (FSH)
(2) Lutein stimulating hormone (LSH)
(3) Effects in male and female

e. Prolactin

2. Unfractioned extracts of anterior pituitary

a. Diabetogenic
b. Glycotropic
c. Ketogenic
d. Parathyroptropic
e. Pancreotropic

C. Posterior lobe physiology

1. Hormones produced and their major effects

a. Pitressin--anti-diuretic
b. Pitocin--oxytocic

2. Other effects

a. General vasoconstriction in contrast to action of adrenaline
b. Contraction of smooth muscles

(1) Intestine
(2) Urinary bladder

(3) Ureters
(4) Lactiferous ducts

D. Disorders of pituitary in man

1. Hyperpituitarism

a. Giantism
b. Acromegaly

2. Hypopituitarism

a. Lorain type dwarfism
b. Frolich's type dwarfism
c. Simmond's disease
d. Diabetes insipidus

III. Thyroid gland

A. Location and size
B. Gross and microscopic anatomy
C. Nerve supply
D. Thyroid hormone

1. Chemistry
2. Functions

E. Disorders of thyroid in man

1. Goiter

a. Simple colloid
b. Diffuse parenchymatous
c. Adenomatous

2. Hypothyroidism

a. Cretinism
b. Myxedma

3. Hyperthyroidism

a. Exophthalmic goiter
b. Toxic adenoma

IV. Parathyroid glands

A. Location, number, size
B. Parathyroid hormone
C. Functions
D. Disorders of parathyroid glands in man

1. Hypoparathyroidism

    a. Associated with parathyroidectomy
    b. Associated with malfunction
    c. Parathyroid tetany
    d. Other forms of tetany not associated with parathyroid glands

2. Hyperparathyroidism

    a. Causes
    b. Effects on neuromuscular mechanisms
    c. Osteitis fibrosa cystica

V. Adrenal glands

A. Location, number, size
B. Gross anatomy

1. Cortex
2. Medulla

C. Microscopic anatomy

1. Cortex
2. Medulla

D. Embryological development

1. Cortex and gonads
2. Medulla and sympathetic ganglia

E. Adrenal cortex

1. Stress theory of function
2. Hormones produced and their functions

    a. Chemistry of hormones and the influence of cholesterol*
    b. Cortisone
    c. Corticosterone
    d. Desoxycorticosterone
    e. Estrone
    f. Progestin
    g. Adrenosterone

3. Disorders of adrenal cortex

    a. Addison's disease
    b. Cortical tumors

(1) Sexual precosity in children
(2) Virilism in women

F. Adrenal medulla

1. Emergency theory of function
2. Hormone adrenaline (epinephrine) and its functions

a. Chemistry
b. Effects

3. Sympathin*

a. Sympathin I
b. Sympathin E (or II)

4. Nervous control

VI. Pancreas as an endocrine gland

A. Islets of Langerhans

1. Relation to other cells of pancreas
2. Secretion of insulin

B. Functions of insulin
C. Insulin deficiency--diabetes mellitus
D. Insulin shock

VII. Gonads as endocrine glands

A. Sexual phenomena of female

1. Puberty and secondary sexual characteristics
2. Maturity

a. Ovarian changes
b. Menstrual cycle

3. Ovarian hormones

a. Chemistry
b. Effects of anterior pituitary FSH upon Graafian follicle--estradiol
c. Effects of anterior pituitary LSH upon corpus luteum--progestin

4. Functions of estradiol*

    a. Menstrual cycle
    b. Pregnancy and parturition

5. Functions of progestin*

    a. Menstrual cycle
    b. Pregnancy and parturition

6. Hormones of the placenta and their function

    a. Estrin
    b. A.P.L. principle

B. Sexual phenomena of male

1. Puberty and secondary sexual characteristics
2. Maturity

    a. Male sex hormone--testosterone

        (1) Chemistry
        (2) Cells of Leydig in testes
        (3) Urine--androsterone

    b. Influence of FSH, anterior pituitary
    c. Influences of LSH, anterior pituitary

VIII. Thymus gland

A. Location
B. Size
C. Structure
D. Reduction in size
E. Possibility of endocrine function

IX. Pineal body

A. Location
B. Size
C. Structure
D. Possibility of endocrine function

Laboratory Unit VIII

Fourteenth Week

Demonstration of effects of removal of the following glands from rats--pituitary, adrenals, gonads, thyroid and parathyroids**

Demonstration of forced metamorphosis in tadpoles using thyroxine**

Demonstration of insulin shock and recovery--rabbit**

Demonstration of histology of thyroid, pituitary (acidophilic, basophilic and chromophobic cells)**, Adrenal cortex and medulla, Islets of Langerhans.

Movie--The Endocrine Glands

Origin and Development of the Human Being

Unit IX. Reproductive System

I. Male

A. Testes

1. Location and size
2. Gross anatomy
3. Microscopic anatomy

a. Seminiferous tubules

(1) Spermatogenic cells
(2) Sustentacular cells
(3) Cells of Leydig (interstitial)

b. Spermatogenesis (meiosis)*

B. Excretory ducts--structure and function

1. Rete testis (vasa efferentia)
2. Epididymus
3. Vas (ductus) deferens
4. Ejaculatory duct
5. Prostatic urethra
6. Membranous urethra
7. Common urino-genital duct

C. Auxiliary structures--structure and function

1. Seminal vesicle
2. Prostate gland
3. Bulbo-urethral (Cowper's) gland
4. Penis

D. Spermatozoa

1. Course
2. Semen
3. Life cycle

E. Nerve and blood supply to male reproductive organs*

II. Female

A. Relation of female reproductive organs to other organs of the abdomino-pelvic cavity*

B. Ovaries

1. Location and size
2. Gross anatomy
3. Microscopic anatomy

a. Germinal epithelium
b. Development of Graafian follicle
c. Oogenesis (meiosis)*
d. Ovulation

(1) Corpus hemmorhagicum
(2) Corpus luteum

C. Fallopian tubes

1. Location
2. Length
3. Structure

a. Gross
b. Microscopic

D. Uterus

1. Location
2. Size*

a. Normal
b. During pregnancy

3. Gross anatomy

a. Fundus
b. Body
c. Cervix
d. Position
e. Supporting ligaments

4. Microscopic anatomy

a. Layers
b. Cervix*

5. Cyclic changes in endometrium

a. Influence of hormones

(1) Estradiol
(2) Progestin

b. Menstruation
c. Pregnancy

E. Vagina

1. Structure

a. Gross
b. Microscopic

2. Secretions**
3. Relation to uterine cervix

F. Nerve and blood supply to female reproductive organs*

G. External genitalia

1. Relation of internal and external female genitalia*
2. Mons Pubis
3. Labia majora
4. Labia minora
5. Clitoris
6. Vulva
7. Relation of external genitalia to urethral meatus*
8. Perineum

H. Mammary glands*

1. Structure
2. Development

a. Puberty
b. Pregnancy

3. Lactation
4. Composition of milk
5. Relation to lymph nodes of chest wall and axilla

J. Female structures analogous with male structures

III. Embryological development*

A. Fertilization of ovum
B. Sex determination
C. Period of the ovum

1. Segmentation of zygote (mitosis)
2. Morula
3. Implantation
4. Blastocyst
5. Trophoblast
6. Chorion
7. Amnion

D. Period of the embryo**

1. Primitive germ layers

a. Ectoderm
b. Mesoderm
c. Endoderm

2. Embryonic plate
3. Development of placenta
4. Development of organs

E. Period of the foetus**

1. Further development of organs
2. Refinement and growth of organs

F. Parturition

1. Position of foetus
2. Birth canal

a. Shape
b. Dilation
c. Uterine contractions

G. Comparison of size of body organs**

1. New born
2. Children
3. Adult

IV. Multiple births

A. Twinning

1. Fraternal
2. Identical
3. Conjoined

B. Triplets
C. Quadruplets
D. Quintuplets

Laboratory Unit IX

Fifteenth and Sixteenth Weeks

Dissection of reproductive organs of male and female cats, compared with human models and charts.

Microscopic study of stained slide of human testis.

Microscopic study of stained slide of cat ovary, compared to illustration of human ovary.

Microscopic study of stained human spermatozoa.

Microscopic study of stained slide of mammary gland, compared with model of mammary gland.

Study of living chick embryos from one day stage of development through twenty-one day stage of development.**

Study of human foetal forms, different stages of development, preserved specimens.

CHAPTER V

SUMMARY AND CONCLUSIONS

Development of the Nursing Curriculum and Collegiate Programs

From the inception of the first training programs for the preparation of nurses in 1873, to the increasing development of collegiate programs for the education of nurses in 1954, nursing in the United States has emerged as a profession.

Curricular changes have paralleled changes in types of programs. Originally focused upon simple procedures, nursing education at the collegiate level today stems from a broad base of general education in the humanities, the natural sciences and the social sciences.

The curriculum developed in several stages. To overcome diversities in programs of nursing, created as a result of the rapid expansion of schools of nursing in the first part of the twentieth century, the Education Committee of the National League of Nursing Education developed The Standard Curriculum for Schools of Nursing (1917). Existing programs were studied by the committee and the publication was the result of a compilation of the best features of these programs.

In 1927 this edition was revised and the title was changed to The Curriculum for Schools of Nursing. The word "standard" was omitted because schools, in attempting to reorganize their individual programs, had conformed fairly precisely to the suggestions made in the 1917 edition. The publication was originally intended as a guide in developing a

program and not a rigid outline all schools must follow. The scope of the curriculum was extended to include sociology, psychology and an introduction to public health nursing.

A more scientific approach to a study of the nursing curriculum was made in connection with the second revision, published in 1937 as A Curriculum Guide for Schools of Nursing. Job analyses and surveys by subcommittees, on a nationwide basis, provided data from which the revised edition was formulated by the Curriculum Committee of the National League of Nursing Education.

Further revision of the curriculum had been planned for 1947, following the previously established pattern for revision every ten years. Because of the many problems confronting nursing at the close of World War II in relation to nursing services and nursing education, revision was postponed until the problems could be analyzed effectively. This decision was the result of two national conferences, in 1949 and 1950, each of which was preceded by local conferences throughout the country. Research in nursing services and nursing education has been stimulated as a result. Through research, it is believed that a curriculum which meets the needs of nursing can be developed more satisfactorily.

Rapid advancements in medical sciences; improved methods of diagnosis and treatment; greater availaoility of facilities for treating patients in hospitals and clinics, and for maintaining the health of a growing population through organized public health agencies, are major factors which have instigated problems for the profession of nursing. These factors have necessitated changes in nursing services, which, in turn have precipitated changes in nursing education.

Growing demands for nursing services have exceeded the supply of nurses to fulfill these demands. Because it has become necessary to augment the services of professional nurses with the services of auxiliary personnel, the role of nurses has broadened in scope. Today, nurses must not only assume added responsibilities related to the care of patients, but must also be capable of supervising and directing the activities of auxiliary workers who assist in the care of patients.

Changes in Teaching Personnel

The changing curricular pattern for nursing has effected changes involving teaching personnel. Originally it was customary for doctors and nurses only, to teach the subject matter pertinent to nursing. At the present time many educators outside the fields of medicine and nursing participate in the general or pre-professional education of students of nursing.

While this trend is not a recent innovation, the employment of educators in the fields of the natural and social sciences in programs of nursing education gained impetus during World War II. As student enrollment in nursing education increased, the proportion of qualified nurse educators in these areas decreased. In order to compensate for this shortage of teachers, many non-collegiate schools of nursing affiliated with institutions of higher education for the purpose of obtaining instruction for their students in general education subjects. Since World War II this pattern has continued.

Professionally, the collegiate program more nearly meets the needs of nursing in providing a greater depth of educational experiences in the

sciences basic to the understanding of medical sciences; in the acquisition of an appreciation of our cultural heritage; and in the development of the knowledge, skills, attitudes and values essential to better human relationships, all of which enrich the professional phase of nursing education.

Wayne University, Basic Collegiate Program in Nursing

The College of Nursing at Wayne University, Detroit, Michigan, began to function as an autonomous unit of the university in 1945. The College is an outgrowth of the Department of Nursing, College of Liberal Arts, established in 1930. Besides offering courses leading to the degree of Bachelor of Science in Nursing to registered nurses, a basic degree program for students preparing to enter the field of nursing was started in 1947.

Summary of Research

It is with one aspect of the basic degree program that this study is concerned. Students enroll in the basic program for forty-four months of general and professional education. Faculty members in other colleges of the university participate in the general education of these students, while faculty members of the College of Nursing are responsible for professional education.

This study centers around an investigation of the course content of human anatomy and physiology. The course is taught by the writer, a member of the faculty of the Biology Department of the College of Liberal Arts, during the second semester of students' experience in general education. The course is designed to provide functional information,

principles and concepts of anatomy and physiology, basic to professional courses in nursing.

The writer joined the teaching staff of the Biology Department in 1948, after content for the course in anatomy and physiology had been planned by members of the faculty of the College of Nursing, meeting in conference with members of the faculty of the Biology Department, in 1947. A Curriculum Guide for Schools of Nursing was used as the basis for selecting essential content.

As the result of a similar conference held in 1949, the writer, hereafter designated as the "science instructor," gained the impression that while some of the needs of the nursing program at Wayne University were being met, the course in anatomy and physiology was not entirely satisfactory. For example, it was suggested by the clinical instructors that more emphasis be given to the structure and function of the autonomic nervous system, but the specific points to be emphasized, and the reasons for this were not stated.

Subsequent discussions with individual clinical instructors were beneficial, in that the science instructor acquired some vicarious orientation to the field of nursing. The discussions, however, did not provide a complete enough solution to the problem. A thorough and more scientific approach was needed before a course in anatomy and physiology, more suitable for the purposes of nursing, could be designed.

Methodological Aspects

The method selected for the purposes of this study was an adaptation of the critical incidents technique. The technique was originally

designed and developed by John C. Flanagan, Director of the American Institute for Research, located in Pittsburgh, Pennsylvania.

The critical incidents technique has been used to determine the crucial requirements of an activity, through observing individual performance. Observers write brief descriptions of incidents in terms of successful or unsuccessful performance as the performance relates to a specific activity. Identical incidents and closely related incidents are then categorized into suitable sub-groupings, and tabulated numerically. Depending upon the frequency of occurrence, the categories become a relative indication of the essential or crucial requirements of the activity.

This study defines critical incidents as those which indicate students' familiarity or unfamiliarity with the principles of anatomy and physiology. In applying these principles clinically, successful or unsuccessful performance determines the crucial requirements in nursing for the course content of anatomy and physiology. In addition, this study determines content requiring special emphasis, content requiring less emphasis and content to be eliminated.

The clinical areas or services selected for study were suggested by the clinical instructors and include nursing arts, medical and surgical nursing, pediatric nursing and obstetric nursing. A total of four groups of students was observed, one group in each of the nursing areas.

Incidents in the four areas of nursing were derived from observations of:

1. Classroom performance - Incidents based upon class discussion related to nursing theory and the application of the principles of anatomy and physiology.

2. Nursing care performance - Incidents based upon the application of the principles of anatomy and physiology to practice involved in patient care.

3. Case conference performance - Incidents based upon student presentation and discussion of specific patients, applying the principles of anatomy and physiology to the condition and treatment of the patient.

Incidents were reported by clinical instructors, students and the science instructor. The science instructor's observations were limited to the classroom and to case conferences.

Forms were provided for the recording of incidents. The observer underlined the appropriate headings:

OBSERVER: Student, Clinical Instructor, Science Instructor

AREA: Nursing Arts, Medicine and Surgery, Pediatrics, Obstetrics

SYSTEM: Skeletal, Muscle-Nerve, Circulatory, Respiratory, Digestive, Excretory, Endocrine, Reproductive

Space was provided on the forms for brief descriptions of the incident as it indicated either adequate or inadequate preparation in anatomy and physiology:

1. Describe the incident which indicated a lack of preparation in anatomy and physiology.

2. Describe the incident which indicated adequate preparation in anatomy and physiology.

Students were asked to participate voluntarily and their reports were unsigned.

Findings and Conclusions

Findings concerned with course content and with methodology are summarized separately. Conclusions are based upon these findings.

Findings and Conclusions Related to Content

Findings from Total Incidents

1. From all sources, total incidents numbered 878. Clinical instructors contributed 359 incidents, students contributed 292 incidents and the science instructor contributed 227 incidents.

2. Total incidents were separated into 751 incidents showing inadequate preparation in anatomy and physiology, and 127 showing adequate preparation.

3. Although these incidents arose in connection with preparation related to all systems of the human body, the two systems least involved with inadequate preparation were the skeletal and digestive systems, while those most involved were the neuro-muscular and the endocrine systems.

4. Careful inspection of individual incidents gave no evidence of content to be eliminated from the content of the present course, nor of content to be less emphasized.

5. Where no incidents are reported in connection with some of the content currently included in the course; for example, content related to the thyroid, parathyroid and posterior pituitary glands, it is assumed that such content is satisfactory and requires no revision.

General Conclusions from Total Incidents

1. Based upon these findings, it is generally concluded that the

1947 outline of course content may be used intact, as a foundation for revising the course in anatomy and physiology.

2. Major changes to be made in the content relate to the neuromuscular system and the endocrine system.

Findings from Categories

Total incidents were reduced to suitable categories for each system. Identical and closely related incidents were classified and tabulated in order to show the crucial requirements for content.

1. The reduction of incidents resulted in a total of sixty-eight categories, fifty categories indicative of inadequate preparation and eighteen categories indicative of adequate preparation.

2. Categories showing inadequate preparation in anatomy and physiology were analyzed for content requiring greater emphasis and new content to be added to the revised outline. This analysis showed thirty-three categories referring to content requiring greater emphasis and seventeen categories referring to new content.

3. Categories showing inadequate preparation were further analyzed to determine whether they concerned anatomy or physiology. This analysis showed thirty-one categories of inadequate preparation in physiology and nineteen categories of inadequate preparation in anatomy.

Examples of Categories Related to Physiology and Content Requiring Greater Emphasis

1. Chemical mediation of nerve impulses at synapses.

2. Peristalsis.

3. Cholesterol and its relationship to the formation of the hormones of the adrenal cortex.

4. Metabolism of proteins, carbohydrates and fats.

5. Specific functions of parasympathetic and sympathetic divisions of the autonomic nervous system.

Examples of Categories Related to Anatomy and Content Requiring Greater Emphasis

1. Detailed structure of the parasympathetic division of the autonomic nervous system and its connections to the central nervous system.

2. Detailed structure of the sympathetic division of the autonomic nervous system--preganglionic, postganglionic and afferent fiber connections to the central nervous system.

Examples of Categories Related to Physiology and New Content

1. Chemical nature of hormones--steroids, proteins and amino acids.

2. Sedimentation rate of blood.

3. Cutaneous reflexes and their relationship to underlying viscera.

4. Total normal constituents of blood in milligrams per 100 cc. of volume.

5. "Forced" breathing.

Examples of Categories Related to Anatomy and New Content

1. Histology of anterior pituitary gland--acidophilic, basophilic and chromphobic cells.

2. Histology of tissue comprising heart valves.

3. Detailed study of embryological structures and their development.

4. Comparison of size of organs of infants, children and adults.

Conclusions Based Upon Findings Related to Categories

1. Indications of inadequate preparation in anatomy and physiology relate more to lack of emphasis of present content than to omissions of content.

2. Content requiring greater emphasis has been identified and noted in the revised course outline.

3. In order to provide for greater emphasis, it will be necessary to devise some new methods of teaching.

4. New content to be added to the revised outline has been determined, and is included in the outline.

5. Because content to be emphasized and new content relate more to physiology than to anatomy, it is concluded that physiological principles are more frequently applied in nursing.

6. In order to provide for the inclusion of new content and to give special emphasis to certain items of present content, the amount of time allowed for the course in anatomy and physiology should be extended.

Findings and Conclusions Related to Methodology

1. The critical incidents technique has been used in a variety of situations to determine the crucial requirements of an activity. That the technique may be further adapted as a means of determining the crucial requirements in nursing for specific course content in the basic sciences of anatomy and physiology has been demonstrated by this study. It is concluded that the critical incidents technique was suitable for the purposes of the study.

2. It is possible that because student participation was voluntary, fewer incidents were derived from this source. Requiring student participation may have resulted in the reporting of more incidents, but the requirement may have had an adverse effect upon the cooperative nature of the study. This question cannot be answered conclusively.

3. Because the critical incidents technique has proved to be satisfactory for identifying the crucial requirements nursing has for the sciences of anatomy and physiology, it is concluded that the technique would be useful in determining the needs of nursing in relation to other natural sciences, such as, chemistry, physics and microbiology.

Recommendations

In connection with extending the course in anatomy and physiology, two plans are proposed.

Plan A

It is recommended that the course in anatomy and physiology be extended from the present one semester to two semesters, the course content to be divided as follows:

First Semester
(16 weeks)

Unit I. Basic Principles of Anatomy and Physiology
(2 weeks instead of 1)

Unit II. Skeletal System
(2 weeks, remains the same)

Unit III. Muscular-Nervous Systems
(8 weeks instead of 5)

Unit IV. Circulatory System
(4 weeks instead of 2)

Second Semester
(16 weeks)

Unit V. Respiratory System
(2 weeks instead of 1)

Unit VI. Digestive System
(3 weeks instead of 1)

Unit VII. Excretory System
(1 week, remains the same)

Unit VIII. Endocrine System
(6 weeks instead of 1)

Unit IX. Reproductive System
(4 weeks instead of 2)

With this distribution, more time could be devoted to those areas shown to be crucial by this study, the muscular and nervous systems during the first semester, and the endocrine system during the second semester. It would also permit added study of embryology shown to be a crucial area in relation to the reproductive system.

This distribution would also make it possible for students to participate individually and in small groups in laboratory experimentation. At the present time physiological demonstrations must be relied upon since they are not so time consuming. It is believed that if students can perform the experiments themselves, the content related to the experiments will be more meaningful and, therefore, retained more completely by the students.

Plan B

As an alternative to the two semester plan, it is recommended that a third hour of lecture be added to the present two one-hour periods per week, and that a third two-hour laboratory period be added to the present

two two-hour periods per week, for a one semester period of time.

Plan B is not so desirable as Plan A, even though it would increase the total number of clock-hours from seven to ten every week, including a one-hour quiz period. There still remains the question of students' powers to retain content, particularly the more complex subject matter, when it is concentrated in one semester. Spreading the course content over two semesters would enable students to have sufficient time to integrate the subject matter to greater degree.

Final Commentary

As a final comment, this study has made it possible for the science instructor to become more informed about the requirements of nursing for the sciences of anatomy and physiology. As a result, it is believed that a course has been designed to meet these requirements more satisfactorily.

A P P E N D I X

SAMPLE OF FORM USED FOR RECORDING INCIDENTS

Student Clinical Instructor Science Instructor

Nursing Arts Med. & Surg. Ped. O.B.

Skel. Musc-Ner. Circ. Resp. Dig. Excr. Endo. Repr.

1. Describe the incident which indicated lack of preparation in anatomy and physiology.

2. Describe the incident which indicated adequate preparation in anatomy and physiology.

SAMPLES OF INCIDENTS RELATED TO ALL SYSTEMS OF THE HUMAN BODY

Incidents Related to Table III--General Incidents

Category 1. Understanding of roots, prefixes and suffixes of scientific terms.

Incident from student in medical and surgical nursing:

"The instructor was asking us to define several new terms. These terms were the names of pathologic conditions. As I looked at them on the board, I recognized some parts of other words I knew and was able to give a pretty good definition of the new terms. I remembered how we did this in anatomy and physiology, and it looks as if it is paying off now."

Incident from clinical instructor in medical and surgical nursing:

"I have noticed that students, in many cases, seem to be able to tell what terms mean without having to look them up. I have been using some terms which describe various conditions in patients, and much of the time, although they have not heard of the condition, they are able to give a fairly accurate definition. They tell me that in anatomy and physiology, in addition to dissecting cats, they also learned to dissect words. This has proved to be very helpful."

Category 2. Comparison of size of adult organs with those of infants and children.

Incident from student in obstetric nursing:

"I was giving a newborn infant a feeding—the first time I had done this. I saw such a small quantity of milk in the bottle, I asked the instructor if it was the right amount. She asked me how big I thought the stomach of an infant was, and I didn't know. We did have the size of organs in anatomy and physiology, but they must have been adult sizes."

Incidents Related to Table IV--Skeletal System

Category 3. Leverage of bones, body mechanics and muscle origin and insertion.

Incident from clinical instructor in nursing arts:

"The group as a whole has a good concept of muscle origin and insertion. This saves much time in connection with learning the principles of massage. They also know the principles of leverage of the skeletal system. I have found that we do not need to spend much time teaching body mechanics as a result."

Incident from student in nursing arts:

"We were learning how to do back massage in nursing arts class, and the instructor asked me to name the groups of muscles of the back and tell where they attach to bones. I had not reviewed this before going to class, but I had no trouble recalling."

Category 4. Joints in relation to connective tissue deposit.

Incident from clinical instructor in pediatric nursing:

"In working with a patient being treated for rheumatic fever, seven of the students I was working with did not know how cortisone functions to reduce connective tissue deposit in joints. Then I asked them to describe the structure of a joint, such as the knee joint. They could not recall how the articular capsule is formed."

Category 5. Red bone marrow deposit in <u>all</u> areas of cancellous bone.

Incident from clinical instructor in medical and surgical nursing:

"Patient diagnosed as possible myelogenic leukemia. In caring for this patient prior to sternal puncture, the student did not understand why the bone marrow sample could be taken from the sternum. She thought that the sternum was a solid bone. I asked where she thought red bone marrow was located, and she replied, 'In all the ends of the long bones.' I asked if that were the only location for spongy bone, and she said 'Yes.'"

Incidents Related to Table V--Muscular-Nervous Systems

Category 1. Autonomic nervous system structure.

Incident from student in pediatric nursing:

"The instructor asked me to explain how the sympathetic system is connected to the spinal cord. I knew there were connections in the thoracic region and in the lumbar region, but I could not recall where the fibers came from, nor how they connected to the lateral chain."

Incident from clinical instructor in pediatric nursing:

"There are twelve students in this group. In reviewing the structure of the autonomic nervous system, not one of them could explain where the preganglionic fibers of the sympathetic fibers originate, nor what relationship they have to the ganglionic chain. They had heard about these fibers as well as postganglionic fibers, but could not recall any of the details. I had to start from the beginning to teach this unit."

Incident from science instructor in pediatric nursing:

"While observing in the classroom, the twelve students in the group could not recall any of the details of the connection of the sympathetic nervous system to the spinal cord. They did not remember anything about pre- and postganglionic fibers, nor the way in which the latter are distributed to viscera."

Category 2. Autonomic nervous system function.

Incident from student in medical and surgical nursing:

"In class we were discussing the use of drugs for stimulating various activities in the sympathetic nervous system. I was able to give some examples of stimulation to the stomach and the intestine, but I did not know how stomach glands and intestinal glands were affected."

Incident from student in pediatric nursing:

"The instructor asked me to tell what effects the parasympathetic and sympathetic systems have on the intestinal and stomach muscles. I didn't know which one stimulated and which one inhibited."

Incident from student in pediatric nursing:

"Miss _____ asked me to explain the unit action of the sympathetic system. I didn't know what she meant. I don't remember that we had this in anatomy and physiology."

Incident from clinical instructor in medical and surgical nursing:

"As a whole, the group has no concept of the differences in function of the parasympathetic and the sympathetic systems. In class we were reviewing functions for the purpose of discussing the use of specific drugs and their effects upon the two systems. Students in the group recalled from anatomy and physiology that the two systems respond differently to drugs but could give no examples of response."

Incident from clinical instructor in pediatric nursing:

"I asked a student, during the classroom period, to explain the unit action of the sympathetic system. She was unable to do so."

Incident from science instructor in pediatric nursing:

"The student was asked to explain the unit action of the sympathetic nervous system, but was not able to answer."

Category 5. Chemical mediators and their relation to nerve impulses.

Incident from clinical instructor in medical and surgical nursing:

"In the classroom, I asked a student to explain the differences between cholinergic and adrenergic fibers, in relation to chemical mediation of nerve impulses. She said she did not know what the terms meant."

Incident from student in medical and surgical nursing:

"The instructor asked me to explain what adrenergic and cholinergic fibers are. I did not know what the words meant, so I couldn't explain."

Incident from clinical instructor in pediatric nursing:

"I asked a student to explain the uses of acetylcholine in 'sparking' nerve impulses at synapses. She said she had heard of acetylcholine, but did not know what it did."

Incident from science instructor in medical and surgical nursing:

"The student was asked to differentiate between the action of Sympathin I and Sympathin E. She could not explain because she indicated she had never heard of the two substances."

Category 6. Deltoid, gluteus muscles in relation to underlying nervas and vessels--intra-muscular injections.

Incident from student in nursing arts:

"Our class was learning to give intramuscular injections into the deltoid and gluteus. Miss _____ asked me what area was safe in both these muscles for inserting the needle and why. I knew where both these muscles were but couldn't answer her question."

Incident from student in nursing arts:

"We were being taught the way to give intramuscular injections into the deltoid and the gluteus. I was asked why the upper outer quadrant of the gluteus was a safe place to insert the needle, and why it was not safe to insert it in the other quadrants. I did not know."

Incident from clinical instructor in nursing arts:

"I was teaching the class the intramuscular injection technique. After asking five students to explain why a specific area in each of the muscles (deltoid and gluteus) was used for the insertion of the needle, and they did not know, I then explained about the pathways of the nerves and the blood vessels underneath the muscles, and that the needle must not strike these."

Incident from science instructor in nursing arts:

"While watching the demonstration of intramuscular injection technique, several students were asked to explain why a certain area in each of these muscles was used for the insertion of the needle, and why it would not be safe in other areas. They could not explain." (Note: Underlying nerves and blood vessels. This relationship not taught in anatomy and physiology.)

Category 14. Reflexes and thermal stimuli, cutaneous areas associated with visceral areas.

Incident from science instructor in nursing arts:

"While preparing to introduce a small group of eight students to the uses of heat and cold applications to skin, the clinical instructor asked them to associate the internal organs reflexly associated with cutaneous areas. No one was able to make this association." (Note: This is not taught in anatomy and physiology.)

Incidents Related to Table VI--Circulatory System

Category 1. Blood, cell-plasma relations, count, sedimentation rate, red cells in anemias.

Incident from clinical instructor in nursing arts:

"In discussing laboratory procedures and diagnostic tests used in connection with blood samples, I asked a student to explain sedimentation rate, how the test was made and how it could be interpreted. She thought sediment meant 'blood dust' and related it to the destruction of red blood cells."

Category 3. Blood--amount of normal constituents per 100 cc.

Incident from science instructor in nursing arts:

"On a pretest students were asked to list the normal constituents of blood per 100 cc. of blood. Twenty students did not know amounts of plasma proteins, salts, cholesterol, urea, uric acid. They were able to give percentage of hemoglobin and number of red and white cells. They stated that they had not been taught the other norms in anatomy and physiology when the clinical instructor questioned them about this."

Incident from student in nursing arts (nineteen other similar incidents reported by students):

"The instructor gave us a pretest on the circulatory system and one of the questions was to list the normal constituents of blood per 100 cc. of blood. All I could list was glucose, hemoglobin and the red and white cells."

Category 6. Heart--function of nodes.

Incident from clinical instructor in nursing arts:

"I gave a pretest on circulation. Thirteen students out of the group of twenty-eight could not give the functional

relationship between the S.A. node and the A.V. node. They were confused about the Bundle of His, as well, and could not describe the cyclic action of the heart."

Incident from science instructor in medical and surgical nursing:

"In discussing the action of certain drugs used to regulate the activity of the A.V. node in a case of 'heart block,' the clinical instructor asked the student to explain the action of this node as it transmits the impulse from the auricles to ventricles. The student confused the S.A. and A.V. nodes, thinking the latter was the pace-maker."

Incidents Related to Table VII--Respiratory System

Category 1. Chemical and nervous factors controlling respiration.

Incident from clinical instructor in nursing arts:

"One of the questions asked on a pretest of the respiratory system was: How is the respiratory center controlled reflexly through nerve impulses, and what chemical factors may affect the center? Twenty-four of the twenty-eight students in the group answered the question accurately."

Category 3. Incident from science instructor in nursing arts:

"The clinical instructor was discussing abnormal types of breathing with the group of students. They indicated they knew about dyspnea, orthopnea, hyperpnea and apnea, having discussed these in anatomy and physiology. The instructor then described a patient experiencing severe dyspnea, and asked the group to define 'forced breathing' and to indicate the extra muscles used in the act. No one responded. She asked for a show of hands--those who knew and those who did not. Seventeen indicated that they did not know what forced breathing meant."

Incidents Related to Table VIII--Digestive System

Category 1. Bile, manufacture, storage, concentration in gall bladder, use.

Incident from clinical instructor in nursing arts:

"A student was able to explain that bile aided in the process of fat digestion, but could not explain why its

effectiveness was lessened after removal of the gall bladder. I asked if she could explain the principal reason that bile was stored in the gall bladder. She could not explain the concentrating function of this organ."

Incident from student in nursing arts:

"I was not able to explain what happens to bile when it is stored in the gall bladder."

Incident from clinical instructor in medical and surgical nursing:

"A student was giving morning care to a patient hospitalized for surgical removal of the gall bladder. After she had finished, and we had left the patient's room to discuss her progress, I asked her what the function of the gall bladder was. She said, 'To store fat.'"

Category 3. Contents of the duodenum.

Incident from clinical instructor in medical and surgical nursing:

"In a test the students were asked to list the substances present in the duodenal contents, and to explain the function of each. Twenty-six students in the group listed only one or two substances such as bile and mucous, but neglected to mention pancreatic juice."

Category 5. Metabolism of proteins, carbohydrates and fats.

Incident from student in nursing arts:

"In class I was asked about protein metabolism and its importance in connection with fever and the healing of wounds. I could not answer and I did not recall that we discussed what happens to proteins after they are digested into amino acids."

Incident from science instructor in medical and surgical nursing:

"The clinical instructor was asking about diet for a patient who was running a persistent elevation in temperature, and why protein was an important consideration in this diet. The student was unable to explain protein metabolism and the role of protein substances in maintaining and repairing body tissues."

Incident from clinical instructor in nursing arts:

"In class we were discussing measures to be taken in bringing about normal healing of wounds. I asked why protein intake should be increased, but the group could not supply the answer."

Incidents Related to Table IX--Excretory System

Category 1. Formation of casts in urine, related to shape of uriniferous tubules.

Incident from student in nursing arts:

"We were learning the procedure for the collection of urine specimens. The instructor asked me why urine must be fresh when a test for casts is made. I did not know what casts are, nor that they disappear as urine becomes alkaline after it has been collected."

Incident from student in nursing arts:

"I was asked to explain how casts are formed. I could not answer this."

Incident from student in nursing arts:

"The instructor asked me why casts are found in urine when a patient has nephritis. I did not know what casts are."

Incident from clinical instructor in nursing arts:

"The student did not know why, in testing for casts in urine, the specimen must be examined fairly soon after collection. She did not know what casts are."

Incident from science instructor in nursing arts:

"While procedure for collection of urine specimen was being taught to the group, the instructor asked how casts are formed. A student said she did not know what casts are."

Category 3. Location of female urinary meatus.

Incident from student in nursing arts:

"We were learning catheterization techniques. The instructor asked me to describe the location of the urinary meatus. I could not give the exact location."

Incident from student in nursing arts:

"I gave the location of the urethral meatus next to the vagina."

Incident from student in nursing arts:

"We were learning how to catheterize a female patient. I located the meatus all right on 'Mrs. Chase,' but when I had to do my first real patient, I had trouble finding the opening."

Incident from clinical instructor in nursing arts:

"The student was not sure where the urethral meatus in the female was located. She thought the vaginal orifice was an ideal spot for the meatus."

Incident from clinical instructor in nursing arts:

"The student located the female urethral meatus 'just inside the vagina.'"

Incident from science instructor in nursing arts:

"The student stated that the urinary meatus was 'just inside the vagina.'" (Note: It is possible that she confused cat anatomy with human anatomy.)

Category 4. Secondary excretory organs, skin, lungs, colon--relation to primary organs.

Incident from student in nursing arts:

"On a pretest one question was, 'Explain in the ways in which fluid is lost from the body, other than through the kidneys.' I was able to explain about the skin, lungs and large intestine."

Category 6. Urine formation.

Incident from student in nursing arts:

"The instructor asked me to explain the principle of filtration in the kidneys. I was able to answer correctly."

Incident from student in nursing arts:

"I could explain what part the kidney tubules play in the formation of urine."

Incident from student in nursing arts:

"The instructor asked me to name high-threshold substances and to explain what the term meant. I remembered this from anatomy and physiology."

Incident from clinical instructor in nursing arts:

"I asked a student how the kidney tubules reduce the amount of filtrate. She was able to answer accurately."

Incident from science instructor in nursing arts:

"The student was asked to differentiate between low and non-threshold substances. She identified the substances correctly."

Incidents Related to Table X--Endocrine System

Category 1. Adrenal cortex hormones, cholesterol in relation to steroids.

Incident from student in medical and surgical nursing:

"I was asked the name of the substance which influences the production of the adrenal cortex. I was surprised to learn it was cholesterol."

Incident from student in nursing arts:

"I did not know what steroid hormones are."

Incident from clinical instructor in medical and surgical nursing:

"Generally students seem not to have heard of steroid hormones. I asked what kind of substance entered into the formation of the hormones of the adrenal cortex. The student replied she did not know."

Category 5. Chemical nature of hormones--steroids, proteins, amino acids.

Incidents from science instructor in medical and surgical nursing:

"The student was asked to name steroid hormones but could not do so."

"When asked to name the protein hormones, the student said she 'didn't know there were any called protein.'"

"The student was asked which gland produced an amino acid hormone, but was not able to give the answer."

Category 7. Ovarian hormones in relation to menstruation and pregnancy.

Incident from student in obstetric nursing:

"I was asked to explain what effects progestin has on the uterus during pregnancy. I did not know that it prevents premature uterine contractions."

Incident from clinical instructor in obstetric nursing:

"In discussing miscarriage, the student was asked why progestin was administered in cases where the physician thought there might be a miscarriage. The student did not know the role of progestin in influencing placental attachment, nor in preventing uterine contractions."

Incidents Related to Table XI--Reproductive System

Category 2. Development of embryo and foetus.

Incident from students in obstetric nursing:

"I was not able to explain the embryology of the heart, although I knew it was formed at an early stage."

"I couldn't explain how the neural groove develops."

"I did not know how the digestive tract is formed."

Incident from clinical instructor:

"While students understand early segmentation of the zygote and the formation of the three germinal layers, they do not seem to have had much information about the further embryology of various organs, nor their refinement during the foetal stage.

Incident from science instructor:

"The student could not explain the formation of the kidney system in the embryo."

Category 3. External and internal female genitalia, location and relationship.

Incident from student in nursing arts:

"I said the uterus was located in front of the urinary bladder."

Incident from student in nursing arts:

"I could not name the external female genitalia."

Category 12. Secretion of the vaginal tract.

Incident from clinical instructor in nursing arts:

"The student did not know that the mucous membrane lining of the vagina is continuous with that of the uterus, Fallopian tubes and peritoneum; therefore, she could not answer the question, 'Why is the vagina sometimes irrigated to cleanse the mucous membrane in order to prevent the spread of infection into the abdominal cavity?'"

Category 10. Size of normal uterus and in pregnancy.

Incident from student in obstetric nursing:

"I was asked to explain how progestin influences the growth of the uterus during the first part of pregnancy. I did not know it grew--I thought it just stretched."

Category 11. Structure of the mammary glands.

Incident from student in obstetric nursing:

"I did not recall having heard of the lactiferous ducts in anatomy and physiology, nor how these are stimulated to produce secretion of milk."

Incident from clinical instructor in obstetric nursing:

"I asked a student to explain the structure of the mammary glands. She started by saying, 'Well, these muscles. . .'"

Incident from science instructor in obstetric nursing:

"The student was asked to explain the relationship between the lymphatic elements of the mammary glands and the axillary lymphatics. She was not able to do so."

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AUTOBIOGRAPHICAL STATEMENT

Name: Wilhelmine L. Haley

Birth: November 5, 1909; Norfolk, Madison County, Nebraska, U. S. A.

Education: H. S., Norfolk; Colleges: Cedar Falls, Iowa, Iowa State Teachers College, B.A. 1931, Middlebury, Vermont, Middlebury College, M.S. 1932.

Positions: Assistant Instructor in Biology: Middlebury College 1932-33; Instructor in Biology and Dramatics: Marjorie Webster Junior College 1933-43; Field Representative, Foreign Service, American Red Cross, Civilian Relief, 1943-45; American Red Cross, Civilian Relief, National Headquarters, 1945-46; Student Counselor, Harper Hospital School of Nursing, 1946-48; Part-time Instructor: College of Nursing, Wayne University 1947-48; Instructor: Biology Department, College of Liberal Arts, Wayne University 1948- .

Recognition: Member Kappa Delta Pi, National Honorary Education Society, Iowa State Teachers College, 1930.

Memberships: Detroit Teachers Association; Michigan Education Association; National Education Association.

Travel: Brazil, Africa, Egypt and the Middle East, 1943-1944; New Guinea, the Philippine Islands, 1945.