

THE SOCIOLOGICAL SIGNIFICANCE
OF SCIENCE FOR PROSPECTIVE
TEACHERS IN SECONDARY SCHOOLS

THESIS FOR THE DEGREE OF M. A.

Alexander MacVittie
1931

THESIS

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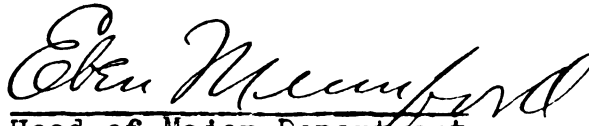
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THESE

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THE SOCIOLOGICAL SIGNIFICANCE OF SCIENCE
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CHAPTER I

INTRODUCTION AND METHOD OF STUDY

This study is a partial realization of a desire to know something of the merits of the curricula for the training of teachers of sciences in secondary schools in different types of institutions of higher learning. It is the outgrowth of several years' experience as a science teacher and of observation of other teachers. While there may not be an ideal course of study or type of institution, the writer has observed teachers who, because of a broad training in sciences, were more effective than were others with apparently equal collegiate standing. Such teachers seem to have a better grasp of science subjects and are able to show more successfully the relation of the subject being taught to the problems of living. They put the human interest element into the teaching of science to such an extent that the pupil's interest is aroused and held. This is due partly to a difference in native ability of the teacher but native ability can be greatly enhanced by a broad training in the sciences. Intensive specialization is demanded, and undoubtedly produces, efficiency in the industrial and

commercial fields; it is needed in colleges and universities, but it does not promote the establishment of a broad, liberal foundation in the education of secondary school pupils.

Teachers are dealing with pupils in the formative period of life and pupils are influenced through these contacts. Obviously teachers of sciences who have a broad training in these subjects can wield a much more potent influence on the pupil than do those teachers whose training is limited to one or two special subjects. Secondary school pupils must have a type of training and influences around them that will give a more comprehensive viewpoint of sciences. A viewpoint such that they will have an appreciation of the relationships existing between the different sciences. They must have conditions and influences about them that will help them make a more intelligent selection of that science subject which may later become their specialty. Then if they do not continue their education beyond the secondary stage they will have a more liberal foundation for their future readings and self education. A teacher trained in only one or two science subjects is handicapped in his endeavor to give this kind of training and experience to those placed in his care.

Society is perpetuated by transmission and the

communication of the experiences of the mature to those of less maturity. The biological factors incident to hereditary influences are the primary transmissions to the immature. Habits, which are fundamental to society, become established as the immature individual begins to make his adjustments to conditions which surround him. Next, language as a means of communication, begins to develop and the child begins to acquire new experiences and to adjust himself to his environment to better advantage. The larger the number of new experiences that the immature individual can acquire, the more versatile he becomes in his adjustments with the balance of the social group. For a time, in the life of the immature individual, these experiences will be new and interesting and act as a constant urge to further investigation, so to speak. They are old and uninteresting to the more mature, but nevertheless they are important factors in the preparation of the child and must be communicated. This is the informal education which takes place in the primary social group, the home or family, and the association with the children in play. This type of education continues until the state or society asserts its rights in directing the training of the individual. Then the child must enter the school where new experiences and contacts will begin to shape his life and activities. The formal education of the individual now

begins.

The education of the individual up to this point has been an informal social process and these experiences have become a part of his life. During this period of formal education he will not be allowed to live the larger part of the subject matter which will be parcelled out to him, but he must needs accept this material. It is a part of the system that has been set up for him by society. Only those experiences which he can live and make a part of himself, will have an educational value. Consequently the greater the number of ideas and experiences that he can be brought into contact with, the greater is his opportunity of acquiring new concepts which may create new experiences and develop ideas of value to himself and to society.

Since education is a social process of growth and development of the individual through contact with others, then, the broader the experiences and training of those who are teaching the immature, the greater will be the opportunities of the latter to acquire a wealth of experiences and therefore a more effective education.

This reasoning is especially applicable with regard to the training rendered to prospective teachers of any of the sciences for,

"Science represents the office of intelligence, in projection and control of new experiences, pursued systematically, intentionally, and on a scale due to freedom from limitations of habit. It is the sole instrumentality of

conscious, as distinct from accidental, progress."¹

In the earlier periods of the immature mind experiences are considered as separate entities. As the individual approaches maturity, these separate experiences are considered in their relationship with one another and ideas and action grow out of them. A diversity of experiences, then, given opportunity for a greater diversity of ideas, which, with the progress of maturity, develop into judgment, reason and knowledge.

The immature individual of secondary school age is dependent largely upon the experiences he gains in his contacts with his more mature teacher. Limit or broaden the experiences of the teacher and the concepts and ideas of the pupil will tend to be limited or broadened proportionally. The judgment, reasoning ability and knowledge of the pupil, as he grows to maturity, will be limited or broad according to the subject matter experiences, training and methods of the teacher.

The teachers of pupils of secondary age are formally educated in the institutions of higher learning, colleges and universities. Most of these teachers are dependent upon the courses of study and the training received in such institutions for the subject matter materials. The breadth of training which students will receive during

¹Dewey, John, Democracy and Education p. 266

their collegiate period is determined chiefly by the nature of the curricula of the institutions which they attend. If the institutions which they attend have a broad selection of prescribed subjects, then the individual teacher will be broadly trained. If not, then it is possible that he may be so trained but that will depend largely upon his own inclinations and his ability to select wisely from the electives offered. Should he be inclined not to make a broad selection, then the secondary pupil, the immature individual, who will become a unit in society, will be limited in the experiences that are communicated to him and in the breadth of training received. The influence of the university or college in this matter, is, therefore, not vague and only indirect, but very real on the secondary pupil, and becomes dominant in society even though it is socially and economically impossible for every individual to acquire the advantages of a college education.

In this study the writer will consider colleges and universities of the "North Central Association of Colleges and Universities". This was deemed advisable because of the availability of data and because of a general acquaintance with that part of the country in which the membership of the association is located. The subjects which will be considered are the Sciences, the so-called Cultural subjects, professional training or Education, Physical Training and Military Training. There are many factors that

present themselves for consideration as one undertakes such a study. All are important and of interest, but the writer is confining this study to those phases which seem to him most important, and which have the greatest bearing upon the welfare of the secondary school pupil. One important function of these institutions is to train students for positions as teachers of secondary school sciences in the respective states where the institutions are located. The training offered by the various types of colleges and universities will be considered.

There are three purposes which, a study of this kind might fulfill. First; To place before educators an investigation that may be of value because of what it indicates in the field of education, and that may stimulate further investigations of a similar character. Second; To indicate, to some extent, the importance and the growing recognition of a broad scientific training for teachers of secondary school sciences. Third; To acquire, if possible, some knowledge of the emphasis placed upon Science training by different types of institutions in keeping with its significance in Social Progress.

SCOPE OF STUDY.

The North Central Association, according to its official organ,¹ is composed of one hundred eighty-nine colleges

¹ North Central Association Quarterly Vol. IV No. 1 June 1929



and universities, forty-four junior colleges and forty-four teacher training institutions, which make a total of two hundred seventy-seven educational institutions. Owing to the limited information in the catalogues of some institutions regarding curricular schedules, and also to the fact that others failed to respond to requests for their publications, 29 institutions in this Associations are not considered statistically. The institutions considered are only those which were and are in a position to give a four year collegiate course of one hundred twenty or more semester hours to students wishing to prepare for positions as teachers of sciences in the high schools accredited in the North Central Association of secondary schools, or in secondary schools requiring a similar degree of preparation. This necessitated omitting the 44 Junior colleges from the considerations.

The data which will be used in the first five objectives of the study were obtained from catalogues dated 1929, 1930 or 1930-1931, depending upon the date of publication of the institutions. The data in that portion of the study dealing with any changes taking place over the three decade intervals 1910-1920-1930 were taken from catalogues of 1909-1911; 1919-1921; 1929-1930. The number of institutions considered in this part of the study was limited because it was impossible to get access to catalogues. In many instances

institutions refused to send a copy of these old publications, since they had only those which were on file in their libraries. Although limited, it is presented as the best available sample and must be interpreted with that in mind. All this data will be referred to as of 1910, 1920 or 1930.

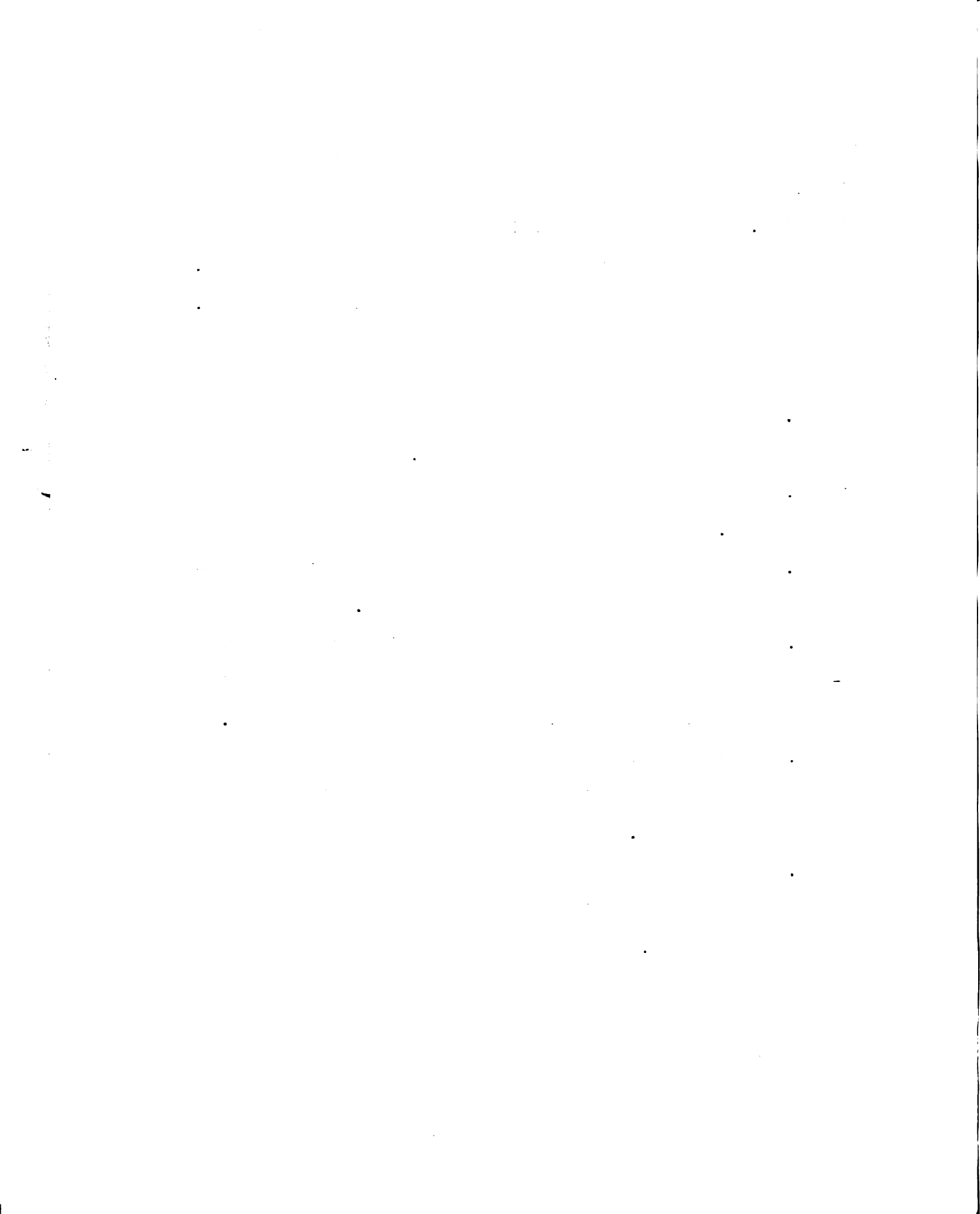
OBJECTIVES OF STUDY

The objectives of this study are as follows;

1. To determine the total number of prescribed and elective hours necessary for graduation.
2. To determine the number of the prescribed hours in each subject.
3. To compute the number of hours of electives necessary to complete requirements for graduation.
4. To compare the total amount of time devoted to the so-called Cultural subjects with the time devoted to training in the Physical, Biological, Applied and Social Sciences.
5. To compare the distribution of prescribed and elective hours devoted to science with those spent in the study of cultural subjects.
6. To show any changes and possible trends that are indicated in the curricula of these institutions during the period 1910 to 1930.

DEFINITION OF TERMS

An explanation of terms which will be used frequently will be given at this time to prevent any confusion which



may arise in the reader's mind.

Total minimum requirements refer to the minimum number of semester hours that a student must carry in order to graduate. It may not represent all the work that a student would be required to take under actual conditions, but according to the catalogues he can not graduate with less than the amount of credit called for in the minimum requirements.

Prescribed hours are those which apply to certain courses in English, History, Mathematics, Sciences, etc. In many institutions they are referred to as required hours.

Elective hours are those representing the time devoted by the student to subjects which he chooses to pursue in order to complete the minimum requirements for graduation over and above the prescribed hours.

METHOD OF STUDY

UNIT OF MEASUREMENT

Owing to the fact that there is considerable diversity of practice as to the means of measuring collegiate achievement, a standard unit had to be decided upon. In as much as the semester hour is used by the majority of institutions, and is the generally accepted standard of measurement, it is the unit used in this consideration.

The term hour, or quarter hour, as used by some institutions, was converted to semester hours. One institution¹

¹Chicago University

uses the Major as the unit of measurement, but this is not a major considered in the usual curricular sense. In this institution a Major is equal to one-ninth of one year of collegiate work, or **thirty-six Majors** for four years. Therefore the unit of measurement, the Major in this case, was converted to semester hours by multiplying the number of Majors by three and one third.

DETERMINATION OF PRESCRIBED HOURS

The prescribed work considered in this study includes all work that is specifically outlined for the freshman and sophomore years and in two or three instances for the junior year. Professional training or Education, is included in the tabulations of Prescribed hours, since it is necessary for prospective teachers. Military and Physical Training are also stated as Prescribed hours although they are not in all instances counted toward graduation credits.

The distribution of the prescribed courses and the hours assigned thereto were tabulated directly from the catalogues, with no special interpretations necessary other than those already referred to above. By deducting the prescribed hours from the total minimum requirements for graduation there is left the amount of time, in hours, which is available for the student's elective courses.

METHOD OF ALLOCATING ELECTIVES

The elective work necessary to fulfill minimum requirements for graduation consists of the student's major and his minor or minors, which are the subjects he is preparing to teach. The assignment of courses and hours, in majors and minors, was determined by following the instructions given in the catalogues. The information given in the literature preceding the description of courses in each of the departments involved was also used. Major and minor requirements in addition to, prescribed courses, were made up entirely of elective subjects, and for purposes of standardization are valued as such in the tabulations. Therefore, all majors and minors consist of purely elective courses and are not in any measure composed of prescribed courses which the student may have taken in his major or minor department. After meeting all major and minor elective requirements, any deficiencies were made up with further supporting elective courses, which were tabulated as free electives.

In order to verify this procedure, and substantiate the judgment used in making the selection of electives to meet the requirements for graduation, the writer sent outlines of complete courses as he had planned them from the catalogues of twenty-five institutions, representative of the various types, to the registrars of those institutions. Eighteen approved of the courses as outlined, three made

minor suggestions, two suggested leaving the matter entirely with a class advisor, and two failed to respond.

CLASSIFICATION OF EDUCATIONAL INSTITUTIONS

The classification of institutions used by the North Central Association was not satisfactory for the purposes of this study. As the catalogues were assembled, it became apparent that these institutions could be grouped into certain types, according to their origin, organization, support and control. They are therefore classified as;

State Universities

State Agricultural Colleges

State Teachers Colleges

Protestant Colleges and Universities

Catholic Colleges and Universities

Endowed Colleges and Universities

Polytechnical Colleges

Municipal Colleges and Universities

State Universities are those institutions which originated in a legislative act, and are maintained by state-wide taxation methods. State Agricultural and Mechanic Arts Colleges originated under the Federal Land Grant Act, and are supported by Federal and State taxation. They may be under the control of a State University or a State Board of Agriculture.

State Teachers Colleges are institutions which are maintained by public taxation. Their primary function is the training of teachers. These institutions were originally organized and known as Normal Training Schools, with but few exceptions during the past decade, they have begun to offer four year collegiate courses to prospective teachers.

Protestant institutions, include all universities or colleges which had their origin in the activities of a protestant church or society and are controlled by a Board of Trustees or similar body representing the particular Protestant denomination. This does not mean that such institutions are necessarily maintained financially by a Church, but that they are, or have been, under the guidance of a protestant denomination.

Schools considered as Catholic are all Colleges and Universities which are under the control and management of Boards of Trustees or Boards of Control, whose membership, as well as that of the faculty, is wholly, or in large part, composed of the priesthood of the Catholic church.

Endowed Colleges and Universities are those giving a broad general academic training in various fields of academic work and which receive all, or a large part of their maintenance expenses from direct endowments, or incomes from endowments made by individuals, estates, organizations or industrial enterprises.

Polytechnical Colleges, endowed or otherwise, include those that, to a large extent, are confining their activities to the technical phases of industry or science, while at the same time their curricula are adapted to the training of teachers.

Universities and Colleges which are maintained by public tax spread over a limited municipal area, controlled by a Board of Directors, Board of Trustees or Board of Education, and operated largely for the benefit of the municipality, are considered in this study as Municipal Institutions.

CLASSIFICATION OF ACADEMIC SUBJECTS

The general classification of subjects, together with their sub-classes, follow the arrangement used by Kelly¹, with exceptions which will be noted.

Biological Sciences

- Anatomy
- Bacteriology and Hygiene
- Biology²
- Botany
- Entomology
- Physiology
- Zoology

Anatomy does not appear as a prescribed subject in any of the institutions studied. It was used as an elective on two occasions to complete a course where the major was in Zoology.

¹"American Liberal Arts Colleges" Kelly, F. J. Appendix B Tables.

²Not used in the tabulations of this study but divided between Botany and Zoology

Courses in Bacteriology were prescribed in several institutions. The courses in Hygiene were combined with Bacteriology because of the fact that many of them were closely allied with fundamental courses in Bacteriology.

Biology is not included in the tabulations as such, but prescribed work in it was distributed equally to Botany and Zoology. Elective hours were apportioned either to Botany or Zoology, according as the major or minor requirements seemed to demand.

Physical Sciences
Chemistry
Geology
Physics

The chemistry prescribed by most of the institutions included both organic and inorganic. In a few cases quantitative analyses was also prescribed.

Geology appears as a prescribed subject quite frequently among the protestant institutions and was used as an elective to round out courses where the major was in Botany, Zoology or Chemistry.

Physics is a prescribed course in most institutions of all types, and was used as an elective where the course was being prepared to fit a student to teach secondary physical sciences. When physics was the major, chemistry would be the minor and vice versa.

Applied Sciences¹
Agriculture
Engineering
Home Economics

With three exceptions the data devoted to Agriculture in this study, consists of the courses prescribed for the training of teachers under the Smith-Hughes Act.

Engineering, as applied to this study, is interpreted as being those courses given in the preparation of teachers under the Smith-Hughes Act, and means practical engineering as applied to agricultural operations, or vocational engineering.

Social Sciences
Economics
History
Political Science
Philosophy and Psychology
Sociology

A very broad selection from these subjects, as prescribed work, was made by all the institutions. In making the distribution of electives, however, the majors and minors, usually varied between History and Political Science, since these are the two subjects most used to fulfill secondary requirements.

Philosophy and Psychology were included among Social sciences, because of the nature of their subject matter and because of the fact that in many Protestant and Catholic institutions, Philosophy and Psychology are included among the Social Sciences. The Psychology considered, is only

¹Not included by Kelley

that which is of a clinical or experimental nature. Other courses in this subject are tabulated as Education under Professional requirements.

Cultural and Tool Subjects¹

Art

English

Languages - Classical and Modern

Mathematics

Music

Art, in the tabulation, includes those courses given to students of Home Economics, which deal with home decorations and courses in Art that are prescribed in many Teachers Colleges. Courses in Free Hand Drawing and Sketching, as prescribed by several Polytechnical institutions are tabulated as Art, also. Because of these two applications of its use, Art may be looked upon as both a Cultural and Tool subject.

The varied nature of the content of English courses given in the different types of institutions justifies placing it, then, in this classification. Just how many hours could be credited to cultural significance and how many to utility purposes would make an extensive study and is not within the realm of this one. In those denominational institutions where courses in Religion were prescribed, the hours were divided equally between English and History.

Modern languages were generally composed of German and French, with a few institutions prescribing courses in Spanish.

¹Not used by Kelley

Languages are generally prescribed courses in the tabulations. They were used as electives only in those instances where the major was in the Biological or Physical field and where the prescribed hours did not amount to twelve or more.

Classical Languages were prescribed in one denominational institution in 1930. In those institutions where the Group system of curricula construction was in use, the writer selected Modern instead of Classic Languages to meet requirements for graduation. During the periods 1910 and 1920, Classical Languages were in quite common use among the prescribed subjects in denominational types of institutions.

Mathematics is considered in this classification rather than in the sciences because it is a common medium appropriated by all sciences for the furtherance of exact quantitative information regarding phenomena observed and for the treatment of facts experimentally determined. Its use is likewise as universally appropriated by the so-called cultural subjects.

Music was prescribed in eight Teachers Colleges and in three Protestant institutions.

Professional¹
Education

Education is considered here in the professional sense. In all tabulations it is shown as a prescribed subject for the reason previously explained. In a few of the institutions

¹Not included by Kelley

Education was catalogued as a major elective. In such cases it was tabulated for the purposes of this study as prescribed study, and in its place, as a major, a subject in science that the student was preparing to teach was substituted.

Miscellaneous¹ :
Physical Training
Military Training

Where Physical Training is prescribed, as is true in practically all institutions, it is generally applied toward requirements for graduation. In the curricula of 1930, it is required of all women students, unless they are excused because of physical disability.

The matter of credit allowance for Military Training is quite variable in the different institutions in which the subject is prescribed. It is generally required of physically fit men students, in all State Colleges of Agriculture and in those State Universities where the College of Agriculture is in combination with the University. The data will show the total hours devoted to the subject, the total hours of credit given and the total hours not counted toward requirement for graduation.

¹Not included by Kelley

CHAPTER II
CONTENT OF CURRICULA IN 1930

It seems expedient to take up at this time a discussion and presentation of the content of the curricula used in the different types of institutions. This will give a comparison on the basis of general requirements in all types of institutions before taking up the comparison of details. The data used are for the period of 1930, and are set forth in Table 1.

TABLE 1
COMPOSITION OF CURRICULA IN 1930.

Type of Institution	No. of Inst.	Aver. Min. Req.	Aver. Presc'd* Hours	Aver. Percent Presc'd	Aver. Elect. Hours.	Aver. Percent Elect.
State Universities	21	125	63.8	51.04	61.2	48.96
State Agri'l. Colleges	17	134.8	77.8	57.7	57.0	42.3
State Teach's Colleges	50	124.48	64.7	52.0	59.78	48.0
Protestant Colleges	82	123.8	71.2	57.5	52.6	42.5
Catholic Colleges	18	126.1	83.4	66.1	42.7	33.9
Polytechnic Colleges	4	149.2	95.0	63.7	54.2	36.3
Endowed Colleges	8	121.2	72.6	60.0	48.6	40.0
Municipal Colleges	4	122	73.0	59.9	49.0	40.1

*Means Prescribed.

Although the facts set forth in this data are very evident, it seems necessary to call the readers' attention to some of the outstanding features. The average Minimum Requirements for Graduation range generally between 122 and 125 semester hours, but the extreme range is from 149.2 hours in Polytechnic institutions to 121.2 hours in Endowed institutions. The average requirements for graduation in State Agricultural Colleges is second only to those for Polytechnic Colleges.

The average Prescribed hours range from 95 hours in Polytechnic Colleges to 63.8 hours in State Universities. Considered on a percent basis, this means a variation from 63.7 percent to 51.04 percent. Catholic Colleges, however, have a higher percent of prescribed hours than Polytechnic Colleges do, viz., 66.1 percent. Endowed and Municipal Colleges have practically the same percent of prescribed hours, 60.0 and 59.9 respectively. The same is true of State Agricultural and Protestant Colleges. These two types have prescribed, for graduation, 57.7 and 57.5 percent respectively of the total minimum requirements. State Teachers Colleges stand next to State Universities which are the lowest in percent of prescribed work.

State Universities show the greatest number of Elective
total
hours in minimum requirements and also the highest percent of electives, 61.2 hours and 48.96 percent. Catholic

Colleges which show 42.7 hours have the lowest number of elective hours, and also the lowest average percent. Endowed and Municipal Colleges are practically identical with regard to electives as was true with regard to prescribed hours.

It is interesting to note that the prescribed hours in these various types of institutions vary between one half and two thirds of the total minimum requirements for graduation. Such a wide variation in prescribed hours seems unnecessary when the chronological and mental age of college students is considered. What is to be looked upon as the optimum proportion of prescribed work to elective work in educational institutions has not yet been determined. However, it seems reasonable to assume that the determination of the proper proportion should be made upon the basis of the degree of maturity, in experiences of judgment, of perception and understanding of life relationships and social responsibilities, possessed by the student. In those types of institutions where only one half of the total requirements are prescribed, a heavy responsibility is placed upon the immature student of which there must be large numbers in such heterogeneous organizations. They may be able to meet scholarship requirements and are beyond the minimum age requirement, but the wise selection of courses of training for a life work requires maturity of judgment. At the

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other extreme are those institutions which prescribe two thirds of a student's course of preparation. The initiative, judgment and self expression of the mature student is handicapped. So much of his collegiate course is utilized in meeting the prescribed requirements that he is unable to find time for training which will overcome weak points and give him an opportunity to develop intensively what may be his major interest in life.

Orientation courses are being offered to freshmen in a very large number of the institutions in all types, and student counsellors are used by many institutions. These two factors could go a long way toward mitigating the influences which these extreme examples might seem to have.

The fourth major objective to be considered in this study is the comparison of the amount of time devoted to the so-called Cultural subjects with the time devoted to the training in Sciences. These data were taken from the catalogues of 1929, 1930 and 1931.

Table 2 shows in detail the distribution of the required semester hours in each of the subject classifications and sub-classes of all types of institutions.

The column entitled "Number" has reference to the number of institutions in which each of the subjects were prescribed. The column "Average" shows the average number of semester hours prescribed, and is based upon the number of institutions in each type and not upon the number of institutions giving the subject. "Median" as used here is purely a position

average. "Range" is used to show the minimum and maximum limits of semester hours in each subject.

Table 9 shows the same details with regard to the elective hours necessary to complete the minimum requirements for graduation.

These two tables will be of value to anyone interested in the detailed distribution of prescribed and elective hours in making up the courses of study. Consolidations of these tables are given later in the study, and in a subsequent tabulation will be given the average hours per subject classification, based upon the number of institutions prescribing the subject or where it is used as an elective.

TABLE 2
DISTRIBUTION OF PRESCRIBED HOURS
IN INSTITUTIONS IN 1930

21 State Universities									17 State Agricult'l Coll.									50 State Teachers Colleges									82 Protestant Colleges									18 Catholic Colleges									4 Polytechnical Colleges									8 Endowed Colleges									4 Municipal Colleges								
Sciences	No.*	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range	No.	Aver. Hours Pres'd	Med- ian	Range																																			
BIOLOGICAL																																																																							
Anatomy	0	0.00	0.00	0-0	3	.35	.60	0-3	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
Bact. & Hyg.	3	.28	.58	0-3	15	3.00	3.74	0-6	20	1.16	1.69	0-5	14	5.36	.61	0-8	0	0.00	0.00	0-0	2	3.60	.99	0-6	2	.50	.66	0-3	1	0.75	.66	0-3	1	0.75	.66	0-3																																			
Botany	8	1.80	.80	0-8	15	5.64	5.49	0-15	23	2.45	1.78	0-6	29	1.49	.78	0-8	7	1.50	.81	0-5	2	1.70	2.99	0-4	2	0.75	.66	0-3	3	2.75	3.49	0-5	0	0.00	0.00	0-0																																			
Entomology	0	0.00	0.00	0-0	9	2.06	2.49	0-6	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
Physiology	1	.34	.52	0-7	7	1.53	.84	0-7	6	.37	1.15	0-4	8	0.39	.55	0-7	1	0.17	.52	0-3	1	0.75	.66	0-3	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
Zoology	7	1.42	.74	0-6	10	2.94	3.74	0-9	22	1.64	1.84	0-8	22	1.04	.66	0-6	6	0.12	.74	0-5	1	1.00	.66	0-4	3	1.50	1.79	0-6	2	2.00	2.99	0-5	0	0.00	0.00	0-0																																			
	19	3.84			59	15.52			71	5.64			75	8.28			14	1.79			6	7.05			7	2.75			6	5.50																																									
PHYSICAL																																																																							
Chemistry	8	2.61	.80	0-8	17	12.82	12.89	4-20	32	3.00	2.99	0-13	54	4.34	4.54	0-20	13	3.70	4.42	0-8	3	8.50	11.99	0-16	7	5.60	6.33	0-12	2	2.75	4.99	0-6	0	0.00	0.00	0-0																																			
Geology	1	.48	.52	0-10	2	.35	.56	0-3	7	.52	1.15	0-6	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	2.00	.66	0-8	1	0.75	.74	0-6	2	1.50	2.49	0-3	0	0.00	0.00	0-0																																			
Physics	6	1.76	.69	0-8	10	3.11	4.49	0-10	23	2.18	1.92	0-10	43	2.82	3.49	0-10	12	3.10	3.99	0-8	2	4.70	2.99	0-16	4	3.25	8.99	0-6	1	1.25	.66	0-5	0	0.00	0.00	0-0																																			
	15	4.85			29	16.28			62	5.70			97	7.16			25	6.80			6	15.20			12	9.60			5	5.50																																									
APPLIED																																																																							
Agriculture	0	0.00	0.00	0-0	13	27.23	16.99	0-50	5	.40	1.11	0-4	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
Engineering	0	0.00	0.00	0-0	9	3.94	3.49	0-15	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
Home Econ's	0	0.00	0.00	0-0	2	3.64	.56	0-42	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
	0	0.00			24	34.81			5	0.40			0	0.00			0	0.00			0	0.00			0	0.00			0	0.00																																									
SOCIAL																																																																							
Economics	8	1.76	.80	0-6	14	5.17	5.49	0-13	11	.78	1.27	0-6	30	1.63	.53	0-8	1	0.77	.55	0-6	3	3.50	3.49	0-8	1	0.75	.42	0-6	2	1.50	2.49	0-3	0	0.00	0.00	0-0																																			
History	14	3.90	4.74	0-14	5	1.29	.72	0-6	45	4.78	5.59	0-8	67	5.30	6.14	0-13	15	7.40	6.85	0-14	4	6.00	6.50	0-6	7	5.10	6.39	0-8	3	5.25	5.99	0-10	0	0.00	0.00	0-0																																			
Pol. Sci.	11	2.57	2.49	0-12	3	1.10	.57	0-22	17	4.70	1.51	0-6	31	1.80	.80	0-10	2	0.67	.52	0-6	2	3.00	3.49	0-6	2	1.40	1.66	0-6	1	1.00	.66	0-4	0	0.00	0.00	0-0																																			
Phil. & Psych.	2	.47	.55	0-6	0	0.00	.00	0-0	4	.29	1.08	0-5	22	1.19	.27	0-10	17	11.10	12.74	0-18	2	1.50	.66	0-6	3	1.86	.79	0-6	3	3.50	2.50	0-6	0	0.00	0.00	0-0																																			
Sociology	4	.85	.61	0-6	4	.82	.64	0-5	30	2.50	2.90	0-8	38	2.09	.86	0-9	4	1.00	.64	0-6	4	4.00	3.99	0-6	2	1.50	.66	0-6	3	3.00	3.49	0-6	0	0.00	0.00	0-0																																			
	39	9.55			26	8.38			107	13.05			188	12.01			39	20.94			15	18.00			15	10.61			12	14.25																																									
Cultural Subjects																																																																							
Art	0	0.00	0.00	0-0	0	0.00	0.00	0-0	10	.56	1.16	0-7	7	0.31	.55	0-9	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	0.32	.42	0-3	1	.75	.66	0-3	0	0.00	0.00	0-0																																			
Languages																																																																							
Classical	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	0.07	.58	0-6	1	0.44	.52	0-8	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
Modern	17	10.00	12.90	0-20	1	.35	.53	0-6	25	5.04	1.83	0-16	75	12.72	12.68	0-42	17	13.90	13.99	0-30	2	7.00	11.99	0-16	7	11.00	12.99	0-16	2	8.00	11.99	0-20	0	0.00	0.00	0-0																																			
English	21	8.00	9.49	6-14	17	9.35	9.24	0-14	50	10.00	10.39	3-18	82	11.20	12.11	4-20	18	14.10	15.99	0-25	4	14.50	13.99	8-18	7	9.20	11.99	0-16	4	10.00	11.00	6-12	0	0.00	0.00	0-0																																			
Math. & Astr'y	13	4.20	5.49	0-5	11	3.00	3.83	0-6	35	3.94	5.88	0-16	45	3.12	3.49	0-12	12	4.10	6.11	0-10	3	6.25	1.99	0-16	6	5.00	6.24	0-6	2	3.00	3.49	0-6	0	0.00	0.00	0-0																																			
Music	0	0.00	0.00	0-0	0	0.00	0.00	0-0	11	.52	1.19	0-5	3	.06	.51	0-16	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			
	51	22.20			29	12.70			131	20.06			213	27.48			48	32.54			9	27.75			21	25.52			9	21.75																																									
PROFESSIONAL																																																																							
Education	21	20.70	19.55	16-30	17	18.41	18.69	14-27	50	23.30	25.13	0-34	82	20.01	20.00	15-27	18	19.30	19.99	15-32	4	18.70	18.49	17-44	8	17.30	20.33	18-24	4	24.50	26.99	18-33	0	0.00	0.00	0-0																																			
MISCELLANEOUS																																																																							
Physical Tr'g	16	2.30	3.49	0-5	11	1.94	3.37	0-4	40	3.38	5.81	0-15	74	3.65	4.58	0-8	11	2.70	2.33	0-8	3	3.20	4.49	4-5	8	5.50	5.99	18-24	2	1.50	2.49	0-4	0	0.00	0.00	0-0																																			
Military Tr'g	12	2.47	4.14	0-6	15	4.14	4.49	0-12	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	0.88	.62	0-8	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0																																			

*Indicates No. giving Course.

Under "Method", the procedure used to secure the data for the consideration of the second objective of this study has been discussed, viz., "To determine the prescribed hours in each type of institution". It will not be necessary, therefore, to enter into further discussion of that matter. There are certain conditions which it would be well to take up in detail. The institutions will be discussed in the same order as they are listed in the classification of institutions.

STATE UNIVERSITIES

There are twenty one institutions of this type considered in the study. The North Central Association lists twenty two in its membership, but, owing to the inadequacy of the information in the catalogue of one institution, it was not considered. These institutions are located in eighteen states, one state having three and another two. In eight states the college of Agriculture is a part of the University. One of these institutions, Ohio University, Athens, Ohio, was established in 1804, which was the earliest date of establishment given in the catalogues of this type of institution.

The total requirements for graduation vary from a minimum of one hundred twenty semester hours to a maximum of one hundred forty-seven hours. Five institutions require one hundred twenty hours; four, one hundred twenty-six; one, one hundred twenty eight; one, one hundred thirty, and one one

hundred forty seven hours. The average total requirements are one hundred twenty five and nine tenths semester hours.

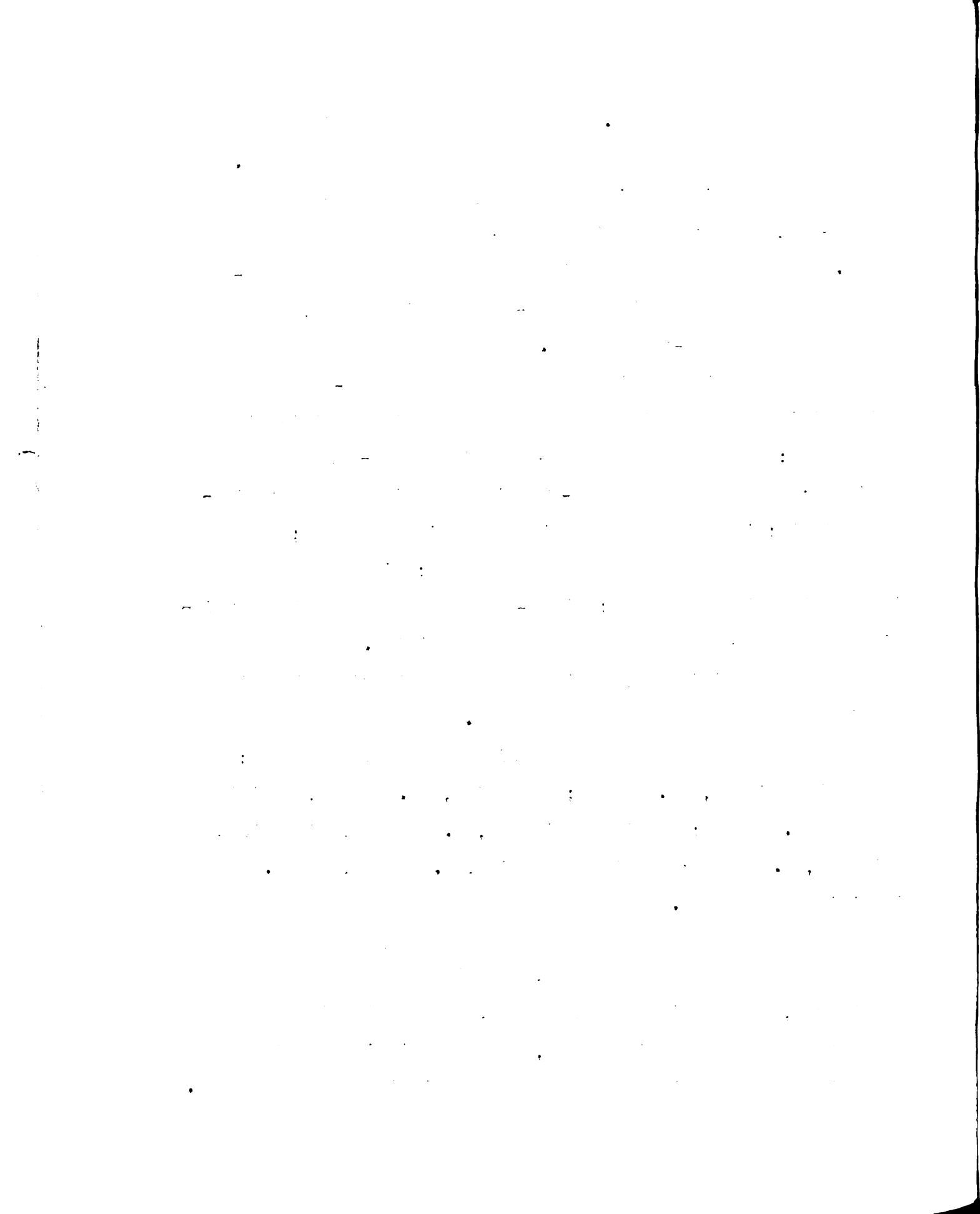
The hours of prescribed work vary from thirty-one to ninety-two, the average being sixty-three and eight tenths hours. The percent of prescribed hours varies from twenty-three and eight tenths to seventy-six and six tenths, the average being fifty-one percent.

The hours of prescribed work in these twenty-one State Universities are distributed over the subject classifications as follows: four hundred sixty-eight in the so-called Cultural subjects; four hundred thirty-five in Education or Professional subjects; two hundred three in the Social Sciences; one hundred two hours in the Physical Sciences; eighty-one hours in the Biological Sciences; fifty-three hours in Physical Training and forty-eight hours in Military Training. A total of seven hours of Military Training in two institutions is not applied toward graduation requirements.

The average hours for each subject classification are: Cultural subjects, 22.3 hours; Education, 20.7 hours, Social Sciences 9.7 hours; Physical Sciences, 4.85 hours, Biological Sciences, 3.9 hours; Physical Training, 2.5 hours, and 2.3 hours in Military Training.

STATE AGRICULTURAL COLLEGES

State Agricultural Colleges, of which there are seventeen considered, located in as many states, go back in history to the year eighteen hundred fifty five, when the Michigan Legislature established the institution now known as Michigan State College.



It was opened for classes in eighteen hundred fifty seven.

This type of institution maintains noticeably high requirements for graduation, and a high percent of prescribed hours. They are likewise outstanding in the number of prescribed hours and courses in the sciences.

The total minimum requirements for graduation vary between one hundred twenty-four hours, and one hundred sixty hours. There is an average minimum requirement for graduation of one hundred forty-two and two tenths semester hours. Prescribed hours vary from sixty-six hours to one hundred twelve hours, or a variation in percent from forty-nine and three tenths to eighty-one percent.

These seventeen institutions prescribe two hundred twenty-six hours in Cultural subjects; five hundred ninety-two hours in the Applied Sciences; two hundred seventy-seven hours in the Physical Sciences; two hundred sixty-three in the Biological Sciences and one hundred forty-five hours in Social Sciences; thirty-three in Physical Training, with three hours in one institution not applied toward graduation requirements, and seventy-five hours in Military Training with sixteen hours in two institutions not applied toward graduation requirements.

These data mean that an average of 13.28 hours are prescribed in Cultural Subjects; 34.80 hours in Applied Sciences;

16.28 hours in the Physical Sciences; 15.47 hours in the Biological Sciences; 8.51 hours in the Social Sciences and 4.40 hours in Military Training. The Professional subject,

Education, with a total of three hundred thirteen hours prescribed, has an average of 14.81 hours per institution.

STATE TEACHER COLLEGES

There are fifty institutions of this type included in this study. The majority of them were organized as Normal Training schools. Of those which gave an historical statement in the catalogues, the oldest is Michigan State Normal College at Ypsilanti, organized in eighteen hundred fifty-two. College degrees were first given there in eighteen hundred ninety-seven. Colorado Normal College at Greeley, Colorado, gave College degrees in eighteen hundred ninety two. The major portion of these institutions have begun giving four year collegiate work since nineteen hundred nineteen.

The minimum requirements for graduation from this type of institution are quite generally standardized within the states in which they are located. In one state, each institution had exactly the same number of total minimum, prescribed and elective hours. Considerable similarity exists in the prescribed courses offered by these colleges within a State, but with enough diversification to indicate that there is not a needless duplication in types of training.

The range in total minimum requirements is from one hundred twenty hours to one hundred thirty-two hours. The average total requirement is one hundred twenty-four and four tenths hours. Nineteen schools require a total of one

hundred twenty-eight hours; seventeen require one hundred twenty hours; four require one hundred twenty-five hours; seven require one hundred twenty-four hours; and there is one each with one hundred thirty-two, one hundred thirty and one hundred twenty-two hours.

The range in prescribed hours is from forty hours to eighty-nine hours, while the percent of prescribed hours varies from 31.2 to 69.5 percent.

The so-called Cultural subjects in the fifty Teachers Colleges have a total of one thousand and three prescribed hours. In the Professional work they require one thousand one hundred ninety-five hours. The Social Sciences prescribe six hundred fifty-three hours; the Physical Sciences; two hundred eighty-five hours; Biological Sciences two hundred thirty-two hours, and in the Applied Sciences, twenty hours are prescribed. Physical Training requires one hundred ninety-four hours, sixty-two hours of which are distributed between thirteen institutions and are not counted toward requirements for graduation.

The average prescribed hours for each subject classification are; Cultural subjects 20.06; Professional subject 23.9; Social Sciences 13.06; Physical Sciences 5.7; Biological Sciences, 4.64; Applied 0.4; and Physical Training 3.88 hours.

As one may expect emphasis is placed upon professional

training by this type of institution. It would seem, however, that there is considerable emphasis given to cultural courses when the attendant cultural value of the professional training is considered.

PROTESTANT COLLEGES

Protestant colleges and universities, of which there are eighty-two in this study, have been, and still are, an important influence in the educational history of this country. They have made it possible for large numbers of young men and women to obtain the training so essential in life services and success. They have likewise been responsible for arousing the interest and aspiration of young people for their own education and improvement, as well as having equipped them for the responsibilities of life. The inception of many of these schools goes far back into the pioneer days of this nation, many of them having been organized and operating long before states or territories were in position to offer such services. Thirty-four of these institutions were founded previous to 1850; one in 1814. Many of them were only of seminary grade to begin with, but later established four year college courses.

This entire group is characterized by very uniform standards of requirements for graduation. Twenty-five schools require a total of one hundred twenty semester hours; thirty-seven require one hundred twenty-four hours; nine require one hundred twenty-eight hours; five require

one hundred twenty-six hours; one requires one hundred twenty-two and another one hundred twenty-five hours, or an average of one hundred twenty-three and eight tenths semester hours per institution. In other words 75.6 percent of these institutions have a range in minimum requirements of one hundred twenty hours to one hundred twenty-four hours, with 45 percent of them requiring the latter.

The range in prescribed hours, twenty-seven to one hundred fifteen, is extremely wide. The percent of prescribed hours reaches a maximum of 88.4 percent and falls to 20.7 percent as a minimum.

The total hours of Cultural subjects prescribed by these institutions are twenty-two hundred and twenty-eight, while there are sixteen hundred forty-one in Education. The Social Sciences account for a total of nine hundred seventy-nine hours. In this classification four hundred thirty-five hours are prescribed in History; one hundred seventy-three in Sociology; one hundred forty-eight in Political Science and Ninety-eight in Philosophy and Psychology. The relative importance given to Sociology by these schools would seem to indicate a growing recognition of the value of knowledge in this subject. In the Physical and Biological Sciences there are prescribed five hundred eighty-eight and two hundred eighty-four hours respectively.

Physical Training requires a total of three hundred hours and is prescribed in seventy-four of the eighty-two institutions while Military Training is prescribed in but one institution.

The average prescribed hours in each subject classification are as follows: Cultural subjects 27.3 hours; Professional 20.0 hours; Social Sciences 11.09 hours; Physical Sciences 7.17 hours; Biological Sciences 3.46 hours and Physical Training 3.6 hours. There were a total of seventy-five hours distributed among fifteen institutions which were not credited toward graduation requirements.

The Cultural classification, as would be expected, is very high in prescribed hours. Of the twenty-two hundred thirty-eight hours, there are ten hundred twenty-five hours in Modern Languages, nine hundred and nine hours in English and two hundred fifty-six hours in Mathematics. The Biological classification is noticeably low in the total number of prescribed hours. Seventeen of the institutions do not prescribe any work in this field. General Biology was the predominating course offered, while very limited courses in Botany and Zoology were generally evident where such courses appeared in the catalogues.

CATHOLIC COLLEGES AND UNIVERSITIES

There are eighteen Catholic institutions of university and college classification that are considered. A few of them, like other denominational types, date their organization back into the early history of this nation, and have likewise been strong factors in the development of progress.

Their requirements for graduation vary from one hundred twenty to one hundred thirty-six semester hours. The average

requirement is one hundred twenty-six hours. There is a greater uniformity in the number of prescribed hours than is apparent in other types of institutions since the range in prescribed hours varies from seventy to ninety-eight hours. The prescribed hours vary from 53.1 percent to 76.5 percent.

The Cultural subjects have a requirement of five hundred eighty-eight hours, of which two hundred fifty-five hours are in English, two hundred fifty in Modern Languages, seventy-five in Mathematics and eight in Classical Languages.

The Social Sciences have prescribed a total of three hundred sixty-seven hours. Two hundred hours of this are prescribed in Philosophy; one hundred thirty-one, in History; eighteen in Sociology; twelve in Political Science and six in Economics.

The Professional requirements total three hundred forty-eight hours.

There are a total of one hundred twenty-three hours prescribed in the Physical Sciences, sixty-seven hours being in Chemistry, and fifty-six hours in Physics.

The prescribed hours in the Biological Sciences are very low in this type of schools. There are twenty-seven hours prescribed in Botany, twenty-two in Zoology and three in Physiology, or a total of fifty-two hours.

Forty-nine hours of Physical Training are prescribed, and one institution prescribes eight hours in Military Training.

The average hours in the various subject classifications are: Cultural subjects 32.6 hours; Professional subjects 19.2; Social Sciences 23.88; Physical Sciences 6.83; Biological Sciences 2.8; and in Physical Training 2.7 hours.

POLYTECHNICAL COLLEGES.

Only four of the seven Technical Colleges that are members of the North Central Association are considered, since the catalogues of two gave no information on Professional requirements, and no response was received from a third one. Two of this type prescribed a total of one hundred twenty semester hours for graduation; one, one hundred thirty-two hours and the fourth two hundred twenty-five hours. An average would be misleading in this case, therefore it is not used. The first two institutions had fifty-seven and seventy-two hours respectively of prescribed work, or 47.5 percent and 60 percent. The third institution with a total of one hundred thirty-two hours, prescribed eighty-two hours, or 62.1 percent, while the fourth prescribed one hundred sixty-nine hours, or 79.5 percent.

There are a total of one hundred seven hours prescribed in the Cultural subjects, with fifty-two in English, twenty-eight in Modern Languages, twenty-five in Mathematics, and twelve in Art. In Professional Training a total of ninety-seven hours is prescribed.

The total hours prescribed in the Social Sciences is Seventy-two, of which twenty-four are in History, sixteen in Sociology, fourteen in Economics; twelve in Political

Science and six in Philosophy.

The Physical Sciences have a total of fifty-one prescribed hours, of which thirty-four are in Chemistry, nineteen in physics and eight in Geology.

Twenty-one hours are prescribed in the Biological Sciences, of which seven are in Bacteriology & Hygiene; four are in Zoology; and three are in Physiology.

Thirteen hours of Physical Training are prescribed by each of three of these institutions.

The average hours in each subject classification are; Cultural subjects 26.7 hours, Professional subjects 24.25 hours, Social Sciences, 18 hours, Physical Sciences 12.7 hours, Biological Sciences 5.25 hours and Physical Training 3.25 hours.

ENDOWED COLLEGES AND UNIVERSITIES

The Endowed colleges and universities, of which there are eight, are very uniform in their total requirements for graduation, six having one hundred and twenty hours, one, one hundred and twenty-four, and one, one hundred and twenty-six. The number of prescribed hours varies from fifty-two to eighty-four. The prescribed hours vary from 43.3 percent to 70.0 percent.

The cultural subjects have a total of two hundred and two prescribed hours, of which there are eighty-eight in Modern Languages; seventy-four in English and forty in Mathematics. There are one hundred and thirty-nine hours prescribed in Professional training.

Social Sciences have a total of eighty-eight prescribed hours with forty-four hours in History; fifteen in Philosophy

Twelve in Sociology; eleven in Political Science; and six in Economics.

Chemistry accounts for forty-five hours, Geology, for six and Physics for twenty-six, in a total of seventy-seven hours prescribed in the Physical Sciences.

The Biological subjects have a total of twenty-two hours prescribed, twelve of which are in Zoology, six, in Botany, and four in Bacteriology.

A total of forty-four hours is prescribed in Physical Training.

The Cultural subjects have an average of 25.2 hours prescribed; the Professional, 17.37; the Social Sciences 11.00; the Physical Sciences 9.60; the Biological Sciences 2.70 and Physical Training 5.50 hours.

MUNICIPAL COLLEGES

Two, of the four Municipal institutions in the study, have one hundred twenty-four hours, and two have one hundred twenty hours each, as total requirements for graduation. These institutions have sixty-eight, seventy, seventy-six and seventy-eight hours of prescribed work respectively. or, in other words, the prescribed hours in each of these four schools of this type are 54.8, 58.3, 61.2 and 65 per cent, respectively, of the total requirements.

Eighty-seven hours are prescribed in the Cultural subjects, of which forty are in English; thirty-two are in Modern Languages; twelve are in Mathematics and three are in Art.

In the Professional subject ninety-eight hours are prescribed.

The Social Sciences have a total of fifty-seven prescribed hours. Twenty-one hours are in History, fourteen are in Philosophy, twelve are in Sociology, six in Economics and four are in Political Science.

There are a total of thirty-two prescribed hours in the Physical Science classification, with eleven in Chemistry, six in Geology and five in Physics.

In the Biological Sciences there are eleven in Botany, eight in Zoology and three in Bacteriology & Hygiene, or a total of twenty-two prescribed hours.

Two institutions require a total of six hours in Physical Training.

The average prescribed hours for each subject classification are as follows, Cultural 21.7 hours, Professional subject 24.5 hours, Social Sciences 14.25 hours, Physical Sciences 8 hours, Biological Sciences 5.5 hours and Physical Training 1.5 hours.

The consideration of these data indicate that Catholic colleges have the highest average number of prescribed hours, 32.60, in the Cultural subjects and that Agricultural Colleges, with 13.28 hours are the lowest. In the professional subject, Education, Municipal Colleges with an average of 24.5 hours and

State Agricultural Colleges with 14.81 hours represent the maximum and minimum in prescribed hours. Endowed Colleges and State Agricultural Colleges with 2.7 and 15.41 average hours, respectively, represent the minimum and the maximum in the Biological Sciences.

Agricultural Colleges prescribe 17.28 hours in the Physical sciences and State Universities prescribe 4.85 hours. These two State institutions represent the upper and lower limits in this subject classification. Catholic colleges, prescribing as they do, 23.88 hours in the Social sciences are far in excess of any other type of institution. This is undoubtedly due to the large number of hours prescribed in Philosophy by this type. State Agricultural colleges prescribe the least number of hours in the Social sciences of any of the types. Attention is called to the fact that there is a trend upward in the prescribed hours in Social Sciences in this type of institution, as is evidenced in a later chapter.

CHAPTER III

DISTRIBUTION OF PRESCRIBED HOURS AMONG THE VARIOUS COURSES IN SUBJECT MATTER IN 1930

In order to arrive at a measure of the breadth and intensiveness of training in these types of institutions, and to make comparisons of them, the data from Table 2 regarding the number of institutions giving subjects and the average hours prescribed have been assembled in Table 3. Attention is called in particular to the number of institutions which are on record as prescribing the various subjects, and to the average hours prescribed.

State Agricultural Colleges, State Teachers Colleges, Polytechnical Colleges, Endowed and Municipal Colleges each have as the sum of the averages a much greater number of prescribed hours in the sciences than they have in the so-called Cultural subjects. State Universities, Catholic Colleges and Universities and Protestant Colleges show more prescribed hours in the Cultural subjects than in the Sciences. The data for these statements are to be found in Table 3.

A measure of the breadth of training in subject matter is evident in the sum of the number of times subjects occur within a subject classification in each type of institution. This is illustrated in the case of State Universities in this manner. Bacteriology and Hygiene are prescribed in three

TABLE

DISTRIBUTION OF
IN INSTITUT

3

PRESCRIBED WORK
IONS IN 1930

Subjects in the Study	21 State Universities		17 State Agri'l Colleges		50 State Teach's Coll's		82 Protes Colleg		18 Catholic Colleges		4 Polytechnical Colleges		8 Endowed Colleges		4 Municipal Colleges	
	No. of Inst's	Aver. Hours Pres'd	No. of Inst's	Aver. Hours Pres'd	No. of Inst's	Aver. Hours Pres'd	No. of Inst's	Aver. Hours Pres'd	No. of Inst's	Aver. Hours Pres'd	No. of Inst's	Aver. Hours Pres'd	No. of Inst's	Aver. Hours Pres'd	No. of Inst's	Aver. Hours Pres'd
BIOLOGICAL																
Anatomy	0	0.00	3	0.35	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Bact. & Hyg.	3	.28	15	3.00	20	1.16	14	5.36	0	0.00	2	3.60	2	.50	1	0.75
Botany	8	1.80	15	5.64	23	2.45	29	1.49	7	1.50	2	1.70	2	0.75	3	2.75
Entomology	0	0.00	9	2.06	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Physiology	1	0.34	7	1.53	6	0.37	8	0.39	1	0.17	1	0.75	0	0.00	0	0.00
Zoology	7	1.42	10	2.94	22	1.64	22	1.04	6	0.12	1	1.00	3	1.50	2	2.00
Totals	19	3.84	59	15.52	71	5.64	73	8.28	14	1.79	6	7.05	7	2.75	6	5.50
PHYSICAL																
Chemistry	8	2.61	17	12.82	32	3.00	54	4.34	13	3.70	3	8.50	7	5.60	2	2.75
Geology	1	0.48	2	0.35	7	0.52	0	0.00	0	0.00	1	2.00	1	0.75	2	1.50
Physics	6	1.76	10	3.11	23	2.18	43	2.82	12	3.10	2	4.70	4	3.25	1	1.25
Totals	15	4.85	29	16.28	62	5.70	97	7.16	25	6.80	6	15.20	12	9.60	5	5.50
APPLIED																
Agricul.	0	0.00	13	27.23	5	.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Engineering	0	0.00	9	3.94	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Home Econ.	0	0.00	2	3.64	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Totals	0	0.00	24	34.81	5	0.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
SOCIAL																
Economics	8	1.76	14	5.17	11	.78	30	1.63	1	0.77	3	3.50	1	0.75	2	1.50
History	14	3.90	5	1.29	45	4.78	67	5.30	15	7.40	4	6.00	7	5.10	3	5.25
Pol. Sci.	11	2.57	3	1.10	17	4.70	31	1.80	2	0.67	2	3.00	2	1.40	1	1.00
Phil. & Psyc.	2	0.47	0	0.00	4	0.29	22	1.19	17	11.10	2	1.50	3	1.86	3	3.50
Sociology	4	0.85	4	.82	30	2.50	38	2.09	4	1.00	4	4.00	2	1.50	3	3.00
Totals	39	9.55	26	8.38	107	13.05	188	12.01	39	20.94	15	18.00	15	10.61	12	14.25
CULTURAL																
Art	0	0.00	0	0.00	10	.56	7	0.31	0	0.00	0	0.00	1	0.32	1	0.75
Languages																
Classic	0	0.00	0	0.00	0	0.00	1	0.07	1	0.44	0	0.00	0	0.00	0	0.00
Modern	17	10.00	1	0.35	25	5.04	75	12.72	17	13.90	2	7.00	7	11.00	2	8.00
English	21	8.00	17	9.35	50	10.00	82	11.20	18	14.10	4	14.50	7	9.20	4	10.00
Astr'y Math.	13	4.20	11	3.00	35	3.94	45	3.12	12	4.10	3	6.25	6	5.00	2	3.00
Music	0	0.00	0	0.00	11	0.52	3	0.06	0	0.00	0	0.00	0	0.00	0	0.00
Totals	51	22.20	29	12.70	131	20.06	213	27.48	48	32.54	9	27.75	21	25.52	9	21.75
PROFESSIONAL																
Education	21	20.70	17	18.41	50	23.30	82	20.01	18	19.30	4	18.70	8	17.30	4	24.50
MISCELLANEOUS																
Phys. Tr'g	16	2.30	11	1.94	40	3.38	74	3.65	11	2.70	3	3.20	8	5.50	2	1.50
Mil. Tr'g	12	2.47	15	4.14	0	0.00	0	0.00	1	0.88	0	0.00	0	0.00	0	0.00

of the 21 institutions, Botany in three, Physiology in one and Zoology in seven. This makes a total of 19 times that Biological Science subjects occur in the twenty-one institutions as compared with a total of fourteen times in the seventeen Catholic institutions. By adding the totals for all types of institutions in the Biological Sciences the grand total can then be compared with the grand totals of the other subject classifications. This data is shown in the following tabulations.

Biological Sciences	255 times
Physical Sciences	251 "
Applied Sciences	29 "
Social Sciences	440 "
Total for all Sciences	975 "

Subjects in the so-called Cultural group occur a total of five hundred fourteen times.

The Professional subject, Education, occurs two hundred four times, which is equivalent to the number of institutions in the study, in as much as it is prescribed in each institution.

Physical Training appears in one hundred sixty-six institutions and Military Training in thirty institutions.

Variations in the breadth of training in subjects as prescribed by these types of institutions is evident also when they are compared on the basis of the frequency with which the subjects appear in each subject classification. In the Sciences, those subjects in the Social classification

appear most frequently in all types (considering the number in each type), with the exception of State Agricultural Colleges. In this classification, History and Political Science appear most frequently in State Universities, State Teachers Colleges, Catholic Colleges, and Protestant Colleges. While Agricultural Colleges are one of the four institutions with the lowest frequency in these two subjects, they show the greatest frequency in Economics. This is probably due to the extra requirements in Agricultural Economics.

Philosophy appears in seventeen of the eighteen Catholic institutions, in twenty-two of the eighty-two Protestant Colleges, in four State Teachers Colleges, in three each of the Endowed and Municipal institutions and in two each of the State Universities and Polytechnical Colleges.

Sociology is prescribed in three of the four Municipal Colleges. State Teachers Colleges have it prescribed in thirty of the fifty institutions. Protestant Colleges have it prescribed in thirty-eight of the eighty-two institutions.

Biological and Physical Sciences are about equal as to the number of times subjects are prescribed, which is two hundred fifty-five and two hundred fifty-one, respectively. Agricultural Colleges occupy the position of leadership in both of these classifications; being especially strong in

Bacteriology, Botany, Entomology and Zoology, in the Biological Sciences. In the Physical Sciences they are strong in Chemistry and Physics. There are three of the Biological subjects, Anatomy, Bacteriology and Entomology, which do not appear in the curricula of the Catholic, Endowed and Municipal types. In State Universities, State Teachers Colleges, Protestant Colleges and Polytechnic Colleges there are two of the Biological subjects, Anatomy and Entomology which are not prescribed.

The position of leadership in the Physical Sciences being held by the Agricultural Colleges has been referred to. Endowed Colleges are in second place with regard to Chemistry. Catholic and Polytechnic institutions are in third place. Teachers and Protestant colleges are in fourth place. Municipal Colleges are in fifth place and State universities are the lowest. With regard to Physics, the types of institutions rank in the following order; Agricultural Colleges, Polytechnic and Endowed Colleges, Catholic Colleges, State Teachers Colleges, Municipal institutions, Protestant Colleges and State Universities.

First rank is taken by Catholic institutions as to the number of times subjects in the Cultural classification appear as prescribed. State Teachers Colleges are in second place. Polytechnic and Municipal institutions share third place. State Universities are in fourth rank, followed very closely

by Protestant Colleges, while Agricultural Colleges have the lowest frequency of Cultural subjects.

English is prescribed in all institutions with one exception, which is found in the Endowed type. Modern languages are found to be of the same frequency in State Teachers Colleges, Polytechnical and Municipal Colleges. State Universities are in second position. Protestant, Endowed and Catholic institutions are in third place. Agricultural Colleges are of the lowest frequency. Classical Languages are prescribed in but one institution in each of two types, viz., Protestant and Catholic institutions.

Mathematics occurs most frequently as a prescribed subject in Protestant Colleges, State Universities rank second; Agricultural Colleges and Catholic institutions are in third place. State Teachers Colleges are in fourth place, while Polytechnic, Endowed and Municipal institutions are in fifth place.

Music occurs as a prescribed subject in but two types of institutions, viz., eleven times in State Teachers Colleges and three times in Protestant Colleges.

Physical Training is prescribed most frequently in Municipal institutions, Catholic Colleges ranking second and Agricultural Colleges third. State Universities and State Teachers Colleges are in fourth place, while Endowed and Protestant institutions are in fifth place. Polytechnic

Colleges do not show it as a prescribed subject.

Military Training is prescribed in all Agricultural Colleges; in twelve State Universities and in one Catholic institution.

Art is a prescribed subject in ten Teachers Colleges, seven Protestant Colleges, one Endowed College and in one Municipal Institution.

The presentation of this data makes it evident that among the science subject classifications the Social Sciences are prescribed by all types of institutions with much greater frequency than either the Physical or Biological Sciences. In fact it is prescribed almost as frequently as the latter two combined. The frequency of the so-called Cultural and Tool subjects is more than one-half the frequency of all the Science subjects combined. If sciences possessed no cultural value, then the difference in frequency between the cultural and the Science subjects in these institutions would not be noticeable.

The degree of intensiveness of training afforded prospective teachers of Science by the various types of institutions as is made evident by the sum of the average hours in each subject classification indicates great disparity of practice among educators. Graduates from some types of institutions are going to enter the Science teaching profession

with a rather limited training in science subject matter, unless wise and effective counselling is done by the institution on behalf of, and participated in by the student.

CHAPTER IV
TYPES OF INSTITUTIONS
AND PRESCRIBED COURSES

In order to make a comparison of the different types of institutions, on the basis of training they require in the sciences, the detailed data that are shown in Table 2, are consolidated in Table 3. In this tabulation, the average hours prescribed in each subject classification are totaled for each type of institution. This total is, therefore, a sum of averages.

A comparison of the types of institutions on the basis of the sum of the averages in each Science subject classification shows four well defined combinations of types as relates to prescribed hours. The maximum and minimum extremes are represented by two types of state institutions, Agricultural Colleges and Universities. Between these extremes are two groups of types with rather wide differences in the sum of the averages of prescribed hours. In one group are the Catholic and Polytechnic institutions. In the other group are the Teachers Colleges, Protestant, Endowed and Municipal institutions.

TABLE 4
COMPARISON OF TYPES OF
INSTITUTIONS PRESCRIBING
TRAINING FOR 1930 PERIOD

Type of Institution	Biological	Physical	Applied	Social	TOTAL
Agricultural Colleges	15.5	16.3	34.8	8.5	75.1
Catholic Colleges	2.9	6.8	0.0	20.4	32.1
Polytechnic Colleges	7.0	15.2	0.0	18.0	30.2
Teachers Colleges	4.6	5.7	.4	13.06	23.76
Protestant Colleges	3.5	7.17	0.0	11.9	22.57
Endowed Colleges	2.75	9.6	0.0	10.7	23.05
Municipal Colleges	5.5	5.5	0.0	14.2	25.2
State Universities	3.9	4.9	0.0	9.7	18.5

A graphic illustration of these data is shown in Figure

Similar series of combinations of institutional types are also evident when the sum of the averages of all subject classifications are observed. These are shown in consolidated Table 5 under the heading "Sum of Averages", but are not arranged in groups as in Table 4.

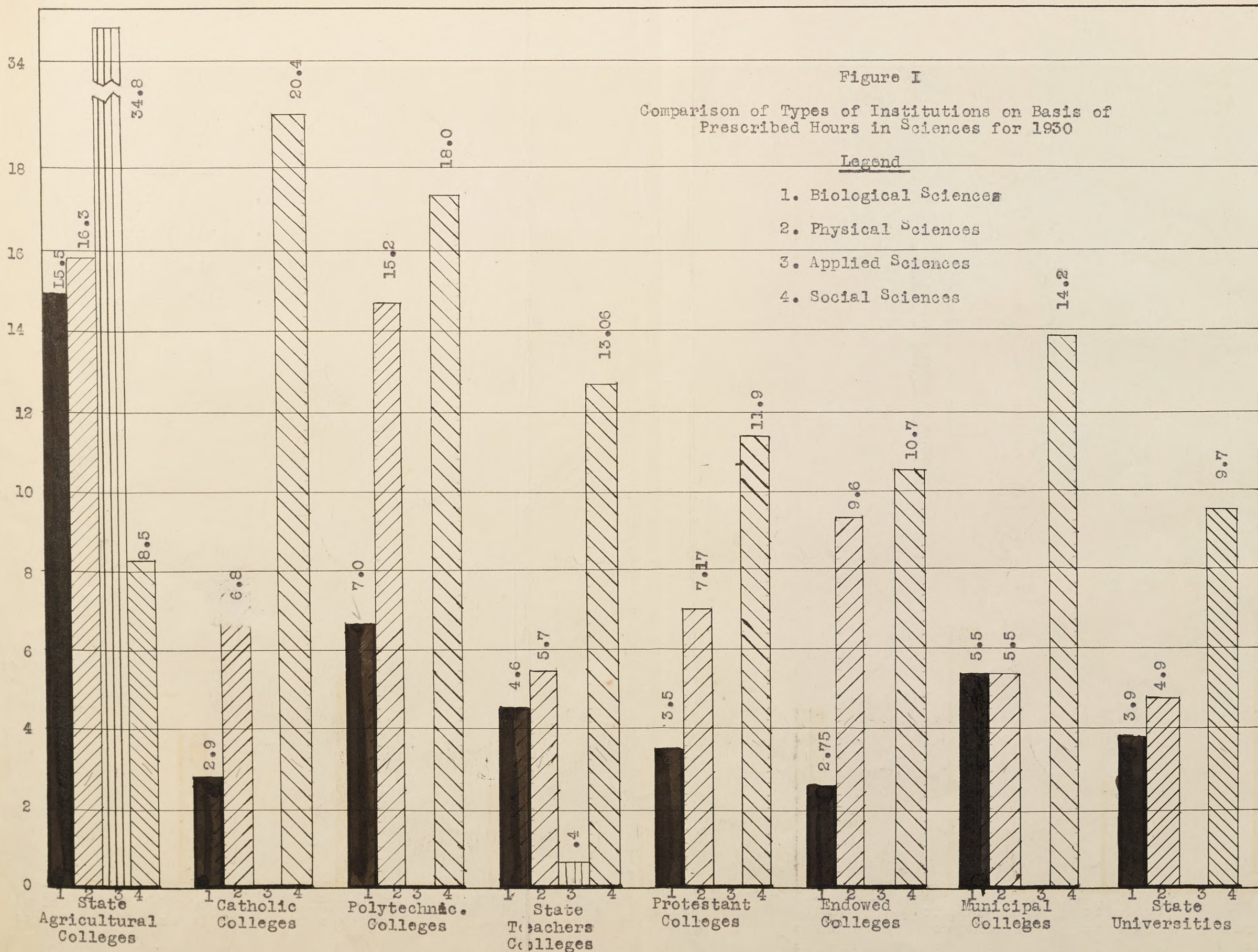


TABLE 5

A COMPARISON OF TYPES OF INSTITUTIONS IN PRESCRIBED

WORK ON BASIS OF SUBJECT CLASSIFICATION FOR 1930

Average number of Prescribed hours:

Type of Institution	No. of Inst.	Bio-logical	Physi-cal	Applied	Social	Total Science	Cultural	Professional	Phys. Trn'g	Mil. Trn'g	Sum of Aver.
State Universities	21	3.9	4.9	0.0	9.7	18.5	22.3	20.7	2.5	2.6	66.6
State Agri'l Colleges	17	15.5	16.3	34.8	8.5	75.1	13.3	18.41	1.94	4.4	113.15
State Teachers Colleges	50	4.6	5.7	..4	13.6	23.76	19.4	23.3	3.9	0.0	70.36
Protestant Colleges	82	3.5	7.17	0.0	11.9	21.57	27.3	20.1	3.88	0.0	73.85
Catholic Univ's and Colleges	18	2.9	6.8	0.0	20.4	30.1	32.7	19.3	2.7	.44	85.24
Polytechnical Colleges	4	7.0	15.2	0.0	18.0	40.2	29.2	18.7	3.2	0.0	91.3
Endowed Colleges	8	2.75	9.6	0.0	10.7	23.05	25.6	17.3	5.5	0.0	71.45
Municipal Colleges	4	5.5	5.5	0.0	14.2	24.2	21.0	24.5	1.5	0.0	72.2

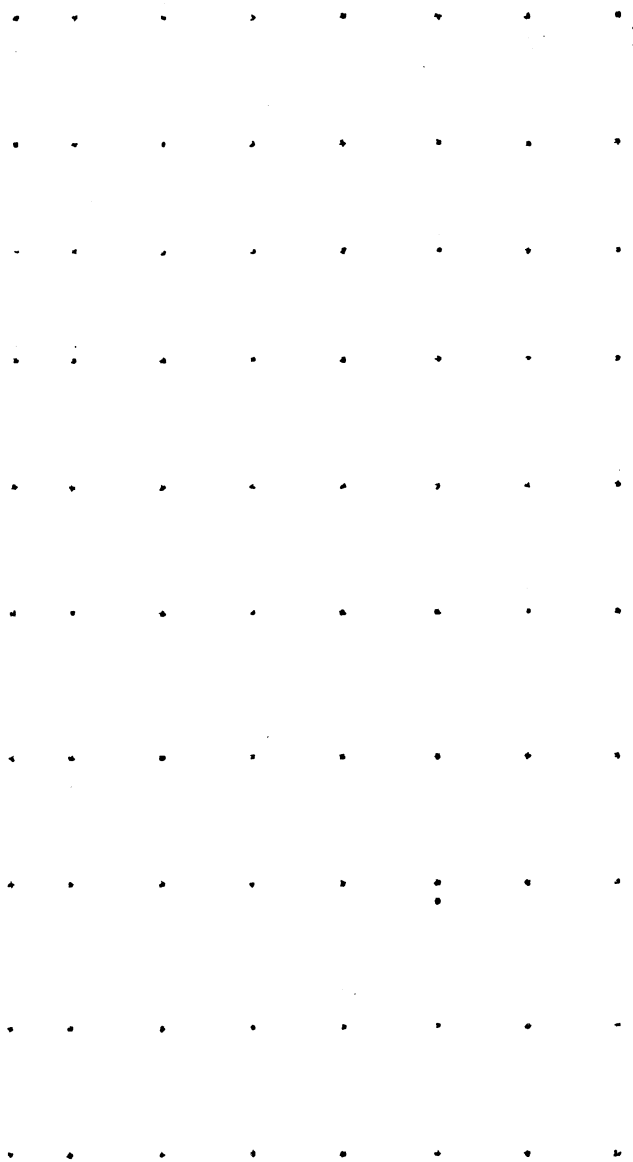
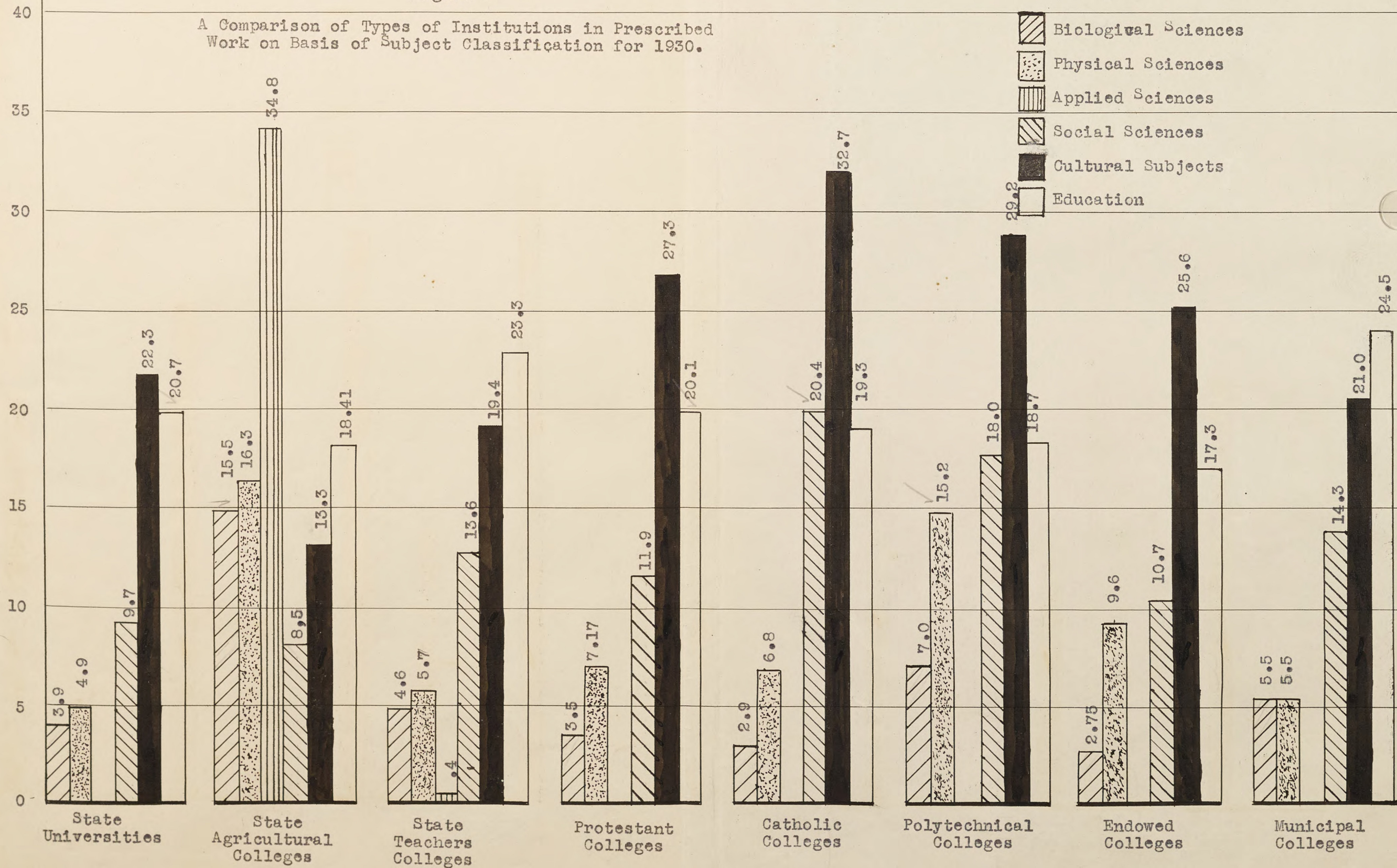


Figure II

A Comparison of Types of Institutions in Prescribed Work on Basis of Subject Classification for 1930.

Legend

-  Biological Sciences
-  Physical Sciences
-  Applied Sciences
-  Social Sciences
-  Cultural Subjects
-  Education



A very different arrangement of types of institutions as to prescribed hours in sciences is observed when the percent of science hours based on the sum of the averages in all subjects is computed. In Table 6 is shown the percent of Prescribed hours in Sciences, Cultural and Professional subjects, and all others, based on the sum of the averages.

TABLE 6

**DISTRIBUTION OF PRESCRIBED HOURS AMONG
SCIENCE, CULTURAL AND PROFESSIONAL SUBJECTS.**

Type of Educational Institutions	:No. of :Insti- :tutions:	:Aver.No.: :of Pres- :cribed :Hours.	Percentage of Prescribed Hours given to			
			Science :Subjects:	Cultur-:al Sub-:jects	Profess-:ional :Subjects:	All :Others
State Agri- cultural Colleges	17	113.15	66.70	11.70	16.20	5.40
Polytechni- cal Colleges	4	91.30	44.00	31.90	20.40	3.70
Catholic Colleges	18	85.24	37.70	38.30	22.60	1.40
Municipal Colleges	4	72.20	34.90	29.80	33.90	1.40
State Teach- ers Colleges	50	70.36	33.70	27.50	33.1	3.70
Endowed Colleges	8	71.45	32.20	35.80	24.20	7.80
Protestant Colleges	82	73.85	30.50	36.90	27.20	5.40
State Uni- versities	21	66.6	27.70	33.40	31.10	7.80

The range between the highest and the lowest percent in each of these subject classifications shows a wide variation and can be interestingly shown as a ratio. In the Sciences it is 1: 2.4. In the Cultural Subjects it is 1: 3.37. In the Professional subject it is 1: 2.09.

The data contained in Tables 5 and 6, when interpreted jointly, show some very interesting facts relative to the comparative facilities of these types of institutions for the training of teachers of secondary sciences. They represent conditions which, it would seem, should be given serious consideration by educators. It is reasonable to assume, if one is going to teach a subject, that he should know that subject, not as a separate entity, but in its relationships with other forms of knowledge. It is likewise reasonable to assume the hypothesis that a teacher of Chemistry, Botany or any other science will be better equipped in knowledge of its subject matter if he knows Zoology, Geology, Physics, Bacteriology, etc., because he will be in position to understand and make understandable the inter-relationships of one or all of these sciences to the subject he is teaching. If the prospective teacher's time is too greatly utilized in Professional courses, or in the so-called cultural studies, aside from the cultural value that any one will get from sciences, then he will have to sacrifice some of the courses which should become his reserve capital, so to speak. Tables 5 and 6 indicate definitely how these

various types of institutions compare in the amount of time that a prospective teacher is required to devote to subject matter, to cultural training and to professional work, in order to prepare himself to teach, interest and inspire the youth placed in his care.

State Agricultural Colleges have as the sum of the averages of all subject classifications 113.15 hours. The sum of the averages in Sciences is 75.1 hours; 34.8 hours of this is in Applied Sciences, i. e. sciences to which all the other science classifications are related; or, in other words 66.6 percent of the sum of the averages of all the prospective teacher's time is devoted to subject matter training. It is also noticeable from observation of Table 2 that this type of institution prescribes a wide diversity of science training.

In the so-called Cultural subjects these institutions prescribe 13.3 hours and 18.41 hours respectively. Whether or not this is enough, too much or too little time to devote to these subjects is not within the realm of this study to discuss or determine. However, this type of institution prescribes the least amount of time to these subject classifications.

Catholic institutions prescribe 85.24 hours as the sum of averages of all subject classifications with 30.1 hours in Sciences. Of these 20.4 hours are in the Social sciences. This means that 32.7 percent of the sum of the averages is in Sciences, but there is no diversification. In the cultural subjects 32.7 hours are prescribed or 38.3 percent. Profess-

ional training, Education, has 19.3 hours prescribed or 22.6 percent. With so much of the student's time devoted to the Social sciences and so-called Cultural subjects, there would seem to be too little opportunity left for training in the Biological and Physical sciences.

Municipal institutions prescribe 24.2 hours in Sciences; 14.2 hours of which are in the Social classification. There are 21.0 and 24.5 hours prescribed in the Cultural and Professional subjects. In terms of percent of the sum of the averages, this means that 34.9 percent of the student's time is devoted to Sciences; 29.8 percent to the Cultural Subjects and 33.9 percent to Professional training. Again the training in Sciences is limited to a narrow selection, and one third of the prospective science teacher's time is devoted to training in a method subject, while a little more than one third of his time is devoted to subject matter training.

State Teachers Colleges prescribe 23.76 hours in the Sciences. Of this total, 13.06 hours are in the Social Sciences. In the Biological and Physical Sciences combined there is a total of only 10.3 hours prescribed. There are prescribed in the Cultural subjects 19.4 hours, while in the Professional subject there are 23.3 hours prescribed. Excepting the case of Municipal institutions, this type of institution has the highest number of prescribed hours in the Professional subject, Education. On a percent basis,

these data mean that 33.7 percent are in subject matter training; 27.5 percent are in Cultural training and 33.1 percent are in Method. In the prescribed hours in this type of institution, almost as much time is taken in teaching how to teach as is used in training for what is to be taught.

Polytechnical Institutions prescribe 40.2 hours in Sciences, of which 18.00 are in Social Sciences; 15.20 in Physical Sciences and 7.00 hours in Biological Sciences. The diversification of sciences in this type is exceeded only by that of State Agricultural Colleges. There are 29.20 hours prescribed in Cultural subjects and 18.70 hours prescribed in Education. The student devotes 33.00 percent of his prescribed hours to Sciences; 31.90 percent to Cultural subjects and 20.40 percent to Professional training. In professional training this type of institution prescribes 4.20 hours in excess of State Agricultural Colleges, which prescribe the least of any type.

Endowed Universities and Colleges prescribe 32.20 hours in Sciences of which 10.70 hours are in the Social Sciences; 9.60 hours are in the Physical Sciences and 2.75 hours are in Biological Sciences. The Cultural subjects require 25.60 of the total prescribed hours and the Professional subject 17.30 hours. Thirty-two and two tenths percent of the prescribed hours are in Sciences; 35.80 percent are in Cultural subjects and 24.20 percent are in Education. These institutions, as a type, prescribe the

2. The second part of the document focuses on the implementation of internal controls to prevent fraud and ensure the accuracy of financial data. It outlines the key components of a robust internal control system, including segregation of duties, authorization procedures, and regular monitoring and evaluation.

3. The third part of the document addresses the challenges faced by organizations in managing their financial resources effectively. It discusses the importance of budgeting, forecasting, and financial analysis in making informed decisions and optimizing resource allocation.

4. The fourth part of the document explores the role of technology in modern accounting and finance. It highlights the benefits of using accounting software, data analytics, and automation to streamline processes, reduce errors, and improve the efficiency of financial reporting.

6. The sixth part of the document provides a summary of the key points discussed and offers recommendations for organizations to improve their financial management practices. It stresses the importance of continuous learning, adaptation, and collaboration between different departments to achieve financial success.

greatest number of hours to Physical Training, which are 5.50 hours. However, this is not as many as the combined hours that are prescribed in Physical Training and Military Training in Agricultural Colleges.

Protestant institutions prescribe 21.70 hours in Sciences, of which 11.90 are in Social Sciences; 7.17 are in the Physical Sciences and 3.50 hours are in the Biological Sciences. In the Cultural subjects, 27.30 hours are prescribed, while in Education there are 20.10 hours prescribed. In the Biological and Physical Sciences and in Education, this type of institutions prescribe about the same number of hours as the Catholic institutions. Geology is a frequently prescribed course in the Physical Sciences. These data show 30.50 percent of the prescribed hours in Sciences; 36.90 percent in the Cultural subjects and 27.20 percent in Professional Training. This type of institution emphasizes the cultural phases of their curricula to almost the same degree as do the Catholic institutions, which prescribe a higher percent of hours in that classification than in any other.

State Universities prescribe 18.50 hours in Sciences, of which 9.7 hours are in Social Sciences; 4.9 hours are in Physical Sciences and 3.9 hours are in Biological Sciences. They prescribe 22.3 hours in Cultural subjects and 20.7 hours in Professional Training. When put on a percentage basis this means that 27.7 percent of the prescribed hours are in Sciences; 33.4 percent are in Cultural subjects and 31.1 percent are in Education. This type of institution shows the

lowest percent of hours prescribed in Sciences of any of the types in the study. They are one of the four highest in percent of prescribed hours in Cultural subjects and one of the three highest in percent of prescribed hours in Education. Although State Universities compare favorably with the other types as to the number of average prescribed hours in Cultural and Professional subjects, they are very low in prescribed Sciences. The curricula of these institutions are ample from the standpoint of electives in Science, and because of the lower number of prescribed hours, the student has more opportunity to avail himself of electives. This theory of liberal elective privileges harmonizes with the basic theory of the purpose of universities, viz., the training of mature students.

The presentation of the data in Tables 5 and 6, as made above, may bring to the readers mind the question, "What type of institution gives the best balanced course of training for science teachers?" Apparently that type of institution is to be found in one of the combinations that exist between the two extremes shown in Table 4, viz., Polytechnical institutions. This type prescribes 44.0 percent of the sum of the average hours in Sciences; 31.9 percent in the Cultural subjects and 20.4 percent in Education. However, this is only a matter of personal opinion and interpretation, since there are no statistical data compiled as yet upon this question of the ideal course of training for teachers. Theories have

been advanced, ideas have been put into practice; speakers and writers have expounded on this question of a balanced type of training for teachers; but the answer will only be obtained through scientific investigation and experiment. Until the facts are established, philosophies, ideas and opinions will be promulgated and followed or discarded.

The hypothesis which has been advanced, that a teacher of science should have a broad training in sciences, is fairly well realized in the Polytechnical institutions. Four subjects, Bacteriology & Hygiene, Botany, Physiology and Zoology are prescribed in the Biological Classification. Three subjects, Chemistry, Geology and Physics are prescribed in the Physical Sciences. Five subjects, Economics, History, Pol. Sciences, Philosophy & Psychology and Sociology are prescribed in the Social Sciences. This distribution of subjects is to be found in Table 3. It has been shown in Table 6 that 31.9 percent of the sum of the average prescribed hours are in the Cultural subjects, which is 29.2 hours; and that 20.4 percent of the sum of the average prescribed hours, or 18.70 hours, are in Education. It would seem that the time prescribed in Cultural subjects is excessive, considering the cultural value that is to be found in courses in Education and the Sciences. A slight reduction of the prescribed hours in Cultural subjects would make it possible to prescribe more work in the Biological sciences, which are basic sciences.

At the maximum extreme of the sum of the average prescribed hours in Sciences are the Agricultural Colleges. These institutions prescribe 66.6 percent of the sum of the average hours in Sciences, or a total of 75.1 hours. All the subjects in the Biological classification are prescribed, which is also true of the Physical and Applied classifications. In the Social Sciences, only Philosophy and Psychology are omitted from the prescribed sciences. These institutions, it would appear, are sacrificing unnecessarily, the value of the Cultural subjects for excessive Science training. The scientist, without a reasonable cultural background, is placed at just as great a disadvantage in life's activities as is the individual with a purely cultural training.

State Universities, representing the minimum in the sum of the averages of the prescribed hours in Sciences, or 18.5 hours, are distinctive for the limited amount of time prescribed in the Biological and Physical sciences, 3.9 hours and 4.9 hours respectively. This seems like a very limited amount of time to be prescribed for students preparing to assume positions as teachers of secondary sciences. It is a fact that this type of institution offers liberal elective privileges. In all probability the mature student would utilize these privileges judiciously, but in spite of the basic theory of the purpose of this type of institution, they are not confined to

training of mature students. An individual who has been away from secondary school supervision for only one or two years is no better qualified to select wisely the courses of study he should pursue, even though he is in a University, than if he were in a small college. This is especially true when a student is going into a profession where he will be a factor in the shaping of other human lives. These institutions prescribe 33.4 percent of the sum of the average hours in all subjects as Cultural subjects, and 31.1 percent in Education, or professional training. With a small number of hours sacrificed in each one of these subject classifications, a broader training in Sciences could be prescribed for prospective teachers of science. If the selection of Science Electives is varied and made as intensive as possible, then good training in subject matter will be the result, but will the inexperienced student make that kind of selection or choose the path of least resistance?

Courses in the "Special Methods" of teaching different sciences are noticeably more evident in the curricula of 1930 than is true of the curricula of the earlier decades. This condition, it seems, would indicate that educators are taking advantage of information growing out of experimentation, even though such experiments may be of the simple trial and error type. It indicates that teaching methods are rapidly passing through a transition from the theoretical to the scientific stage. In the tabulation of this portion of the

data, only courses in special methods were considered. Courses in general methods of class room management, records, discipline, etc., were not considered. Only those dealing with the best method of presenting subject matter and procedure in science, the use of display material and class helps, laboratory technique, etc., are given recognition. Such courses were usually given under the direction of the department in which the science subject was being taught, rather than in the department of education.

Table 7 shows the number of times that courses in "Special Methods" were listed for each of the secondary school science subjects in the various types of universities and colleges.

TABLE 7

COMPARISON OF TYPES OF EDUCATIONAL INSTITUTIONS
ON BASIS OF FREQUENCY OF COURSES IN SPECIAL
METHODS OF TEACHING SCIENCE SUBJECTS

Type of Inst.	No.	Bot- any	Zool- ogy	Chem- istry	Phy- sics	Agri'l :	Home Eco	Econ. :	His- tory	Pol. Sci.
State	:	:	:	:	:	:	:	:	:	:
Univer.	21:	17	9	8	10	0	15	2	10	1
State	:	:	:	:	:	:	:	:	:	:
Agri'l	:	:	:	:	:	:	:	:	:	:
Colleges	17:	4	3	5	5	9	7	0	4	2
State	:	:	:	:	:	:	:	:	:	:
Teach's	:	:	:	:	:	:	:	:	:	:
Colleges	50:	18	27	26	14	21	2	26	9	:
Protes-	:	:	:	:	:	:	:	:	:	:
tant	:	:	:	:	:	:	:	:	:	:
Colleges	82:	34	32	39	26	0	33	5	43	2
Catholic	:	:	:	:	:	:	:	:	:	:
Colleges	18:	7	5	8	8	0	2	1	7	0
Polytech	:	:	:	:	:	:	:	:	:	:
nic. Col	4:	0	0	0	0	0	0	0	0	0
Endowed	:	:	:	:	:	:	:	:	:	:
Colleges	8:	6	6	5	5	0	6	0	6	0
Munici-	:	:	:	:	:	:	:	:	:	:
pal	:	:	:	:	:	:	:	:	:	:
Colleges	4:	3	2	2	1	0	3	0	3	0



These data show that courses in "Special Methods" for science teaching occur a total of 72 times in State Universities or an average of 3.4 times per institution; in Agricultural Colleges, 37 times, or an average of 2.17 times, in each institution. State Teachers Colleges offer such courses a total of 157 times, thus making an average of 3.1 times per school. In the 82 Protestant Colleges these courses appear 214 times, or an average of 2.6 times. In Catholic Colleges, they occur 38 times, which is an average of 2.23 times in each institution. Polytechnical Colleges do not offer such courses in Science subjects. The 8 Endowed Colleges offer them a total of 32 times, or an average of 4 times, which is the highest average of all types of institutions. In Municipal Colleges such courses occur a total of 14 times, which makes an average of 3.5 times for each institution in this type.

The distribution of "Special Methods" courses in the various types of institutions includes, in most instances, all of the science subjects in the usual secondary school classification. State Teachers Colleges offer such courses in each of the subjects classified. State Universities and Protestant Colleges do also, with the exception of one subject, Agriculture, which does not appear in their curricula. State Agricultural Colleges give "Special Methods" courses of training in all subjects except in Economics, which in reality is not a secondary school subject, although occasionally given in some High Schools. Except in the case

Of Agriculture and Pol. Science, Catholic Colleges give these courses for all subjects. Endowed Colleges and Municipal Colleges do not show courses of this kind in Agriculture, Economics or Political Science. Relatively, more courses in "Special Methods" are given by each of the types of institutions in History, Chemistry, Home Economics and Botany than in other subjects. Courses in "Special Methods" for the teaching of Zoology and Physics are quite comparable, although somewhat less frequent than in the subjects mentioned above. Political Science and Economics are subjects in which such courses are seldom offered by the types of institutions in this study.

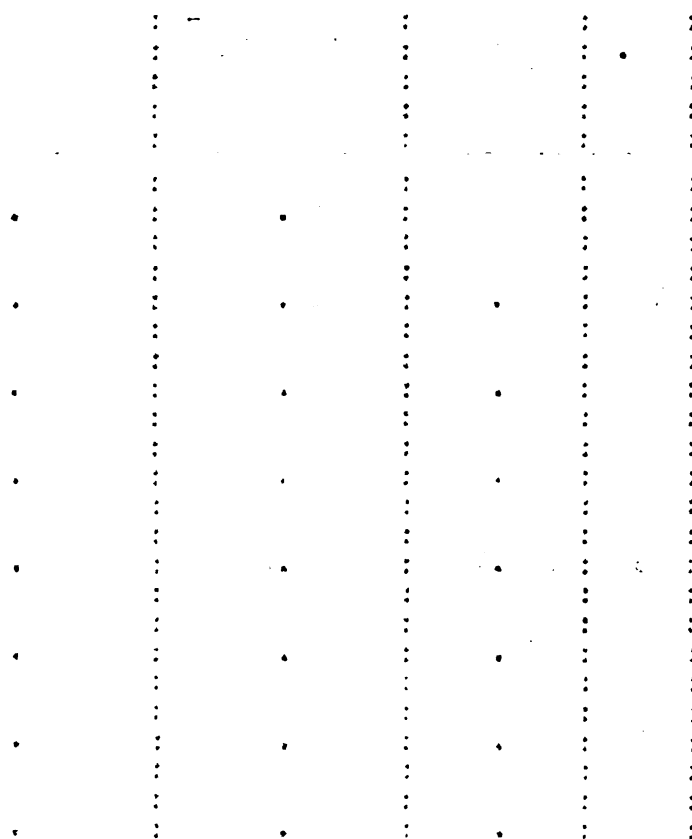
The wide variation in Prescribed professional training, which is evident in the various types of institutions, is indicative of the fact that either too much time is required of the prospective teacher in some types of institutions or not enough in other types. The North Central Association of Colleges and Universities have^s set as a standard for membership fifteen hours in Education. It is evident that the association believes this to be an optimum amount of training necessary for a teacher of secondary school subjects. All institutions in the various types meet that requirement and one type exceeds it by 9.5 hours. The type of institution with the lowest number of Prescribed hours in Education exceeds the requirement of the Association by 2.3 hours. The data in Table 8, consolidated from Tables 1 and 5 show average number of hours

and the percent of the total minimum requirements which are devoted to Education in the various types of Educational institutions in this study.

TABLE 8
COMPARISON OF PRESCRIBED HOURS
AND PERCENT OF TOTAL MINIMUM
HOURS DEVOTED TO EDUCATION

Types of Institutions	No.	Average Total Minimum Hours	Hours Prescribed in Education	Percent of Total Hours
State Universities	21	125	20.70	16.6
State Agri'l Colleges	17	134.80	18.41	13.70
State Teachers Colleges	50	124.48	23.30	18.70
Protestant Colleges	82	123.80	20.10	16.23
Catholic Colleges	18	126.10	19.30	15.30
Polytech. Colleges	4	149.20	18.70	12.53
Endowed Colleges	8	121.20	17.30	14.19
Municipal Colleges	4	122.00	24.50	20.08

The significance of the data shown in this tabulation is self evident and needs little, if any, explanation. If eight Endowed Colleges with an average of 17.30 hours, or 20.08 percent of 121.20 hours, the total minimum requirements, meet the necessary requirements of the North Central Association, what justification



is there for Municipal Colleges, State Teachers Colleges and State Universities requiring the apparently excessive number of hours which they do in the technique of teaching? An excessive amount of time devoted to learning how to teach science limits the prospective teacher to a narrower field of learning in subject matter. The finished product, the secondary school pupil, will not profit at the hand of the skilled pedagogical technician unless he knows the subject matter to be taught. It is not enough that a teacher of science know only Physical Science or Biological Science, he should know either one of them in relation to the other and in relation to Applied Sciences and the Social sciences. One does not employ a skilled mechanic in construction to build a house and fail to supply him with the building materials, if so, he does not get the house in which to make a home. Perhaps these conditions are influenced by legislative or state department administrative regulations, but if that is true, why are they not uniform and applied to all types of institutions? Such a distribution of a prospective teacher's time raises the question again of the comparative values of technical knowledge in teaching and a comprehensive and adequate knowledge of the subject matter to be taught. This question has been propounded and discussed many times by educators with regard to various subjects. The answer to it, with regard to sciences, seems to be found in the following quotation:

"The function which science has to perform in the curriculum is that which it has performed for the race; emancipation from local and temporary incidents of experience, and the opening of intellectual vistas unobscured by the accidents of personal habit and predilection. The logical traits of abstraction, generalization and definite formulation are all associated with this function. In emancipating an idea from the particular context in which it originated and giving it a wider reference the results of the experience of any individual are put at the disposal of all men. Thus ultimately and philosophically science is the organ of general and social progress" ¹

¹Dewey, John

Democracy and Education. p 269.

CHAPTER V

TYPES OF EDUCATIONAL INSTITUTIONS AND ELECTIVE COURSES

A discussion of the time devoted to electives and the distribution of those electives, in this study, might seem to be unnecessary, since they represent what is left of the minimum requirements for graduation after the prescribed hours have been considered. However, there are conditions existing with regard to the curricula compositions in some types of institutions which are not entirely apparent if the prescribed hours are to be the extent of the study. Physical Training and Military Training will not be considered in this part of the discussion since they are not tabulated in the study as electives. This is likewise true with the Professional subject, Education. The discussion will be confined to the Sciences and so-called Cultural subjects.

The manner of determining the elective hours, necessary to complete courses of training for prospective teachers, has been discussed under "Method", but attention is called to Table 1 "Composition of 1930 Curricula" where there is given the average hours of electives and the average per cent of electives for each type of institution, based upon the minimum requirements for graduation.

State Teachers Colleges, with forty-eight per cent of the total minimum requirements as electives are outstanding. Protestant Colleges, State Agricultural Colleges and State Universities with 42.5, 42.3 and 42 per cent, respectively, compare very favorably. Endowed Colleges and Universities with 40.0 per cent and Municipal Colleges with 40.1 per cent are also comparable. Polytechnical Colleges with 36.3 per cent and Catholic Colleges with 33.9 per cent in electives hours are hardly comparable and are as outstanding at the lower limit as are Teachers Colleges at the upper limit.

The detailed distribution of elective hours in subject classifications for each type of institution is shown in Table 9. There are conditions existing in these tables which will need further explanation than has been given under, "Method of Allocating Electives".

In each subject classification for each type of institution, under the column heading "Average Elected", it will be noticed that there are generally two subjects which show a greater number of hours than any of the others. In the Biological Sciences it is Botany and Zoology. In the Physical Sciences it is Chemistry and Physics. In the Social Sciences it is usually History and Political Science, although there are exceptions in this subject classification.

TABLE 9
DISTRIBUTION OF ELECTIVE HOURS
IN INSTITUTIONS IN 1930

21 State Universities					17 State Agricultural Colleges				50 State Teachers Colleges				82 Protestant Colleges				18 Catholic Colleges				4 Technical Colleges				8 Endowed Colleges				4 Municipal Colleges			
Sciences	No.	Aver. Hours Elect.	Med- ian	Range	No.	Aver. Hours Elect.	Med- ian	Range	No.	Aver. Hours Elect.	Med- ian	Range	No.	Aver. Hours Elect.	Med- ian	Range	No.	Aver. Hours Elect.	Med- ian	Range	No.	Aver. Hours Elect.	Med- ian	Range	No.	Aver. Hours Elect.	Med- ian	Range	No.	Aver. Hours Elect.	Med- ian	Range
BIOLOGICAL																																
Anatomy	1	.28	.52	0-6	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Bact. & Hyg.	1	.14	.52	0-3	1	.29	.97	0-5	8	.82	.97	0-15	12	.47	.56	0-4	2	.61	.59	0-6	1	1.00	.66	0-4	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Botany	15	8.10	4.99	0-30	4	1.23	3.49	0-6	27	4.82	3.49	0-20	39	4.57	.90	0-30	6	3.30	.74	0-24	1	.70	.66	0-3	3	3.20	.79	0-18	1	5.00	.66	0-20
Entomology	1	.19	.52	0-4	2	.48	1.01	0-4	1	.14	1.01	0-7	1	.03	.59	0-3	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Physiology	4	.90	.57	0-9	2	.58	1.14	0-5	4	.30	1.41	0-5	15	.68	.67	0-6	3	.66	.59	0-6	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	.75	.66	0-3
Zoology	13	7.80	4.74	0-30	4	1.17	1.29	0-8	30	5.00	1.29	0-24	33	4.03	.83	0-30	7	2.80	.81	0-15	0	0.00	0.00	0-0	2	1.10	.66	0-6	3	8.50	14.99	0-16
PHYSICAL																																
Chemistry	18	8.20	6.49	0-32	5	1.70	7.49	0-8	14	9.50	6.99	0-30	2	3.50	6.99	0-30	2	3.60	4.49	0-6	2	3.50	5.99	0-8	5	9.50	4.99	0-24	2	7.50	5.99	0-24
Geology	3	1.33	.58	0-20	1	.19	1.16	0-3	7	.08	1.16	0-16	17	1.17	.62	0-12	2	.39	.56	0-4	0	0.00	0.00	0-0	1	.62	.42	0-5	0	0.00	0.00	0-0
Physics	17	7.70	5.37	0-30	7	1.72	.59	0-5	38	5.79	.59	0-25	52	6.31	4.31	0-30	10	4.80	2.99	0-18	3	3.60	4.49	0-6	5	5.72	4.99	0-20	1	2.50	.66	0-10
APPLIED																																
Agriculture	0	0.00	0.00	0-0	2	1.53	1.06	0-20	3	1.56	1.06	0-30	0	0.00	0.00	0-30	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Engineering	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	7.70	4.99	0-31	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Home Econ's	0	0.00	0.00	0-0	2	3.76	1.14	0-33	6	3.12	1.14	0-30	16	5.79	4.28	0-46	3	4.30	.59	0-30	2	16.50	23.99	24-42	1	4.50	.42	0-36	0	0.00	0.00	0-0
SOCIAL																																
Economics	8	3.20	1.61	0-30	2	.48	3.49	0-5	28	3.08	3.49	0-24	44	2.25	2.49	0-6	9	2.10	2.99	0-6	0	0.00	0.00	0-0	4	2.60	2.99	0-8	2	4.50	2.99	0-15
History	10	5.60	1.90	0-24	9	2.29	2.20	0-5	27	7.32	2.20	0-30	49	6.24	4.49	0-30	6	4.70	.74	0-30	1	1.00	.66	0-4	5	9.00	5.49	0-24	2	8.75	4.99	0-30
Pol. Sci.	12	4.60	4.74	0-12	5	1.58	4.69	0-5	33	4.88	4.69	0-28	49	3.64	4.14	0-24	12	4.00	3.99	0-12	2	2.50	3.49	0-5	5	6.30	5.49	0-12	2	3.50	5.99	0-8
Phil. & Psych.	2	.38	.55	0-4	1	.29	1.01	0-5	1	.15	1.01	0-5	5	.17	.53	0-3	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Sociology	9	4.00	1.94	0-30	10	2.64	2.99	0-5	31	3.38	2.99	0-17	32	1.80	.83	0-9	5	3.10	.69	0-24	1	4.00	.66	0-4	3	2.20	.79	0-6	1	6.25	.66	0-25
CULTURAL SUBJECTS																																
Art	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Languages																																
Classic	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Modern	4	2.40	1.23	0-16	3	1.29	1.38	0-10	14	2.76	1.38	0-14	7	.65	.54	0-12	1	.66	.52	0-12	0	0.00	0.00	0-0	1	.87	.42	0-7	0	0.00	0.00	0-0
English	7	2.10	.74	0-10	1	.24	1.27	0-4	10	1.17	1.27	0-7	17	1.10	.62	0-9	0	0.00	0.00	0-0	0	0.00	0.00	0-0	2	2.25	.66	0-10	0	0.00	0.00	0-0
Math. & Astr'y	8	2.38	.8	0-16	4	.76	3.85	0-4	27	2.74	3.85	0-15	38	2.29	.93	0-12	4	1.20	.64	0-6	2	2.70	3.99	0-7	5	2.50	2.99	0-5	3	5.50	4.49	0-5
Music	0	0.00	0.00	0-0	3	.76	1.01	0-6	1	.08	1.01	0-4	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
PROFESSIONAL																																
Education	No Electives																															
MISCELLANEOUS																																
Physical Tr'g	No Electives																															
Military Tr'g	No Electives																															

These pairs of subjects, so to speak, represent the subjects within each subject classification which teachers of sciences in secondary schools are called upon to teach. They represent the major, and the first minor, as termed by some institutions. Opposite these subjects in the column, "Number Giving" is always found a greater number of institutions than is found opposite other subjects in the same classifications. This means that these subjects were elected more frequently, and is not to be construed as meaning that any type of institution is deficient in facilities for giving training in other subjects in those classifications.

There are several instances of individual institutions, within certain types, where it was not possible to elect sufficient hours in a subject to meet major requirements. In such instances the major had to be elected in another classification, and in some institutions a sufficient amount of work in a first minor might not be available, which necessitated using subjects in other classifications.

The minimum limit under "Range" indicates that there were no elections made in those subjects in some of the institutions within a type. The maximum limit indicates the highest number of hours elected in a subject within a given type of institution.

The subjects in the Cultural classification which were elected most frequently and for the greatest number of hours, were Mathematics, Modern Languages and English. These elections were made because it seemed that these subjects were the more useful tool subjects. It will be noticed that Mathematics is used more frequently than are either English or Modern Languages. This seemed expedient because the prescribed Mathematics in a large number of institutions in all types seemed too low in the number of hours. Effective work in sciences is accomplished only with a thorough training in this tool subject. Many teachers of secondary sciences have expressed regret to the writer that their training in Mathematics did not include Calculus.

Modern Languages were used as electives in those institutions, if possible, where the prescribed hours in that subject were less than twelve. English was used as an elective in those instances where the prescribed English was not in excess of eight hours.

The data which are tabulated in Table 9 are consolidated in Table 10 in order to make comparisons of the types of institutions with regard to distribution of elective hours.

TABLE 10

COMPARISON OF TYPES OF INSTITUTIONS IN
ELECTIVE HOURS ON THE BASIS OF SUBJECT
CLASSIFICATIONS

Type of Inst.	No.	Biolo- gical	Phys- ical	Ap- plied	Soc- ial	Cult- ural	Sum of Aver.
State Univ.	21	17.41	17.23	0.0	17.78	6.38	59.30
State Agri'l	17	3.75	3.61	5.29	7.23	3.05	22.93
State Teach.	50	11.08	15.99	4.63	18.81	6.75	57.31
Protestant	32	9.73	17.32	5.79	14.10	4.04	51.63
Catholic	13	7.37	14.69	4.30	13.90	1.36	42.12
Polytech.	4	1.70	7.2	24.20	7.50	2.70	43.30
Endowed	3	4.30	15.34	4.50	20.10	5.62	50.36
Municipal	4	14.25	10.0	0.0	23.00	2.50	49.75

From these data it is evident that the electives are confined almost wholly to the Biological, Physical, and Social Sciences. The large number of electives in Applied Sciences credited to Polytechnical Colleges is due to the fact that in this type, Home Economics was the most available subject from which to make elections. This does not mean that majors in this science were not assigned in other types. The fact that there were only four Polytechnic schools in the study and many more than that in some other types would have the effect of raising or lowering the

average within any given type.

The average hours in the Cultural subjects are lower than in the science subjects in all types of institutions. In some types it seemed necessary to elect more hours than in others in order to give training requisite to effective teaching of science as has been previously explained.

The data regarding the number of institutions in each type in which subjects were elected, and the average hours which were elected in each institution are shown in Table 11. This information is set up in the same manner as was used for the Prescribed hours in Table 3. State Universities, which were the lowest in Prescribed hours, are naturally the highest in the sum of the averages of Electives, which is shown in Table 10, viz., 59.30 hours. This type has Biological subjects elected a total of 65 times, with the sum of the averages being 17.45 hours. In the Physical Sciences, subjects were elected a total of 33 times, with the sum of the averages 17.23 hours. The Social Science subjects were elected 41 times and the sum of the averages is 17.78 hours. In this type of institution there was no difficulty experienced in making up a broad selection of subjects in any of the science classifications. It is likewise true that there is offered opportunity for intensive training in each one of the subjects which the prospective secondary teacher might be preparing to teach.

TABLE 11
DISTRIBUTION OF ELECTIVE HOURS
IN INSTITUTIONS IN 1930

	21 State Universities		17 State Agri'l Colleges		50 State Teach's Coll's		82 Prote stant Coll eges		18 Catholic Colleges		4 Polytechnic Colleges		8 Endowed Colleges		4 Municipal Colleges	
Subjects in the Study	No. of Inst's	Aver. Hours Elect.	No. of Inst's	Aver. Hours Elect.	No. of Inst's	Aver. Hours Elect.	No. of Inst's	Aver. Hours Elect.	No. Times Elect.	Aver. Hours Elect.	No. Times Elect.	Aver. Hours Elect.	No. Times Elect.	Aver. Hours Elect.	No. Times Elect.	Aver. Hours Elect.
BIOLOGICAL																
Anatomy	1	.28	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Bact. & Hyg.	1	.14	1	.29	8	.82	12	.47	2	.61	1	1.00	0	0.00	0	0.00
Botany	15	8.10	4	1.23	27	4.82	39	4.57	6	3.30	1	.70	3	3.20	1	5.00
Entomology	1	.19	2	4.80	1	.14	1	.03	0	0.00	0	0.00	0	0.00	0	0.00
Physiology	4	.90	2	.58	4	.30	15	6.68	3	.66	0	0.00	0	0.00	1	.75
Zoology	13	7.80	4	1.17	50	5.00	33	4.03	7	2.80	0	0.00	2	1.10	3	8.50
Totals	35	17.41	13	3.75	70	11.08	100	9.78	18	7.37	2	1.70	5	4.30	5	14.25
PHYSICAL																
Chemistry	18	8.20	5	1.70	41	10.12	63	10.44	14	9.50	2	3.60	5	9.50	2	7.50
Geology	3	1.33	1	.19	7	.08	17	1.17	2	.39	0	0.00	1	.62	0	0.00
Physics	17	7.70	7	1.72	38	5.79	52	6.31	10	4.80	3	3.60	5	5.72	1	2.50
Totals	38	17.23	13	3.61	86	15.99	132	17.92	26	14.69	5	7.20	11	15.84	3	10.00
APPLIED																
Agriculture	0	0.00	2	1.53	3	1.56	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Engineering	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	7.70	0	0.00	0	0.00
Home Econ's	0	0.00	1	3.76	6	3.12	16	5.79	3	4.30	2	16.50	1	4.50	0	0.00
Totals	0	0.00	3	5.29	9	4.68	16	5.79	3	4.30	3	24.20	1	4.50	0	0.00
SOCIAL																
Economics	8	3.20	2	.48	28	3.08	44	2.25	9	2.10	0	0.00	4	2.60	2	4.50
History	10	5.60	9	2.29	27	7.32	49	6.24	6	4.70	1	1.00	5	9.00	2	8.75
Pol. Sci.	12	4.60	5	1.58	33	4.88	49	3.64	12	4.00	2	2.50	5	6.30	2	3.50
Phil.&Psych.	2	.38	1	.29	1	.15	5	.17	0	0.00	0	0.00	0	0.00	0	0.00
Sociology	9	4.00	10	2.64	31	3.38	32	1.80	5	3.10	1	4.00	3	2.20	1	6.25
Totals	41	17.78	27	7.28	120	18.81	179	14.10	32	13.90	4	7.50	17	20.10	7	23.00
CULTURAL SUBJECTS																
Art	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Languages																
Classic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Modern	4	2.40	3	1.29	14	2.76	7	.65	1	.66	0	0.00	1	.87	0	0.00
English	7	2.10	1	.24	10	1.17	17	1.10	0	0.00	0	0.00	2	2.25	0	0.00
Astr'y Math.	8	2.38	4	.76	27	2.74	38	2.29	4	1.20	2	2.70	5	2.50	3	2.50
Music	0	0.00	3	.76	1	.08	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Totals	19	6.88	11	3.05	52	6.75	62	4.04	5	1.86	2	2.70	8	5.62	3	2.50
PROFESSIONAL																
Education	No Electives															
MISCELLANEOUS																
Phys. Tr'g.	No Electives															
Mil. Tr'g.	No Electives															

State Teachers Colleges, with 57.3 hours as the sum of the averages of hours elected, are in second position. In these institutions, the Social Science subjects were elected a total of 120 times, with an average of 18.81 hours. The Physical Science subjects were elected 86 times with the sum of the averages 15.99 hours, and the Biological Sciences were elected 70 times, with the sum of the averages 11.08 hours. Applied Sciences were elected a total of 9 times, the sum of the averages being 4.63 hours. In this type of institution, facilities for intensive training in the Social Sciences were very good. The facilities for breadth and intensiveness of training in the Biological Sciences were limited in many of these institutions. Attention is called to the elections that it seemed advisable to make in the Modern Languages and Mathematics in the Cultural classification. This was done because of the usually small number of Prescribed hours in these two subjects. Effective work in sciences require these tool subjects.

Protestant Colleges, which show 51.63 hours as the sum of the Averages in Table 10, offered exceptional facilities in electives in the Social sciences. Subjects in this classification occurred a total of 179 times, while the sum of the averages is 14.10 hours. This type of institution was also well equipped with regard to breadth and

intensiveness of training in the Physical sciences. Courses in this classification appear as electives 132 times. Geology which was elected 17 times appears very frequently in the curricula of this type. In the Biological classification difficulty was frequently experienced in securing sufficient intensiveness of training in many institutions. Breadth of training is evidenced, but the descriptive material regarding the subjects given, indicated that the nature of the courses was largely elementary. A total of 100 hours with the sum of the Averages as 0.78, is indicative of these conditions. In the Cultural classification, English was used as an Elective 17 times, for an average of 1.10 hours. The average is low, considering the fact that two institutions in this type did not show English as a Prescribed subject. Mathematics was used as an Elective 33 times, for an average of 2.29 hours.

The situation with regard to the Endowed Colleges is very similar to that of the Protestant Colleges. In the eight institutions, the Social sciences appear as electives a total of 17 times, with the sum of the average 20.1 hours ; Physical sciences, 11 times, with the sum of the averages 15.34 hours. The Biological sciences were elected a total of 5 times and the sum of the averages is 4.3 hours. Even **more** difficulty was experienced in securing breadth and intensiveness of training in this subject classification than

was true in the Protestant Colleges. The limited number of institutions in this type which were considered in the study might have some influence on these interpretations. In the Cultural subjects, it was deemed advisable to elect work in Modern Languages, English and Mathematics for a total of 8 times, and the sum of the averages of these electives is 5.62 hours. In the Applied Sciences, one course was majored in Home Economics in this type of institution, which gives an average of 4.5 hours when distributed over the eight institutions.

The four Municipal Colleges show 49.75 hours as the sum of the averages of all subjects. Subjects in the Social Science classification were elected a total of 7 times, with the sum of the averages as 23.00 hours. Biological sciences were elected a total of 5 times, with the sum of the averages as 14.25 hours. While the breadth of training in Biological subjects was limited, the intensiveness of training in Botany and Zoology was not limited. The Physical sciences were elected 3 times and the sum of the averages is 10.00 hours. Courses in Chemistry and Physics were generally adequate to meet the standards established in the study. Mathematics was elected in three of the four institutions. The total hours elected average 2.5 for the four institutions.

The four Polytechnical institutions offer exceptional facilities for training in the Applied Sciences, and a total

of three courses were elected in this classification, with the sum of the average 24.20 hours. Four courses were elected in the Social sciences, with the sum of the averages 7.5 hours. Physical science subjects occur a total of five times, with the sum of the average 7.20 hours. In the Biological sciences, Bacteriology and Hygiene and Botany were each elected once and the sum of the averages is 1.7 hours. This does not indicate the degree of availability of subjects in this classification in this type of institution. Under the discussion of Prescribed hours, attention has been called to the breadth and intensiveness of training in this type.

Catholic Colleges, of which there are eighteen considered in the study, show subjects in the Social science classification being elected a total of 32 times, with the sum of the averages 13.9 hours. The Physical science subjects were elected a total of 26 times, with the sum of the averages 14.69 hours. In the Biological sciences, subjects were elected 18 times with the sum of the averages as 7.37 hours. Each of the institutions in this type offered ample facilities for breadth and intensiveness of training in the Social sciences. No particular difficulty was experienced in securing electives in the Physical sciences subjects, except in three institutions. In the Biological sciences, however, the situation was entirely different. Not only are the subjects within this classification

generally very limited, but the intensiveness of the courses offered in those subjects are generally very rudimentary in this type of institution. Owing to the high standard of Prescribed hours in the Cultural classification maintained in this type of institution, Modern Language was elected once and Mathematics four times. The sum of the averages is 1.36 hours.

State Agricultural Colleges have as the sum of the averages of elective subjects 22.93 hours. In the 17 institutions of this type, Social science subjects were elected a total of 27 times. The sum of the averages is 7.23 hours. Subjects in Applied science were elected a total of three times and the sum of the averages is 5.29 hours. Subjects in the Biological and Physical sciences were used as electives 13 times in each instance. The sum of the averages is 3.75 and 3.61 hours, respectively. In the Cultural classification of subjects, Modern Languages, English, Mathematics and Music were elected a total of eleven times and the sum of the averages is 3.05 hours. The breadth and intensiveness of courses offered as electives by this type of institutions for the training of science teachers in secondary schools is equalled only by the State Universities. The number of times that subjects in each science classification are used as electives and the sum of the averages of hours is not an indication of their facilities. These values are low when compared with the figures in similar

subject classifications in other types of institutions,
but this is only true because of the very high standards
maintained in Prescribed hours of this type.

CHAPTER VI

DISTRIBUTION OF PRESCRIBED HOURS
IN SUBJECT CLASSIFICATIONS BY TYPE OF
INSTITUTIONS FOR 1910, 1920, 1930

The last objective of this study, which deals with changes and possible trends that may be developing in the curricula of educational institutions with regard to Science , cultural and professional subjects, will now be considered. In order to obtain this information it was necessary to assemble data for 1930 and from periods previous to 1930. Accordingly, the data was taken from catalogues of approximately the 1910, 1920 and 1930 periods as has been previously explained.

The distribution of prescribed hours in each subject classification for the periods 1910, 1920 and 1930 are shown in Tables 12 to 15 inclusive. They will be of interest to anyone wishing to know the method used. The column "Number" refers to the number of institutions in which each of the subjects was prescribed. The column "Average" has reference to the average hours prescribed, based upon the number of institutions in the study, and not upon the number giving the subject. Median is a position average. Range expresses the upper and lower limits of the number of hours prescribed by different institutions to a subject. In other words, one institution in a type might not prescribe any time in Botany,

TABLE 12

**A COMPARISON OF CREDITS PRESCRIBED IN SCIENCE
FOR GRADUATION IN NINE STATE UNIVERSITIES
FOR 1910 - 1920 - 1930.**

Sciences	1910				1920				1930			
	No.	Aver. Requir- ed	Median	Range	No.	Aver. Req'd.	Median	Range	No.	Aver. Req'd.	Median	Range
Biological:												
Anatomy	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Bact. & Hyg.	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	.66	.56	0-6
Botany	5	3.3	3.49	0-10	4	2.0	.89	0-5	3	2.3	.74	0-8
Entomology	0											
Physiology	3	1.6	.74	0-8	0				1	.77	.56	0-7
Zoology	3	1.2	.74	0-6	3	1.5	.74	0-5	4	2.1	.89	0-6
Physical:												
Chemistry	8	6.3	6.24	0-12	6	4.8	4.49	0-12	3	1.55	.74	0-5
Geology	2	1.2	4.64	0-8								
Physics	4	2.4	4.89	0-8	5	3.2	4.16	0-12	3	1.6	.74	0-6
Applied:												
Agriculture	1	.88	.99	0-8	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Engineering	1	.88	.99	0-8	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Home Econom.	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Social:												
Economics	1	.66	.56	0-6	4	2.9	.89	0-12	4	2.0	.89	0-6
History	5	2.66	4.24	0-6	8	5.4	6.74	0-8	7	3.6	4.24	0-6
Pol. Sci.	0				2	1.0	1.28	0-10	6	2.9	3.49	0-7
Phil. & Psych.	2	.77	.63	0-4	1	.48	.59	0-5	0			
Sociology	1	.66	.56	0-6	1	.70	.54	0-7	1	.51	.56	0-5

Continued over.

TABLE 12 Continued

Subject Sciences	1910			1920			1930		
	No.	Aver. Req.	Median	Range	No.	Aver. Req.	Median	Range	Aver. Req.
Art									
Languages									
Classic	2	1.1	.64	0-5	1	1.3	.89	0-12	0 0.00
Modern	7	11.0	12.49	0-20	8	10.7	12.99	0-16	8 9.2 10.49
English	9	8.1	8.74	0-10	9	9.0	8.99	6-12	9 8.5 8.74
Math.&Astry.	9	7.6	6.49	0-16	9	6.0	5.74	3-12	5 3.4 5.89
Music	0	0.0	0.00	0-0	0	0.0	0.00	0-0	0 0.00
Education	9	18.7	19.49	15-30	9	20.99	20.99	11-32	9 20.1 20.41
Physical Training	4	1.4	.89	0-6	1	.4	.99	0-4	7 2.7 4.13
Military Training	5	2.1	2.49	0-5	6	2.0	2.49	0-4	4 1.8 .89

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TABLE 13

**COMPARISON OF CREDITS IN SCIENCE PRESCRIBED FOR GRADUATION
IN FOUR STATE AGRICULTURAL AND MECHANICAL COLLEGES.**

IN 1910 - 1920 - 1930.

Sciences	1910				1920				1930			
	Aver. Req.	Median	Range	Aver. Req.	Median	Range	Aver. Req.	Median	Aver. Req.	Median	Range	
Biological												
Anatomy	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	7.5	.66	0-3	
Bact. & Hyg.	4.79	4.66	4-7	0.00	0.00	0-0	0.00	0.00	2.5	2.99	0-4	
Botany	5.5	7.99	0-9	3.7	4.99	0-10	0.00	0.00	7.7	6.49	4-15	
Entomology	2.5	4.0	0-4	0.00	0.00	0-0	0.00	0.00	1.7	2.99	0-4	
Physiology	0.5	.66	0-2	2.7	3.99	0-7	0.00	0.00	.5	.66	0-2	
Zoology	5.0	5.49	4-6	3.0	4.99	0-7	0.00	0.00	1.7	2.99	0-4	
Physical												
Chemistry	9.7	10.99	5-13	8.2	9.99	0-18	0.00	0.00	11.0	11.0	10-12	
Geology	10.2	3.99	0-5	0.00	0.00	0-0	0.00	0.00	.75	.66	0-3	
Physics	6.0	5.99	5-8	4.0	4.99	0-7	0.00	0.00	5.0	4.99	4-6	
Applied												
Agriculture	38.0	44.90	0-72	43.7	32.99	0-44	0.00	0.00	45.0	50.99	31-59	
Engineering	2.0	2.99	0-5	0.00	0.00	0-0	0.00	0.00	0.00	0.00	0-0	
Home Econ.	0.00	0.00	0-0	4.5	16.99	0-18	0.00	0.00	0.00	0.00	0-0	
Social												
Economics	2.5	2.99	0-38	3.5	3.56	0-7	0.00	0.00	7.5	6.49	0-11	
History	3.25	4.99	0-8	5.0	6.99	4-10	0.00	0.00	.5	.66	0-2	
Pol. Sci.	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0.00	0.00	0-0	
Phil. & Psy.	1.25	.66	0-5	0.00	0.00	0-0	0.00	0.00	0.00	0.00	0-0	
Sociology	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0.00	0.00	0-0	

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TABLE 13 **Continued**

Cultural Subjects	1910			1920			1930		
	Aver. Req.	Median	Range	Aver. Req.	Median	Range	Aver. Req.	Median	Range
Art	2.0	1.99	0-6	2.5	.66	0-10	0.00	0.00	0-0
Languages									
Classic	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0-0
Modern	1.30	13.99	0-20	8.3	14.99	0-18	0.00	0.00	0-0
English	10.00	9.99	8-16	9.7	9.99	6-15	7.7	8.49	6-9
Math.& Ast'y	6.5	5.99	5-10	8.3	6.49	4-15	3.5	4.49	0-6
Professional									
Education	14.2	12.99	12-20	16.7	17.99	15-18	18.7	18.49	15-24
Physical Tr.	1.0	.66	0-4	2.0	1.99	0-6	.75	.66	0-3
Military Tr.	4.0	4.0	4-0	3.0	3.99	0-6	4.5	4.66	4-6

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TABLE 14

**COMPARISON OF PRESCRIBED CREDITS FOR GRADUATION
IN FOUR STATE TEACHERS COLLEGES IN SCIENCES**

FOR 1910 - 1920 - 1930

Sciences	1910			1920			1930		
	Aver. No. Req.	Median Range	No. Required	Average No. Required	Median Range	No. Required	Average No. Required	Median Range	Range
Biological									
Anatomy	0	0.00	0	0.00	0.00	0	0.00	0.00	0-0
Bact. & Hyg.	0	0.00	0	0.00	0.00	0	3.5	1.7	0-4
Botany	0	0.00	0	5.0	2.5	0	4.0	1.0	0-4
Entomology	0	0.00	0	0.00	0.00	0	0.00	0.00	0-0
Physiology	0	0.00	0	0.00	0.00	0	4.0	1.0	0-4
Zoology	0	0.00	0	0.00	0.00	0	4.0	1.0	0-4
Physical									
Chemistry	0	0.00	0	5.5	2.75	0	10.5	5.25	0-13
Geology	0	0.00	0	0.00	0.00	0	0.00	0.00	0-0
Physics	0	0.00	0	6.5	3.25	0	7.5	3.7	0-10
Applied									
Agriculture	0	0.00	0	8.0	2.0	0	0.00	0.00	0-0
Engineering	0	0.00	0	0.00	0.00	0	0.00	0.00	0-0
Home Econom.	0	0.00	0	0.00	0.00	0	0.00	0.00	0-0
Social									
Economics	0	0.00	0	0.00	0.00	0	3.0	.75	0-3
History	0	0.00	0	9.5	4.75	0	5.3	4.0	0-8
Pol. Sci.	0	0.00	0	2.5	2.75	0	0.00	0.00	0-0
Phil. & Psych.	0	0.00	0	7.0	1.7	0	0.00	0.00	0-0
Sociology	0	0.00	0	4.0	2.0	0	4.0	2.0	0-5

Continued over.

TABLE 14

	1910	1920	1930							
Cultural	No.	Average Required	Median Range	No.	Average Required	Median Range	1930			
Art	0	1.0	.25	.66	0-1	0	2.0	1.7	3.99	0-4
Languages										
Classic	0	12.0	3.0	.66	0-12	0	10.5	5.25	5.99	0-11
Modern	0	7.7	7.7	8.99	2-12	0	6.5	6.5	8.0	3-9
English	0	6.5	3.25	4.99	0-8	0	0.0	0.0	0.00	0-0
Math.& Astr'y										
Education	0	29.25	29.25	30.99	27-32	0	24.0	24.0	23.45	22-27
Physical Tr'g	0	4.0	4.0	5.49	4-6	0	10.37	7.7	4.99	0-15

TABLE 15

COMPARISON OF PRESCRIBED CREDITS IN SCIENCE
FOR GRADUATION IN EIGHT PRESTANT COLLEGES
in 1910 - 1920 - 1930.

1910			1920			1930		
Sciences	No.	Aver. Req.	Med-ian	Range	No.	Aver. Req.	Med-ian	Range
Biological								
Anatomy	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Bact.&Hyg.	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Botany	0	.75	.56	0-6	0	3.0	6.99	0-8
Entomology	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Physiology	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Zoology	0	1.5	.59	0-6	0	1.2	.66	0-5
Physical								
Chemistry	0	6.5	6.59	0-12	0	4.7	6.99	0-8
Geology	0	0.00	0.00	0-0	0	0.0	0.00	0-0
Physics	0	1.2	.66	0-6	0	2.7	3.99	0-6
Applied								
Agricul.	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Engineer.	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Home Econ.	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Social								
Economics	0	0.00	0.00	0-0	0	.5	.56	0-4
History	0	3.8	6.66	0-10	0	4.2	6.33	0-8
Pol. Sci.	0	.75	.56	0-6	0	1.2	.66	0-6
Phil.&Psych	0	7.2	6.74	0-14	0	1.6	.79	0-6
Sociology	0	.50	.56	0-4	0	1.0	.66	0-4

Continued over.

TABLE 15 **Continued**

		1910		1920		1930	
Cultural		Average Required	Med- ian	Range	Average Required	Med- ian	Range
Art							
Languages							
Classic	7.3	6.74	0-30	.7	.56	0.00	0-0
Modern	12.0	12.66	0-20	13.7	12.99	15.99	0-24
English	12.7	12.49	6-24	10.7	10.74	10.49	6-15
Math.&Astr'y	11.00	6.74	0-8	3.5	6.99	6.20	0-6
Music	0.00	0.00	0-0	0.00	0.00	0.00	0-0
Professional							
Education	16.0	15.66	12-24	16.9	18.99	20.20	15-20
Physical Tr.	3.7	4.49	0-8	3.2	4.99	4.28	2-4
Military Tr.	0.00	0.00	0-0	0.00	0.00	0.00	0-0

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while another institution might prescribe ten hours to Botany. The Range would be 0 - 10 in that case.

Tables 12 to 15 are consolidated in Tables 16, 17 and 18 for the purpose of consideration and interpretation. The data contained in these tables also make it possible to observe changes and trends that are developing with regard to the prescribed hours in each Science subject in the different Science classifications, in each type of institution.

BIOLOGICAL SCIENCES

State Universities reduce the prescribed hours from 6.2 in 1910 to 3.5 hours in 1920, and increase it again in 1930 to 5.2 hours, which is a net reduction of one hour.

Agricultural Colleges reduce the prescribed hours from 18.2 in 1910 to 9.5 in 1920, and raise it again to 15 hours in 1930; a net reduction of 3.2 hours.

The extreme reduction in both of these State controlled institutions during the 1920 period is probably a reflection of World War influences and activities.

State Teachers Colleges increase the prescribed hours from 2.5 in 1920 to 4.7 hours in 1930, or a net increase of 2.2 hours.

Protestant Colleges show an increase from 2.2 hours prescribed in 1910 to 4.2 hours in 1920 and then reduce to 0.0

TABLE 16

DISTRIBUTION OF PRESCRIBED AND ELECTIVE HOURS
IN SCIENCE, CULTURAL AND PROFESSIONAL SUBJECTS
IN DIFFERENT TYPES OF INSTITUTIONS

FOR 1910

REQUIRED

Type	No.	Biolog.	Physical	Applied	Social	Science	Cultural	Profess'l	Phys.	Tr.	Mil.	Tr.
						Totals						
State Univ.	9	6.2	10.1	1.7	4.1	22.1	27.9	19.8	1.4	2.1		
State Agri'l	4	18.2	8.0	18.5	7.0	51.7	31.5	14.2	1.0	4.0		
State Teacher	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Protestant	8	2.2	7.7	0.0	14.3	24.2	38.1	16.1	3.7	0.0		

ELECTIVE

State Univ.	9	4.2	10.2	0.0	27.0	41.4	3.4	0.0	0.0	0.0		
State Agri'l.	4	2.5	1.2	27.5	2.5	33.7	0.5	0.0	0.0	0.0		
State Teachers	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Protestant	8	14.5	18.5	0.0	12.3	45.3	1.0	0.0	0.0	0.0		

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TABLE 17

**DISTRIBUTION OF PRESCRIBED AND ELECTIVE HOURS
IN SCIENCE, CULTURAL AND PROFESSIONAL SUBJECTS
IN DIFFERENT TYPES OF INSTITUTIONS**

FOR 1920

REQUIRED

Type	No.	Biolog.	Physical	Applied	Social	Science	Cultural	Profess'l	Phys.Tr.	Mil.Tr.
						Totals				
State Univ.	9	3.5	8.0	0.0	11.4	22.8	27.2	20.9	.44	2.0
State Agri'1	4	9.5	12.2	39.2	8.5	69.4	28.7	16.7	2.0	3.0
State Teacher	4	2.5	6.0	2.0	11.2	21.7	14.2	29.2	5.0	0.0
Protestant Col.	8	4.2	7.5	0.0	8.6	20.3	28.7	16.8	3.2	0.0

ELECTIVE

State Univ.	9	9.1	20.3	0.0	17.3	46.7	8.0	0.0	0.0	0.0
State Agri'1	4	4.2	5.5	12.5	12.5	34.7	2.7	0.0	0.0	0.0
State Teacher	4	10.7	23.5	0.0	14.5	48.7	7.5	0.0	0.0	0.0
Protestant	8	13.3	19.8	0.0	16.7	49.8	3.25	0.0	0.0	0.0

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TABLE 18

DISTRIBUTION OF PRESCRIBED AND ELECTIVE HOURS
IN SCIENCE, CULTURAL AND PROFESSIONAL SUBJECTS
IN DIFFERENT TYPES OF INSTITUTIONS

FOR 1930

REQUIRED

Type	No.	Biolog.	Physical	Applied	Social	Science	Cultural	Profess'l	Phys.	Tr.	Mil.	TR.
												Totals
State Univ.	9	5.2	3.0	0.0	8.3	16.5	21.2	21.2	2.7			15.7
State Agric'l	4	15.0	16.7	41.0	6.2	78.9	11.2	18.7	.75			4.5
State Teacher	4	4.7	9.0	0.0	6.7	20.4	13.5	24.0	4.0			0.0
Protestant	8	0.0	5.0	0.0	13.2	18.2	27.3	18.8	3.7			0.0

ELECTIVE

State Univ.	9	12.0	21.6	0.0	19.0	52.6	10.7	0.0	0.0			0.0
State Agric'l	4	1.2	4.0	3.7	5.0	13.9	0.0	0.0	0.0			0.0
State Teacher	4	5.2	14.0	7.5	12.7	39.4	3.2	0.0	0.5			0.0
Protestant	8	14.6	24.6	0.0	5.8	45.0	3.1	0.0	0.0			0.0

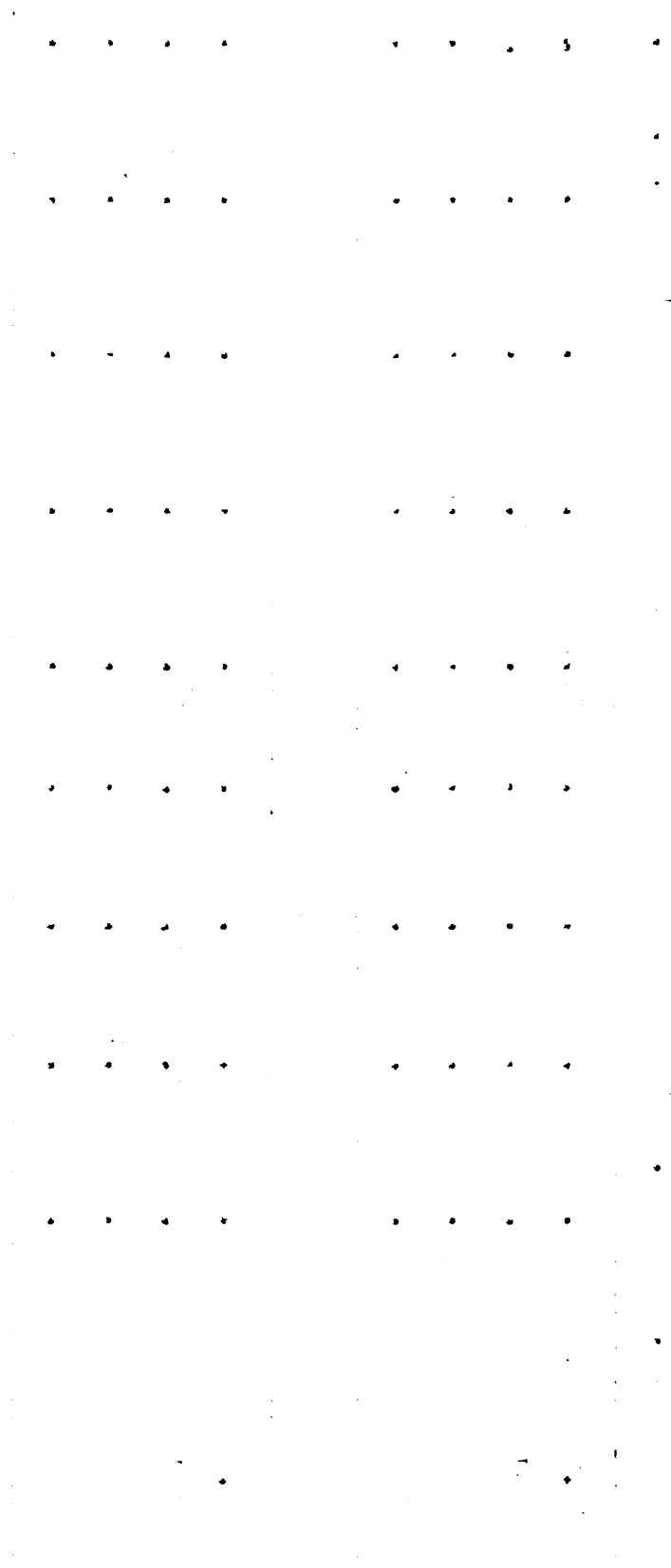
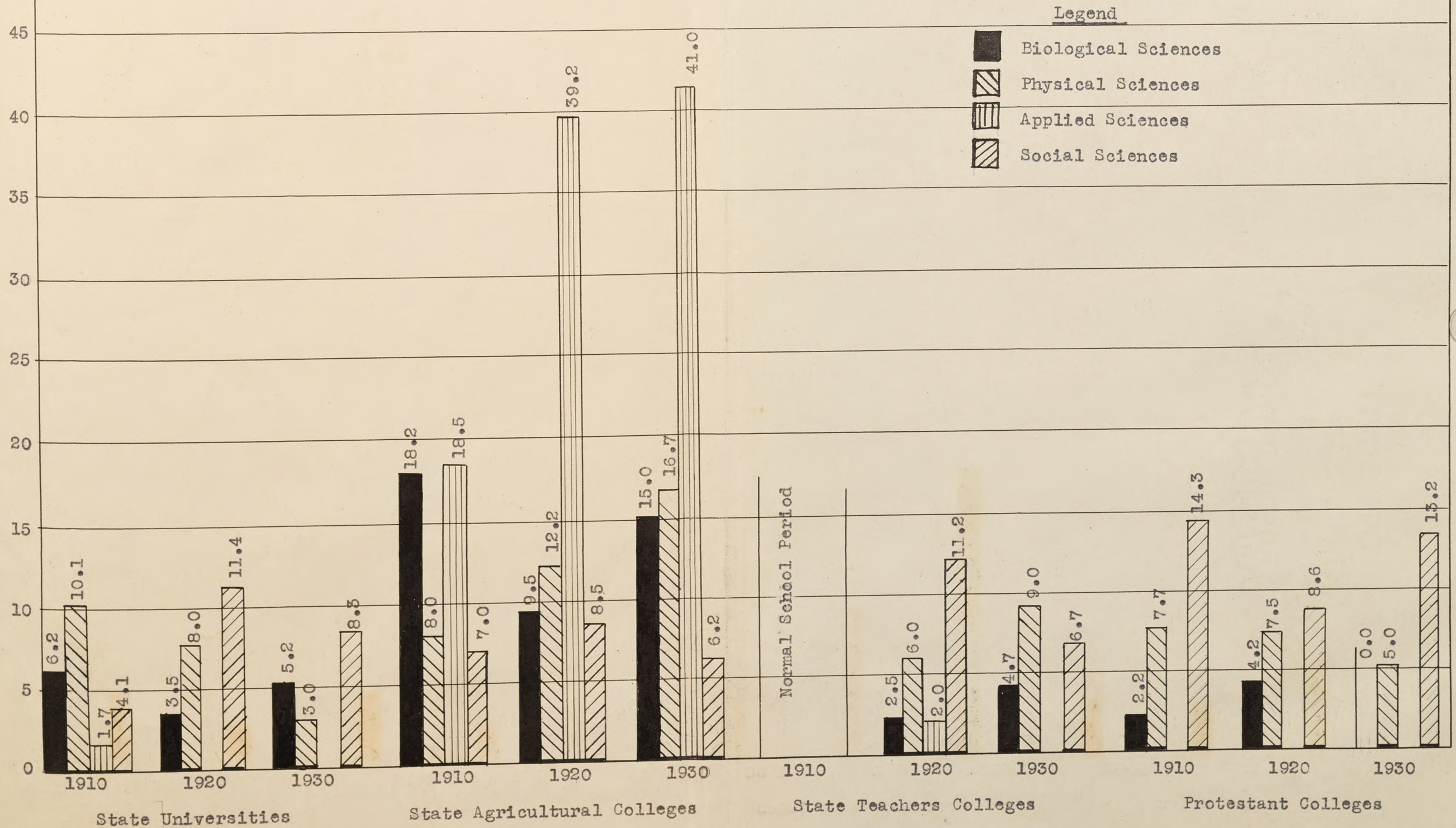


Figure III
Distribution of Prescribed Hours in Science
Subjects for 1910, 1920, 1930.



hours in 1930, or a net loss of 2.3 hours.

PHYSICAL SCIENCES

State Universities reduce prescribed hours in this science from 10.1 in 1910 to 8.0 hours in 1920 to 3.0 hours in 1930, a total reduction of 7.1 hours in the twenty years.

State Agricultural Colleges increase the prescribed hours in the Physical Sciences from 8.0 hours in 1910, to 12.2 in 1920, to 16.7 hours in 1930. This increase is largely due to increases in the subject of Chemistry.

State Teachers Colleges increase the number of hours from 6.0 in 1920 to 9.0 in 1930.

Protestant Colleges decrease the prescribed hours in these sciences from 7.7 in 1910 to 7.5 hours in 1920, to 5.0 hours in 1930; a total decrease of 2.7 hours.

APPLIED SCIENCES.

State Universities show an average of 1.7 hours prescribed in Applied Science in 1910 and none thereafter. Applied Science was prescribed in but one school in this type of institutions, and that institution discontinued it after 1910.

State Agricultural Colleges show a steady increase in the prescribed hours from 13.5 hours in 1910, to 39.2 hours in 1920, to 41.0 hours in 1930.

State Teachers Colleges prescribe an average of 2.3 hours

in Applied Sciences in 1920, but none thereafter.

Protestant Colleges do not prescribe any work in these Sciences, except where courses in Domestic Science are undertaken. In this part of the study it just happened that in the rotation of schools and subjects which was used to decide upon the outline of the courses, no domestic science courses occurred.

SOCIAL SCIENCES.

State Universities increase prescribed hours in these sciences from 4.1 in 1910, to 11.4 in 1920, and then reduce the hours to 8.3 in 1930.

State Agricultural Colleges increase the prescribed hours in these sciences from 7.0 in 1910 to 8.5 in 1920 and then reduce them to 6.2 hours in 1930; a net loss of 1.8 hours.

State Teachers Colleges reduce the prescribed hours from 11.2 hours in 1920 to 6.7 hours in 1930.

Protestant Colleges decrease the prescribed hours from 14.3 in 1910 to 8.6 in 1920, and then increase them to 13.2 in 1930, which is a net loss of 1.3 hours.

There is a trend toward lowering the prescribed hours in Biological Sciences, and Physical Sciences in all types of institutions, excepting the State Agricultural Colleges. In this type the trend is upward in prescribed hours. In the Social Sciences the trend is upward in all types of institutions excepting in the Agricultural Colleges. In this type

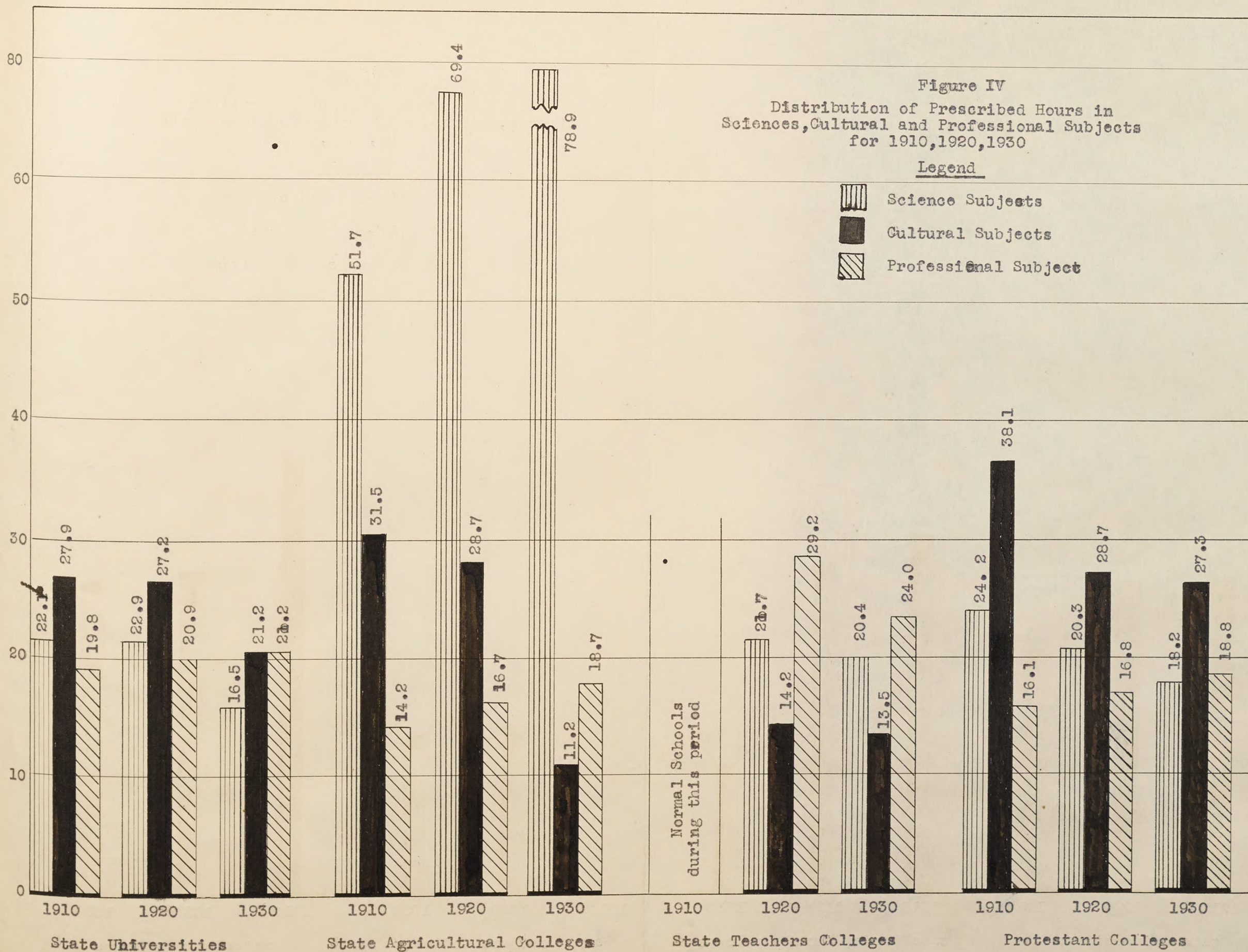
the trend is downward. The net loss in prescribed hours in the social sciences that is indicated in Protestant institutions is not sufficient to call a trend.

FigureIII, which follows Tables, 16, 17 and 18 gives a graphic illustration of these facts.

Figure IV
Distribution of Prescribed Hours in
Sciences, Cultural and Professional Subjects
for 1910, 1920, 1930

Legend

-  Science Subjects
-  Cultural Subjects
-  Professional Subject



CHAPTER VIIDISTRIBUTION OF ELECTIVE HOURS
IN SUBJECT CLASSIFICATIONS IN TYPES OF
INSTITUTIONS FOR 1910, 1920, 1930

The method used in the distribution of the elective hours in each subject classification for 1910, 1920 and 1930 is the same as is described under "Method" for 1930 data. In Tables 19 and 22 are shown the same factors for elective hours as are shown in Tables 12 to 15 inclusive, with regard to prescribed hours. While it is a self-evident fact that the elective hours must make up the balance of the total requirements after the prescribed hours have been met, the writer deems it advisable to exhibit at this point the distribution of those elective hours. To avoid confusion, it is necessary to explain what might otherwise appear to be serious discrepancies.

Botany and Zoology, being correlative subjects in secondary school curricula, made it necessary, in selecting either as a major, to use the other as a minor. Similar situations arose in the case of Chemistry and Physics and History and Political Science.

In making up the course outlines, every effort was made to distribute the frequency with which subjects were used as a major, over as many sciences in any one decade period as possible; but owing to information carried in the

.

TABLE 19

**COMPARISON OF ELECTIVE CREDITS ASSIGNED TOWARD GRADUATION
IN NINE STATE UNIVERSITIES IN 1910 - 1920 - 1930**

Sciences	1910			1920			1930					
	No.	Aver. Req.	Med-ian	Range	No.	Aver. Req.	Med-ian	Range	No.	Aver. Req.	Med-ian	Range
Biological												
Anatomy	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Bact.& Hyg.	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Botany	1	2.2	.56	0-20	6	9.1	5.24	0-24	5	5.6	2.99	0-30
Entomology	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	.44	1.12	0-4
Physiology	0	0.00	0.00	0-0	0	0.00	0.00	0-0	1	.22	1.12	0-2
Zoology	2	2.0	.63	0-10	6	7.5	5.74	0-14	3	4.1	1.49	0-18
Physical												
Chemistry	7	3.1	5.49	0-16	5	8.0	5.49	0-24	7	10.8	8.49	0-32
Geology	2	1.6	.62	0-8	0	0.00	0.00	0-0	1	.44	1.28	0-4
Physics	5	5.5	4.82	0-10	5	4.8	4.49	0-16	7	10.7	8.49	0-30
Applied												
Agriculture	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Engineering	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Home Econom.	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Social												
Economics	6	5.6	3.99	0-8	4	2.1	.89	0-7	4	5.6	1.79	0-30
History	8	11.6	7.49	0-24	6	7.6	4.99	0-24	4	3.0	1.79	0-11
Pol. Sci.	8	7.0	5.49	0-16	7	5.0	5.37	0-12	5	3.2	4.33	0-8
Phil.&Psy.	2	2.2	5.82	0-16	0	0.0	0.00	0-0	2	.9	1.28	0-4
Sociology	5	2.4	3.24	0-6	5	2.5	3.49	0-6	4	6.0	1.83	0-30

Continued over.

TABLE 19 Continued.

1930

1920

1910

Cultural Subjects	No.	Aver. Req.	Median	Range	No.	Aver. Req.	Median	Range	No.	Aver. Req.	Median	Range
Art	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Languages	2	2.4	.63	0-12	4	4.4	.89	0-16	2	2.6	1.28	0-16
Classic	1	.44	.55	0-4	2	1.1	.64	0-7	5	3.4	4.99	0-8
Modern	1	.55	.55	0-8	4	2.5	.89	0-8	6	4.6	4.99	0-16
English	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Math. & Ast'y												
Music												

Professional Education None Elective

Physical Tr. " "

Military Tr. " "

TABLE 20

**COMPARISON OF ELECTIVE CREDITS ASSIGNED TOWARD GRADUATION
IN FOUR STATE AGRICULTURAL AND MECHANICAL ARTS COLLEGES
FOR 1910 - 1920 - 1930.**

Sciences	1910				1920				1930			
	No.	Average Required	Med- ian	Range	No.	Average Required	Med- ian	Range	No.	Average Required	Med- ian	Range
Biological												
Anatomy	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Bact.&Hyg.	0	0.00	0.00	0-0	0	5.0	1.25	.66	0	0.00	0.00	0-0
Botany	0	5.0	1.25	0-5	0	4.5	2.25	3.99	0	0.00	0.00	0-0
Entomology	0	5.0	1.25	0-5	0	3.0	.75	.66	0	0.00	0.00	0-0
Physiology	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	5.0	1.25	.66
Zoology	0	0.00	0.00	0-0	0	3.5	1.75	1.99	0	0.00	0.00	0-0
Physical												
Chemistry	0	0.00	0.00	0-0	0	10.0	2.5	6.49	0	6.0	3.0	3.99
Geology	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Physics	0	5.0	1.25	0-5	0	5.0	1.25	.66	0	4.0	1.0	.66
Applied												
Agriculture	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Engineering	0	0.00	0.00	0-0	0	4.0	2.0	1.99	0	0.00	0.00	0-0
Home Econom.	0	38.0	9.5	0-38	0	42.0	10.5	.66	0	0.00	0.00	0-0
Social												
Economics	0	0.00	0.00	0-0	0	4.0	1.0	2.99	0	0.00	0.00	0-0
History	0	5.0	1.25	0-5	0	4.6	3.5	3.99	0	5.0	2.5	2.99
Pol. Sci.	0	5.0	1.25	0-5	0	8.5	4.25	7.99	0	0.00	0.00	0-0
Phil.& Psy.	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Sociology	0	0.00	0.00	0-0	0	5.5	2.75	4.99	0	5.0	2.5	2.99

Continued over.

TABLE 20 Continued

		1910			1920			1930				
Cultural Subjects	No.	Aver. Req.	Med-ian	Range	No.	Aver. Req.	Med-ian	Range	No.	Aver. Req.	Med-ian	Range
Art												
Languages	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Classic	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Modern	2	.5	.66	0-2	0	0.00	0.00	0-0	0.	0.00	0.00	0-0
English	0	0.00	0.00	0-0	0	1.0	.66	0-8	0	0.00	0.00	0-0
Mathematics	0	0.00	0.00	0-0	0	.75	.66	0-3	0	0.00	0.00	0-0
Music	0	0.00	0.00	0-0	0	0.00	0.00	0-0	0	0.00	0.00	0-0

TABLE 21

**COMPARISON OF ELECTIVE CREDITS ASSIGNED TOWARD GRADUATION
IN FOUR STATE TEACHERS COLLEGES IN 1910 - 1920 - 1930**

Sciences	1920				1930			
	No.	Aver. Req.	Med- ian	Range	No.	Aver. Req.	Med- ian	Range
None								
Biological								
Anatomy	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Bact. & Hyg.	0	0.00	0.00	0-0	0	1.25	4.99	0-5
Botany	0	4.5	2.99	0-15	0	1.25	5.99	0-5
Entomology	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Physiology	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Zoology	0	6.25	.66	0-25	0	2.75	6.99	0-6
Physical								
Chemistry	0	13.5	9.99	0-28	0	9.25	4.99	4-24
Physics	0	8.75	9.99	0-20	0	4.75	5.49	0-10
Geology	0	1.25	1.99	0-3	0	0.00	0.00	0-0
Applied								
Agriculture	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Engineering	0	0.00	0.00	0-0	0	0.00	0.00	0-0
Home Economics	0	0.00	0.00	0-0	0	7.5	.66	0-30
Social								
Economics	0	1.0	.66	0-4	0	0.00	0.00	0.00
History	0	8.75	7.99	0-24	0	1.5	.66	0-6
Pol. Sci.	0	3.5	4.99	0-5	0	2.5	2.49	0-5
Phil. & Psych.	0	0.00	0.00	0-0	0	1.25	.66	0-5
Sociology	0	1.25	.66	0-5	0	7.5	.66	0-30

Continued over.

TABLE 21 **Continued.**

		1910			1920			1930		
Cultural		No.	Aver. Req.	Med- ian	Range	No.	Aver. Req.	Med- ian	Range	
Art		None								
Languages										
Classic		0	0.00	0.00	0-0	0	0.00	0.00	0-0	
Modern		0	0.00	0.00	0-0	0	1.5	.66	0-6	
English		0	2.75	3.99	0-7	0	1.75	5.99	0-7	
Math. & Astr'y		0	4.75	5.49	0-6	0	1.5	.66	0-6	
Music		0	0.00	0.00	0-0	0	0.00	0.00	0-0	

TABLE 22

**COMPARISON OF ELECTIVE CREDITS ASSIGNED TOWARD
GRADUATION IN EIGHT PROTESTANT COLLEGES
IN 1910 - 1920 - 1930.**

	1910			1920			1930		
Sciences	Aver. Req.	Med- ian	Range	Aver. Req.	Med- ian	Range	Aver. Req.	Med- ian	Range
Biological									
Anatomy	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0-0
Bact. & Hyg.	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0-0
Botany	7.6	4.99	0-20	7.25	5.99	0-20	8.5	5.99	0-24
Entomology	0.0	0.00	0-0	0.00	0.00	0-0	.37	.57	0-3
Physiology	0.0	0.00	0-0	0.00	0.00	0-0	.50	.57	0-4
Zoology	6.85	11.99	0-22	6.1	6.66	0-18	5.25	4.99	0-20
Physical									
Chemistry	10.6	8.99	0-24	10.1	11.99	0-24	13.87	11.99	0-32
Geology	.5	.56	0-4	2.25	3.99	0-6	.5	.57	0-4
Physics	7.37	5.99	4-18	7.5	7.99	0-18	10.25	11.99	0-24
Applied									
Agriculture	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0-0
Engineering	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0-0
Home Econom.	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0-0
Social									
Economics	2.2	3.99	0-5	1.25	6.66	0-6	1.37	.79	0-4
History	5.0	1.99	0-24	8.65	7.99	0-25	2.25	.79	0-8
Pol. Sci.	5.2	3.99	0-24	5.75	6.49	0-12	1.12	.66	0-5
Phil. & Psych.	0.00	0.00	0-0	0.00	0.00	0-0	0.00	0.00	0-0
Sociology	0.00	0.00	0-0	1.10	.66	0-6	1.12	.79	0-4

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sources of data, it was not always possible to get uniform distribution. Consequently, peaks, so to speak, developed in one or another decade period for the sciences. For example, in 1920, there were three majors in Botany selected from as many institutions, but only one in 1910 and one in 1930. Therefore, Botany shows extremely high average hours and median, with a high range in 1920. With this explanation and by using Tables 12 to 15 in conjunction with Tables 16, 17 and 18 what at first sight might be termed discrepancies are only apparent discrepancies. Figure IV aids materially in interpreting the data in these Tables.

With this explanation regarding these three combinations of majors and minors, it seems advisable to discuss in the summary only those features which involve the electives necessary to complete the requirements for graduation. The free electives were selected in such a way as to give the student as broad and thorough a training as possible, in Sciences. However, not all of the free electives were assigned to science subjects as was stated earlier in the study. Where the hours in English, Mathematics or Modern Languages were below a predetermined minimum, free elective hours were assigned to that subject, whichever it might be. At the same time, wherever possible, the courses were so outlined that training in a third teaching subject, as is

so often required of secondary teachers, was given.

SUMMARY OF ELECTIVES

Entomology and Physiology did not appear as possible electives in State Universities until 1930 and then in only one institution.

Geology shows an increase in median only, with a decrease in number, average and range.

State Universities, likewise, indicate an increase in the case of Economics, owing to the fact that it seemed necessary to major in that subject in one institution.

Electives in Philosophy and Psychology show a decrease from 2.2 average hours in 1910 to .9 hours in 1930.

Sociology, like Economics, was used as a major in one institution in 1930. However, there is indicated a definite trend upward in the availability of this science as an elective in State Universities. In 1910 the average hours were 2.4 while in 1930 there were 6.0 hours.

Entomology was available as an elective in Agricultural Colleges in each of the three decades and was used for the 1910 and 1920 data but was not needed in the course outlined for 1930. Physiology was available in each decade but was used only in 1930.

The average hours available in Agricultural Colleges for electives in Economics were 4.0 hours in 1920 only.

Philosophy and Psychology do not appear in any decade.

Sociology averages 2.75 hours in 1920 and 2.5 hours in 1930.

State Teachers Colleges do not have Entomology or Physiology available as electives in 1920 or 1930. Economics are available in 1920 only. Sociology averages 1.25 hours in 1920 and 7.5 hours in 1930, which can not be termed a trend.

Protestant Colleges have both Entomology and Physiology available as electives for the first time in 1930. Geology is available in all three decades. Economics decreases in average hours from 2.2 in 1910 to 1.37 in 1930. Sociology appears first in 1920 and remains constant in 1930.

Bacteriology is available in 1920 in Agricultural Colleges and in 1930 in State Teachers Colleges.

The data relative to Cultural subjects in Tables 12 to 15 indicates that there is a definite trend upward in Modern Languages, English and Mathematics. This fact is probably due to recommendations accompanying Science Majors and Minors, and to the grouping of subjects used by many institutions with regard to both prescribed and elective courses.

CHAPTER VIII

CHANGES AND APPARENT TRENDS IN CURRICULA SINCE 1910

This objective was inserted for consideration in order to satisfy what would be a perfectly natural inquiry in any one's mind. The inquiry might take any one of several forms, but essentially it would have as its purpose the desire to ascertain whether or not there have been changes in curricula, and to what extent, and whether or not there are trends developing. If those changes are general in all types of institutions, or if they are confined to certain types and are of a uniformly permanent nature, then they can be called trends. If trends are developing, it is justifiable to conclude that all types, or some types, of institutions are adjusting their curricula to the changing conditions of life. Trends are evident in the case of total minimum requirements. In those types of institutions that are considered there appears to be a leveling out of the high peaks that were maintained by some types of institutions two decades ago. A trend in the direction of more uniform requirements of prescribed hours between different types is also witnessed. Within types of institutions, there are numerous and marked changes which indicate that trends are developing toward a greater number of prescribed hours in Professional subjects

and toward a lower number of hours in the Cultural subjects and Sciences. This is true of State Universities, State Agricultural Colleges and Protestant Colleges. State Teachers Colleges, however, are lowering the number of hours in all subjects.

The prescribed hours in the institutions considered were determined by following the instructions that were given in the catalogues. The same procedure with regard to the distribution was followed as was applied to the distribution of hours and subjects for the 1930 period. This distribution of prescribed and elective hours and subjects was made for each type under consideration and for each decade period 1910, 1920 and 1930.

The institutions considered are nine State Universities, four State Agricultural Colleges, four State Teachers Colleges, and eight Protestant institutions. Catalogues for these four types, and for the individual institutions in each type, were found, in some instances, in the library files at Michigan State College and University of Michigan. In other instances they were obtained through the Inter Library Loan. This latter statement applies to most of the catalogues of 1910. It was found impossible to include more types in the consideration or more institutions in those types which are considered, because of the impossibility of getting publications for the 1910 period. Another factor which reduced the

number for consideration was the inadequacy of information regarding curricula in many institutions and even in some types of institutions. Recent catalogues are very carefully written and compiled, with few exceptions, and are a credit to the schools publishing them. The fact that the institutions considered are widely distributed and are quite representative of the types of institutions, compensates in a measure for the limited numbers.

TOTAL MINIMUM REQUIREMENTS

The nine State Universities have reduced their total minimum requirements from 124.2 hours in 1910 to 123.6 hours in 1930. In 1920 the average was 125 hours. Although this change is slight, nevertheless it is indicative since it is an average of nine institutions.

State Agricultural Colleges show a steady trend downward from 145.4 hours in 1910 to 142.5 hours in 1920 and 133.0 hours in 1930. This is averaged over four institutions and indicates a definite trend.

The data relative to State Teachers Colleges were taken for 1920 and 1930 only, since previous to 1919 the majority of this type of institutions were not offering four years of collegiate training. The average of the total requirements in four institutions was reduced from 125 hours in 1920 to 122.5 hours in 1930. While there are but two periods con-

sidered in this data, the change is definite enough to indicate that a trend similar to the above trends is developing.

Total minimum requirements in the eight Protestant Colleges do not show any material change, being 121.7 in 1910 and 121.5 in 1930. However, there is a change toward lower total requirements.

These facts indicate that there is a trend toward a more uniform number of hours in total requirements for graduation in these types of institutions.

PRESCRIBED HOURS

The average prescribed hours in Sciences are reduced by State Universities from 22.9 in 1910 to 16.7 in 1930. In the so-called Cultural subjects, there is a reduction from 27.9 in 1910 to 21.2 in 1930. Education is increased from 19.7 hours to 20.1 hours over this same period of time.

State Agricultural Colleges increase the prescribed hours in Sciences from 65 in 1910 to 69.5 in 1920; and decrease to 65.7 in 1930, a slight increase over the whole period. The large increase in 1920 is probably explained by the changes necessitated by the large amount of rehabilitation activities following the World War. In the Cultural subjects these institutions show a very marked decrease. In 1910 they prescribed 31.5 hours, while in 1930 they prescribed 11.2

hours. Education increased from 14.2 prescribed hours, to 18.7 hours from 1910 to 1930.

State Teachers Colleges reduce the prescribed hours in Sciences from 22.5 hours in 1920 to 20.5 hours in 1930. Cultural subjects are reduced also from 14.2 hours in 1920 to 13.5 in 1930. Prescribed hours in Education indicate the most pronounced change. They are reduced from 29.2 in 1920 to 24.0 in 1930. This change could be expected, however, since the whole curricular construction had to be adjusted to a different purpose, as well as to a longer period of training.

Protestant Colleges have reduced the prescribed hours in Sciences very steadily from 24.37 hours in 1910 to 20.4 in 1920, to 18.25 hours in 1930. The prescribed hours in Cultural subjects have been reduced also from 33.1 in 1910 to 27.3 hours in 1930. Education increases in prescribed hours from 16.1 hours in 1910 to 18.8 hours in 1930.

These data show a definite trend toward lowering the prescribed hours in Sciences in each of these four types of institutions. Likewise, the Cultural subjects show a similar trend in all types. In the Professional subject, Education, the trend is upward in prescribed hours in all types of institutions, except in State Teachers Colleges.

ELECTIVE HOURS

State Universities increase Elective hours in Sciences from an average of 41.6 in 1910, to an average of 50.4 hours in 1930. Cultural subjects are increased from 3.44 hours in 1910 to 10.7 hours in 1930. The professional subject, Education, was considered only as a prescribed subject, therefore, it does not enter into the consideration of Electives, in any of the types of institutions.

State Agricultural Colleges have decreased the Electives in Sciences from 33.7 hours in 1910 to 26.5 hours in 1930. In the Cultural subjects in 1910 there is an average of .5 hours, in 1920, 2.7 hours and .0 hours in 1930.

State Teachers Colleges show a decrease in elective hours from 43.7 hours in 1920 to 39.5 hours in 1930, for Sciences. Cultural subjects are reduced in Elective hours from 7.5 in 1920 to 4.7 hours in 1930.

Protestant Colleges reduce Elective hours in Science from 45.37 hours in 1910 to 42.6 hours in 1930. There was an increase to 50 hours in 1920, which might be accounted for in the fact that the decrease in prescribed Cultural subjects was extreme at that period. Cultural Electives increase from 1.0 hours in 1910 to 3.1 in 1930.

The significance of the data which are contained in Tables 23, 24, and 25 are displayed to better advantage and

TABLE 23

COMPARISON OF AVERAGE REQUIRED HOURS AND AVERAGE
ELECTIVE HOURS IN SCIENCES
FOR DECADES 1910 - 1920 - 1930

Type	1910				1920				1930			
	No. in Study	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No. in Study	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No. in Study	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours
State Universities	9	124.2	22.9	41.6	9	125	23	46.8	9	123.6	16.7	50.4
State Agri'l Colleges	4	145.4	65.0	33.7	4	142.5	69.5	30.3	4	133.0	65.7	26.5
State Teachers Colleges	0	(Normal Schools)			4	125.0	22.5	48.7	4	122.5	20.5	39.5
Protestant	8	121.7	24.37	45.37	8	121.5	20.4	50.0	8	121.5	18.25	42.6
Catholic	0	0.0	0.00	0.00	0	0.0	0.0	0.0	0	0.0	00.0	0.0
Endowed	0	0.0	0.00	0.00	0	0.0	0.0	0.0	0	0.0	00.0	0.0
Technical	0	0.0	0.00	0.00	0	0.0	0.0	0.0	0	0.0	00.0	0.0
Municipal	0	0.0	0.00	0.00	0	0.0	0.0	0.0	0	0.0	00.0	0.0

Figure V

Total Minimum, Prescribed and Elective Hours
in Sciences for 1910 - 1920 - 1930

Legend

Total Minimum Hours

Prescribed Hours

Elective Hours

1. State Universities

2. State Agricultural Colleges

3. State Teachers Colleges

4. Protestant Colleges

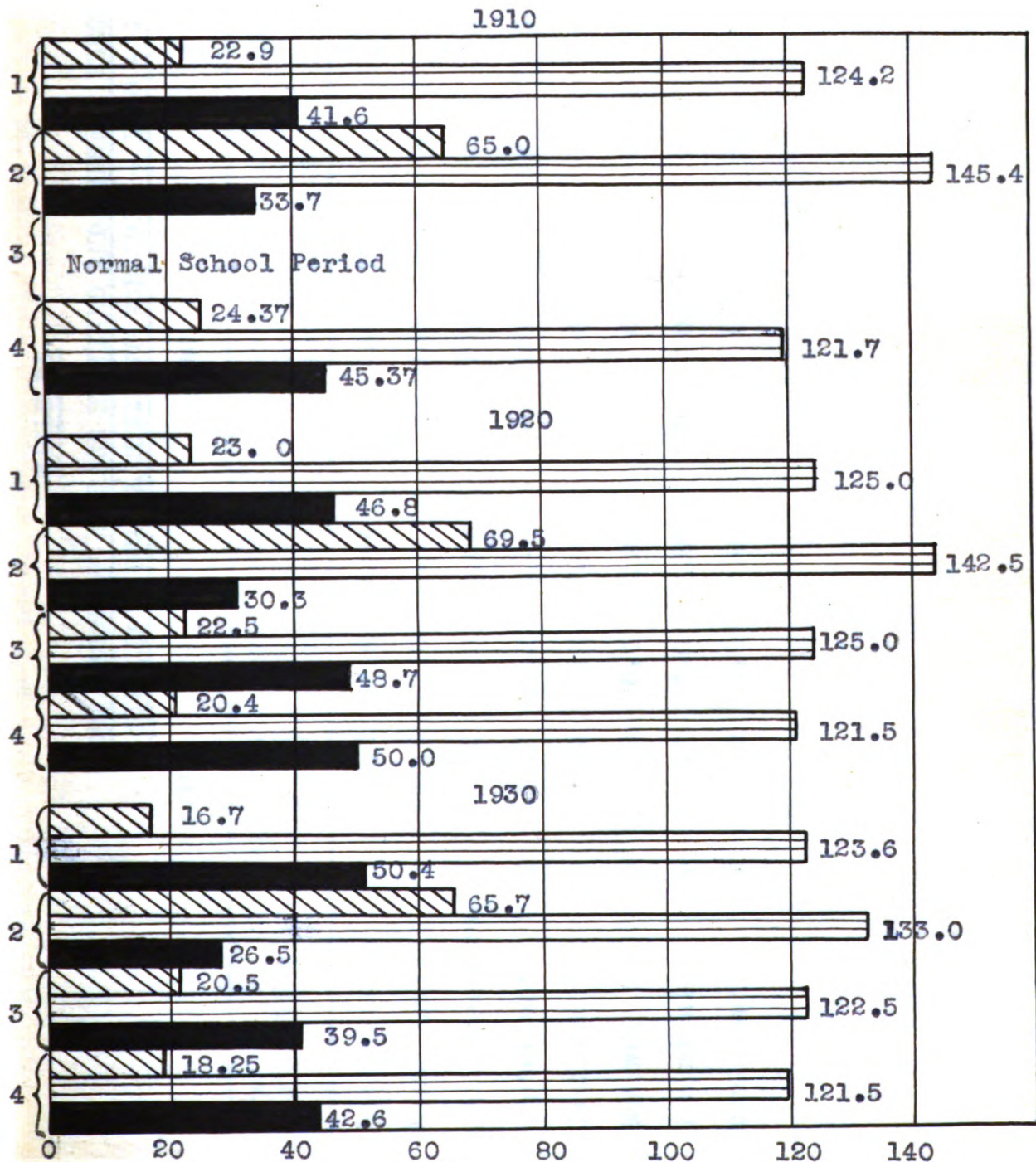


TABLE 24

COMPARISON OF AVERAGE REQUIRED AND AVERAGE ELECTIVE
HOURS IN CULTURAL SUBJECTS FOR 1910 - 1920 - 1930

Type of Institution	1910				1920				1930			
	No.	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No.	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No.	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours
State Univ.	9	124.2	27.9	3.44	9	125	27.2	8.0	9	123.6	21.2	10.7
State Agric'l	4	145.4	31.5	.5	4	142.5	28.7	2.7	4	133.0	11.2	0.0
State Teachers	0	0.0	0.0	0.00	4	125.0	14.2	7.5	4	122.5	13.5	4.7
Protestant	8	121.7	38.1	1.0	8	121.5	28.7	3.2	8	121.5	27.3	3.1
Catholic	0	0.0	0.0	0.00	0	0.0	0.0	0.0	0	0.0	0.0	0.0
Endowed	0	0.0	0.0	0.00	0	0.0	0.0	0.0	0	0.0	0.0	0.0
Technical	0	0.0	0.0	0.00	0	0.0	0.0	0.0	0	0.0	0.0	0.0
Municipal	0	0.0	0.0	0.00	0	0.0	0.0	0.0	0	0.0	0.0	0.0

Figure VI

Total Minimum, Prescribed and Elective Hours in Cultural and Tool Subjects for 1910, 1920, 1930.

Legend

Total Minimum Hours

Prescribed Hours

Elective Hours

1. State Universities
2. State Agricultural Colleges
3. State Teachers Colleges
4. Protestant Colleges

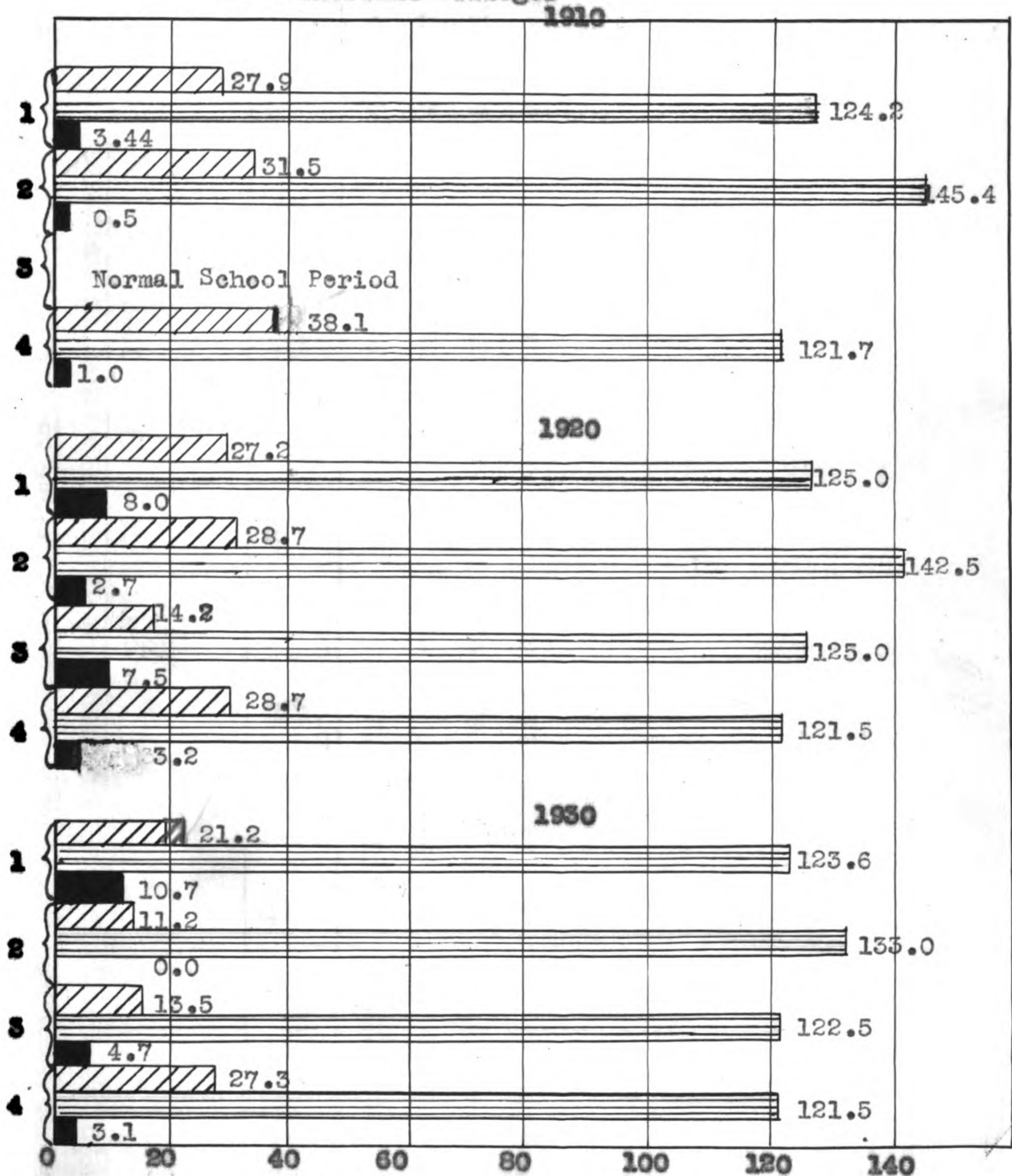


TABLE 25

COMPARISON OF REQUIRED HOURS IN EDUCATION

FOR 1910 - 1920 - 1930.

Type	1910				1920				1930			
	No.	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No.	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No.	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours
State Univ.	9	124.2	19.7	0.0	9	125.	20.9	0.0	9	123.6	20.1	0.0
State Agric'l	4	145.4	14.2	0.0	4	142.5	16.7	0.0	4	133.0	18.7	0.0
State Teach.	0	0.0	0.0	0.0	4	125.0	29.2	0.0	4	122.5	24.0	0.0
Protestant	8	121.7	16.1	0.0	8	121.5	16.8	0.0	8	121.5	18.8	0.0

Figure VII

Comparison of Total Minimum and Prescribed
Hours in Education for 1910, 1920, and 1930

Legend

Prescribed Hours

Education

1. State Universities
2. State Agricultural Colleges
3. State Teachers Colleges
4. Protestant Colleges

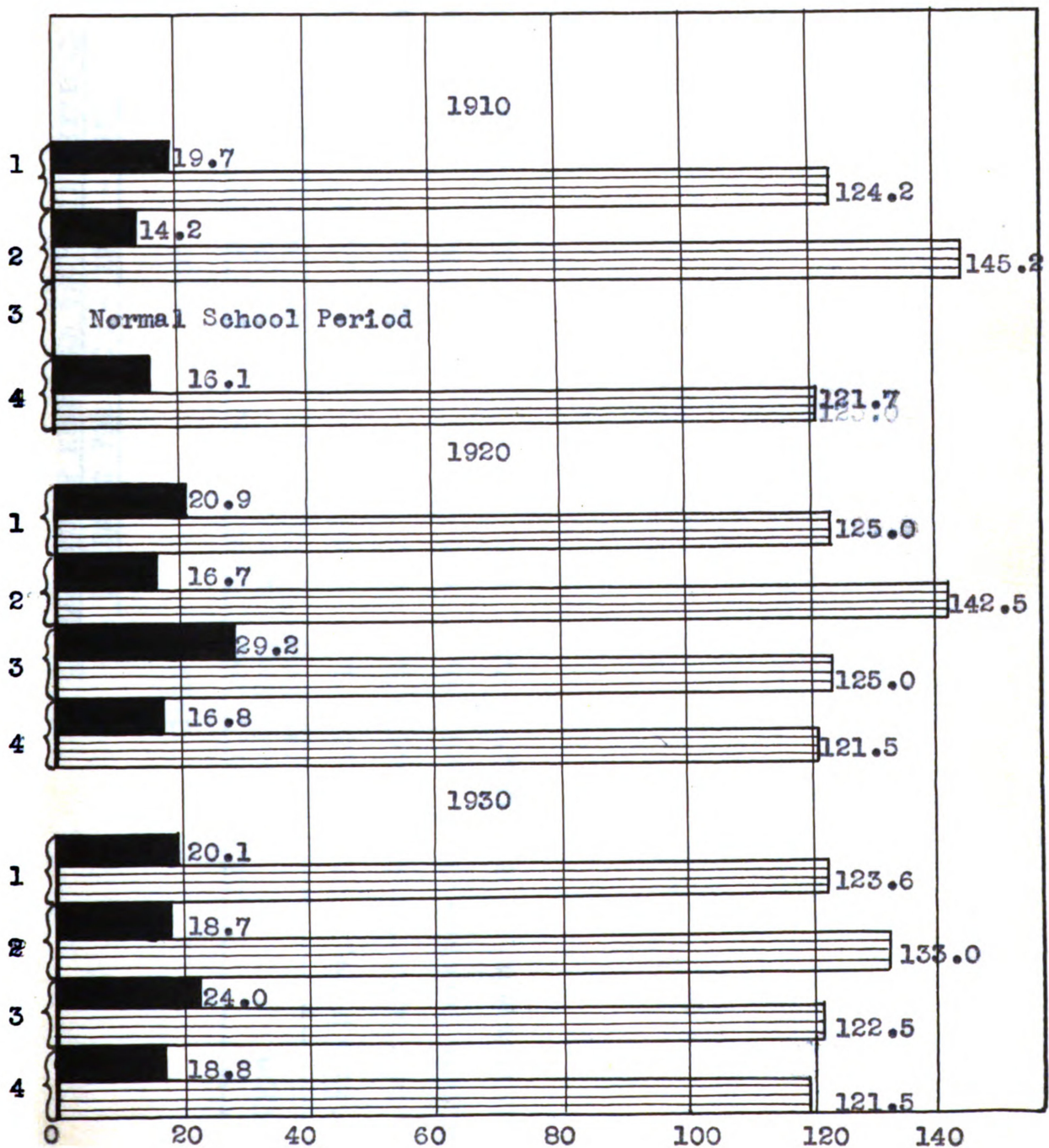


TABLE 26

COMPARISON OF REQUIRED HOURS IN PHYSICAL
TRAINING FOR 1910 - 1920 - 1930

Type	1910			1920			1930			
	No.	Aver. Total Hours	Aver. Req. Hours	No.	Aver. Total Hours	Aver. Req. Hours	No.	Aver. Total Hours	Aver. Req. Hours	
State Univ.	9	124.2	1.4	0.0	9	125	.44	0.0	9	123.6
State Agric'l	4	145.4	1.0	0.0	4	142.5	2.0	0.0	4	133.0
State Teachers	0	0.0	0.0	0.0	4	125.0	5.0	0.0	4	122.5
Protestant	8	121.7	7.5	0.0	8	121.5	3.2	0.0	8	121.5

TABLE 27

COMPARISON OF REQUIRED HOURS IN MILITARY TRAINING

FOR 1910 - 1920 - 1930.

Type	No.	1910				1920				1930.			
		Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No.	Aver. Total Hours	Aver. Req. Hours	Aver. Elect. Hours	No.	Aver. Total Hours
State Univ.	9	124.2	2.1	0.0	9	125.	2.0	0.0	9	123.6	1.8	0.0	0.0
State Agri'l.	4	145.4	4.0	0.0	4	142.5	3.0	0.0	4	133.0	4.5	0.0	0.0
State Teachers	0	0.0	0.0	0.0	4	125.	0.0	0.0	4	122.5	0.0	0.0	0.0
Protestant	8	121.7	0.0	0.0	8	121.5	0.0	0.0	8	121.5	0.0	0.0	0.0

made more understandable by graphic illustrations. Therefore following Tables 23, 24 and 25 are Figures V, VI, and VII.

It is not the writer's desire to leave in the reader's mind the impression that the hours assigned to Electives is a measure of the facilities of the various institutions in Elective subjects. The Electives represent the number of hours that the student is obliged to take, over and above the prescribed hours, in order to graduate. He is privileged to take more, and may even be required to take more in actual practice.

The data which has been presented can be interpreted as indicating that there has developed during the past thirty years a very definite trend toward a fewer number of hours necessary for graduation from three of these types of educational institutions. Protestant Colleges show such a slight change that it is not possible to call it a trend. Prescribed hours, in all types of institutions have been reduced sufficiently to say that trends toward fewer hours have been developing during this time. In this regard the Protestant institutions are in an outstanding position. This reduction of Prescribed hours is explained, in the general adoption, by all types of educational institutions, of the elective privilege, which came into vogue a few decades ago in the large Eastern Universities. The pendulum, so to speak, gives evidence of swinging in the opposite

direction, and, judging from present tendencies, will probably come to rest in a position where the collegiate work of the immature student will be outlined in conferences with mature advisors. Under such conditions it will be possible for the institution to come more nearly meeting the needs of the student from a cultural and vocational viewpoint. In other words, student potentialities, latent and otherwise, are in need of, and under such administration, will receive educational guidance. In fact several institutions that are considered in this study are already working toward this plan of administration.

The steady increase in the number of hours prescribed in Education during the past thirty years applies to all types, excepting State Teachers Colleges, which show a decided reduction. This trend upward would appear to be due to influences outside of the institutions. The uniformity of rate and amount of increase makes this evident. It is undoubtedly due to the influence and even pressure that is brought to bear upon educational institutions by Departmental educational authorities as previously mentioned. Whether or not the development of skilled technicians, in Education, at the expense of broad training in subject matter and social interpretations, is demanded in education, is a question which only the fruit of the years will ever determine.

CHAPTER IX

SUMMARY

The average total minimum requirements for graduation in the eight types of institutions is 123.32 semester hours. The highest average requirement is made by Polytechnic Colleges which is 149.20 semester hours. The lowest average requirement for graduation, 121.20 hours, is required in Endowed institutions. The median total requirement for graduation is 124.5 semester hours.

The average of prescribed hours in the eight types of institutions in all subjects varies from 95 semester hours in Polytechnic institutions to 63.30 semester hours in State Universities. The average percentage of the total which is allotted to Prescribed semester hours, ranges from 66.1 in Catholic institutions to 51.04 percent in State Universities.

The average number of semester hours in Elective subjects in these eight types of institutions is 53.13 and varies from 61.20 hours in State Universities to 42.70 hours in Catholic institutions. The average percentage of the total semester hours credited to Elective subjects varies from 43.96 in State Universities to 33.90 percent in Catholic Colleges.

State Agricultural Colleges and Polytechnic Colleges give 75.1 hours and 40.2 hours, respectively, to prescribed courses in Sciences. They exceed all other types of institutions in the breadth and intensiveness of training offered in Sciences. State Universities having 13.5 hours prescribed in Sciences represent the minimum requirements when all types of institutions are compared.

State Agricultural Colleges surpass all other institutions in prescribing the greatest number of average hours in the Biological, Physical and Applied Sciences. Endowed Colleges have the smallest number of hours, 2.75 hours, in Biological sciences and State Universities have the smallest number, 4.9 hours in the Physical Sciences.

Catholic Colleges and Universities prescribe 32.7 hours in the Cultural and Tool Subjects, while State Agricultural Colleges require only 13.3 hours, the smallest amount prescribed in any type of institution.

Municipal Colleges prescribe 24.5 hours in Professional Training or Education; Endowed Colleges 17.3 hours. These two types represent the two extremes in this subject. "Special Methods" courses, where given, are usually confined to Botany, Zoology, Chemistry, Physics, History and Home Economics. The various State institutions, Protestant Colleges and Municipal institutions offer these courses most frequently.

A trend toward a more uniform number of total minimum hours required for graduation in the various types of institutions seems to have developed since 1910. Also a trend toward higher requirements in prescribed hours in Education is evident in Agricultural Colleges and Protestant Colleges. In State Universities and State Teachers Colleges the trend is downward. State Agricultural Colleges and State Teachers Colleges have increased the required hours in Sciences somewhat. On the other hand, State Universities and Protestant Colleges have lowered their requirements in prescribed hours in Science.

It is evident from the findings of this study that in the various types of institutions belonging to the North Central Association of Colleges and Universities, there is considerable variation in the breadth and intensiveness of training in Sciences which is available for prospective teachers of secondary school sciences. These variations occur in the total minimum requirements for graduation as well as in the number of Prescribed and Elective hours in all subject classifications. The variation in total minimum requirements is, perhaps, not of vital importance, although it means that a student may complete his cultural and vocational training in one institution with 132 semester hours of work, while in another he would be required to complete 140 to 145 semester hours. In the

latter type of institution the student will acquire, of course, a greater knowledge of subject matter and this will be helpful to him since education is necessary to social progress. These contacts with a greater range of subject matter material and with more mature minds will make him a more effectively trained individual.

The variation between prescribed and elective hours in these types of institutions is a determining factor in the effective development and training of teachers somewhat in proportion to the degree of maturity which has been attained by the student. For example, the attainment of legal franchise does not mean, in all instances, the attainment of maturity in judgment and understanding. In some cases maturity of a high degree is reached long before the legal age. In general, prescribed courses of training in Colleges and Universities are more effective for the more immature individual. This is especially true if the individual is contemplating entering the teaching profession where he will be in a position to mold and shape human lives. Immaturity with its attendant lack of understanding of life's responsibilities and good judgment borne of experiences, is not a reliable background for one entering the teaching profession. The economic and social welfare of secondary pupils requires mature guidance which may

be partly attained through prescribing courses for the young teacher.

The variations in breadth and intensiveness of training in the subject matter of Sciences which are prescribed for the training of science teachers of these types of institutions are of vital importance. From the data which has been presented it is evident that State Agricultural Colleges not only offer the greatest variety of Science subjects but they prescribe a greater number of hours in a greater variety of sciences than do any other type of school. Colleges of this type are also next to the highest in the number of total minimum semester hours required for graduation. The limited number, 8.5 hours which they prescribe in the Social sciences, however, indicates that there is need for more of these sciences in their curricula. These sciences are needed in order that the student preparing to teach secondary sciences may have a broad conception of the significance and influence of Science in its relation to social evolution and social progress. It would seem that these institutions could afford to reduce the number of prescribed hours in the Biological and Physical Sciences, thus making it possible to prescribe more work in the Social Sciences; also in the Cultural and Tool Subjects, in order that the prospective teacher may make a more efficient use of the subject matter material in Sciences.

The fact that State Universities draw large numbers of their students from secondary schools immediately after graduation, means that the average chronological and mental ages of those students compare favorably with those of students in other types of institutions. There is, therefore, no apparent reason for assuming that their students will be more mature. However, this type of institution places upon these immature students a large measure of responsibility in deciding what courses are essential to fit them for teaching secondary school pupils. Will these immature college students make a selection of science subjects from the curricula, which will equip them to interpret to their future pupils the interrelationships of the Sciences? If so, then, they have a much better opportunity to train themselves in a broad way because of the many electives in sciences, which are offered at State Universities. The curricula of this type of institution is abundantly supplied in all branches of science and especially strong in the variety of courses in the Social Sciences. If the selection of science subjects, which is made by the immature college student, is more or less limited to those special subjects which he is preparing to teach, then the secondary school pupil must necessarily experience the handicap, which the teacher has unwittingly imposed upon himself during his collegiate period.

The requirements of all other types of institutions regarding prescribed hours and variety of courses available in Sciences fall between the two extremes represented by these two types of State institutions, State Agricultural Colleges and State Universities.

Some interesting facts relative to the frequency with which courses in Sociology are offered and the number of semester hours available in these various types of institutions, were observed during the reading of the catalogues. In the twenty-one State Universities, eighteen offered the subject. The semester hours varied from 15 to 112. Of the seventeen Agricultural Colleges, seven offered courses, varying from 9 to 53 semester hours. Forty-four of the fifty Teachers Colleges offered from 2 to 43 semester hours. Protestant Colleges offered such courses in seventy-nine of the eighty-two institutions, with the credit value ranging from 3 to 99 semester hours. Courses in Sociology were offered in sixteen of the seventeen Catholic Colleges, in which the semester hour credits ranged from 6 to 35 hours. Four Polytechnical schools had a range of from 11 to 28 semester hours. Of the eight Endowed Colleges seven offered this work, with a range of 4 to 33 hours. Each of the four Municipal Universities offered Sociology in which the semester hour credits varied from 6 to 44 hours.

The fact that courses in Sociology are given with a uniformly high percent in each type of institution indicates that this science is being generally recognized by educational institutions. It also indicates that the humanistic phases of sciences will receive more recognition by educated people in the future than in the past, because, they will have a new and broader interpretation of the true significance of scientific knowledge.

APPENDIX I
BULLETINS AND PUBLICATIONS OF
STATE UNIVERSITIES, CATALOGUE EDITIONS

University of Arizona Record.....	1910	1920	1930
University of Arkansas Bulletin.....			1930
University of Colorado.....	1910	1920	1930
University of Indiana Bulletin.....			1930
University of Illinois Bulletin.....	1910	1920	1930
University of Iowa Bulletin.....	1910	1920	1930
University of Kansas Bulletin.....	1910	1920	1930
University of Mich., School of Ed. Bulletin			1930
University of Minnesota, School of Ed. Bulletin			1930
University of Minnesota, Coll. of Agr., For'y., and Home Economics			1930
University, Miami, Ohio.....			1930
University of Missouri Bulletin.....	1910	1920	1930
University of Montana Bulletin.....			1930
University of Nebraska Bulletin.....	1910	1920	1930
University of New Mexico Bulletin.....	1910	1920	1930
University of North Dakota Bulletin.....			1930
University of Ohio, Athens Bulletin.....			1930
University of Ohio, Columbus, Bulletin.....	1910	1920	1930
University of Oklahoma Bulletin.....			1930
University of Purdue Bulletin.....			1930
University of South Dakota Bulletin.....			1930
University of Wisconsin Bulletin.....			1930
University of Wyoming Bulletin.....			1930

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APPENDIX II
BULLETINS AND PUBLICATIONS OF
STATE COLLEGES OF AGRICULTURE, CATALOG EDITION

Arizona College of Agri'l., Univ. of Ariz., Bull.			1930
Arkansas Coll. of Agr'l., Univ. of Ark. Bull.			1930
Colorado Agri'l., College Bulletin.....			1930
Illinois, Coll. of Agri'l., Univ. Bulletin....			1930
Iowa College of Agri'l. Bulletin.....			1930
Kansas Agri'l., College Bull.....	1910	1920	1930
Mich. State College of Agri'l. Bulletin.....	1910	1920	1930
Minn. Coll. of Agri'l., Univ. of Minn. Bulletin			1930
Missouri Coll. of Agri'l., Univ. of Mo. Bulletin			1930
Montana State College, Univ. of Mont. Bulletin			1930
New Mexico College of Agri'l. Record.....			1930
North Dakota Agri'l College, Catalog.....	1910	1920	1930
Ohio Coll. of Agri'l., Ohio State Univ. Bulletin			1930
Oklahoma College of Agri'l. Bulletin.....			1930
Purdue Coll. of Agri'l., Univ. of Purdue Bull.			1930
South Dakota College of Agri'l. Catalog			1930
Wisconsin Coll. of Agri'l. Univ. of Wis.			
	Bulletin 1910	1920	1930
Wyoming Coll. of Agri'l. Univ. of Wyo. Bulletin			1930

APPENDIX III
BULLETINS AND PUBLICATIONS
OF
STATE TEACHERS COLLEGES
CATALOGUE EDITIONS

Colorado, West. State Coll. Gunnison.....	1930
Colorado, State Teachers, Greeley.....	1920, 1930
Illinois, Eastern State Bulletin.....	1930
Illinois, State, Northern Catalogue.....	1920, 1929
Illinois, State Norm. Bulletin.....	1929
Illinois, Western State Quarterly.....	1930
Indiana, Ball State Catalogue.....	1930
Indiana State College, Bulletin.....	1930
Iowa State Teachers College Bulletin.....	1920, 1929
Kansas State Teachers Coll., Hays, Bulletin.	1930
Kansas State Teachers Coll. Emporia Catalog.	1929
Kansas State Teachers Coll. Pittsburg. Cat..	1920, 1930
Michigan State Normal College Bulletin.....	1929
Michigan, Central State Coll. Quarterly.....	1930
Michigan, Northern State Coll. Bulletin.....	1930
Michigan, Western State Coll. Bulletin.....	1929
Minnesota State Teachers, Moorhead, Catalog.	1929
Minnesota State Teachers, St. Cloud, Catalog	1929
Winona State Teachers Coll. Minn., Catalog..	1929
Missouri, Central State Teachers, Bulletin..	1930

Missouri, Northeast, State Teachers Bulletin.....	1930
Missouri, Northwest, State Teachers, Catalogue....	1930
Missouri, Southeast, State Teachers, Catalogue....	1929
Missouri, Southwest, State Teachers, Catalogue....	1930
Nebraska, Norm. Coll. Chadron, Catalogue.....	1930
Nebraska, Norm. Coll., Kearney, Catalogue.....	1930
Nebraska, Peru State Teachers College.....	1930
Nebraska State Teachers, Wayne, Catalog.....	1930
New Mexico, Normal Univ. Las Vegas, Bulletin.....	1930
New Mexico State Teach. Coll. Silver City, Cat.....	1929
North Dakota, State Norm. & Indust. Sch. Ellendale Cat.....	1930
North Dakota, State Teach. Coll., Mayville, Cat.....	1929
North Dakota, State Teachers Coll. Minot, Quarterly	1929
North Dakota, State Teach. Coll. Valley City, Cat...	1930
Ohio Teach. Coll. Athens, Univ. of Ohio, Bulletin..	1930
Ohio State Norm. Coll., Bowling Green, Catalog.....	1929
Ohio State Coll., Kent, Catalog.....	1920 1930
Oklahoma Central State Teach., Edmond, Quarterly..	1930
Okla. Northeast, State Teach., Tahlequah, Bulletin..	1930
Oklahoma, N. West., State Teach., Alva, Bulletin....	1930
Oklahoma, S. East, State Teachers, Durant, Bulletin..	1930
Oklahoma, S. West, State Teach., Weatherford, Quart...	1930
Oklahoma, Coll. for Women, Chickasha, Catalogue.....	1930
South Dakota, Eastern State Norm, Sch., Madison, Cat..	1930
South Dakota, Spearfish Normal, Catalog.....	1930

South Dakota, Northern Normal, Aberdeen Catalog.....	1930
West Virginia, State Normal School, Fairmont, Cat...	1930
West Virginia, Marshall Coll., Huntington, Catalog..	1929
Wisconsin, State Teachers Coll., La Crosse, Bulletin	1930
Wisconsin, State Teachers Coll., Milwaukee, Bulletin	1930
Wisconsin, State Teachers Coll., Oshkosh, Bulletin..	1930
Wisconsin, State Teachers Coll., Superior, Catalog..	1930

APPENDIX IV

PUBLICATIONS OF ALL OTHER TYPES OF INSTITUTIONS,

CATALOG EDITIONS

Albion College Bulletin, Catalog Edition.....	1929
Alma College Bulletin, Catalog Number.....1910	1920 1929
Antioch College Bulletin, Catalog.....	1930
Augustana College & Seminary, Bulletin, Catalog	1929
Baker University Catalog.....1910,	1920, 1929
Baldwin Wallace College Bulletin, Catalog.....	1930
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