

HUMAN BIOLOGY
FOR
THE LIBERAL ARTS STUDENT

by

CHAILLE MOSELY LOVE

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APPROVED:

Redacted for Privacy

Professor of Physical Education, Major Professor

Redacted for Privacy

Associate Professor of Science Education, Second
Minor Professor

Redacted for Privacy

Chairman of Department of General Science

Redacted for Privacy

Chairman of School Graduate Committee

Redacted for Privacy

Dean of Graduate School

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Typed by Wanda Bareinger

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HUMAN BIOLOGY FOR THE LIBERAL ARTS STUDENT

CHAPTER I

INTRODUCTION

What is human biology? Is there a need for this course as part of general education for liberal arts students? What should be the content of this course? The purpose of this study represents an attempt to find the answers to these questions.

Some phases of human biology are taught in the secondary schools. The medical schools and allied institutions teach specialized phases of human biology in the training of clinicians. The colleges and universities offer specialized human biology courses when training students in semi-professional curricula. It is believed that no provision is made for the teaching of human biology as a part of general education for all liberal arts students. Various factors seem to justify a need for a course of this type. Rapid scientific advancements are being made in human biology which may be considered an essential part of a general education. People are basically interested in themselves and their personal welfare. A vast amount of information concerning the human body is available to the public. It is believed a finer sense of discrimination in this area should be developed as one of the outcomes of general education.

As a teacher of human biology for the past fifteen years, experiences have shown that this course represents a real need for the non-science student. More recently, as Coordinator of Medical

Technology at Sacramento State College, evidence indicates this course could serve well as an introductory course for human biology majors. It is believed the course would constitute an excellent supplement to a survey of plants and animals.

A Statement of the Problem

What is the content of a course in human biology for liberal arts students as part of general education?

Definition of Terms

"Content"—a body of knowledge determined in the order of emphasis by recommendations of a group of college and university teachers in the departments of biology, physical education, and education.

"Human biology"—a study of the human body in eighteen areas of knowledge as subsequently enumerated.

"Liberal arts student"—a student enrolled as a candidate for a bachelor's degree in a four year college, university, or teachers college. No distinction is made between the science and non-science student.

"General Education"—common knowledge in the liberal arts college offered in the areas of physical science, biological science, social studies, humanities, and foreign language.

Delimitations of the Problem

The determination of the content of a course in human biology for the liberal arts student as part of general education restricts the scope of this investigation.

All four year liberal arts colleges, universities, and teachers colleges in the United States were considered since general education is a primary concern to these institutions. The professional schools, normal schools, and junior colleges of the United States were eliminated from the study.

A solution of the problem was limited to a consensus of staff members in the departments of biology, education, and physical education. Since this is a problem in general education, it was believed opinions from members of at least three departments would possess more significance.

It is believed equal representation of all four year liberal arts institutions was obtained due to a method of sampling based on stratification.

Opinions of staff members of medical schools were not requested since these institutions are not liberal arts colleges.

A questionnaire was used to obtain the greater portion of the data. These data were augmented by personal interviews and catalog studies.

Ultimate Objectives of the Study

The determination of the content of a course in human biology for liberal arts students as part of general education is the main objective of this study.

The need for the course will be determined concurrently.

Determination will be made to indicate whether existing biology courses meet this need.

The content of courses in human biology in other institutions will be reviewed to ascertain the status of thinking on the problem.

Since the problem of this investigation is concerned with science in general education, the opinions of various contributors to this area will be reviewed and related to the problem.

If the content of the course can be determined, then attention should be devoted to the future teachers of this course. Accordingly, consideration will be taken of the methods for training college science teachers in general education.

The solution of the problem will be followed by a topical analysis to provide information for possible future use by teachers of this course.

Assumptions

Certain basic assumptions in this investigation seem necessary.

Courses in some aspects of human biology are offered at

various levels of secondary education. Training in biology, hygiene, health, and physiology is quite common in the high schools. It is presumed the content of these courses varies with the interest and training of the teacher and are offered at a level compatible with the academic background of the students.

Specialized courses in human biology are offered in the medical, dental, and allied professional schools. These courses form curricula designed to train clinicians.

The four year liberal arts colleges, universities, and teacher colleges offer specialized human biology courses designed to service the needs of students in various semi-professional curricula.

It is believed that the need and content of a course in human biology as a part of general education in the liberal arts institutions have not been determined by wide-spread consensus of teachers.

In recent years, the transition to integrated courses in general education has been most rapid and further acceleration is anticipated. Solution of the problem of this investigation would be compatible with this trend.

It is assumed that there is a rapid development of scientific information in human biology essential to the college student as a part of general education.

Zoology is a study of all animal life, including man. This area of concentration is very large and further complicated with

rapid scientific advancements. Due to the importance of man a supplementary course in human biology may be necessary. Of all animals, people are most interested in themselves.

Within recent years, the liberal arts colleges have assumed responsibility for various semi-professional curricula in human biology. A course in human biology could serve as an introductory course for these curricula when designed as a course in general education.

Elementary college courses in health do not solve the problem of this investigation.

Methods of Research

Personal interviews with teachers and students accentuated a long felt need for this study. The investigation proceeded for several years in an informal manner.

A review of college catalogues indicated courses were offered in some institutions concerned with the biology of man. In most cases, the exact content of these courses could not be determined.

Review of other literature revealed planned courses in some institutions for teaching the biology of man. Other sources of information were checked to determine the status of biological sciences in general education. Many viewpoints were obtained concerning the training of future college science teachers for participation in general education courses.

These experiences lead to a statement of the problem and devising a means for its solution.

A representative number of four year liberal arts colleges, universities, and teachers' colleges in the United States were selected on a basis of stratification. One staff member from the departments of biology, education, and physical education was solicited by questionnaire in each institution. This selected jury of teachers was requested to furnish information on which to base a solution of the problem.

These data were classified, graphically represented, and interpreted. Based on these findings, a solution to the problem was derived.

CHAPTER II

A REVIEW OF THE LITERATURE

Courses Designed in Other Institutions Concerning
the Biology of Man

Reports in the literature indicate considerable thought has been given this problem. The attitudes of the writers clearly indicate a need for a solution to the problem. Much thought is devoted to the biology of man as an integral part of general education for the liberal arts student. Various procedures have been initiated to solve the problems in different institutions. In each instance, the plan offered appears to reflect the attitude of a few individuals. No wide-spread consensus is offered as to the content of a course in human biology.

Based on the findings of this investigation, it is estimated that approximately one-fifth of the four year liberal arts colleges, universities, and teachers colleges offer a course concerning the biology of man. The findings of a study¹ of human biology offerings in thirty institutions in the States of Washington, Oregon, and California agree with this estimate. Limited course descriptions may be found in the catalogs of the respective institutions from which, it is difficult to determine their content. It is believed these descriptions reflect, at most, the thinking of a few individuals.

1 Love, Chaille Mosely. Unpublished Summary of Human Biology Offerings in Thirty Colleges and Universities in Washington, Oregon, and California. 1952. 5p.

The rationale of courses in human biology is reported infrequently in the literature. In most instances, the articles direct considerable attention to the problem but appear to be limited as to widespread consensus.

Three categories of publications relevant to the problem may be found in the literature, (a) articles which describe existing courses in human biology, (b) textbooks which place much emphasis on the biology of man, and (c) articles which are dedicated to the philosophies of science in general education. A very large amount of literature is found in the last category but the articles do not deal with the problem specifically. They direct attention to the need for a course in human biology and also to the methods of training college science teachers in general education.

Specific course analysis in certain institutions may contribute to the solution of the problem. A course on man and his relation to the living world is offered at Antioch College. Federighi and Leuba (31, pp. 193-198) published a rationale of this course. Information from the areas of anthropology, biology, psychology, and sociology is integrated into a two year sequence. It is noted staff members from various departments are requested to correlate the subject matter. These staff members include representatives from the departments of psychology, biology, education, personnel, speech, health, and physical education.

Three objectives are stated for the course, (1.) to organize the knowledge of man around the four significant topics, (2.) to give the student information helpful to him in making adjustment "at the particular period in his development when deans and counselors deem it most useful," and (3.) to integrate textbooks and lecture subject matter with daily living and also to develop appropriate attitudes and habits.

Federighi and Leuba sponsored the course at Antioch College in 1945 and were entrusted by the administration of this institution with all planning and most of the instruction. These workers cite excellent student appraisal for the course and believe this is indicative of a better method of teaching the biology of man. The demise of separate introductory courses in anthropology, zoology, physiology, psychology and sociology is forecast.

The content of the first year of the course is based largely on the concepts of human physiology. The content of the second year is divided into two units of study. The first unit involves a study of differences among living things, and general orientation in biology. The second unit of study considers personality, adjustments, and general orientation in psychology and sociology.

These authors state that some colleges and universities have organized new departments to bring together knowledge pertinent to an understanding of man, regardless of the academic source. Examples are cited at the University of Chicago in the

Department of Human Development, Harvard University in the Department of Social Relations, The University of Rochester in its Department of Vital Economics, and the University of Minnesota in its Department of General Studies.

A course entitled "Human Biology" is offered at Oregon State College, Corvallis, Oregon (71, pp. 206). This course is described as a presentation of "man's place in the animal kingdom; human anatomy and physiology; development, heredity, evolution, relations to disease and parasites, and human ecology. The course is offered over a period of one academic year for nine quarter units of credit. The content of the course² is arranged around the following units of study, 1. Introduction, 2. Characteristics of living organisms, 3. Maintenance of the individual, 4. Maintenance of the species, 5. History of life on the earth, 6. Interrelationships, and 7. Human populations. The course is not represented as a part of general education for all liberal arts students. Physical education majors are required to take the course. Fundamental concepts of biology are interspersed in the presentation.

A course entitled "Human Biology and Health" is offered at San Francisco State College, San Francisco, California. This course resulted from discussions in the development of a program of general education at this institution. A recent publication entitled "The Biology of Man" by Hensill, Gustafson, and Zaiman

2 Anderson, Carl Leonard. Unpublished course outline.
May 7, 1952.

is used as the text for the course. (47, pp. 1-140). As objectives, the students are taught, (1.) to determine the relation and effect of other organisms on the human organism, (2.) to understand normal and abnormal processes involved in the origin and development of human life, (3.) to understand the mechanism of inheritance, or non-inheritance of human characteristics, and (4.) "to appreciate place, force, and significance of biological science in our modern society." The content of the course is based on the publication entitled "The Biology of Man" and reflects the thinking of three authors. The need for the course appears to have been justified on a basis of faculty deliberations in formulating a program in general education.

Crittenden³ directs attention to a course entitled "Physiology and Bacteriology" offered at Goucher College, Baltimore, Maryland. The content of this course is correlated with the subject matter found in the publication "Machinery of the Body" by Carlson and Johnson. Thirty lectures are given concurrently with laboratory work. Three lectures in bacteriology are given near the end of the course. The relation of this course to general education and the method of deriving the course content are not stated.

A course in "Human Biology" is offered at the University of Minnesota as part of a program of general studies. (65, pp. 13.) The content of this course centers around three general topics;

3 Crittenden, Phodoe J. Unpublished mimeograph outline. 1952.

(1) The fundamentals of human biology, (2) How the living machinery in man works, and (3) Healthful living. The first unit of study is concerned with man's place among living organisms. The second topic is largely a presentation of human physiology and the third topic is concerned with the problems of health. The course resulted from faculty deliberations on a program of general studies.

Two year courses are offered at Scripps College, Claremont, California concerning the biology of man. (76, pp. 63-64). These courses are entitled "Man and his Physical World," and "Man and his Biological World." The content of the first course concerns atomic physics and earth science. The second unit of study considers the anatomy, physiology, and embryology of man. Interwoven into these subject matter areas are found the principles of first aid, nutrition, nursing, and occupational therapy. Evidence for the establishment of the need and content of the courses was not found.

A course entitled "The Principles of Human Biology—Health and Hygiene" is offered at Western Washington College of Education, Bellingham, Washington. (89, pp. 32). This course combines three hours of lecture material with two hours of laboratory work per week. The course is organized around the following topics, (1) The nature and distinctive characteristics of life, (2) The cellular basis of life, (3) The physical and chemical processes

necessary for life, (4) The development and behavior of tissues and organs, and (5) Problems in personal health and hygiene.

A sequence of three courses is offered in The College of the University of Chicago. (17, pp. 20-22). These courses are designated as Natural Science 1 (ABC); Natural Science 2 (ABC), and Natural Science 3 (ABC). The three units contain the same general topics and which are offered at progressive levels of intensity. The content of the courses is composed of a sequence including cellular morphology, photosynthesis and respiration, physiology and development, enzyme systems, complex molecules, homeostasis, and behavior problems. The courses are not centered around the biology of man but attempt to integrate the phenomena of life in all living organisms.

Hatch and Buechner initiated an integrated course in the biological sciences at the State College of Washington. (46, pp. 3-11). The content of this course is divided into three units, namely, (1) The nature of life, (2) The activities of living things, and (3) The whole man and the whole plant. This integrated presentation divides emphasis between plants and man. The authors are specialists in the areas of botany and wildlife management and present much valuable information based on their training. Much emphasis is placed on biochemical phenomena and the interrelationship between plants and man. The course was activated as a result of discussions during the second meeting of the

Pacific Northwest Conference on the Arts and Sciences in 1944.

An account of excellent student appraisal is noted. Various problems are recalled by the authors in designing the content which was determined at the local level.

Ten Hoor proposes a science sequence for the arts students. (79, pp. 208-232). This course was represented as a broad survey of the natural sciences with man discussed in relation to his environment. It is proposed that eighteen semester hours of credit should be allowed for the course and that the subject matter should be centered around the following topics, (1) An introduction to the scientific method, (2) The fundamentals of physics, (3) The fundamentals of chemistry, (4) The fundamentals of biology, (5) The fundamentals of geology, and (6) The history of science.

The sparsity of reporting on human biology courses may be contrasted with their believed existence in approximately one-fifth of the four year liberal arts colleges, universities and teachers colleges. One may suspect that most courses represent the deliberations of a small group of staff members in each institution. Publication of their deliberations might be welcomed by other groups with similar problems.

A review of the literature appears to indicate that staff members of a few institutions are actively concerned with the problem. An increased interest is anticipated. Staff members in some institutions appear to have made progress on modifying or

improving the content of human biology at the local level. Staff members in other institutions express a preference for an integrated course in all phases of biological science with man studied in relation to his environment. The existence of these two viewpoints is confirmed by additional comments of respondents found in Chapter IV, The Data. The majority of these commentators favor more emphasis on the biology of man.

Textbooks Which Offer Information in Human Biology

Textbooks used in the professional schools offer a very competent source of specialized information in human biology. Many of these texts are used in specialized human biology courses in liberal arts colleges. It seems needless to state that the content of professional textbooks appears much in excess of the academic background of liberal arts students. When these books are used, the interest of the superior general student may be enhanced.

It is believed that some attention is now being given by professional book authors to the student learning processes. Ham states his recent book "Histology" was written with the problems of student learning in mind. (40, preface). An interesting format is noted and technical words are translated. Even students with prior Latin and Greek training may find this procedure helpful. Cates recent text on human anatomy assumes a format and style which should be of interest to all students in this course. (14, pp. 1-344).

It is believed this writing trend in professional books will be helpful to the liberal arts student. Quite often elementary biology books are used in general education courses. In an attempt for brevity, much valuable information is deleted, and the student might gain more from reading a professional text properly adapted to his academic background. Perhaps, a need exists for a textbook integrated in all phases of human biology for general education.

Hardin recently published a book entitled "Biology: Its Human Implications." (43, pp. 1-973). Much emphasis is placed on man in relation to his environment. The rapid rate of adoptions of this text may indicate a trend by teachers for increased emphasis of man in the teaching of biology. It is believed Hardin has made a valuable contribution to biology.

Winchester published "Biology and its relation to mankind" in 1949. (90, pp. 1-777). An interrelationship between plants and animals is presented. This author also published an excellent text entitled "Genetics" with a style and format which should appeal to the general student. (91, pp. 1-371).

Other texts are available which give a presentation of man and his environment. Baitsell's "Human Biology" places much emphasis on man. (2, pp. 1-621). Villee's "Biology: the human approach" also treats mainly of the biology of man. (86, pp. 1-580). The publication of Hensill, Gustafson, and Zaiman entitled "The Biology of Man" has been mentioned previously. (47, pp. 1-140).

"College Biology" written by William Etkin is another widely used text presenting man and his environment. (30, pp. 1-687).

The content of these texts reflect the opinions of the authors, and varies greatly in each publication.

It is believed the content of a course in human biology has not been determined by widespread polling of teacher opinion. At present, it seems that each writer offers his own concept as to what information should comprise human biology.

Many excellent texts are published in the area of introductory human physiology. This course is a standard offering in most liberal arts colleges. It is believed that some content of this course should form an integral part of a course in human biology. The following texts may be considered excellent collateral reading. "Elements of Human Physiology" by Lucas (58, pp. 1-534), "Machinery of the Body" by Carlson and Johnson (13, pp. 1-620), "An Introduction to Human Physiology" by Grandall (20, pp. 1-325), "Textbook of Physiology" by Zoethout and Tuttle (97, pp. 1-692).

It is believed human anatomy and physiology textbooks would be valuable references for a course in human biology. A few of many excellent texts are mentioned: "Physiology and Anatomy" by Greisheimer (39, pp. 1-706), "Human Anatomy and Physiology" by Millard and King (64, pp. 1-514), "Anatomy and Physiology" by Jung and Earle (54, pp. 1-829), "Anatomy and Physiology by Francis and Knowlton (35, pp. 1-513), "Textbook of Anatomy and Physiology" by Anthony (1, pp. 1-614).

Text references in the area of genetics and evolution may be considered essential in human biology. Scheinfeld's "The new you and heredity" (75, pp. 1-616), Dodson's "Evolution" (28, pp. 1-419), and Moody's "Introduction to Evolution" (66, pp. 1-423) are considered valuable contributions in these areas.

Logan Clendenning's "The Human Body" (18, pp. 1-339), Fritz Kahn's "Man in Structure and Functions" (55, 2 vols.), are valuable publications in the field of popular reading. Certain scientific phenomena of the human body are present in a style which should be of much interest to the reader. These publications may be useful as collateral reading in human biology.

Science in General Education

Many articles are found in the literature which discuss the status of science in general education. The science of human biology may be considered an essential component of that common knowledge known as general education.

The problem under consideration is to determine the content of a course in human biology for the liberal arts students as a part of general education. The determination of the need and content of this course is the immediate objective of this investigation; however, it may be considered appropriate to discuss various viewpoints concerning science in general education, and the preparation of teachers to handle these courses.

General education is intended to prepare students to handle various life situations. Among these situations, no doubt, many will be concerned with the human body. A vast amount of information is available to the public. Various media of expression are used including the press and radio. Many household periodicals relate popular articles concerning the biology of man. Frequently these articles are written by physicians. Is the reader academically prepared to profit most from these articles? Various claims are made for innumerable commercial products. Practically all individuals seek medical advice during their life. It is believed a well defined and authentic presentation of human biology as a part of general education would produce a more enlightened and discriminating graduate.

Pothoff emphasizes that general education is an absolute necessity in preparing students to deal with life situations. (73, pp. 369-374). He believes courses must be developed to meet this need and that general education in science can not be obtained by memorizing an enormous number of facts. Tyler investigated fact retention in a freshman zoology course. (82, pp. 590). Fifteen months after completion of the course, the students forgot seventy-seven percent of the specific facts they had memorized. However, the test revealed the students retained most of the principles they were taught. Pothoff prefers the development of reflective thinking. This may be acquired, he states, by defining problems

pertaining to life situations and seeking their solutions.

He believes the life sciences can not remain aloof to the needs of the general student.

Wakeman quotes President Conant of Harvard to the effect that non-science students need a knowledge of the sciences. (87, pp. 146-149). These students would not be expected to use scientific knowledge for technical or professional purposes. The information should be adjusted to the background of the general student and his educational and cultural goals.

Todd reviews the science education provisions for the general student at Colgate University. (81, pp. 71-79). The plan of this institution endorsed the belief that the average citizen should know more about biology in everyday life. It is believed the public has a right and duty to know about the sciences. This report observed that some professional biologists "looked down their noses" at these courses; however, it may be generally agreed that few freshmen want to know the osteology of the grunt fish. Perhaps, this disdain for introductory courses on the part of a few biologists may be due to specialized training in the graduate schools. However, it must be admitted the biologist must be trained in a vast amount of facts before he is in a position to interpret these facts in an introductory course.

Scoggs believes that the Harvard Report "General Education in a Free Society" will prove to be the charter of popular colleges at the liberal arts level. (77, pp. 429-432). He believes these

colleges will be adapted to the needs, interests, and abilities of its students. Scoggs states that the new curriculum goals for liberal colleges should be based on broad experiences in general education.

Brett believes that many changes are needed in the curricula of the liberal arts colleges. (11, pp. 481-484). It is his opinion that courses should be introduced in general education to prepare students to handle life situations. Apparently some techniques used in specialized courses do not meet with his approval when he states "the high minded manipulations of symbols are not adapted to the needs of the masses of the student body."

The need for natural science courses adapted to the purposes of general education is stressed by Ten Hoor. (79, pp. 208-221). He believes non-science students should have available more courses in the natural sciences which are adjusted to their academic background. Ten Hoor expressed the belief that the best instruction in the natural sciences is available to the specialized pre-professional students. In these courses the students know definitely their educational objectives, and the teachers know how to present this specialized viewpoint. Usually the non-science student does not know how this course is supposed to contribute toward his cultural education, and in many cases, the course is taken because it is required for graduation. Non-science students face the dilemma of taking a specialized course

or no course. Usually the material is so technical that even the better student has trouble relating it to his future interests. Ten Hoor observes further that difficulty may be experienced with science textbooks. Content material has increased enormously within the last thirty years and he believes these texts must be written for the benefit of the instructor and the pre-professional student. The instructor rationalizes he must present a course of high calibre in order to meet rigid scientific standards. This viewpoint should prevail for the specialized science student. However, Ten Hoor observes, the pre-professional student follows rigid disciplines of knowledge which are unnecessary for the non-science student. This writer suggests a different type of presentation in the natural sciences for non-science students. This course sequence has been reviewed previously. This writer reflects thinking shared by many teachers, including those of the natural sciences; however, the high standards demanded by specialized scientific training can not be compromised. Procedures used in these courses should continue to service specialized students at a high level of competency. The trend is evident that overt provisions must be made for the scientific training of all students as a part of general education. Therefore, it is believed the problem of this investigation is compatible with this trend.

The report of the President's Commission of Higher Education contains information concerning specialized courses in the natural sciences. (83, pp. 52). The observation is made that the purposed courses in physics, chemistry, and zoology are directed

toward the preparation of future scientists and not toward the education of future citizens. The functional demands of society necessitates zoological information related to situations encountered in life. The Commission observed that the college graduate should possess practical and usable knowledge concerning his own body. It is believed that our colleges and universities are doing far less than they might to dispel the ignorance that lies at the root of ill health of many of our people. (83, pp. 7). The Commission also observes that courses in healthful living are offered in many colleges. These courses vary enormously as to content and presentation. Quite often they are scattered over many departments, including the department of physical education. This statement of the Commission augments the need for solution of the problem in this investigation. It is believed the content of a course in human biology has not been determined adequately hereto. The findings of this group stress the need for courses of the biology of man which will enable the student to understand the human body and to improve his health and that of his community.

The Training of College Teachers for Science

Courses in General Education

Since the need and content of a course in human biology has been considered, then attention should be directed toward the methods of training college teachers to handle this course in general education.

Graduate schools are responsible for the training of college science teachers. If we examined the literature, we find firm opinions on how these schools are training college teachers for general education. Most of the comments appear to be confined to the training of science teachers for general education courses.

No adverse comment is noted concerning the preparation of prospective college teachers in specialized science courses. The lack of adverse comment may be interpreted to mean that certain writers are pleased with the handling of specialized science courses.

The effectiveness of any course as part of a general education will, of necessity, depend on the quality and attitudes of those who teach the course. The President's Commission on Higher Education observes that, unfortunately, the training of college teachers today is orientated so overwhelmingly toward research that all too few are either competent to teach general courses or sympathetically inclined to try to do so. (83, pp. 60-61). A quite different kind of education for college teachers and a new definition of scholarship and the purposes of higher education in America are basic necessities if general education is to move forward to its goals. Specialized training has its definite place and accomplishes much good. The progress of civilization depends on it, however, the training of science specialists in the graduate schools should be classified and relegated to its proper functional status. Some provisions should

be made in the graduate schools for a combination of technical training and training for all phases of college science teaching. Only a small percentage of the student body will become specialists, and an attempt should not be made to educate the non-science students as specialists. The Commission observes that present college programs are not contributing adequately to the quality of students' adult life either as workers or as citizens. (83, pp. 47-49). This is true in large part because the unity of liberal education has been splintered by specialization. By training in technical or professional courses in colleges today, the non-science student is not prepared to perform his duties as a man, a parent, and a citizen.

The Commission on Higher Education believes that graduate education must be made more functional and carried on in terms of the work of the Nation and adapted to everyday living. During the decade 1930-31 through 1939-40, 20,783 persons earned the doctor of philosophy degree. (83, pp. 87). Of these, 65 percent were employed in teaching in higher education, three-fifths of whom worked mainly at the undergraduate level. These persons need specific training in college teaching, and, as the Commission observes, it is unrealistic to confine graduate programs to the kinds of experience that contribute in the main to proficiency in research. (83, pp. 88).

Hansen believes that the tradition of specialization afforded by the doctor of philosophy program does not prepare

adequately for good college teaching and that this tradition is being discarded rapidly by many colleges and universities.

(36, preface). Too frequently advanced degrees are granted in a narrow field of research, thus producing technicians in a very special field of science rather than scientists. Some graduate schools have introduced college teaching minors into their curricula. Oregon State College recently has established this minor. (71, pp. 445).

There is an apparent need for the training of teachers to handle general education science courses. However, there should be no decrease in the standards for technical training. The two types of training should be combined. A college science teacher well trained in general education but without adequate technical training would provide an equally unsatisfactory situation.

CHAPTER III

PROCEDURES OF COLLECTING DATA

The Questionnaire

The questionnaire was presented for action to a staff member of the departments of biology, education, and physical education in each of the institutions. This procedure should yield a broader consensus on a problem pertaining to general education. Accordingly, 315 questionnaires were sent to staff members of the 105 selected institutions.

Certain representations were made in the covering letter concerning the proposed course. The course should be considered as part of general education and may be contrasted with specialized courses in human biology. It should be open to both science and non-science majors. The science major should not substitute the course for a specialized human biology course. The course may be elective and should supplement the presentation of an introductory course in plants and animals.

The questionnaire is composed of seven questions and designed to furnish data on various aspects of this investigation. Question one attempts to determine the extent to which a course entitled "Human Biology" is offered in the four year liberal arts colleges, universities, and teachers colleges. Question two requests data to determine the extent this course is open to all students as part of a general education. Question three solicits the opinion of respondents as to whether the proposed course could contribute

toward a liberal education. Question four requests information to determine whether the proposed course could be designed without conflicting with existing biology courses. Question five is designed to determine if human biology could be obtained adequately from existing biology courses. The consensus of respondents to the above five questions should establish the need for the course. If a need for the course exists, then the time allotment and type of presentation should be determined. This is the purpose of question six. The course content was determined by use of the data obtained in question seven.

Of the 315 questionnaires mailed, 156 were returned. Of these, 142 were in usable condition. This represents a return of 49.5 percent of the questionnaires mailed. Specimen copies of questionnaire and covering letter are located in Appendix.

A Sampling of Colleges and Universities

The Educational Directory, U. S. Office of Education (84, pp. 1-8) lists 1,685 institutions of higher education in the United States. This investigation was limited to four year liberal arts colleges, universities and teachers colleges in the United States. Seven hundred and thirty professional schools, normal schools, and junior colleges were omitted from the study, leaving nine hundred and fifty five liberal arts institutions. The staff members of 10.9 percent of these institutions were polled by a predetermined method.

Certain criteria were used as a basis for stratification sampling. Regional geographic distribution of institutions was the first criterion. Fifteen institutions were selected from each of the following regional districts: 1. Middle States Association of Colleges and Secondary schools, 2. New England Association of Colleges and Secondary Schools, 3. North Central Association of Colleges and Secondary Schools, 4. Northwest Association of Secondary and Higher Schools, 5. Southern Association of Secondary and Higher Schools.

The second criterion was based on nation-wide distribution. Fifteen institutions were selected from each of the following associations: 1. Association of American Universities, and 2. American Association of Teachers Colleges.

Additional criteria of selection were used within these seven groups which determined the selection of the one hundred and five institutions. These criteria are listed. 1. The control of the institution: public, private, or denominational, 2. The type of the student body: men, women, or coeducational, 3. Institutions for white or colored students, 4. The type of four year liberal arts institution: college, university, or teachers college, 5. Membership in Association of American Universities, 6. Accreditation: (a) by the Association of American Universities, (b) by the respective regional association, 7. Attitude of the local state university on: (a) unconditional admission of students

to graduate school, (b) full transfer of credit to graduate school, and (c) partial transfer of credit to graduate school,

8. Teacher training: (a) membership in American Association of Teachers Colleges, (b) recognized by local state department of education for training of teachers.

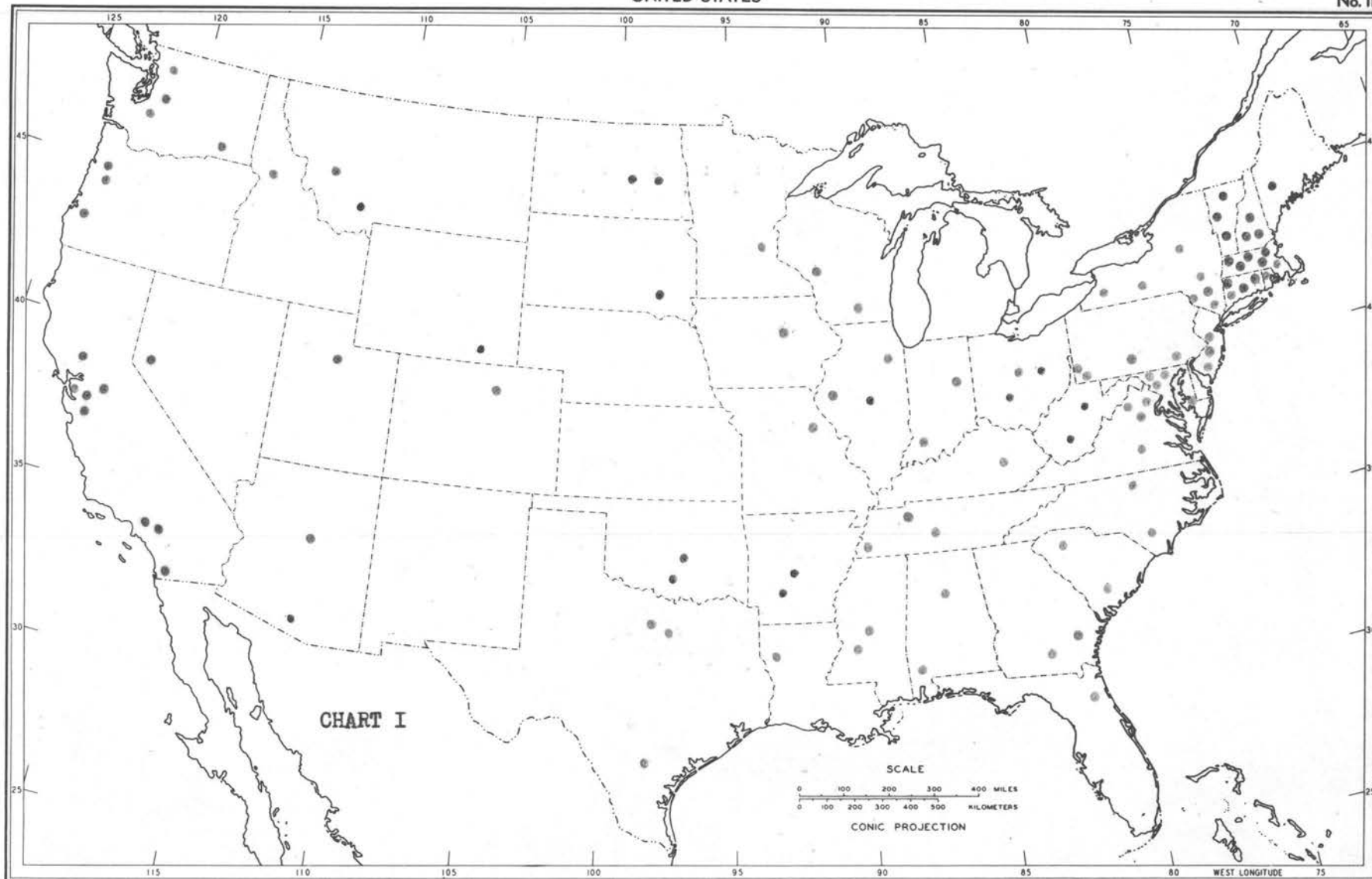
Geographic locations of the one-hundred five
institutions are indicated on Chart I.

LEGEND

- | | |
|-----------|---|
| 1. blue | Association of American Universities. |
| 2. red | American Association of Teachers Colleges. |
| 3. brown | New England Association of Colleges and
Secondary Schools. |
| 4. black | North Central Association of Colleges
and Secondary Schools. |
| 5. green | Middle States Association of Colleges
and Secondary Schools. |
| 6. purple | Northwest Association of Secondary and
Higher Schools. |
| 7. orange | Southern Association of Colleges and
Secondary Schools. |

UNITED STATES

No. 110



GOODE'S SERIES OF BASE MAPS
HENRY M. LEPPARD, EDITOR

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Criteria Used in Selecting the Institutions

Tables I through VII contain detailed information concerning the criteria used in the selection of the one hundred five institutions.

Tables I and II present information concerning the institutions selected on a nation-wide basis. Fifteen institutions were selected from the membership of each of two nation-wide organizations, namely, The Association of American Universities and The American Association of Teachers Colleges.

Tables III through VII present information concerning the institutions selected from each of five regional districts.

Fifteen members were selected from the membership of each of the following districts: The Northwest Association of Secondary and Higher Schools, The New England Association of Colleges and Secondary Schools, The Middle States Association of Colleges and Secondary Schools, The North Central Association of Colleges and Secondary Schools, and The Southern Association of Colleges and Secondary Schools.

One hundred five institutions were selected from the above seven groups. Seventeen criteria were used for selection of the institutions within each of the seven groups. These criteria are stated in the tables.

TABLE I

ASSOCIATION OF AMERICAN UNIVERSITIES

	Control			Student Body			Type Institution			Accreditation							State Dept. Ed.
	Public	Private	Den.	Coed	Men	Women	4 yr. L. A.* University	4 yr. L.A. College	4 yr.**Te.Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full credit Trans.	Partial Trans.	Credit AATC #	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Yale University, New Haven, Connecticut		X			X		X			X	X	X	X				X
2. Catholic University of America, Washington, D.C.			X	X			X			X	X	X					
3. Northwestern University Evanston, Illinois		X		X			X			X	X	X	X				X
4. Indiana University Bloomington, Indiana	X			X			X			X	X	X	X				X
5. Harvard University Cambridge, Massachusetts		X			X		X			X	X	X					
6. University of Minnesota Minneapolis, Minnesota	X			X			X			X	X	X	X				X
7. Washington University St. Louis, Missouri		X		X			X			X	X	X	X				X
8. Johns Hopkins University Baltimore, Maryland		X			X	X	X			X	X	X					X

Legend: * L. A. : liberal arts; ** Te.Tr. Teacher training; # AATC: American Association Teachers Colleges.

TABLE I (Continued)

ASSOCIATION OF AMERICAN UNIVERSITIES

	Control			Student Body			Type Institution			Accreditation							
	Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L.A. College	4 yr. teacher tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
9. Columbia University, New York City.		X			X	X	X				X	X	X				X
(Columbia College)																	
(Barnard College)					X	X											
10. Duke University, Durham, North Carolina		X		X			X				X	X	X	X			X
11. Ohio State University Columbus, Ohio	X			X			X				X	X	X	X		X	X
12. University of Texas Austin, Texas	X			X			X				X	X	X	X			X
13. Brown University Providence, Rhode Island		X			X	X					X	X	X				X
14. University of California Berkeley, California	X			X			X				X	X		X			X
15. University of Wisconsin Madison, Wisconsin	X			X			X				X	X	X	X			X

TABLE II

AMERICAN ASSOCIATION OF TEACHERS COLLEGES

	Control			Student Body			Type Institution			Accreditation							
	Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L.A. College	4 yr. Te. Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Arizona State Teachers College, Flagstaff, Arizona	X			X					X			X	X			X-G	X
2. New York State College for Teachers, Albany, N.Y.	X			X					X		X	X				X	X
3. Illinois State Normal University, Normal, Illinois	X			X					X			X	X			X	X
4. State Teachers College Shippensburg, Penn.	X			X					X			X	X			X	X
5. Georgia Teachers College Collegeboro, Georgia	X			X					X			X		X		X	X
6. State Teachers College La Crosse, Wisconsin	X			X					X			X	X			X	X
7. Colorado State College of Education, Greeley, Colo.	X			X					X		X	X	X			X-G	X

TABLE II (Continued)

AMERICAN ASSOCIATION OF TEACHERS COLLEGES

	Control			Student Body		Type Institution				Accreditation							
	Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L. A. College	4 yr. Te. Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
8. North Texas State Teachers College, Denton, Texas	X			X					X		X	X	X			X-G	X
9. Western Washington College of Educ., Bellingham, Wash.	X			X					X			X	X			X	X
10. Lewiston State Normal School Lewiston, Idaho	X			X					X			X		X		X	X
11. George Peabody College for Teachers, Nashville, Tenn.		X		X					X		X	X	X			X-G	X
12. Iowa State Teachers College, Cedar Falls, Iowa	X			X					X		X	X	X			X	X
13. New Jersey State Teachers College, Upper Montclair, N.J.	X			X					X		X	X	X			X-G	X
14. Ball State Teachers College, Muncie, Indiana	X			X					X		X	X		X		X-G	X
15. Miner Teachers College, Wash.	X			X					X							X	X

TABLE III

NORTHWEST ASSOCIATION OF SECONDARY AND HIGHER SCHOOLS

	Control		Student		Type		Accreditation										
	Public	Private	Den.	Coed	Men	Women	4 yr. L. A. University	4 yr. L. A. College	4 yr. Te.Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans Credit	Partial Trans Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. San Jose State College, San Jose, California	X			X				X			X	X	X				X
2. Oregon State College, Corvallis, Oregon	X			X				X			X	X	X				X
3. Reed College, Portland, Oregon		X		X				X			X	X	X				X
4. Willamette University, Salem, Ore.			X	X			X				X	X	X				XX
5. Brigham Young University, Provo, Utah			X	X			X				X	X	X				X
6. Montana State University, Missoula, Montana	X			X			X				X	X	X				X
7. University of Nevada, Reno, Nev.	X			X			X				X	X	X				X
8. State College of Washington Pullman, Washington	X			X				X			X	X	X				X
9. Whitman College, Walla Walla, Washington		X		X				X			X	X	X				X

TABLE III (Continued)

NORTHWEST ASSOCIATION OF SECONDARY AND HIGHER SCHOOLS

	Control			Student Body			Type Institution			Accreditation							
	Public	Private	Den.	Coed	Men	Women	4 yr. L. A. University	4 yr. L. A. College	4 yr. Te.Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
10. Mills College, Oakland, California		X		X				X			X	X	X				X
11. Scripps College, Claremont, California		X				X		X			X						
12. College of The Pacific, Stockton, California		X		X				X			X		X				X
13. Dominican College of San Rafael San Rafael, California			X			X		X			X	X	X				X
14. University of Southern California Los Angeles, California		X		X			X				X		X				X
15. San Diego State College San Diego, California	X			X				X				X	X			X	X

TABLE IV

NEW ENGLAND ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

	Control			Student Body			Type Institution			Accreditation							State Dept. Ed.
	Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L. A. College	4 yr. Te. Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Dartmouth College, Hanover, New Hampshire		X			X			X			X	X	X				X
2. Colby College, Waterville, Me.		X			X	X		X			X	X		X			X
3. University of New Hampshire Durham, New Hampshire	X			X			X				X	X					X
4. Bennington College Bennington, Vermont		X				X		X			X	X	X	X	X		X
5. Norwich University Northfield, Vermont		X			X		X					X					X
6. Middlebury College Middlebury, Vermont		X			X	X		X			X	X					X
7. Tufts College, Medford, Mass.		X			X	X		X			X	X					
8. Smith College, Northampton, Massachusetts		X				X		X			X	X					

TABLE IV (Continued)

NEW ENGLAND ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

	Control			Student Body			Type Institution			Accreditation							
	Public	Private	Den	Coed	Men	Women	4 yr. L.A. University	4 yr. L.A. College	4 yr. Te. Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Cr.	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
9. College of The Holy Cross, Worcester, Massachusetts			X			X		X			X	X					
10. Massachusetts State College Amherst, Massachusetts	X			X				X			X	X					X
11. Wesleyan University Middletown, Connecticut		X			X		X				X	X	X				X
12. Connecticut College New London, Connecticut		X				X		X			X	X	X				X
13. University of Connecticut Storrs, Connecticut	X			X							X	X					X
14. Simmons College Boston, Massachusetts		X				X					X	X					
15. Northeastern University Boston, Massachusetts		X		X								X					

TABLE V

MIDDLE STATES ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

	Control		Student Body		Type Institution				Accreditation								
	Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L.A. College	4 yr. Te. Tr.	Member AAU	Accred. AAU	Accred. Region	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Vassar College Poughkeepsie, New York		X				X		X			X	X					X
2. City College of the City of New York, New York City	X				X	X		X			X	X					X
3. Syracuse University Syracuse, New York		X		X			X				X	X					X
4. Duquesne University, Pittsburgh, Pennsylvania			X	X			X				X	X					X
5. Temple University Philadelphia, Pennsylvania		X		X			X				X	X	X				X
6. University of Pittsburg Pittsburg, Pennsylvania		X		X			X				X	X	X				X
7. Rutgers University New Brunswick, New Jersey	X	X			X	X	X				X	X	X				X
8. Upsala College, East Orange, New Jersey			X	X				X				X	X				X

TABLE V (Continued)

MIDDLE STATES ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

	Control			Student Body			Type Institution			Accreditation							State Dept. Ed.
	Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L. A. College	4 yr. Te. Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
9. University of Maryland College Park, Maryland	X			X			X				X	X	X				X
10. Goucher College Baltimore, Maryland		X				X		X			X	X					
11. George Washington University Washington, D.C.		X		X			X				X	X					
12. Georgetown University Washington, D.C.			X		X		X				X	X					
13. Cornell University Ithaca, New York	X	X		X							X	X					X
14. University of Buffalo Buffalo, New York		X		X							X	X					X
15. Morgan State College Baltimore, Maryland	X			X								X					X

TABLE VI

NORTH CENTRAL ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

		Control		Student		Type		Accreditation										
		Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L. A. College	4 yr. Te.Tr.	Member AAU	Accred. AAU	Accred. Regional Uncon. Assn. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	University of Arizona Tucson, Arizona	X			X			X				X	X	X				X
2.	John Brown University Siloam Springs, Arkansas		X		X			X							X			X
3.	Ouachita College Arkadelphia, Arkansas			X	X				X				X		X			X
4.	University of North Dakota University, North Dakota	X			X			X				X	X	X				X
5.	Wesley College Grand Forks, North Dakota			X	X				X									X
6.	Oklahoma City University Oklahoma City, Oklahoma			X	X			X						X				X
7.	Oklahoma College for Women Chickasha, Oklahoma	X					X		X			X	X	X				X
8.	Montana State College Bozeman, Montana	X			X				X			X	X	X				X

TABLE VI (Continued)

NORTH CENTRAL ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

	Control			Student Body			Type Institution			Accreditation								
	Public	Private	Den.	Coed	Men	Women	4 yr. L. A. University	4 yr. L. A. College	4 yr. Te.Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm.	Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
9. Dakota Wesleyan University Mitchell, South Dakota			X	X			X					X	X				X	
10. Bethany College Bethany, West Virginia		X		X				X			X	X	X				X	
11. West Virginia University Morgantown, West Virginia	X			X			X				X	X	X				X	
12. University of Wyoming Laramie, Wyoming	X			X			X				X	X	X				X	
13. Antioch College Yellow Springs, Ohio		X		X				X			X	X	X				X	
14. Denison University Granville, Ohio			X	X			X				X	X	X				X	
15. Rockford College Rockford, Illinois		X				X		X			X	X	X				X	

TABLE VII

SOUTHERN ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

	Control			Student Body			Type Institution			Accreditation							
	Public	Private	Den.	Coed	Men	Women	4 Yr. L.A. University	4 yr. L. A. College	4 yr. Te.Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Grad. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Alabama College Montevallo, Alabama	X					X		X			X	X	X				X
2. Birmingham-Southern College Birmingham, Alabama			X	X				X			X	X	X				X
3. University of Miami Coral Gables, Florida		X		X			X					X	X				X
4. Mercer University Macon, Georgia			X	X			X					X	X				X
5. Berea College Berea, Kentucky		X		X				X			X	X	X				X
6. Centenary College Shreveport La.			X	X				X				X					X
7. Mississippi State College State College, Mississippi	X			X				X				X	X				X
8. Millsaps College, Jackson, Miss.			X	X				X			X	X	X				X

TABLE VII (Continued)

SOUTHERN ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

	Control			Student Body			Type Institution			Accreditation							
	Public	Private	Den.	Coed	Men	Women	4 yr. L.A. University	4 yr. L.A. College	4 yr. Te.Tr.	Member AAU	Accred. AAU	Accred. Regional	Uncon. Adm. Sch.	Full Trans. Credit	Partial Trans. Credit	AATC	State Dept. Ed.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
9. Wake Forest College Wake Forest, North Carolina			X	X				X			X	X	X				X
10. Furman University Greenville, South Carolina			X	X			X				X	X	X				X
11. Benedict College Columbia, South Carolina			X	X				X				X					X
12. Southwestern University Memphis, Tennessee			X	X			X				X	X	X				X
13. University of the South Sewanee, Tennessee		X			X		X				X	X	X				X
14. Texas State College for Women Denton, Texas	X					X		X			X	X	X				X
15. College of William and Mary Williamsburg, Virginia	X			X				X			X	X	X				X

CHAPTER V

THE DATA

Tabulation and Analysis of Replies to the FirstFive Questions of the Questionnaire

These questions were designed for the purpose of determining the need for a course in human biology. The questions are restated.

1. Does your school offer a course entitled human biology?
2. Is this course open to the general student as a part of liberal education?
3. Do you believe the proposed human biology course could contribute toward a liberal education for the general student?
4. Do you believe the proposed course could be designed for the general student without conflicting with the purposes of existing biology courses?
5. If the general student can be considered deficient in biological background, do you believe this student could obtain, most advantageously, similar information in human biology from biology courses currently available?

The questionnaires of 156 respondents were returned. This represents a return of 49.5 percent of the questionnaires mailed. Of the questionnaires returned, 142 were in usable condition.

An Analysis of Table VIII

Table VIII indicates the composite view of all respondents. The Biology respondents were greater in number. These respondents may have a greater interest in a problem in their area. However, it is believed the problem is also of much interest to teachers of physical education. Since the problem is in the area of general education, it is understandable the teachers of education should manifest much interest.

The respondents indicate thirty-three institutions offer a course entitled human biology and 108 institutions do not offer the course. Human biology now exists as a course entity in slightly more than one-fifth of the institutions polled. It is believed the rationales of implementation are not reported from most institutions. The few reports available indicate no wide-spread evaluation of need and content of the course. Some articles state the course was sponsored by one or more local individuals.

Eight institutions do not open the course to all students as a part of a liberal education. The table indicates forty-four institutions open the course to all students; however, only thirty-three institutions are shown to offer the course. This discrepancy can not be accounted for completely. Perhaps, eleven respondents would offer the course to all students if their institutions offered the course. Obviously, most respondents did not answer question two because the course was not offered by their institutions.

Most of the respondents believed the proposed course could contribute toward a liberal education. There were eight dissenting respondents and twelve who did not answer the question.

The consensus of respondents was that the course could be designed without conflicting with the purposes of existing biology courses. Thirty-one did not share this view.

Seventy-one respondents believed human biology could not be obtained from existing biology courses. Fifty-one did not share this view and twenty did not answer the question.

The consensus of respondents indicate the following answers to the first five questions of the questionnaire: Question one: NO. Question two: NO. Question three: YES. Question four: YES. Question five: NO.

TABLE VIII
TABULATION OF REPLIES TO FIRST FIVE QUESTIONS
OF QUESTIONNAIRE

Serial Number*	Respondents	Number of Respondents	Percent of 142
1.	biology	70	49.0
2.	education	42	29.4
3.	physical education	30	21.0
		<u>142</u>	<u>99.4</u>
QUESTION No. 1. Does your school offer a course entitled human biology?			
4.	yes	33	23.1
5.	no	108	75.6
6.	unanswered	1	0.7
		<u>142</u>	<u>99.4</u>
QUESTION No. 2. Is this course open to the general student as part of a liberal education?			
7.	yes	44	30.8
8.	no	8	5.6
9.	unanswered	90	63.0
		<u>142</u>	<u>99.4</u>
QUESTION No. 3. Do you believe the proposed human biology course could contribute toward a liberal education for the general student?			
10.	yes	122	85.4
11.	no	8	5.6
12.	unanswered	12	8.4
		<u>142</u>	<u>99.4</u>

* Serial numbers itemize the component parts of Table VIII.

TABLE VIII (Continued)
 TABULATION OF REPLIES TO FIRST FIVE QUESTIONS
 OF QUESTIONNAIRE

Serial Number	Respondents	Number of Respondents	Percent of 142
QUESTION No. 4. Do you believe the proposed course could be designed for the general student without conflicting with the purposes of existing biology courses?			
13.	yes	98	68.6
14.	no	31	21.7
15.	unanswered	<u>13</u>	<u>9.1</u>
		142	99.4
QUESTION No. 5. If the general student can be considered deficient in biological background, do you believe this student could obtain, most advantageously, similar information in human biology from biology courses currently available?			
16.	yes	51	35.7
17.	no	71	49.7
18.	unanswered	<u>20</u>	<u>14.0</u>
		142	99.4

An Analysis of Table IX

Table IX gives a comparative study of the replies of respondents in the departments of biology, education, and physical education. This table may be contrasted with Table VIII in which the composite replies of all respondents were given to the first five questions.

Table IX also indicates most institutions do not offer the course, and therefore it is not open to all students as part of general education.

Most respondents believed the proposed course could contribute toward a liberal education. It is noted a few (4.9 percent) who did not share this view. Perhaps this group believes that a survey course in plants and animals would accomplish the purposes of a course in human biology.

The majority of respondents believed the course could be designed without conflicting with the purposes of existing biology courses. It is noted that biology respondents constitute most of the minority.

In answering question five, seventy-one respondents believe human biology can not be obtained most advantageously in existing biology courses. Fifty-one respondents do not share this view and twenty respondents did not answer the question. There is a marked difference in the attitude of biology respondents from those of the education and physical education departments on this

question. Thirty-eight biology respondents indicated "yes" and thirty-three "no." The ratio of affirmative to negative answers in the education department was 10:24, and 3:14 in the department of physical education. The biology respondents are nearly evenly divided on this question. Perhaps, a minority of biologists specialize in human biology. This impression may support the fact that some other specialists in biology believe human biology can not be obtained from existing biology courses. Respondents of the education and physical education departments were quite decisive in their view that human biology could not be obtained from existing biology courses.

TABLE IX
TABULATION OF REPLIES TO FIRST FIVE QUESTIONS OF
QUESTIONNAIRE BY DEPARTMENTS

Serial Number*	Respondents	Number of Respondents	Percent of 142
QUESTION No. 1. Does your school offer a course entitled human biology?			
YES:			
1.	biology	19	13.3
2.	education	10	7.0
3.	physical education	4	2.8
NO:			
4.	biology	52	36.4
5.	education	31	21.7
6.	physical education	25	17.5
UNANSWERED:			
7.	all departments	$\frac{1}{142}$	$\frac{0.7}{99.4}$
QUESTION No. 2. Is this course open to the general student as part of a liberal education?			
YES:			
8.	biology	25	17.5
9.	education	12	8.4
10.	physical education	7	4.9
NO:			
11.	biology	2	1.4
12.	education	3	2.1
13.	physical education	3	2.1
UNANSWERED:			
14.	all departments	$\frac{90}{142}$	$\frac{63.0}{99.4}$

* Serial numbers itemize the component parts of Table IX.

TABLE IX (Continued)
 TABULATION OF REPLIES TO FIRST FIVE QUESTIONS OF
 QUESTIONNAIRE BY DEPARTMENTS

Serial Number	Respondents	Number of Respondents	Percent of 142
QUESTION No. 3. Do you believe the proposed biology course could contribute toward a liberal education?			
Yes:			
15.	biology	58	40.6
16.	education	40	28.0
17.	physical education	24	16.8
No:			
18.	biology	7	4.9
19.	education	1	0.7
20.	physical education	0	0.0
Unanswered:			
21.	all departments	$\frac{12}{142}$	$\frac{8.4}{99.4}$
QUESTION No. 4. Do you believe the proposed course could be designed for the general student without conflicting with the purposes of existing biology courses?			
Yes:			
22.	biology	42	29.4
23.	education	32	22.4
24.	physical education	24	16.8
No:			
25.	biology	23	16.1
26.	education	6	4.2
27.	physical education	2	1.4
Unanswered:			
28.	all departments	$\frac{13}{142}$	$\frac{9.1}{99.4}$

TABLE IX (Continued)
 TABULATION OF REPLIES TO FIRST FIVE QUESTIONS OF
 QUESTIONNAIRE BY DEPARTMENTS

Serial Number	Respondents	Number of Respondents	Percent of 142
QUESTION No. 5 If the general student can be considered deficient in biological background, do you believe this student could obtain, most advantageously, similar information in human biology from biology courses currently available?			
YES:			
29.	biology	38	26.6
30.	education	10	7.0
31.	physical education	3	2.1
NO:			
32.	biology	33	23.1
33.	education	24	16.8
34.	physical education	14	9.8
UNANSWERED:			
35.	all departments	<u>20</u> 142	<u>14.0</u> 99.4
COMPOSITE YES:			
36.	all departments	51	
COMPOSITE NO:			
37.	all departments	71	

Recommended Time Allotment and Type
of Presentation

Table X indicates the recommended time allotment for the course and the type of presentation.

The respondents were nearly evenly divided on the question of whether to include laboratory work with the lecture sessions. Fifty-five opposed laboratory work while forty-seven respondents were in favor of including this work. Thirty-nine respondents either did not answer the questions or offered other suggestions. The largest single group of respondents (thirty-one) suggested the course be designed to fit three lectures a week without laboratory for one semester. Twenty respondents indicated the same system to two semesters. Fifty-one favored this system for either one or two semesters. This represents the largest group. Obviously, a very diverse attitude exists on this question. Three lectures a week for one semester without laboratory work was selected for purposes of this investigation.

TABLE X
 REPLIES OF RESPONDENTS CONCERNING TIME ALLOTTMENT
 AND TYPE OF PRESENTATION

Serial Number*	Class Sessions	Number of Respondents
LECTURE DEMONSTRATION WITHOUT LABORATORY:		
One lecture per week for		
1.	one semester	0
2.	two semesters	0
Two lectures per week for		
3.	one semester	1
4.	two semesters	3
Three lectures per week for		
5.	one semester	31
6.	two semesters	20
7.	total 1 through 6	55
LECTURE DEMONSTRATION WITH LABORATORY:		
One lecture with three hour laboratory per week for		
8.	one semester	0
9.	two semesters	0
Two lectures with three hour laboratory per week for		
10.	one semester	10
11.	two semesters	13

*Serial numbers itemize the component parts of Table I.

TABLE X (Continued)
 REPLIES OF RESPONDENTS CONCERNING TIME ALLOTTMENT
 AND TYPE OF PRESENTATION

Serial Number	Class Sessions	Number of Respondents
Three lectures with three hour laboratory per week for		
12.	one semester	14
13.	two semesters	<u>10</u>
14.	total 8 through 13	47
15.	other suggestions	12
16.	unanswered	<u>27</u>
17.	total 15 and 16	39

The Consensus of Respondents Concerning

Course Content

Question number seven of the questionnaire was designed for the purpose of determining the content of a course in human biology. In the prior questions, it is believed the need for the course has been established and also the time allotment and type of presentation for the course has been determined. Determination of the content of the course was based on eighteen predetermined areas of knowledge known to be related to human biology. These areas of knowledge were selected from various textbooks. No degree of emphasis was attached to each area. The respondents were requested to suggest additional areas of knowledge which they thought should be included in human biology.

The verdict of the respondents is that eight of the eighteen suggested areas of knowledge should be retained for the basis of a course in human biology. (See serial numbers 1-8, Table XI.) The consensus of the respondents was that ten of the suggested areas should not be included in the proposed course. (See serial numbers 9-18 Table XI). Additional areas were suggested which constituted 5.95 percent of the course.

The degrees of emphasis placed on each area of knowledge is indicated by number of respondents in Table XI, columns 1,2,3, and 5. The data contained in column 6 indicates the net consensus of respondents on all areas of knowledge. This consensus was

obtained by subtracting the frequency of areas omitted from the frequency of areas recommended to be retained regardless of emphasis.

TABLE XI
 CONSENSUS OF RESPONDENTS CONCERNING COURSE CONTENT

Serial Number*	Subject	Column Number					
		1	2	3	4	5	6
1.	physiology	58	21	36	115	27	88
2.	embryology	4	44	64	112	30	82
3.	nutrition	22	29	54	105	37	68
4.	heredity	14	28	59	101	41	60
5.	gross anatomy	14	29	50	93	49	44
6.	hygiene	16	25	43	84	58	26
7.	evolution	7	14	56	77	65	7
8.	bacteriology	4	17	52	73	69	4
9.	physiological psychology	7	10	46	63	79	-16
10.	parasitology	0	8	54	62	80	-18
11.	pathology	1	6	49	56	86	-30
12.	histology	0	6	51	56	86	-30
13.	anthropology	5	7	42	54	88	-34
14.	ecology	0	13	37	50	92	-42
15.	first aid	7	5	35	47	95	-48
16.	hematology	0	3	34	37	105	-68
17.	kinesiology	1	3	31	35	107	-72
18.	serology	0	4	28	32	110	-78

LEGEND

Column 1	Most emphasis. Indicated by number of respondents.
Column 2	Moderate emphasis. Indicated by number of respondents.
Column 3	Weak emphasis. Indicated by number of respondents.
Column 4	Sum of columns 1, 2, and 3. Number of respondents.
Column 5	Subject matter areas to be omitted. Number of respondents.
Column 6	Difference column 4 minus column 5. Net number of respondents who favor area of knowledge regardless of emphasis. Negative value indicates area will be omitted.

* Serial numbers itemize the component parts of Table XI.

Additional Comments of Respondents

Thirty-four of the one hundred and forty-two respondents expressed additional comments concerning the questionnaire. This information adds much to the viewpoint of these respondents and thereby enhances this study.

Of the thirty-four respondents, most were generally in favor of the proposed course, but eleven offered some reservations.

Excerpts of comments have been paraphrased as follows:

Fletcher G. Watson, Dean, Graduate School of Education, Harvard University: He likes the proposed course in Human Biology and doubts if students can obtain human biology from existing biology courses. He compares proposed course with Harvard's Natural Science No. 5, and refers to developments at San Francisco State College and San Diego State College.

Clarence M. Pruitt, Visiting Professor and Editor, Science Education, University of Miami. He believes content of proposed course could be improved by inclusion of material from the following publications: Machinery of the Body by Carlson and Johnson and Hygiene by Meredith.

Roy Brammell, Dean, School of Education, University of Connecticut: Likes concept of proposed course very much. Believes students can not obtain human biology from existing biology courses.

Robert H. Woodworth, Professor of Biological Sciences, Bennington College, Bennington, Vt., offers course entitled "Human Life and Environment." Uses Science and the Goals of Man

by Rapoport and The Living Body by Best and Taylor.

H. Bentley Glass, Professor of Biology, The Johns Hopkins University: Believes students usually do not receive adequate information from existing biology courses but does believe some courses in this country accomplish this aim. Believes majors and non-majors should not be separated so far as laboratory work is concerned.

Eb C. Giruin, Professor of Biology, Millsaps College: Believes proposed course in human biology would be of great value to the liberal arts student.

John R. LeFevre, Assistant Professor, George Peabody College for Teachers: This institution desires to implement a course to accomplish the purposes of human biology. Believes there is need for a course of this type.

C. L. Anderson, Professor of Hygiene and Health Education, Oregon State College: This institution offers a course entitled "Human Biology." Believes students can not obtain human biology from existing biology courses.

Declar F. Barron, Assistant Professor of Biology, Western Washington College of Education: This institution offers a course in human biology. Believes students can not obtain this information from existing biology courses.

Daryl Pendergraft, Curriculum Coordinator, Iowa State Teachers College: This institution offers a course in human

biology. Believes students can not obtain human biology from existing biology courses.

Laurence E. Morehouse, Associate Professor of Physical Education, University of Southern California: Believes proposed course in Human Biology would make a good offering for lower division students. He regards this course as a companion course to their upper division course entitled "Scientific Bases for Physical Education."

Thomas C. Polson, Supervisor of Science Teaching, University of California at Berkeley: Believes proposed course in human biology should be built around a problem solving method. His opinion is that students can not obtain human biology from existing biology courses.

L. G. Kranz, Professor of Physical Education, Northwestern University, Evanston, Illinois: Likes proposed course in human biology. Believes this course could serve well as a background for physical education majors. Believes students can not obtain human biology from existing biology courses.

R. M. DeCoursey, Professor of Zoology, University of Connecticut: He believes students can not obtain adequate human biology information in existing biology courses. This institution offers a course in human biology.

Dorothy R. Stewart, Professor of Zoology and Head of Department, Rockford College, Rockford, Illinois: Believes students do not obtain adequate human biology information in existing

biology courses. Suggests content for the proposed course.

W. Blair, Dean of Education, North Texas State College:
Believes students do not obtain adequate information in human biology from existing biology courses. Suggests use of the problem solving method in proposed course.

W. R. Breneman, Acting Chairman, Department of Zoology,
Indiana University: This institution plans to introduce a course in human biology.

E. F. Bortorn, Professor of Biology, Upsala College:
This institution offers a course in human biology as part of health education. Believes no textbook in health education gives the proper biological approach; therefore, mimeographed notes are used.

Beatrice S. Richardson, Director of Physical Education,
Scripps College, Claremont, California: Believes students do not obtain adequate information in human biology from existing biology courses. This institution offers a course in human biology for the general student.

Howard M. Smith, Jr., Chairman Department Men's Physical Education, William and Mary College: Believes proposed course would be very popular and useful to the general student. He desires a similar course at William and Mary College.

Ruth Stammund, Chairman, Department of Physical Education,
Connecticut College, New London, Connecticut: Likes proposed course and thinks it should be required of all students.

Frank Richardson, Associate Professor of Biology, University of Nevada: He teaches a course entitled "Survey of Zoology" for general students but believes the proposed course without laboratory would serve better the purposes of his institution.

Douglas G. Gemeroy, Assistant Professor of Zoology, Rutgers University: Believes students do not obtain adequate information in human biology from existing biology courses. This institution offers a course entitled "Biology of Man."

E. M. Miller, Chairman, Department of Biology, University of Miami: Does not favor substituting human biology for general zoology. Thinks zoology is "humanized" too much now.

William McBlair, Assistant Professor of Zoology, San Diego State College: Would relegate question of the proposed course to local staff and administration. Believes Human Biology could absorb the Health Education requirement by the State of California. Believes staff can not communicate properly about the definitions of general education.

K. Rystrom, Associate Professor of Education, Upsala College, East Orange, N. J.: Does not understand why a questionnaire is needed to decide the content of a course. He believes an institution in need of a course should implement it.

William Ethair, Associate Professor of Biology, College of the City of New York: Believes a course in hygiene could serve the purposes of proposed course.

ThurLOW C. Nelson, Professor of Zoology, Rutgers University: Believes student obtains adequate information in human biology from existing biology courses. This institution offers a course entitled "Biology of Man."

Rudolf T. Kempton, Professor of Zoology and Head of the Department, Vassar College: Believes a broad biology course with emphasis on man could accomplish the purposes of a course in human biology. Whether students obtain adequate human biology from existing biology courses depends on the structure of the course.

G. L. Carver, Professor of Zoology and Head of the Department, Mercer University, Macon, Georgia: Believes existing biology courses offer adequate information on human biology.

A. W. Lindsey, Professor of Biological Sciences, Denison University: This institution uses the "core course" idea. Would like to accomplish the purposes of a course in human biology with a broad biology course emphasizing anatomy, physiology, histology, and ecology.

Richard T. Hartley, Professor of Zoology, LaCrosse State College, LaCrosse, Wisconsin: Believes adequate information in human biology is available from existing biology courses. Believes the best way to study human biology is through laboratory study of many animal forms.

Wallace E. Maarsingh, Associate Professor of Biology, Dokato Wesleyan University: Prefers the broad biological survey approach for a course in human biology.

J. W. Severy, Chairman, Division Biological Sciences,
Montana State University: Prefers the broad biological survey
approach for a course in human biology.

It is believed these additional comments contribute much
in the consideration of the problem. There seems to be a trend
for firm endorsement of the course by a majority of the group.
A minority of the group share the belief that existing biology
courses could accomplish the purposes of the proposed course.

CHAPTER V

Solution of the Problem

The problem in this investigation is to determine the content of a course in human biology. A content for this course has been recommended by the jury of teachers. The findings of this group are shown in Table XII and graphically represented in Chart II.

The content recommended for the course includes the following areas of knowledge: physiology, embryology, nutrition, heredity, gross anatomy, hygiene, evolution, and bacteriology.

The jury of teachers recommended that this subject matter be given emphasis in the course in accordance with the following class session evaluations: physiology 10.45, embryology 9.73, nutrition 8.07, heredity 7.12, gross anatomy 5.22, hygiene 3.09, evolution 0.84, and bacteriology 0.47.

Analysis of Table XII

The eight recommended areas of knowledge are listed by serial numbers, beginning with the area of most emphasis.

Column I shows the net amount of respondents who favor inclusion of each area of knowledge. These figures were obtained from Column Six, Table XI. The net respondents were obtained by subtracting the number of respondents who do not favor inclusion of the area from the number of respondents who favor inclusion of an area, regardless of the degree of emphasis.

Column II represents the unit equivalents of the net respondents in Column I. One unit is assigned the value of eight respondents.

Column III indicates the metric scale equivalents of the unit values in Column II. Three millimeters are assigned the value of one unit.

The sum of the metric values of Column III is 142.14 millimeters, which is represented as 100 percent.

Column IV represents the percentage each area of knowledge represents on the metric scale.

Column V represents the number of sessions of forty-five sessions which were determined by the percent values of Column IV.

TABLE XII
RECOMMENDED AREAS OF KNOWLEDGE FOR A
COURSE IN HUMAN BIOLOGY

Serial Number	Area of Knowledge	COLUMN				
		I	II	III	IV	V
1.	physiology	88	11.00	33.00	23.22	10.45
2.	embryology	82	10.25	30.75	21.63	9.73
3.	nutrition	68	8.50	25.50	17.94	8.07
4.	heredity	60	7.50	22.50	15.83	7.12
5.	gross anatomy	44	5.50	16.50	11.61	5.22
6.	hygiene	26	3.25	9.75	6.86	3.09
7.	evolution	7	0.88	2.64	1.86	0.84
8.	bacteriology	4	0.50	<u>1.50</u>	<u>1.05</u>	<u>0.47</u>
				142.14	100.00	44.99

LEGEND

- Column I Net respondents of 142 who favor area of knowledge.
Table XI, Col. 6.
- Column II Unit: One unit is equivalent to eight respondents.
- Column III Scale: Three millimeters are equivalent to one unit.
- Column IV Percent: One hundred percent is equivalent to
142.14 millimeters.
- Column V Sessions: Number of sessions of forty-five
allotted to each area of knowledge.

Analysis of Chart II

The metric scale equivalents (Column III, Table XII), the metric percent values (Column IV, Table XII), and the number of sessions of forty-five equivalent to the metric percent value (Column V, Table XII) are shown graphically in Chart II for each area of knowledge. The vertical measurement of the chart is 142.14 millimeters which represents 100 percent.

MILLIMETERS
Column III
Table XII

PERCENT
Column IV
Table XII

SESSIONS
Column V
Table XII

142.14 mm	33.00	23.22	10.45	1. physiology
	30.75	21.53	9.73	2. embryology
	25.50	17.94	8.07	3. nutrition
	22.50	15.83	7.12	4. heredity
	16.50	11.61	5.22	5. gross anatomy
	9.75	6.86	3.09	6. hygiene
	2.64	1.86	0.84	7. evolution
	1.50	1.05	0.47	8. bacteriology

LEGEND: 1 unit = 3 mm.; 142.14 mm. = 100 percent.

CHART II

DISTRIBUTION OF RECOMMENDED COURSE CONTENT IN
HUMAN BIOLOGY

The recommended areas of knowledge may be grouped under three general topics for presentation, namely: 1. The origin and development of the human body, 2. The structure, function and maintenance of the human body, and 3. The pathology and prophylaxis of the human body.

The jury of teachers also recommended that the subject matter be given in forty-five lecture sessions without laboratory work. Other factors must be considered during these lectures. Examinations, discussions, demonstrations, guest speakers, and motion picture films may be examined for their potential value to this course. No recommendations were solicited from the respondents on these topics. Subsequent experience should indicate the value for which each factor may be used. It is not the purpose of this investigation to adjudicate the use of these topics. Course planning will be done on the basis of the recommended areas of knowledge.

The Origin and Development of the Human Body

The components of this area may include evolution, heredity and embryology for 0.83, 7.12, and 9.67 sessions respectively, and would utilize approximately 17/45 of the time allotted for the course.

A very logical series of biological principles may be evolved in this topic. The origin of man; the mechanisms of the

genes; and the development of the body systems should present a logical and thought-provoking unit of study.

The study of evolution should be organized along basic principles. Evidence in support of evolution may be presented. The source of this evidence may be derived from morphology, embryology, paleontology, and physiology. The theories of evolution should be summarized, including natural selection, mutations, orthogenesis, and the Lamarckian theory.

The vast body of information pertaining to heredity should be organized quite efficiently for effective presentation during the allotted time. The principles to be presented during this segment of the course may be organized into a sequence. A discussion of germ cells and fertilization would lead into the broader area of heredity. The initial discussion in this segment should involve germinal continuity, spermatogenesis, oogenesis, fertilization, chromosomes and, sex determination. Subsequent discussions should be based on the Mendelian principles, the monohybrid cross, phenotype, genotype, dihybrid crosses, lethal factors, the influence of sex hormones on genetical factors, linkage, crossing over, eugenics, and sociological implications of heredity.

This subject matter of embryology is well adapted for presentation as the next logical sequence. Discussion topics may be arranged in the following order: The transport of spermatozoa and ovum, fertilization, implantation, cleavage, the blastula, the

gastrula, fate of the ectoderm, mesoderm and entoderm, embryonic membranes, nature of connection between fetus and mother, fundamental factors in development. These topics may be followed by a discussion on parturition.

The Structure, Function, and Maintenance
of the Human Body

The second general topic of the course would utilize approximately 24/45 of the allotted sessions. The components of this area may include gross anatomy, physiology, and nutrition for 5.22, 10.38, and 8.07 sessions respectively.

In order to create a logical liaison with the preceding unit of study, discussions should start with the newborn from the time of parturition. A presentation of general principles concerning the growth and development of children could initiate this phase of the course. The next sequence may be based on teaching concepts formulated in many textbooks of human anatomy and physiology. Particular emphasis should be given to nutrition. It is believed the presentation of anatomy and physiology can not be completed in detail during the time allotted for this segment of the course. However, some detailed information must be presented in order to give an accurate concept of body structure and function. This portion of the sequence may be centered around the following topics: 1. An integrated concept of the whole body, 2. Human body movements, 3. Human body metabolism, 4. The integration and control of the human body.

An integrated concept of the whole body should include general discussions on terminology, planes of reference, surface anatomy, the basic tissues of the body, and splanchnology.

The sequence of discussions concerning body movement may be centered around osteology, articulations, functional groups of skeletal muscles and the physiology of skeletal muscle.

The metabolism of the human body involves a large body of knowledge. In this unit the anatomy and physiology of the various systems of the body may be discussed as the basis for body metabolism. The intake, digestion, absorption, and metabolism of foods and excretion of wastes should constitute the central theme as a means of understanding the body systems. The science of nutrition may form a core of these discussions.

Pathology and Prophylaxis of the Human Body

The third unit in human biology will consider disease processes and their prevention. Many related topics may be included conveniently in this unit. The respondents were asked to suggest additional areas of knowledge to be included in this course. The following areas were suggested: community health, sex hygiene, sociobiology, somatotyping, geriatrics, mental health, neurology, and elementary physical diagnosis. Most areas were suggested by one respondent and should constitute only a small portion of time. These topics may be included as threads of thought through-out this unit.

According to the recommendations of the jury of teachers, this unit should utilize approximately 4/45 of the course. Practical aspects of human biology would constitute appropriate subject matter for the last few sessions of the course. Broad principles must be taught as it would be impossible, obviously, to consider detailed information. It is believed that much general information can be given at this time concerning healthful living. At this stage, the student should have the proper academic background to perceive quickly the many practical applications of human biology. The presentation of this phase of the course may be based on a problem solving method of teaching. The teacher should assist the class in selecting problems of widespread significance and should predicate discussions on the information taught in the prior two units of the course.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The primary objective of this investigation was to determine the content of a course in human biology for liberal arts students as part of a general education. A solution to the problem was obtained. A jury of teachers recommended the subject matter of this course and indicated the emphasis which should be placed on each area of knowledge. This emphasis is shown by the session evaluation of each area of knowledge. Physiology 10.38, embryology 9.67, nutrition 8.07, heredity 7.12, gross anatomy 5.22, hygiene 3.08, evolution 0.83, and bacteriology 0.48.

The consensus of respondents was that the course could contribute toward a general education and that the subject matter of human biology could not be obtained in existing biology courses. The opinion of the biology respondents was closely divided on the latter statement. Some biology representatives expressed the belief that adequate information on human biology could be obtained in existing biology courses. However, nearly half the biology respondents and the large majority of the education and physical education respondents did not share this view.

The content of human biology courses in other institutions were reviewed. Much variety was found in the subject matter included. Based on the data obtained by this investigation and catalog studies, it is believed that approximately one-fifth of

all four year liberal arts colleges, universities, and teachers' colleges offer courses in the biology of man. However, very few of these courses have been reported in the literature. From the articles available, it is believed that the content of these courses have been formulated locally. There is no evidence of a nation-wide polling of teacher opinion.

Reports in the literature emphasize the viewpoint that specialized science courses in the liberal arts colleges do not meet the needs of non-science liberal arts students. The need is indicated for general courses about the human body to prepare non-science students for life situations. No adverse comment was noted concerning the methodology used in curricula for specialized students. Perhaps, one may assume that the contributors were satisfied that specialized courses satisfied the needs of science majors but did not meet the needs of the non-science majors. It seems evident that specialized science courses must remain at their technical level of presentation to assure competency of students enrolled in these specialized major curricula. This observation does not relieve the necessity of adapting science courses to general education.

Articles in the literature indicate that more attention should be paid by the graduate schools to the training of college science teachers in general education. It appears more emphasis has been placed on specialized scientific training for college teaching than training for general education courses. Specialized training

is necessary for the progress of mankind, and the high standards of specialized training can not be compromised. The training of prospective college science teachers in graduate schools also appears to be a necessity. It was established that most persons who have earned the doctor of philosophy degree teach college students at the undergraduate level. Provisions should be made to train these individuals in the art of teaching science as a part of general education.

It is believed that a course in human biology as a part of general education possesses much potential value for all students. The verdict of the jury on this question is stated quite clearly. The majority of respondents who made additional statements on the questionnaire enthusiastically endorsed the purposes of human biology. These individuals are distinguished representatives from major educational institutions through-out the country.

It is believed the problem is of utmost importance, and provisions for teaching human biology as part of general education should be established in the liberal arts colleges. The prime source of human biology remains in the medical schools. The staff members of these institutions are busily engaged in training prospective physicians in the technical aspects of human biology. This source of teachers is unavailable to most liberal arts colleges. The biology course in the liberal arts college places major emphasis on plants and animals which serves excellent

purposes and may be expected since few college teachers specialize in human biology. However, nearly half of the biology respondents believe adequate human biology information can not be obtained from existing biology courses.

On the basis of evidence contained in this study, the following recommendations may be made concerning the place of human biology in the liberal arts college program.

1. The liberal arts colleges, universities, and teachers' colleges should make a careful study of existing courses in biology to determine the extent to which human biology is offered.

2. It is believed a separate course in human biology is needed as a supplement to the survey course in plants and animals, however, man should not be omitted entirely from the discussions in the latter course. Due to the importance of human biology to the liberal arts students, a separate course entity is believed justified.

3. The liberal arts colleges should give full attention to the status of human biology in general education. Liberal arts students should have available this course as an essential part of their preparation for life situations.

4. The liberal arts colleges should hire teachers with special qualifications for the teaching of human biology. These teachers are needed for general education courses and also for specialized human biology courses in semi-professional curricula.

5. It is recommended that research in human biology be emphasized in the liberal arts colleges. The need exists for the preparation of textbooks adapted to the purposes of general education.

6. The graduate schools should pay particular attention to the preparation of prospective college science teachers. A college teaching minor should be recommended for those graduate students who plan to teach.

BIBLIOGRAPHY

ADVANCE BOND

CITIZEN BROWN PAPER

BIBLIOGRAPHY

1. Anthony, Catherine Parker. Textbook of anatomy and physiology. 3d ed. St. Louis, Mosby, 1950. 614p.
2. Baitsell, George Alfred. Human biology. 1st ed. New York, McGraw-Hill, 1950. 621p.
3. Baucher, Chauncey Samuel. The chicao college plan. Chicago, University of chicao press, 1935. 413p.
4. Bawden, George. The conference plan of teaching general chemistry. Journal of chemical education 11:618-620. 1934.
5. Bernard, J. Darrell. The lecture demonstration versus the problem-solving method of teaching a college science course. Science education 26:121-132. 1942.
6. Best, Charles Herbert and Norman Booke Taylor. The living body. Rev. ed. New York, Holt, 1944, 571p.
7. Blanc, Sam S. Review of general goals in science teaching. Science education 36:47-52. 1952.
8. Blauch, Lloyd E. Teaching in colleges and universities, with special reference to dentistry. Indianapolis, American dental association, 1945. 341p.
9. Blumgarten, A. Textbook of materia medica. 5th ed. New York, MacMillan, 1951. 417p.
10. Brechbill, Henry. Status of college and university offerings in the teaching of science. Science education 18:221-225. 1934.
11. Brett, Axel. A vocational program for the arts college. Journal of higher education 17:481-484. 1946.
12. Bundy, Elizabeth Roxana. Textbook of anatomy and physiology. 5th ed. rev. Philadelphia, Blakiston, 1923. 442p.
13. Carlson, Anton Julius and Victor Johnson. The machinery of the body. rev. ed. University of Chicago, 1941. 620p.
14. Cates, H. A. Primary anatomy. Baltimore, Williams and Wilkins, 1948. 344p.

15. Chappellear, Claude S. Health subject matter in natural science. Teachers college, Columbia university, New York, 1929. 108p.
16. Charters, W. W. General survey courses. Journal of higher education 13:1-4. 1942.
17. Chicago, University. Announcements. The college. Chicago, May 10, 1952. 53p.
18. Clendening, Logan. The human body. 4th ed. N. Y., Knopf, 1949. 399p.
19. Conklin, Edwin G. The aims of science teaching. Science education 21:1-4. 1937.
20. Crandall, Lathan A. An introduction to human physiology. 3d ed. Philadelphia, W. B. Saunders, 1942. 325p.
21. Cretzinger, John Irvin. Principles of biology. Science education 25:310-313. 1941.
22. Crombie, Charles W. Selecting science texts. Science education 35:277-278. 1951.
23. Curtis, Francis D. Investigations of vocabulary in science in secondary schools. University Chicago introductory general course in biological science. New York, Ginn, 1938. 127p.
24. Cunningham, Daniel John. Textbook of anatomy, 8th ed. Oxford medical publications, Oxford, 1943. 1558p.
25. Darlington, James E. Introduction to medical science on the basis of pathology. Philadelphia, Lippincott, 1942. 432p.
26. Davison, Alvin. Human body and health. New York, American book company, 1908. 320p.
27. Digests of investigations in science education. Science education 36:248-56. 1952.
28. Dodson, Edward O. Textbook of evolution. Philadelphia, Saunders, 1952. 419p.
29. Edwards, Linden F. Concise anatomy. Philadelphia, Blakiston, 1947. 657p.

30. Etkin, William. College biology. New York, Crowell, 1950. 687p.
31. Federighi, Henry and Clarence Leuba. The proper study of mankind is man. The journal of general education 2:193-198. 1948.
32. Fisher, John J. General education in relation to premedical education. Science education 34:126-137. 1950.
33. Fontanella, Henry. The premedical student: a martyr. Journal of higher education 22:138-144. 1941.
34. Francis, Carl C. Introduction to human anatomy. St. Louis, Mosby, 1949. 470p.
35. _____ and James E. Knowlton. Textbook of anatomy and physiology, 2d ed. St. Louis, Mosby, 1950. 513p.
36. Goode, Delmer M. Seventy college teaching procedures. Corvallis. Graduate school, Oregon state college, 1952. 15p.
37. Grant, John Charles Boileau. A method of anatomy. 4th ed. Baltimore, Williams and Wilkins, 1948. 650p.
38. Gray, Henry. Anatomy of human body. 25th ed. Ed. by Charles Mayo Goss. Philadelphia, Lea and Febiger, 1948. 1478p.
39. Greisheimer, Esther M. Physiology and anatomy. 3d ed. rev. Philadelphia, Lippincott, 1936. 706p.
40. Ham, Arthur Worth. Histology. Philadelphia, Lippincott, 1950. 756p.
41. Hancock, Cyril. Evaluation of popular misconceptions related to science. Science education 24:208-212, 1940.
42. Hard, H. O. and F. C. Jean. Natural science survey courses in colleges. Science education 22:294-299. 1938.
43. Hardin, Garrett. Biology: its human implications. San Francisco, Freeman, 1950. 973p.

44. Harvard university. Committee on the objectives of a general education in a free society. General education in a free society. Cambridge, Harvard university press, 1945. 267p.
45. _____. General catalogue. vol. XLIX. Cambridge. Harvard university press, January 25, 1952, 886p.
46. Hatch, W. R. and H. K. Buechner. Teaching an integrated course in the biological sciences. Improving college and university teaching. vol. 1. no. 2. May 1953, p. 3-11.
47. Hensill, John S., Joel F. Gustafson, and Herman Zaiman. The biology of man. Millbrae, California, The national press, 1950. 140p.
48. Hurd, A. W. Man and his environment. Science education 34:102-104. 1950.
49. _____. Problems of science teaching at the college level. Minneapolis, University of Minnesota press, 1929. 195p.
50. _____. Science teachers' preparation. Science education 25:247-251. 1941.
51. Jacobson, Willard J. Science education and ability to cope with problematic life situations. Science education 35:156-159. 1951.
52. Johnson, Phillip G. Today's need for better science education. Science education 34:310-317. 1950.
53. Johnson, John C. Some important consideration in the education of science teachers. Science education 21:4-7. 1937.
54. Jung, Frederic Theodore and Elizabeth Carpenter Earle. Anatomy and physiology. 3d ed. Philadelphia, F. A. Davis, 1950. 829p.
55. Kahn, Fritz. Man in structure and function, New York, Knopf, 1943. 2 vols.
56. Laing, Gordon J. The doctor of philosophy and college teaching. Association of american colleges. Bulletin 16:95-112. 1930.

57. Leuba, Clarence and Henry Gederighi. A course in the life sciences. The American psychologist 3:30-34. 1948.
58. Lucas, Miriam Scott. Elements of human physiology, 2d ed. Philadelphia, Lea and Febiger, 1950. 534p.
59. McDonald, John, Howard Chusid, and Jack Lange. Correlative neuroanatomy, 4th ed. Palo Alto, California, University medical publishers, 1938. 287p.
60. McGrath, Earl J. Science in general education. Dubuque, Iowa, William C. Brown, 1948. 400p.
61. Marshall, Clyde and Edgar L. Lazier. An introduction to human anatomy. 3d ed. Philadelphia, Saunders, 1947. 328p.
62. Marshall, Max Skidmore. College conference on college teaching. Proceedings. Oregon state college, Corvallis, 1952, 92p.
63. Merck manual of diagnosis and therapy. Montreal, Merck and company, 1950. 1176p.
64. Millard, Nellie D. and Barry G. King. Human anatomy and physiology, 2d ed. reset. Philadelphia, Saunders, 1946. 514p.
65. Minnesota. University. The general college. Catalogue 1951-53. vol. LIV. no. 27. 1951. 30p.
66. Moody, Paul Amos. Introduction to evolution. New York, Harper, 1953. 475p.
67. National society for study of education. Science education in American schools. Part 1. By Nelson B. Henry. Chicago, University of chicago press, 1947. 296p.
68. Neal, E. E. Developing a science program around the needs of the people. American biology teacher 13:76-80. 1951.
69. New York academy of medicine. Biological foundations of health education. Columbia university press, 1950. 318 p.
70. Novak, Benjamin J. Science in the newspaper. Science education 26:138-143. 1942.

71. Oregon. State College. Bulletin. no. 34. Catalogue issue 1953-54. Corvallis, Oregon, Oregon state system of higher education, 1953. 478p.
72. Perlman, James S. Integration in college courses in science for general education. Science education 35:122-133. 1951.
73. Pothoff, Edward F. General education and problems of life. Journal of higher education 17:369-374. 1946.
74. Pruitt, Clarence M. Survey courses in the natural sciences. Science education 21:10-16. 1937.
75. Scheinfeld, Amran. The new you and heredity. Philadelphia, Lippincott, 1950. 616p.
76. Scripps College. Bulletin. vol. XXV. no. 3. Announcements 1951-52. Claremont, California. 96p.
77. Scoggs, Schillem. College for all. Journal of higher education 17:429-432. 1946.
78. Sweet, Ronald W. Who teaches anatomy anyhow? Journal of the association of american medical colleges 17:95. 1942.
79. Ten Hoor, Marten. A science sequence for the arts student. Journal of higher education 17:208-221. 1946.
80. Tidy, Henry Letheby. A synopsis of medicine. 9th ed. Baltimore, Williams and Wilkins, 1949. 1632p.
81. Todd, Robert E. Biology in a program of general education. Journal of higher education 20:386-391. 1949.
82. Tyler, Ralph W. Tests in biology. School science and mathematics 37:590-595. 1953.
83. United States. President's commission on higher education. Higher education for american democracy. vol. 1. Washington, U. S. government printing office, 1947. 83p.
84. United States. Educational directory. Part III. Colleges and universities. 1944-45. Washington, U. S. office of education. 118p.

85. Van Deventer, W. C. Trends and problems in general education college science courses. Science education 33:183-190. 1949.
86. Villee, Claude Alvin. Biology: the human approach. Philadelphia, Saunders, 1950. 580p.
87. Wakeman, Albert. Historical sequences in science orientation courses. Journal of higher education 19:146-149. 1948.
88. Warkenton, John and Jack D. Lange. Physician's handbook. Palo Alto, California, University medical publishers, 1941. 294p.
89. Western Washington College of Education. General catalogue. vol. XLIX. no. 1. Bellingham, June 1953. 180p.
90. Winchester, Albert McCombs. Biology and its relation to mankind. New York, Van Nostrand, 1949. 777p.
91. _____ . Genetics. Mifflin, Boston, 1951. 371p.
92. Wise, Harold E. Curricular studies in science education. Science education 27:36-40. 1943.
93. Wolf, Abraham. Essentials of scientific method. New York, Macmillan, 1925. 160p.
94. Wooster, Harold A. and Fred C. Blanck. Nutritional data. Philadelphia, Heinz Company, 1949. 114p.
95. Wright, H. N. A textbook of materia medica pharmacology and therapeutics, 2d ed. Philadelphia, Saunders, 1942. 716p.
96. Zeigler, Robert T. A study of fact retention in general science. Science education 26:83-84. 1942.
97. Zoethout, William D. and W. W. Tuttle, Textbook of physiology. 11th ed. St. Louis, Mosby, 1952. 692p.

APPENDIX A

April 28, 1952

TO: The Appropriate Departmental Representative

We desire to solicit information concerning a proposed course in human biology.

This course would be designed to service the needs of general students seeking a liberal education. Authentic yet limited aspects of human biology would be integrated into a presentation adapted to the background and use of the general student. It would not be intended to service the science majors and those students required to have specialized life science courses. Students with fixed majors would not be permitted to substitute this course for departmental requirements. The course would be elective and planned to supplement the presentation of certain survey or introductory courses in the wider area of all life sciences.

There appears to be a need for a presentation of human biology for the general student as part of a liberal education. The public is exposed to an enormous amount of popular and commercial information concerning the human body by various media, including the press and radio. Many household periodicals regularly present popular articles concerning human biology. Various claims are made for innumerable commercial products. It is believed a selected, accurate and limited presentation of applied human biology would yield a more enlightened and discriminating graduate in this area of everyday living. It is believed this person would be in a better position to evaluate popular and professional information. We would seek the aggregate opinions of staff members in departments of zoology, health, physical education, science education and medicine as to course content.

We believe this course would not conflict with the purposes of established courses usually offered in the above departments. The specialized human biology courses in the various departments should continue to service the needs of the student in certain curriculums.

Your reaction will be of great value to us in formulating a basis of thought concerning a course of this type. Your early return of the enclosed questionnaire in the envelope provided will be greatly appreciated.

Very truly yours,

C. M. Love, Ass't Professor
of Life Sciences

enc.

APPENDIX B

QUESTIONNAIRE HUMAN BIOLOGY

1. Does your school offer a course entitled human biology? 1. _____
2. Is this course open to the general student as part of a liberal education? 2. _____
3. Do you believe the proposed human biology course could contribute toward a liberal education for the general student? 3. _____
4. Do you believe the proposed course could be designed for the general student without conflicting with the purposes of existing biology courses? 4. _____
5. If the general student can be considered deficient in biological background, do you believe this student could obtain, most advantageously, similar information in human biology from biology courses currently available? 5. _____
6. TYPE OF PRESENTATION AND TIME ALLOTMENT: We favor (3) three lecture-demonstrations a week for (2) two semesters as a good method. Please indicate your preference:
 (A) Lectures with appropriate demonstrations:
 _____ 1 lect. per week for _____ 1 sem. OR _____ 2 sem.
 _____ 2 lect. per week for _____ 1 sem. OR _____ 2 sem.
 _____ 3 lect. per week for _____ 1 sem. OR _____ 2 sem.
 Other suggestions: _____

- - - - - OR - - - - -

- (B) Lectures with separate laboratory periods:
 _____ 1 lect. & 3 hrs. lab. per wk. for _____ 1 sem. OR _____ 2 sem.
 _____ 2 lect. & 3 hrs. lab. per wk. for _____ 1 sem. OR _____ 2 sem.
 _____ 3 lect. & 3 hrs. lab. per wk. for _____ 1 sem. OR _____ 2 sem.
 Other suggestions: _____
7. COURSE CONTENT: It is not anticipated that all phases of the areas listed will be presented even in an introductory manner. Limited yet accurate portions of these areas will be integrated into a course outline indicating subject matter allocation and including an analysis of presentation techniques with various teaching aids. The course would be adapted entirely to the general student and limited to the human body. It is anticipated that specialists in each area will check course details. We desire to determine the degree of emphasis for each area. Please check areas you think should be included and omit others. Increase the number of check marks to three as to the amount of emphasis you think should be placed on each area.

_____ physiology	_____ hygiene	_____ nutrition
_____ gross anatomy	_____ first aid	_____ kinesiology
_____ histology	_____ heredity	_____ hematology
_____ pathology	_____ evolution	_____ serology
_____ parasitology	_____ anthropology	_____ bacteriology
_____ embryology	_____ ecology	_____ physiological psychology

Would you suggest other areas? _____

Name _____ Title _____
 College or _____
 University _____ Date _____
 Please use reverse side for additional comments.