A Functional Curriculum in Professional Forestry

BY

EARL GEORGE MASON

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A Functional Curriculum in Professional Forestry

BY

EARL GEORGE MASON
PROFESSOR OF FORESTRY
OREGON STATE COLLEGE

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The curriculum, being one of the cornerstones of forestry education, is basically important to the profession. It was therefore most gratifying to find a ready interest on the part of practicing foresters in problems connected with improving the forestry curriculum.

A functional approach to the forestry curriculum is quite different from the approach customarily used. Foresters and educators may, in consequence, find new and untried ideas with which they do not agree. If so, it is hoped they will consider such ideas with an open mind and offer constructive suggestions for their improvement.

The original study was undertaken as a thesis project in partial fulfillment of the requirements for the degree of Doctor of Education at the University of Oregon. This publication is an abridgment of the thesis.

The author is indebted to his colleagues on the staff of the School of Forestry at Oregon State College, to foresters in the Oregon State Department of Forestry, and to foresters in the United States Forest Service for helpful suggestions and assistance. He is also indebted to the staff of the School of Education, University of Oregon, and particularly to Dean J. R. Jewell and Professor Fred L. Stetson, for their friendly criticisms, encouragement, and guidance.
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A Functional Curriculum in Professional Forestry

INTRODUCTION

PURPOSE OF THE STUDY

The purpose of this study is twofold: first, the construction of a major framework outlining a functional curriculum in professional forestry and, second, the suggesting of a method of procedure that will enable a staff in any forestry school to develop a functional curriculum adapted to local needs. No attempt is made to present a detailed curriculum or to outline a precise course of study. It is assumed, however, that if the two major purposes of the study are achieved satisfactorily, they will provide a valuable guide to proper approaches and procedures for forestry school faculties interested in developing a functional curriculum based on the particular requirements of the region.

It is recognized that American forestry practice varies somewhat in different regions. These differences in practice, it is felt, do not change the general pattern but are reflected in the relative importance of different units. It is hoped that schools of forestry will find this framework satisfactory for use as a basic structure within which to incorporate specific changes in keeping with variations that may occur in the work of a forester and in keeping with sound educational practice.

The suggested procedure indicates a method whereby individual staff members may develop courses in their particular fields which will be in keeping with the philosophy of a functional curriculum. No detailed course content is given since the development of the courses and the methods of presentation are assumed to be the function of the instructor. A discussion on administration is presented to indicate the type of administration that is regarded as most helpful in the proper development of a functional curriculum.

The pattern for a functional curriculum in professional forestry is believed to be adequately comprehensive in nature and fully in harmony with current developments in related fields.

DESIRABILITY FOR A FUNCTIONAL CURRICULUM IN FORESTRY

A functional curriculum in forestry is desirable if the training of foresters is to be in keeping with the changes made in educational theory and practice and if the lag between school training and professional practice is to be kept to a minimum. Lag is a common circumstance. It is particularly

---

1See Glossary of Terms, p. 100.
peculiar to higher education since the instructor is often unable to have a full and active contact with the world outside his classroom. In such a situation major developments will occur in professional practice without a corresponding change in the work in the classroom. Evidences of lag are likely to be especially significant in courses taught by new instructors as these men often lack broad professional experience and contact. Experienced instructors without adequate contact with professional practice are not likely to discard the old and adopt the new developments in professional work as rapidly as is desirable.

The customary changes in the curriculum are small shifts, from time to time, in the required list of courses. In the same manner, changes are made in subject matter content of individual courses whenever the instructor, through his research work or his contacts with professional work, becomes aware of the necessity for changes. Systematic scrutiny of the entire curriculum in the light of changes in professional practice is seldom undertaken.

There is a strong tendency for lag to develop in all fields of education. Medicine, for example, takes noticeable care to reduce the tendency toward lag in its field. Forestry should do likewise as lag is likely to be found in forestry education, particularly during periods of rapid change in professional practice.

CHANGES IN EDUCATIONAL THEORY AND PRACTICE

Originally American colleges were intended for the education of the few and aimed to develop "citizens of the republic of letters." The classical curriculum, now largely although not entirely displaced, was then regarded highly. The method of instruction was tutorial and the outcome desired was a disciplined and experienced mind.¹

The advancement of knowledge, particularly in the field of science during the past two centuries, the growth and development of the land grant colleges with their emphasis on education for a vocation or profession, and the introduction of universal education resulted in many new curricula in institutions of higher learning.² These curricula were centered essentially in subject matter, the assumption being that mastery of a given or prescribed list of subjects would result in a satisfactorily educated individual. Teachers were expected to be specialists in their field. Furthermore the curricula were designed to produce specialists only. Outcomes were measured in terms of the student's mastery of the selected subject matter, often

being limited to the memorization of factual materials presented to him during his course of instruction.

The recognized failure of many such curricula to give the most desirable results in continued student growth has promoted a movement for improving the curriculum. French reported, in 1931, that the curriculum "has held the spotlight in American education for the last five years."¹ Newland found in 1936 that there were at least 1,400 changes being undertaken in higher education but that only twenty-four of these indicated a means of evaluation of results.² The movement toward an improved curriculum, while not so advanced as at the primary level, is apparently one of growing importance in the field of higher education.

The formulation of an integrated curriculum definitely related to the lives of the students is the objective of present curricular changes. It is recognized that study, however thorough, of a past culture cannot be relied on to attain the desired outcomes in education in an age when our aim is to develop citizens in a complex and changing civilization. "The first thing, therefore, in curriculum making is to take the lag out of our existing curriculum and build the new curriculum out of current American life."³

Formal curricular studies seldom cover the entire scope of any one curriculum. Of the many studies reported prior to 1933, only six were sufficiently comprehensive to cover the curriculum in any one field.⁴ The changes made that rest on these and later studies, however, have been summarized as follows:⁵

1. Institutions of higher education have made a beginning in the objective study of curriculum problems.
2. There is much variation in all fields in practices governing curricular patterns. There is, however, little or no evidence on which to base any standardization, if standardization is ever desirable or possible.
3. The aims and outcomes of units, courses, and curricula are not well defined and are not yet sufficiently the objectives of research.
4. Vocational departments are apparently more alive to a functional approach to the curriculum than are the older arts and science departments. There is, no doubt, more satisfaction and complacency about current offerings, without check of research, than should prevail.

The tendency toward a functional curriculum has evolved out of changes

made in educational philosophy, educational psychology, teaching techniques, and techniques employed in curriculum development. These changes are summarized for comparison by a recent writer.

**Contrasting Educational Theories**

<table>
<thead>
<tr>
<th>Educational Philosophy</th>
<th>Experimental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authoritarian</td>
<td>The primary aims of education are the perpetuation of the social heritage per se, and preparation of boys and girls for adult life.</td>
</tr>
<tr>
<td>Educational objectives are determined for youth by adults through best practice, scientific research, and other quantitative methods.</td>
<td>Educational objectives are determined cooperatively by the learner and the teacher on the basis of needs and interests, frontier thought, philosophizing, and other qualitative methods.</td>
</tr>
<tr>
<td>The curriculum consists primarily of subject matter set-out-to-be-learned, with emphasis often on unrelated facts and skills found in textbooks, courses of study, regent's examinations, etc.</td>
<td>The curriculum consists of all the experiences of life found in one's environment, with emphasis on new meanings as the product of purposeful experiences.</td>
</tr>
<tr>
<td>Values are derived primarily from the past; the &quot;good life&quot; is determined by an analysis of proved values.</td>
<td>Values are relative; they spring from the past but are conditioned by the present, and the demands of the future; they do not remain constant.</td>
</tr>
<tr>
<td>Education and the school are synonymous.</td>
<td>Education and life are synonymous.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational Psychology</th>
<th>Organismic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanistic</td>
<td>The individual is conceived to be a mechanical assemblage of parts.</td>
</tr>
<tr>
<td>Behavior is more or less a complex series of mechanical S-R responses.</td>
<td>Behavior is the conscious interaction of the organism with the environment.</td>
</tr>
<tr>
<td>Behavior is based on habits properly built into the learner's reaction system by adults.</td>
<td>Behavior is based on intelligent &quot;acting on thinking.&quot;</td>
</tr>
<tr>
<td>Learning takes place through response conditioning or shifting of associations.</td>
<td>Learning takes place through creating new responses to novel situations and incorporating these in the organism.</td>
</tr>
<tr>
<td>Learning situations are set for the individual.</td>
<td>Individual must &quot;set&quot; the situation for himself; i.e., he must &quot;accept&quot; it.</td>
</tr>
<tr>
<td>Mastery precedes understanding.</td>
<td>Understanding precedes mastery.</td>
</tr>
<tr>
<td>The primary verb is &quot;to teach.&quot;</td>
<td>The primary verb is &quot;to learn.&quot;</td>
</tr>
</tbody>
</table>

**Methods of Selecting and Organizing Instructional Materials**

<table>
<thead>
<tr>
<th>Subject Matter Curriculum</th>
<th>Integrating Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum materials are rather rigidly organized in advance of the learning situation.</td>
<td>The organization of the curriculum materials evolves out of the learning situation; only preliminary planning precedes this.</td>
</tr>
<tr>
<td>Content is limited primarily to books, lectures, etc.</td>
<td>Content is drawn from total environment of the individual.</td>
</tr>
<tr>
<td>Materials are selected &quot;scientifically,&quot; thus may be removed from the life of the child.</td>
<td>Materials grow out of the actual experiences of the individual, his needs and interests, thus are likely to be close and real.</td>
</tr>
<tr>
<td>Materials are organized for the individual into narrow, logically arranged compartments.</td>
<td>Materials are organized by the individual into broad, meaningful experiences, psychologically arranged.</td>
</tr>
<tr>
<td>Materials tested by time are utilized primarily.</td>
<td>Individual is permitted to test many materials for himself.</td>
</tr>
</tbody>
</table>

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INTRODUCTION

Methods of Teaching

Instruction
The teacher is the drillmaster; imposes page assignments; tests, drills, re-tests; and is the center of the learning situation.

There is a mass "factoryized" instruction and conformity to norms.

The teacher is the exalted initiator and controller of human behavior.

Teaching is a "pouring in" process; the recipient supposedly passive.

Guidance
The teacher is a guide; assists the learner to select materials and carry on worthwhile experiences; the learner is the center of the learning situation.

There is individualized guidance and recognition of, and respect for, individual differences.

The individual is the initiator and controller of his own behavior; the teacher serves as a guide.

Teaching is a process of helping the individual to learn through active participation in an experience.

Methods of Measuring Outcomes

Testing
Outcomes are measured primarily in terms of facts, skills, and habits, and the per cent of acquisition of definite assignments.

Adult-determined and imposed goals are measured.

Measurement is conducted by the teacher alone in terms of group achievement only.

Evaluation
Outcomes are measured in terms of individual growth in understandings, concepts, attitudes, adaptiveness, and desirable changes in behavior.

Goals accepted by the learner, cooperatively determined, are measured.

Evaluation is conducted by the teacher and the learner in terms of individual and group achievement.

Techniques Employed in Curriculum Development

Curriculum Making
Experts are called in to make the curriculum.

Steps in curriculum making:
1. Appointment of a committee to reorganize the curriculum.
2. Collection of the best courses of study and tests available.
3. Application of the "scissors and paste" technique.
4. Publication of the courses of study.
5. Distribution of the courses to teachers with orders to use them.
6. Remaking of the courses when they become obsolete.

Curriculum Planning and Development
Local teachers and staff, pupils and parents, participate in curriculum planning and development.

Steps in curriculum planning and development:
1. Recognition of a need for curriculum improvement emerging from the teaching staff.
2. Orientation period for development of social and educational philosophy and study of principles of learning.
3. Survey of pupils, teachers, community resources, equipment and facilities, needs, interests, etc.
5. A try-out of newly developed materials in other classrooms.
6. The publication of courses in temporary form and distribution to those who wish to use them.
7. Making special provision for helping inexperienced teachers who wish to use the new materials.
8. Evaluation and revision of the materials from time to time through the same cooperative procedure.

Educational theory, and to a lesser extent educational practice, has emphasized during the past two decades the necessity for curricular changes. Inasmuch as these changes are now of sufficient importance to indicate clearly a trend in educational thought, it is assumed that the curriculum in professional forestry also needs to be analyzed in the light of these newer
concepts. The desirability of this type of analysis is therefore revealed even more clearly when consideration is given to the question of lag that may exist between educational and professional practices in forestry.

LAG BETWEEN PROFESSIONAL FORESTRY PRACTICE AND EDUCATION

Forestry education lags behind professional forestry practice whenever it fails to develop or change as rapidly as the field practice. To determine the extent to which lag exists it is necessary to view the changes made in field practice and in forest education over the same period. Accordingly, a brief history of forestry development in the United States is presented here, followed by an account of the development of a typical curriculum in forestry.

HISTORY OF FORESTRY IN THE UNITED STATES

Forestry has enjoyed a constant and substantial growth since it started in the United States. While forestry practices can be traced back to early colonial times, the actual development of the movement has taken place during the past half century. The federal government, as typified by the U. S. Forest Service, has consistently been the leader in developing forestry since the turn of the present century. The national forests, constituting more than 160 million acres of forest land, were originally established by setting aside land from the public domain. Authorization for this purpose was given the President of the United States by the act of March 3, 1891. By 1910, 150 million acres of land had been designated as national forests under this act.\(^1\)

On July 1, 1898, only eleven persons, two of whom were professional foresters, were employed by the federal government. In 1933 the U. S. Forest Service alone employed more than 6,000 people, more than half of whom were professionally trained foresters.\(^2\) In addition, foresters were employed by the National Park Service, the U. S. Indian Service, the Federal Extension Service, the General Land Office, the Fish and Wildlife Service, the Bureau of Entomology and Plant Quarantine, the Internal Revenue Bureau, the Bureau of Foreign and Domestic Commerce, and the Census Bureau. Since 1933, additional federal agencies employing foresters include the Soil Conservation Service, the Tennessee Valley Authority, the Resettlement Administration (now the Farm Security Administration), the New England Emergency Timber Salvage Authority, the Oregon and California Revested Lands Administration, and the National Resources Planning Board. Similar growth has occurred in state forestry, in municipal forestry, and to a lesser

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\(^2\) Ibid., p. 84.
INTRODUCTION

extent in the employment of foresters by private concerns and by endowed institutions.  

The growth of forestry has resulted in two important developments that exert a definite influence on the forest schools. The first was the broadening of the field of the forester in the nature of the work assigned. The second was the progressive accumulation of knowledge of our forests, of the economic problems of forestry, and of methods of forestry applicable to American conditions.

The broadening field of the forester has been particularly significant during the past decade. The rapid expansion of the Civilian Conservation Corps and its program, the growing emphasis on stand improvement work, the necessity for land use planning, the growth of forest recreational activities, and the expansion of soil conservation projects are indicators of the general trend toward the broadening field of service of the forester.

The growth of forest research has been particularly noteworthy during the past two decades. The federal government spent for forest research in 1915 less than $50,000 while in 1938 in this field it spent more than $3,500,000. In 1923, there were ninety projects covering ten fields with a full time personnel of thirty-five men. In 1938, there were 1,308 projects with 442 full time and 904 seasonal workers in forestry research. The possibilities of continued growth in forest research are good. This is indicated in the following summary:

1. Forest research has made a substantial beginning.
2. In some fields, forest research is highly scientific; in others it bears the stamp of empiricism.
3. There is a decided need for more adequate facilities for publishing results.
4. The great range of forest conditions extending from tropical to arctic, the great variety of climate, soils, and topography, and the presence of large areas of virgin forest present an opportunity to draw broad generalizations and to discover biological laws that exist nowhere else in the northern hemisphere except possibly in Russia.
5. American forest research is destined to provide new leadership to the entire field of forest science. It has already made a distinct imprint on the forestry practice in America. It will continue to do so.

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1Ibid., pp. 103-106.
3Illick, op. cit., p. 38.
4Program of Work of the Forest Experiment Stations, 1923, Mimeographed publication U. S. Forest Service, pp. 2-3.
6Ibid., pp. 71-72.
The great wealth of material made available by the forest research agencies has made it difficult for forestry teachers to cover the ground in their special subjects within the time allotted. The resultant changes in the curriculum have been in the nature of a reduction of the amount of basic work, an allotment of more time to technical courses, and a drift away from a standardized curriculum.¹

The modifications of the curriculum in forestry caused by the increase in the amount of available scientific material on forestry and in the breadth of the work of the forester should be in keeping with the changes made in professional practice. The extent to which instruction has kept pace with field practice may be shown in part by a brief review of the steps taken toward standardization of curricula in this field.

**Standardization of Forestry Curricula**

Curricula in forestry have been developed by the individual schools. In the early period of establishment there was no organized activity toward standardization of curricula. In December 1909, a conference of forest schools to consider the aim, scope, grade, and length of curriculum was called by Chief Forester Gifford Pinchot of the U. S. Forest Service. At this conference a committee was appointed that planned and called a second conference of forest schools in Washington, D. C., in December 1911. This second conference gave careful consideration to the curriculum in forestry.²

The next organized effort toward standardization occurred in December 1920 when a conference of forest school representatives was called at Yale University.³ Following a discussion in the Society of American Foresters in 1927, a study of forestry education in the United States was made under a grant by the Carnegie Corporation. The results were published in 1932.⁴ The Society of American Foresters then developed standards and graded the forest schools of the nation in 1933 and again in 1942.⁵

Large changes in the curriculum have not been made in the forestry schools since 1935. The problems involved in meeting rapid increases in enrollment and the resultant overloading of the staff personnel effectively prevented any serious consideration of curricular changes.⁶

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¹Graves and Guise, op. cit., p. 19.
²"Standardization of Instruction in Forestry," *Forestry Quarterly*, X (September 1912), pp. 341-394.
⁴Graves and Guise, op. cit.
⁶Minutes of Meeting of Executives of Western Forestry Schools, Spokane, Washington, December 27, 1939.
Although there has been no one central agency capable of forcing the curricula in forestry into a uniform pattern, comparative data from the various schools indicate a general similarity of pattern. While the curriculum in forestry differs from school to school, the main group requirements as indicated by the Society of American Foresters' survey do not show a large variation.¹

**Development of a Typical Curriculum**

Because of the general similarity of the curricular patterns found in forestry, it is possible to gain a general idea of the development of forestry curricula by following the changes made in a typical forest school. The forest school curriculum selected was the one that approximated an average for the schools accredited by the Society of American Foresters in 1936. Data presented by Chapman² were arranged to show the three accredited schools nearest the average in requirements for each group of studies. The school found to be in the nearest three schools to the average the most times was selected. The following table indicates the result.

<table>
<thead>
<tr>
<th>Group</th>
<th>Average requirement for United States</th>
<th>Three schools nearest the average</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silviculture</td>
<td>15.98</td>
<td>Oregon State, Michigan State, Minnesota</td>
<td>15.33</td>
</tr>
<tr>
<td>Management</td>
<td>15.13</td>
<td>Oregon State, Montana, Pennsylvania State</td>
<td>15.00</td>
</tr>
<tr>
<td>Utilization</td>
<td>11.85</td>
<td>Michigan State, Idaho, Oregon State</td>
<td>10.00</td>
</tr>
<tr>
<td>Protection</td>
<td>5.75</td>
<td>Idaho, Iowa State, Oregon State</td>
<td>5.33</td>
</tr>
<tr>
<td>Economics</td>
<td>5.44</td>
<td>Michigan State, Minnesota, Washington</td>
<td>5.33</td>
</tr>
</tbody>
</table>

Oregon State College is found to be in four of the five groups. No other school appears so often; consequently, this school was selected as representative and the development of its curriculum traced in detail.

²Ibid.
Instruction in forestry started at Oregon State College in 1896-97 when one course was offered in the Department of Botany. The course offerings in forestry were increased to four in 1901-02. The first curriculum was printed in the 1905-06 catalog. A curriculum in forestry has been listed each year since 1905-06.1

A comparison of the original curriculum with the one in the current catalog indicates the following differences:

1. The staff has increased from one man who taught ten courses in forestry and eight in botany to a staff of 13 men, all professionally trained foresters.

2. Curricular changes have resulted in increase in the number of professional forestry courses offered, reduction in the amount of science given, elimination of instruction both in foreign language and in craftsmanship, and development of a provision for elective courses.

3. The arrangement of courses in order of time is approximately the same. The increase in the number of forestry courses scheduled has resulted in courses being added throughout the freshman year and in the inclusion of two or more courses each term in the upperclass years. Aside from this expansion, the only changes in timing of the courses has been the raising of silviculture from a sophomore to a junior course and the lowering of wood technology from the fourth to the third year.

4. The growth in individual fields has been uneven. There has been little quantitative increase in the fields of silviculture, forest economics, and the informational courses concerning wood and its uses. Moderate expansion has taken place in the fields of forest finance, dendrology, and lumbering while the fields of management and policy have been expanded the greatest amount.

Changes in course content were determined by comparing the early textbooks with those now being used. This procedure indicated two major qualitative changes:

1. European influence on American forestry has been minimized. Early texts, as well as modern ones, in the fields of utilization and dendrology covered only American material. The early texts in the fields of silviculture and management had, very definitely, a European background. Outstanding in this regard are the texts in the subject of forest mensuration. The first text, Forest Mensuration by Henry S. Graves,2 contains 358 pages not including the Appendix. Of these 358 pages, 177, or nearly one-half the book, dealt with European practice. Of the 157 works listed in the bibliography, 124 are by European authors. Finally, nine of the thirteen instruments described are European instruments. In contrast, not a single page or reference is devoted to European practice by any of the four texts in this field today.

The minimizing of European influence indicates a trend toward functionalized instruction. Forestry work in the United States is different from that in Europe because of the difference in the nature of the stands, the species of trees involved, and the economic and business practices. In so far as forestry work in the United States is unique, the elimination of European forestry practice from the instruction of foresters represents an attempt to make the instruction more functional.

2. The subject matter is covered with increasing thoroughness. The field of silviculture, for instance, which has not been allotted an increase in the amount of time, has developed into three distinct areas of learning with a text for each area. The first text,

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1Oregon State College, Annual Catalogs.
appearing in 1916, was in the applied field. Five years later the second text was published and in 1928 the last of the three appeared. An examination of both the first and the last editions of the first text reveals an increase in size from 455 pages to 503 pages. There is also an increase in specific references from 203 to 436. These changes are in keeping with the growing importance of research work in forestry.

**PERIODIC DEVELOPMENT OF A FORESTRY CURRICULUM**

A comparison of the first and the last curricula cannot be conclusive evidence that the trends so ascertained are reliable ones as samples taken on either extreme may not be normal. It is necessary, therefore, to trace the tendencies so ascertained through the intervening years to see whether they changed consistently. It is also desirable to determine whether other tendencies did not arise after the initial year. Accordingly it was deemed advisable to break the history of the school into periods and compare the changes made on a periodic basis. The determination of periods was made by:

1. Classifying of courses into “Preparatory,” “Pretechnical,” and “Technical” subjects in accordance with the definitions used by Graves and Guise.

2. Listing, year by year, for each group the number of credit hours required in the curriculum. The listing was then examined to see whether periods gave a fair degree of uniformity of pattern. The grouping selected on this basis resulted in a period of establishment before 1910, a period of development from 1910 to 1919, a period of stabilization from 1920 to 1933, and a period of standardization from 1933 to the present.

A check with the historical development of forestry indicated that the periods selected roughly coincided with major developments in governmental forestry. Thus, national forest areas expanded greatly while Theodore Roosevelt was President and Gifford Pinchot was Chief of the U. S. Forest Service. In 1910, Gifford Pinchot was removed as Chief Forester by President Taft and Colonel Henry S. Graves appointed. Under Graves, the Federal Forest Service did not expand greatly but it did undergo a gradual and definite growth in perfecting professional techniques and developing forestry personnel. Graves resigned as Chief Forester in 1920. The early 1920’s saw the embryonic crystallization of a forest policy for all the forest lands of the nation regardless of ownership. Another rapid expansion in forestry occurred in 1933 due to the enlarged work relief and land use programs of the federal government. The forester’s enlarged sphere of activity now brings him into close contact with the social and technical problems involved in the proper management of the forest lands of

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A FUNCTIONAL CURRICULUM IN PROFESSIONAL FORESTRY

the nation. The widened horizons make the work of the forester more varied and more complex.

Since the rough analysis of professional development indicated a parallel periodicity with those changes found in the curricular alterations in forestry, the periods selected were considered adequate for the purpose in view. The next step was to subdivide the three main curricular groups as follows:

1. Preparatory—divided into science and social science, literature, and humanities.
2. Pretechnical—not divided.
3. Technical—divided into silviculture, protection and management, utilization, and economics and policy.
4. Electives.
5. Miscellaneous—including such courses as physical education, drill, and hygiene.

The average credit hours for each group, as shown in Table 2, were then determined by computing the arithmetical mean of each group for each period.

Table 2. Average Number of Credit Hours in Each Group of Courses in Forestry Curriculum at Oregon State College for Each Period

<table>
<thead>
<tr>
<th>Course group</th>
<th>Period</th>
<th>1908-10</th>
<th>1910-20</th>
<th>1920-33</th>
<th>1933-39</th>
<th>1941-42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory</td>
<td></td>
<td>Credit</td>
<td>Credit</td>
<td>Credit</td>
<td>Credit</td>
<td>Credit</td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td>69.75</td>
<td>51.7</td>
<td>27.5</td>
<td>30.5</td>
<td>27.0</td>
</tr>
<tr>
<td>Social Science</td>
<td></td>
<td>46.5</td>
<td>36.8</td>
<td>25.0</td>
<td>24.3</td>
<td>27.0</td>
</tr>
<tr>
<td>Pretechnical</td>
<td></td>
<td>29.25</td>
<td>33.95</td>
<td>45.1</td>
<td>36.3</td>
<td>36.0</td>
</tr>
<tr>
<td>Technical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silviculture, Protection, and Management</td>
<td></td>
<td>18.25</td>
<td>47.2</td>
<td>42.0</td>
<td>52.1</td>
<td>50.0</td>
</tr>
<tr>
<td>Utilization</td>
<td></td>
<td>21.8</td>
<td>12.8</td>
<td>18.2</td>
<td>15.6</td>
<td>15.0</td>
</tr>
<tr>
<td>Economics and Policy</td>
<td></td>
<td>3.0</td>
<td>4.5</td>
<td>5.5</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td>.6</td>
<td>.8</td>
<td>25.3</td>
<td>23.2</td>
<td>26.0</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td>13.5</td>
<td>18.0</td>
<td>18.0</td>
<td>16.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>202.5</td>
<td>206.5</td>
<td>206.6</td>
<td>204.0</td>
<td>204.0</td>
</tr>
</tbody>
</table>

Several important conclusions may be drawn from the data in Table 2:

1. The time of rapid change was before 1920. Most of the over-all trends observed by comparing the first and the last curricula had occurred by that time. A total reduction of 42 credit hours in science and of 20 credit hours in social science, literature, and humanities had occurred by 1920.

2. The shifts made before 1933 were largely in the nature of increasing the elective credits allowed at the expense of science and social science.

3. The changes made during the last two decades are minor. It should be recognized, however, that changes have undoubtedly been made in course content that are reflected in changes in course names. Changes in course content are made more or less regularly by all instructors. Such changes do not, of necessity, indicate a careful revision of the curricular pattern.
PROCEDURE

The desirability of developing a sound, well balanced curriculum, worked out on a basis of the needs of forestry in this country, was recognized in 1927 as an important factor in the proper stimulation of forestry education.¹ In so far as Table 2 shows that no major curricular changes have been made since that time and in so far as the past two decades have witnessed large changes in professional practice and in the scientific knowledge on which such practices are based, it is concluded that a marked lag exists between professional practice and professional education.

PROCEDURE

Although the curriculum question receives careful consideration by the colleges, there has been developed no single, well defined and commonly accepted method of solving problems connected with curriculum construction. The diversity in current procedures is illustrated by the following list of practices used by schools of agriculture as guides in making decisions on problems in this field.²

<table>
<thead>
<tr>
<th>Guide to Curriculum Decision</th>
<th>Number of Institutions Using Each Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study of the curricula of other colleges</td>
<td>38</td>
</tr>
<tr>
<td>Analysis of occupations of graduates</td>
<td>37</td>
</tr>
<tr>
<td>Staff discussions of objectives of agricultural training</td>
<td>34</td>
</tr>
<tr>
<td>Study of elements of basic sciences essential to understanding of the technical courses</td>
<td>33</td>
</tr>
<tr>
<td>Analysis of agricultural industries of state</td>
<td>30</td>
</tr>
<tr>
<td>Study of range of opportunities and their frequency</td>
<td>26</td>
</tr>
<tr>
<td>Systematic inquiry of students and others as to purpose college training should meet</td>
<td>20</td>
</tr>
<tr>
<td>Study of reasons for which students abandon the study of agriculture</td>
<td>12</td>
</tr>
<tr>
<td>Study of non-technical activities in agricultural vocation</td>
<td>9</td>
</tr>
<tr>
<td>Study of causes of failure in agricultural vocation</td>
<td>6</td>
</tr>
</tbody>
</table>

METHODS COMMONLY EMPLOYED IN CURRICULUM CONSTRUCTION

The simplest and most common approach to curriculum construction is the pattern technique. According to this technique the curriculum is formulated in terms of the offerings of other institutions. Catalogs of the leading institutions are scanned, and a curriculum is put together corresponding to the norm of the curricula inspected or with minor variations therefrom based on the judgment of those in charge. Such a curriculum is sometimes referred to as the pattern curriculum and can be made with a minimum of attention to the nature of the human mind or to the psychological processes involved in learning.³

As a guide to the construction of a second type, the functional curriculum, attention is given to the future life and work that the student is expected to follow. In this approach, a list of aims or objectives is set up and a program is devised to accomplish these aims. A third approach to curriculum construction is known as the psychological one wherein attention is centered on the changes in student knowledge, attitudes, and character that are deemed desirable. It is necessary when using the psychological approach to measure the changes that actually take place in the mind of the student.

It calls for an inventory of the student's mind and the measurement of his accomplishments through carefully constructed and validated examinations. It demands a picture of the mental process of the learner and a restatement of a curriculum as it is differentially selected and organized in his mind.¹

The psychological approach to the curriculum obviously must be undertaken over a considerable period of time. The curriculum must be devised, students exposed thereto, tests made of its effectiveness, and revisions made in the original draft which will be in accordance with the results of the tests.

The approach chosen for this study is the second or functional one for the following reasons:

1. The study can be completed within a reasonable time.
2. It will form the necessary framework which can be supplemented by additional studies and which, if changed from time to time in the light of the results of such studies, will be in essence a curriculum made by the psychological approach.
3. It is in keeping with the approach used by a large number of curriculum makers; consequently, it will be in accord with developments in educational theory and practice.
4. It will minimize the lag between professional forestry education and practice since the functional curriculum will evolve from the expected future work and life of the student forester.

The general steps followed in building a functional curriculum commonly consist of: (a) setting the aims or objectives to be reached, (b) determining the order or sequence of the anticipated development of the student, (c) selecting the course content, and (d) devising methods of instruction and of testing.

The general procedure used in this study for developing a functional curriculum in forestry is one of analysis in which the entire problem is broken into the following steps:

1. The determination of guiding criteria.
2. The development of the curriculum in keeping with the guiding criteria as determined.
3. The development of administrative procedures in accordance with sound principles of staff control.

In accomplishing each step, two guiding principles were used; namely, that the entire study be consistent in philosophy with that of a functional

¹Ibid., p. 10.
PROCEDURE

curriculum and that the data used to validate decisions made be as authoritative as possible. The literature on the curriculum contains many expressions of opinion unverified by data. Such opinions were not accepted as authoritative unless they were expressions on the part of groups or persons whose status was such as to merit the respect due to leaders in the field under consideration.

The techniques used in the separate parts of the study are somewhat varied. It is desirable, consequently, to present the procedures followed in developing each section.

**SELECTION OF GUIDING CRITERIA**

**Criteria from Educational Theory**

Guiding criteria were obtained from two sources; namely, the general theory of education and the theory of education as applied in the professions. Criteria obtained from the general theory of education were selected from the writings of individuals since there is no one central agency that has the authority to control or by custom has controlled the educational activity of educators. The selection of the criteria used from the field of education involved the following steps:

1. Listing, from authoritative books published during the past two decades on the curriculum, the ideas or criteria used that indicated the nature of a functional curriculum.
2. Classifying the ideas so obtained into homogeneous groups. This step combined a large number of items from various sources into groups.
3. Characterizing each group by a general statement that represents the guiding criteria selected.
4. Validating the criteria by checking to see whether the ideas found in any other authoritative literature on the functional curriculum could be placed in the groups selected.

**Criteria from Professional Education**

Professional societies in each of the important professional fields have given careful consideration to the education of prospective workers in these fields. In medicine and in engineering the societies involved have exerted a strong influence on the educational policies of the schools. The official reports of these groups, therefore, represent authoritative opinion regarding the education of young professionals.

Discussions, on the part of the professional societies, of their curricular patterns clearly indicate that the curricula are organized on two separate plans:

1. Those, such as medicine, dentistry, and law, in which the professional work is concentrated in the years following a general education that includes a limited number of essential prerequisite subjects. The medical profession was the first group to attempt to exert controls over the professional education of its members.
2. Those, such as engineering, in which the professional work is dovetailed with the
instruction in general education. This plan contemplates an integrated curriculum starting with the freshman year.

It is evident, because of the differences in pattern, that one plan is more applicable than the other as a guide in developing a functional curriculum in forestry. Accordingly, the engineering plan was chosen since it is more in keeping with the guiding criteria adopted from the general theory of education.

The procedure followed in selecting the guiding criteria consisted in listing the pertinent ideas expressed in the latest reports on professional education in medicine, in engineering, and in forestry. The ideas obtained were classified into broad groups for each of the three professions. They were then compared and those ideas found to be common to the three professions were adopted as guiding criteria.

DEVELOPMENT OF THE CURRICULUM

In the process of determining the component parts of the proposed curriculum, two divisions were established; namely, "what should be taught" and "how it should be taught." The items to be taught were further divided into those necessary to make the student competent in his job and those necessary to give him a cultural background. Accordingly three divisions of the study were developed: one a core in professional forestry, designed to make for job competency; one a section on general education, designed to give cultural background; and one on the work of the instructor, designed to set up criteria that would enable the instructor to determine how to proceed in directing the work of the students.

THE CORE IN PROFESSIONAL FORESTRY

The first step in developing the core in professional forestry was to determine the general nature of a forester's work. After personal discussions with administrative officers of the U. S. Forest Service and the Oregon Department of Forestry, it was decided to classify the work of the forester into the actual tasks done, including any essential skills and underlying knowledge, the necessary personal qualifications, and the desirable types of mental and physical abilities. The validity of this classification was partly checked by reviewing more specifically the writings of foresters on the subject.

The work list in professional forestry was based on a questionnaire¹ mailed to graduates of the School of Forestry of Oregon State College since this school was found to be representative.² The questionnaire was divided into three parts:

¹See Appendix for a copy of the form used.
²See p. 15.
1. A section dealing with knowledge about things. The purpose of this section of the questionnaire was to obtain a systematic and comprehensive list of the principal fields of knowledge. The catalogs of the State System of Higher Education in Oregon were used as a guide since this System was organized on the principle that the separate curricula should be complete but with a minimum of duplication. The items on the questionnaire were obtained by listing each of the departments in all the schools in the State System. One item, that of knowledge of the physical things about the forest, was added.

2. A section dealing with the professional work undertaken. This part of the questionnaire consisted of a list of group headings as given in the instructions for job analysis procedures in the Federal Forest Service. These instructions represent standardized procedures developed by the U. S. Forest Service for the use of its personnel division.

3. A section dealing with necessary skills. A list of skills was prepared from suggestions received from practicing foresters. No eliminations were made from suggestions received since it was desired to compile as comprehensive a list as possible.

The items in the questionnaire were made broad in scope so as to be in keeping with the guiding criteria adopted. It was expected that the returns from such a questionnaire would facilitate the development of a core without developing a maze of detailed aims. Further, it was assumed that the instructor should develop the detailed aims for each of the courses under his supervision. This procedure allowed the formulation of a questionnaire that was comprehensive, yet not too bulky for rapid checking on the part of the individual giving the data requested.

From the 234 graduates employed in professional forestry work, 110 returns were received. Each of the returns had been checked for each section according to the following instructions:

Section 1. Check the following items if a good knowledge of them has proved necessary in the professional tasks which you have done. List any other activities not specifically mentioned in the spaces provided.

Section 2. The following is a list of jobs. Check all that you have actually done in part or in whole. Add any other jobs not mentioned.

Section 3. Check the following skills, the possession of which would have been a material aid to your getting started well on your first professional job as secured after leaving college. Add any skills not mentioned.

Table 3 shows the number of returns received in three periods of elapsed time since graduation.

Table 3. Returns Received from 110 Graduates of Oregon State College Employed in Professional Forestry Work

<table>
<thead>
<tr>
<th>Period of graduation</th>
<th>Number of graduates</th>
<th>Number of returns</th>
<th>Per cent of returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1920</td>
<td>14</td>
<td>10</td>
<td>71</td>
</tr>
<tr>
<td>1920-1932</td>
<td>123</td>
<td>64</td>
<td>52</td>
</tr>
<tr>
<td>1933-1937</td>
<td>97</td>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td>Total</td>
<td>234</td>
<td>110</td>
<td>47</td>
</tr>
</tbody>
</table>

1 Supra.
The adequacy of the sampling must be judged on the basis of the number of returns in relation to the variation involved and the nature of the use of the data. Inasmuch as there were but two possible answers for each item and the data were used in their entirety, 110 returns were judged to be sufficient.

The items were listed in order of the number of checks received by each so as to determine their relative importance. Breaks appeared in the tabulations between frequencies of 55 and 59 and between frequencies of 42 and 46. It was decided, therefore, to list the items for inclusion in the curriculum in order of preference. Accordingly, all items mentioned 59 times or more were listed as most desirable, those checked between 46 and 55 times as desirable, and those with less than 46 checks as least desirable.

Since there is a possibility that the scope and nature of a forester's work depends somewhat on his length of service in the field, the validity of the foregoing classification was tested by studying the returns made by those who graduated prior to 1920, between 1920 and 1932, and after 1932 respectively. A tabulation was made, first, of all items that were checked by as many as one-half of each of the three groups of graduates. Each of the resulting lists was then compared with the list of items already placed in the "most desirable" classification. As no significant differences were found, it was assumed that the length of the period since graduation was not a serious factor in determining the scope of the work of the forester. In consequence, no further effort was given to improving the initial classification.

The next step in developing the core in professional forestry was to group the items that were regarded as most desirable in accordance with the specifications for the various grades of professional and subprofessional work used by the U. S. Forest Service.\(^1\) This, in effect, arranged the items in keeping with the promotional ladder of that organization.

The personal qualities that are essential to a job-competent forester were decided on after surveying the recent articles in forestry journals on this subject. A list of attributes was then selected that had received the approval of foresters in administrative work.

The desirable mental abilities for a job-competent professional forester were determined by analyzing the work of the forester. The procedure used was to characterize the distinctive features of the work of those at the bottom of the professional pyramid and also of those at the top, thereby allowing a maximum of contrast. The characteristics selected by this process were then discussed with administrative officers in the U. S. Forest Service in order that the final list of items would represent a consensus of opinion of

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\(^1\)Infra., p. 47.
men actively directing the work of professional foresters. At the same time attention was given to the possibility of trends in the characteristics selected as the foresters were advanced in their professional work. The mental abilities necessary were then typified briefly for the positions at the bottom, at the middle, and at the top of the professional pyramid. A check against individual job specifications as found in the U. S. Forest Service indicated that the characterization was essentially true.

The next important step in building the job competency section of the curriculum was to integrate all the elements into a core phase of the curriculum. It was assumed that the element most important to the integration was the work requirement. Accordingly the data obtained from the questionnaires were taken as basic to the integration.

The first trial core was obtained by assigning one course to each of the items on the questionnaire returns that had been checked at least fifty-six times. It was assumed that the other items tabulated from the questionnaire returns would be given consideration if time proved to be available in the curriculum.

A comparison between the trial core, the present curriculum in forestry at Oregon State College,¹ and the percentage of time spent by forest officers of the Federal Forest Service in each work-load group was made so as to judge whether the trial core was sufficiently in keeping to warrant its perfection. This comparison was accomplished by listing in the same table² for each work-load group, the number of courses in the trial core and in the present curriculum, together with the per cent of the work-load devoted by forest officers to each activity as computed for Region Six of the U. S. Forest Service. From the data presented it was observed that the trial core was more than merely a rearrangement of the usual courses as taught at present and that it was not materially out of line with the work-load data. It was decided, therefore, to perfect the core section of the curriculum.

Inasmuch as the total amount of work in the trial curriculum constituted a full five year's work and as it had been decided to limit the curriculum to five years, it was necessary to reduce the amount of work indicated in the trial core so as to provide for the requirements for general education. It was evident that the minimum time possible to assign to general education was a quarter of the available time if adequate provision was to be made for the continuous growth of the student in this phase of the curriculum. It was also apparent that the amount of time now assigned to this phase of the

¹Supra., p. 15.
²See Table 6, p. 58.
student's education was less than a quarter of the total time. In consequence, the amount of time allotted to general education was set at this minimum so that the present offerings in this field would not be weakened. The modification necessary in the trial core was slight.

The final step in determining the core in professional forestry was to arrange the courses in a proper sequence so as to promote the continuous growth of the student throughout all the areas of learning. This was accomplished by arranging the courses in accordance with the promotional scale of the U. S. Forest Service. It was assumed that the necessary knowledge and skill areas would be covered early in the curriculum. As a result the proposed courses covering the basic knowledge areas and the skills and arts were placed in the first two years. The courses dealing with inventory making, supervision of a single activity, planning, and leadership were placed in the last three years.

Provisions for General Education

The section on general education was developed after reviewing the recent authoritative writing on that subject to determine the nature of general education and the present practice. As a result of this review and in accord with the previously selected guiding criteria, the broad objective of the general education phase of the curriculum was fixed as the orientation of the student for adult life. It was decided, further, that this phase should be general in nature, yet not merely a survey of present areas of learning. Finally, the process of instruction, in order to be in keeping with the nature of a functional curriculum, should be such as to develop the student's thinking ability and his interest in society.

The next step in developing the curriculum in general education was to determine a functionalized description of our present civilization. Evidence for this determination was obtained from observation of current life, from discussions with practicing foresters concerning the general nature of their nonprofessional activities, and from a review of the courses offered in the General College of the University of Minnesota and of the University of Florida. A description made of observations of the nonprofessional life of foresters allowed the list of fundamental activities to be classified into five groups; namely, those acts necessary to use or consume, to produce, to live together cooperatively, to maintain and develop, and to lead. These fundamental activities were used as a basis for organizing the general education section and a year's work was assigned to each.

1For references see pages 63-68.
GUIDING CRITERIA

THE WORK OF THE INSTRUCTOR

Since the functional curriculum demands a type of teaching that guides the self-learning process of the student,1 it is important that the general nature of the work of the instructor be understood. The instructor cannot use teaching procedures designed for the subject matter centered curricula since these practices do not meet the requirements of the underlying philosophy of a functional curriculum. It is essential, therefore, that the teacher plan his classroom work in accord with the principles that guide the self-learning process.

The nature of the classroom work will be contingent upon the general guides used by the instructor in planning his work. For this reason, the work of the instructor was divided into its component parts, and the literature that has appeared since 1930 was reviewed for each section. In this manner, certain general guides were developed that should be useful in indicating desirable procedures. No attempt was made to evolve fixed rules to be followed in detail by the teacher since it was assumed that an instructor, as a master workman,2 would be capable of developing the details of each course.

THE DEVELOPMENT OF ADMINISTRATIVE PROCEDURES

The section on administration was evolved to indicate the type of procedure desirable for the successful development of a functional curriculum. The degree of success attained by this type of curriculum, it is assumed, depends largely on the ability of the staff to understand and implement properly the scholastic requirements. The function of the administrator, therefore, is to develop each staff member into the proper kind of instructor. In consequence, a type of administration was recommended that centers the attention on the growth of individual staff members in their understanding of the functional curriculum and its requirements.

GUIDING CRITERIA

The gradual development of education has resulted in the establishment of a number of major ideas that guide the educational process. These ideas vary from time to time and from place to place. Unfortunately, all of them cannot be welded into one basic educational philosophy that will receive universal acclaim. Hence it is necessary to select and epitomize a group of basic ideas into a set of general guiding criteria.

1Infra., pp. 68-80.
2Ibid.
Guiding criteria are essential if a curriculum in professional forestry is to be developed that is consistent in philosophy. They should represent the ideas of a group of authorities, but they cannot be representative of all authorities since among educators there are fundamental differences in philosophy.

Guiding criteria are found in two sources; namely, in the literature on education and in the literature of specific professions such as medicine and engineering. Criteria found in the field of education are necessarily general in nature. Those found in the literature of the specific professions are especially adapted to professional education. The selection of such criteria therefore becomes a task of unifying the basic ideas found in the two major sources into principles that can be used as guides in the development of a functional curriculum.

CRITERIA SELECTED FROM THE FIELD OF EDUCATION

As guiding criteria obtained from authorities on the curriculum are comprehensive in scope, it is desirable to group them into classes and to epitomize each group. Accordingly, the basic ideas selected were classified into four groups; namely, those that indicate the attributes of the curriculum itself, those that specify the relation of the student to the curriculum, those that designate the relationship of the curriculum to the environment, and those that particularize the work of the teacher. These four groups have been summarized as follows:

1. The curriculum should be a dynamic whole. It must be so integrated that the individual parts play an important role, not as entities, but as essential elements of the whole. Provision should be made for constant change and improvement. The coordination of the curriculum and the testing of the outcomes revolve around an analysis of the aims selected.

2. The functional curriculum is student centered. It should be organized in terms of the purposes and needs of the students and should provide for the progressive development of such essential abilities and characteristics as are appropriate for the culminating period of formal education.

3. The central objective of the curriculum is to prepare the student for adult living. The basic aims should therefore be derived from an analysis of adult living and should include education for general living, education for job competency, instruction in essential skills and knowledges, and development of desirable personal qualities for adult living.

4. The principal function of the teacher is to guide the student in selecting and organizing course materials. To do so properly requires that the teacher have a wide knowledge of adult life and of student interests. The learning process should be one that emphasizes the development of the mind of the student and obtains the proper correlation between theory and practice. The mechanics of the administrative process should be such that the teacher is given a share of the responsibility for developing the curriculum.

CRITERIA SELECTED FROM SPECIFIC PROFESSIONS

The ability of the professional societies to speak with authority on the education of young professionals is the result of an historical development
in which the professions have endeavored to improve the education of their students. Each society represents the pooled opinions of its educational leaders. In some cases, the program of professional education is partly compulsory while in other cases it is entirely a matter of choice resting with individual schools. In all cases, however, the program of the professional society exerts a profound influence on the thought and action of the schools themselves.

Historically the development of instruction in the professions differs for the various professions. Medicine, dentistry, and law on the one hand developed their educational programs from an early apprenticeship system, through a proprietary school period, and thence to university affiliation. Engineering and other professions, on the other hand, originated as coherent parts of a university program. In so far as the origins of professional education explain some of the present difficulties and practices, it is desirable to trace briefly the development of the two leading types of professional education—namely, those of medicine and of engineering. Similarly, a brief review of forestry education is advisable.

Medical Education

The early method of training physicians was by apprenticeship under practicing doctors and the clergy. (Clergymen in the early American colonies were often given instruction in medicine in England for service in the church.) Under the apprenticeship system, the young student learned by observation and imitation the art of medical practice. This procedure grew because of the lack of medical schools in this country and because of the urgent need for doctors.

The general level of practice was unsatisfactory, particularly as there was no means of insuring adequate and scientific medical training under an apprenticeship system. The first major problem in medical education became one of raising and standardizing the requirements of medical training.

The early medical societies made the first attempt to raise standards of medical instruction. These societies attempted to differentiate between competent and incompetent physicians. In so doing, they used, as one criterion, the training of the physician.

A number of medical schools were established by groups of physicians banding together to form medical faculties. Such schools were customarily operated for profit. Teaching standards were low. These schools were not connected with universities—in fact they competed directly with the few medical schools that were connected with universities.

Standards in medical education were materially raised by the activities of the American Medical Association. This organization in 1904 created a Council on Medical Education. This Council initiated the work of classifying and standardizing the medical schools. An impetus was given this work when a survey of medical education was made by Abraham Flexner and published in 1910.1

The years following 1910 saw medical education develop into a definite pattern. The licensure movement and the classification of medical schools by the American Medical Association forced the development of medical education by organizing the medical schools as integral parts of universities, with high standards of admission to their medical schools.2

The development of medical education during the past quarter century has produced certain problems and criticisms such as:

1. The difficulties that arise from efforts to provide instruction in too many subjects in too great detail. These endeavors have created great overloading of the curriculum. The dependence on sheer memory tends to defeat the development of a scientific attitude and point of view.3

2. The methods of presentation in the classroom are often unsatisfactory. Topics are often presented from the standpoint of the special interest of the teacher and from the aspects of technical details.4

3. Rare and serious diseases requiring the services of specialists are often overemphasized in the curriculum.5

4. The instruction is often given without full consideration of the teaching schedules in other subjects. The course should be regarded as a unit and the instruction in individual departments ought to be presented with respect to the whole.6

5. The training should aim to develop in the student sound methods and habits of study and arouse an interest in the fundamental problems of medicine that will equip him to continue his own self education throughout his professional life.7

6. The newer aims and methods place greater responsibility on the student for his own training. An effort is made to adapt the training to the ability, preparation, methods of study, and interests of the individual student, and to discontinue the former “lock-step” scheme of instruction, the rigid class system, and the uniform time and course schedules.8

7. Stimulating teachers who are masters of their subjects and who can inspire their students are vital features of the educational program.9

8. Premedical education should be general, not preprofessional education. Selection of students should be on evidence of a grasp of principles and philosophy of the scientific method, rather than the amount and division of time spent on individual subjects.10

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1Abraham Flexner, Medical Education in the United States and Canada, Bulletin four, Carnegie Foundation for the Advancement of Teaching, 1910.
2Ibid., p. 176.
3Ibid.
5Ibid., p. 175.
6Ibid.
7Ibid., p. 246.
8Ibid.
9Ibid.
individual subjects. There is an urgent need for change in the motivation and content of the teaching in premedical sciences . . . It is a question of different, not longer courses in physics, chemistry, and biology, and of discrimination in the subject matter and illustrative laboratory exercises. 1

From the foregoing discussion of medical education, conclusions may be drawn that instruction in a professional field should:

1. Be given by teachers capable both as educators and as professional men.
2. So relate academic and professional work that the interest of the student in the fundamental problems of the profession is stimulated and that he is motivated to continue his self education throughout his life.
3. Cover the field as a whole without undue emphasis on any one subject or group of details.
4. Place the responsibility on the student for mastery of the field rather than for conformance to a rigid class system of "lock-step" instruction.

Engineering Education

Engineering education in the United States, aside from that given at West Point, dates from 1824. It has consistently developed as an integral part of a university, never having gone through the apprentice and commercialized phases common to the professions of dentistry, law, and medicine. In the main it has been particularly free from professional influence because the teachers employed were not practicing engineers but were men who devoted their time primarily to teaching. Engineering education was an outgrowth of educational institutions rather than one arising mainly from a professional movement. 2

The improvement of standards in engineering education has followed, in general, the pattern of similar work in the field of medical education. Inasmuch as professional organizations in engineering developed as separate groups for each of the main branches of engineering, it was necessary to centralize the study of engineering education. Accordingly, the Society for the Promotion of Engineering Education was formed. In 1907, this organization invited the principal professional engineering societies to join in appointing delegates to a joint committee on engineering education to examine into all branches of engineering education and to formulate a report or reports on the appropriate scope of engineering education and the degree of cooperation and unity that may be advantageously arranged between the various engineering schools. This committee eventually obtained the active financial backing of the Carnegie Foundation for the Advancement of Teaching for a study of engineering education. The resultant report recommends: 3

1Ibid., p. 282.
3Ibid.
A FUNCTIONAL CURRICULUM IN PROFESSIONAL FORESTRY

1. Reduction of the number of courses studied by the engineering student at a given
time to not more than five so as to allow thorough mastery of subject matter.
2. Adequate provision during the first two years for orientation and contact with
real engineering projects and practical experiences.
3. Proper interrelation between the concrete and the abstract throughout the entire
college course.
4. The giving of a broad and sound training in engineering science rather than a
highly specialized training in some one narrow field.
5. A curriculum based on the proposition that it is possible to analyze engineering
practice and to make a list of all principles, facts, and theories that are essential
to the equipment of every engineer, and then to organize this subject matter
into a curriculum in which the several types of work are interrelated in such a
way that their inherent relations are obvious to the learner.
6. A common training in the beginning for all engineering students with a gradual
separation into specialized groups in the upper class years.
7. The requirement of laboratory work throughout the first two or three years.
8. A close coordination between the scientific courses, the common core of engineer-
ing, and practical work.
9. Emphasis on the problems of value and costs to the end that engineering educa-
tion may be tied directly to the practical world and that the engineer will
recognize fully the value of engineering projects to society.

A comprehensive investigation of engineering education was undertaken
from 1923 to 1929. The technique used was a questionnaire by means of
which opinions of practicing engineers and teachers of engineering were
obtained on various items. The findings of this study are:

1. An engineering education must be more than the mere sum of its parts; it must
be conceived and planned as a whole. The coherent, integral structure of the
engineering curriculum at its best, with its logical sequences running from be-
ginning to end, drawing on many fields of knowledge, but progressively bring-
ing the student’s efforts to a focus in a well-defined realm, is probably its
most constructive element.
2. The mastery of much of the specialized knowledge and technique of engineering
properly belongs to the period after graduation. Engineering instruction should
train in the fundamentals so that the practicing engineer may have a thorough
and broad base upon which to develop.
3. Adequate and sustained emphasis should be given to the bearings of engineering
on the broader problems of society and the social responsibilities of the engineer-
ing profession. This can be accomplished by having a band of humanistic
subjects extending throughout the curriculum; by frequent comments and
illustrations by the teacher in regular courses of instruction and by supple-
mentary lectures, tutorial instruction, recommended reading and activities of
student organizations.

The policies in engineering education that have been presented above
point to the desirability of formulating a professional curriculum that:

1. So trains the student in the fundamentals of the profession that a thorough and
broad base is provided on which those practicing the profession may develop.

\[Report of the Investigation of Engineering Education, 1923-29, Society for Promo-
tion of Engineering Education (Pittsburgh, Pa.: Office of the Secretary of the Society,
University of Pittsburgh, 1930), Vol. I, p. 85.\]
2. Covers the field as a whole with all the various elements integrated into the total pattern in such a way that the inherent relations are obvious to the student.

3. Provides a close coordination between the academic and the practical work in the field.

4. Includes an adequate emphasis on the relationships between the profession and the broader problems of society.

5. Favors the laboratory or problem type of instruction.

6. Gives the student not more than four or five subjects in order that thorough mastery of the courses may be attained.

Forestry Education

Education in professional forestry in the United States did not commence until 1898. Before 1898 only lectures and individual courses were offered in institutions of higher education. These early lectures and courses reflected the growing interest in forestry and indicated, particularly, the interest in forestry education on the part of land grant institutions, of which at least twenty-two were given forestry instruction prior to 1898.

The Biltmore Forest School and Cornell University began instruction in professional forestry in 1898. Forest schools that now exist, however, started in 1900 when Yale and the University of Minnesota established forestry work. By 1911, nineteen of the present schools had been organized. Five more schools were added during the 1920's, with two additional schools emerging since 1933.

The early American forest school based its course of study largely on forestry instruction as given in European institutions, especially German forest schools. The aim was to give a sound foundation in the principles underlying forestry, with an adaptation to American conditions. The early schools found it necessary to build forestry education from the very foundation. There was a lack of facilities and of teaching materials dealing with American forests and there were almost no experienced teachers. The work of the American forester had not yet taken a definite mould, hence there was a good deal of confusion in the minds of employers as to the difference between a professional forester and a woodsman. In the face of these obstacles, the early schools maintained high educational ideals, trained promising young men to become experienced instructors, and instituted much of the work that developed a core of professional knowledge and practice that was essentially American rather than European.

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1Herbert A. Smith, "Forest Education Before 1898," *Journal of Forestry* XXXIV (October 1934), 684-689.
2Ibid.
5Ibid., pp. 15-16.
Most of the schools developed on the basis of four year undergraduate curricula in forestry. Yale, however, has always been organized on a graduate basis, the course of study being only for students who have received a baccalaureate degree. Yale’s work has led to a Master of Forestry degree, with at least two years’ residence required for nonforestry graduates and one year for those who had completed a four year undergraduate course in forestry. Harvard developed its instructional work in connection with its Harvard Forest. Its instruction is strictly on a research and graduate basis. Forestry education therefore has developed upon three distinct bases as follows:

1. That of the plan of engineering schools wherein the student is accepted at the beginning of the freshman year. Most of the schools are of this type.
2. That of the plan of medical schools wherein the student is accepted only on a graduate basis. Yale is definitely of this type.
3. That of the research institute. Harvard is the representative of this type.

The development of graduate work in forestry has tended to decrease the clearcut line of demarcation between the three types of schools. Individual forestry schools, as they developed strong faculties, began to offer graduate work, first on the master’s level and then for the doctorate as well. The development of this work was accomplished by utilizing the basic or service departments for most of the work. More and more of the program of the graduate student was taken over by the forestry staff as it developed its ability to give graduate work. Today, sixteen forestry schools offer graduate work on the master’s level, with eight also giving doctorate work.1

Graduate work has crystallized into two definite forms: first, that which leads to the M.S., M.A., or Ph.D. degrees; and, second, that which leads to the professional degree of M.F. or D.F.2 The essential difference between the two types of graduate programs lies in the relative emphasis on breadth or depth of training, and in research training as opposed to professional training. Students desiring to enter research work are encouraged to take work leading to a philosophical degree. Programs of study are so constructed that students obtain thorough training in their selected field. Students desiring to enter professional work are encouraged to take the professional degree; these programs of study are constructed to give a broad training in forestry.

It so happens that many graduate students are recruited from nonforestry graduates. It follows, therefore, that schools that accept such students

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must develop programs for them quite similar to the plan followed at Yale. On the other hand, the work that leads to the philosophical degree develops, in many respects, into a pattern similar to the graduate program of Harvard.

The development of junior colleges is resulting in pressure on the forest schools to change the arrangement of their courses of study. Undergraduate programs for forestry students are now so arranged that graduates of junior colleges cannot, as a rule, complete the course in another two years. The junior colleges, to meet this situation, have sometimes introduced forestry work into their curricula. The University of California has met the problem by placing all professional work in the last two years and urging all students to take a five year course. This school seems to be moving, therefore, toward the type of organization represented by the medical schools.

Since a very large majority of the forest schools of the nation are organized on the same basic plan as that of the engineering schools, it is probable that this type of organization will continue to be the most desirable one. It is believed that this is the superior type of organization for the following reasons:

1. It allows a better unification of the curricula. Sequences of work can be extended throughout the four years. The scientific grounding can be built up consistently and thoroughly since the faculty of the professional school is able to exert some control over this type of training. It subtracts nothing vital from cultural ideals.

2. It is more adaptable. Changes can be made throughout the entire program more easily as all work is given on one campus. This allows a closer contact to be maintained between development in the professional field and the course content of basic courses.

3. It places the selection of professional students more directly in the hands of the professional schools. Experience in engineering and in medicine indicates that two years in a liberal arts school hinders rather than helps the selection of those fields by the better students. Poor guidance plus the killing of the enthusiasm for the profession concerned are given as the principal reasons for the poor selection of students when students attend nonprofessional schools for two or more years.

4. It is more economical of the students' time as it allows a better integrated program to be constructed. It is also possible to capitalize better on the students' natural motivation, thereby allowing higher standards of instruction to prevail.

5. It allows a longer time and a better opportunity to build professional ideals and attitudes.

6. It is in keeping with the principles of organismic psychology.

Education in professional forestry, as in the other professions, is characterized by a definite tie between the instruction given and the work of the professional man after graduation. It emphasizes thoroughness of scholarship and understanding of the fundamental principles rather than the mere techniques of doing a job. It endeavors to produce cultured men who can apply their knowledge in a given sphere of work, who do so thoughtfully and understandingly.

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SECONDARY CRITERIA

In addition to the primary or general criteria so far developed, two criteria of a more specific nature should receive attention. These specific criteria have to do with the amount of time allowed for formal education and with measures taken to improve the quality of instruction through better selection of students and through adequate provisions for staff, plant, and equipment.

LENGTH OF PERIOD OF STUDY

No clear cut consensus prevails regarding the most desirable period for formal study. Educators in medical schools find that the training program for medicine requires about ten years. They feel that many American students enter their medical practice too late for optimum service. The solution suggested is primarily the saving of time in elementary and secondary schools, reorganization of existing courses, the elimination of unnecessary vacations, and the stimulation of scholarship.¹

Educators in engineering schools advocate the four year curriculum because efforts to establish longer curricula so far have not been successful, because the young professional may enter his life's work in his early twenties without an undue financial burden, and because such a curriculum affords time and opportunity for additional training after graduation.²

Educators in forestry schools are consistently advocating a five year course of study.³ One forest school, the University of Minnesota, has announced a compulsory five year curriculum. Others have developed an elective five year program.

The question of specialization is closely connected with that of the period of study since it is possible to provide an intensive course of instruction by narrowing the field without lengthening the time devoted to formalized study. There seems to be little unity in practice among the various forest schools as far as specialized courses are concerned. Neither is there an agreement among educators in this field as to a common core of professional training that should be included in all specialized curricula.⁴

While there is a divergence of action on the question of specialization, there is nevertheless a fair amount of agreement as to the basic philosophy

¹Medical Education, op. cit., p. 273.
to be followed. Educators in forestry,1 in medicine,2 and in engineering3 are of the opinion that specialization should follow general professional training and should represent an additional type of training. It follows, therefore, that the forestry curriculum should be based on the premise that adequate training for the general practice of forestry must be provided. It would be undesirable to set a four year limit and develop thoroughness of training by dividing the field of forestry into specialty groups. Likewise, it would be undesirable to set a four-year limit at the expense of thoroughness.

In view of the opinions expressed, it is concluded that the forestry curriculum should not be broken into a series of specialties but that the curriculum should be designed to cover the entire field of professional forestry and that five years should be the period of time devoted to the training of a forester.

QUALITY OF INSTRUCTION

High quality of instruction is deemed an essential provision in the education of professional students. Efforts to improve the quality of instruction have centered around the selection of students and faculty and the provision of adequate facilities for instruction for the most part.

STUDENTS

So far no attempts have been made to select or otherwise control the students electing forestry beyond the application of the general scholarship rules of the college or university concerned. It is recognized, however, that the entering student is the raw material out of which the school must develop a professional forester. In consequence, the selection of the proper type of student should receive adequate consideration.

Forestry, like other professions, returns to the individual a salary much above average; consequently, foresters should be men of superior ability. Thus, while the average wage for the United States is less than $1,500 and the average salary below $2,500,4 the average income of foresters is approximately $3,000 a year.5 This is in keeping with the average earnings of other professional people. As foresters receive an income above the general average, their service to society should be above the average. It follows that foresters should be well trained men of ability.

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1Graves and Guise, op. cit., pp. 176-190.  
5Graves and Guise, op. cit., p. 87.
Forest schools have more than their proportion of students of limited capacities for outstanding academic success. There is some question whether the present supply of forestry students is needed to meet the real demand for professional foresters. The presence of too many students of mediocre ability is not essential, therefore, nor is it desirable.

The problems involved in selecting the men of the highest ability for the professional grade and in balancing the supply of trained foresters with the demand will, in all probability, gradually grow more severe with the passing of time. Meanwhile the tendency is for more and more youths to seek a college education.

Since 1890 the total college enrollment has increased nearly 900 per cent; from 1918 to 1938 alone the increase has been over 400 per cent. Of all the inhabitants who were between the ages of 19 and 22, 983 per 100,000 were enrolled in 1934 in some kind of higher education as compared with the 313 per 100,000 in 1900. During the same period the proportion of those between the two ages who were in college rose from .3 per cent to 18 per cent.

In contrast to the growing enrollment in higher schools there is, comparatively speaking, a rigidity in the number of positions at the professional level.

A solution of this problem of selection may be attempted on three bases as follows:

1. The schools may refuse to accept any responsibility in the selection of men for professional levels. This policy would encourage any and all prospective students to enter schools of forestry where they would be given the best training available facilities would permit. The task of ultimate selection of professional foresters would be passed on to employing agencies. This policy, if universally adopted and pursued to its logical conclusion would, in accordance with the economic law of supply and demand, reduce the salaries of professional foresters to a point where men of superior ability would not find it desirable to enter professional work. It would also create dissatisfaction among large numbers of graduates who, under emergency conditions, are capable of supplying leaders for any radical or revolutionary movements.

2. Forest schools may accept complete responsibility for acting as selective agencies. This policy would follow closely the European practice. It is doubtful, however, whether such a program would be possible in present day America, particularly since all but three of the forest schools are in public institutions. Graves and Guise advise against this procedure because state supported institutions cannot adopt a policy of rigid selection of students, because there are few if any special tests and standards that can be used effectively in selecting forestry students, and because of the tendency of university administrators to allocate funds merely on a basis of class enrollments.

3. Forest schools may accept only that portion of the selective role that they can
perform effectively. This policy would presuppose a flexible system, skillful and cautious use of available criteria of student success, and intelligent development of needed measuring sticks and guidance data. This plan of procedure would require that high school students be supplied with accurate and comprehensive data concerning forestry as a profession and that students who are obviously unfit for professional forestry work be eliminated. Studies to determine the exact qualities desired in a forestry student and the development of special tests to measure such qualities would be necessary. Likewise, a guidance program would be essential for each forest school. Finally, there should be a flexible means of transferring students from and to forestry as their potentialities become known to their instructors.

In view of the evidence, it is advocated that the forest schools accept only that part of selective role that they can perform effectively. The resultant guidance program, if developed on a basis that requires the participation of all staff members, will aid the type of teaching necessary for a functional curriculum.

Faculty

The literature concerning the faculty provides two types of data; namely, the opinions of individual authors and the results of systematic surveys by questionnaires of opinions of students, college faculties, and administrators.1 Educators in the professional fields recognize the importance of the staff and the desirability of in-service training in order that young staff members may develop into master teachers. The Society of American Foresters has set objective standards for forestry staffs.2 These standards should be adopted as minimum essentials of staff quality.

Facilities

Adequate facilities are essential for proper instruction in the profession so essential that the Society of American Foresters has set objective standards to use in grading the forest schools of the nation. These standards cover building, libraries, laboratory equipment, and school forests. They should be accepted as essential minimum standards.3

CORE IN PROFESSIONAL FORESTRY

It is apparent from the guiding criteria selected that the curriculum in professional forestry must be twofold in nature; it must prepare the student to be job competent and at the same time give him a cultural background. The curriculum has, accordingly, been broken into two parts, and each developed separately. One part of the curriculum is the core in professional for-

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1Lester W. Bartlett, "Bibliography on the Professional Growth of Faculty Members," Association of American Colleges Bulletin XII (November 1926), 275-300.
2Chapman, op. cit., p. 10.
3Ibid., pp. 129-150.
A FUNCTIONAL CURRICULUM IN PROFESSIONAL FORESTRY

A FUNCTIONAL CURRICULUM IN PROFESSIONAL FORESTRY

stry based on the work of the forester. The second part is concerned with the general education of the forester and is designed to give him a background for that portion of his activities that are not a part of his professional work.

A functional curriculum designed to make a student job competent in the field of professional forestry must derive its aims from and relate them directly to the work a forester does. While the work of the forester is varied in nature, nevertheless there is a marked concentration in a few major fields of employment. Almost 83 per cent of the forest school graduates of the nation are working for the federal government, the state forestry services, the forest industries, and educational institutions. It so happens that twelve of the fourteen forest schools approved by the Society of American Foresters in 1935 had developed separate curricula for men entering the forest industries. Accordingly, the forest industries were eliminated as a source of major employment for professional foresters since the work was sufficiently diverse to be recognized, in the main, by a separate curriculum. On this basis, the U. S. Forest Service employs about two-thirds of the professional foresters of the nation. Most of the remainder are in work essentially similar to that of the Federal Forest Service. In view of this situation, the U. S. Forest Service was selected as the agency typifying the work of the professional forester.

The general nature of a forester's work was determined, after discussions with administrative officers in the U. S. Forest Service and the Oregon State Department of Forestry, to consist of the following categories:

1. The work done, consisting of the professional tasks together with any essential skills and underlying knowledge.
2. The necessary personal qualities.
3. The desirable types of mental and physical abilities.

The validity of the proposed classification was checked by reviewing the recent literature on this subject in the fields of forestry, medicine, and engineering. Hatcher reports the following characteristics as excellent selective indexes of success in the U. S. Forest Service:

1. A work-business division of executive and organizing ability, judgment and common sense, reliability, practicability, and persistence.
2. A person-qualities group of leadership, cooperation, ambition, adaptability, and personality.
3. A mental reactions group of intelligence, mental curiosity, imagination, and enthusiasm.

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1Graves and Guise, op. cit., p. 33.
2Chapman, op. cit., p. 163.
3Graves and Guise, op. cit., p. 32.
In the medical profession, the opinion of physicians is that the most important elements in success are: character, personality, industry, good training, and sound judgment, in the order named. The engineers list: character, leadership, training, physical qualities, and scholastic record as being of importance to success.

It is concluded, therefore, that the proposed division is sufficiently valid and that the essential features of the forester's work in each of the three main divisions should be ascertained in order to determine the proper aims of a functional curriculum.

THE JOB LIST

The work of the forester is necessarily complex. It requires certain skills, a basic knowledge about things, and job competency in professional tasks. The questionnaire designed to ascertain the important elements of the work of the forester, when tabulated, gave the following results for each division.

Table 4. THE ESSENTIAL FEATURES OF THE WORK OF A PROFESSIONAL FORESTER LISTED IN THREE DEGREES OF DESIRABILITY ON THE BASIS OF 110 QUESTIONNAIRE RETURNS

<table>
<thead>
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<th>Amount of Consideration to Be Given*</th>
<th>Most Desirable</th>
<th>Desirable</th>
<th>Least Desirable</th>
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<tr>
<td><strong>1. THE NECESSARY SKILLS</strong></td>
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<tr>
<td>Typing, 80</td>
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<td>Telephone Repairing, 53</td>
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<td>Report Writing, 83</td>
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<td>Manners, 55</td>
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<td>Letter Writing, 80</td>
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<td>Filling Out Forms, 49</td>
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<td>Photography, 40</td>
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<td>Teaching, 51</td>
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<td>Conversation, 47</td>
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<td>Filing (office), 42</td>
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<td>写故事, 28</td>
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* Numbers indicate times checked.
Table 4. **The Essential Features of the Work of a Professional Forester Listed in Three Degrees of Desirability on the Basis of 110 Questionnaire Returns—Continued**

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*Numbers indicate times checked.
Table 4. **THE ESSENTIAL FEATURES OF THE WORK OF A PROFESSIONAL FORESTER LISTED IN THREE DEGREES OF DESIRABILITY ON THE BASIS OF 110 QUESTIONNAIRE RETURNS—Continued**

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<td>Control Projects, 32</td>
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</table>

*Numbers indicate times checked.

The following items were written in, but none was mentioned more than thirteen times: public speaking, shorthand, lumber grading, office machines, personnel management, radio, cooking, and tact.

The first observation made of these data indicates that most of the phases of the job list are done by 50 per cent or more of the graduates in forestry. This would tentatively indicate the necessity for an almost complete coverage of the field in the technical phase of the curriculum.

In order to determine whether all phases of the work were of equal importance, an analysis of all the Job Load records for Region Six of the Federal Forest Service was made. The process used was to total for each classification the number of man-hours spent by the various forest officers for each forest for 1938. These totals were then summed up for the region and expressed as a percentage of the grand total. The resultant data are presented in Table 5.
Table 5. Allocation of Time to Different Phases of Forestry Work During 1938 in Region Six

<table>
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<tr>
<th>Phase of Work</th>
<th>Per cent</th>
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<tr>
<td>1. Fire Control</td>
<td>20.3</td>
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<td>2. General Administration</td>
<td>19.5</td>
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<td>3. Engineering</td>
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<td>4. Travel</td>
<td>12.0</td>
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<td>5. Range Management</td>
<td>10.9</td>
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<td>6. Timber Management</td>
<td>7.6</td>
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<td>7. Recreation and Lands</td>
<td>6.4</td>
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<td>8. Education and Information</td>
<td>3.8</td>
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<tr>
<td>9. Wild Life Management</td>
<td>2.9</td>
</tr>
<tr>
<td>10. State and Private Forestry</td>
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<tr>
<td>Total</td>
<td>100.0</td>
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1Regional averages are listed in order of amount of time spent.

These data indicate the desirability of weighting the ultimate amount of instruction given in any one field by giving some consideration to the relative importance of the activity in the total job list picture. They indicate also the desirability of a careful elimination of certain phases of the job list from a collegiate curriculum. Travel, for instance, while utilizing 12 per cent of the forest officer’s time, could not logically be considered a portion of the technical instruction given foresters in view of the principle of teaching the fundamentals rather than the practice. Obviously there are parts of the forester’s work that can best be learned on the job. It becomes necessary, therefore, to have a further analysis of the nature of the job activity list.

Further, these data point to the possibility of combining certain phases of the work so as to get a better grouping of fundamental concepts. “Plans and Surveys” for instance appears in nine of the thirteen groups; “Improvements” appears in six of the classifications; and the item, “Administrative Research” or “Studies” appears in nine of the groups. The possibility of a better grouping of the work was therefore undertaken.

GROUPING THE JOB LIST ACTIVITIES

Descriptions of each activity in the job list showed that much work was routine in nature. It was decided, consequently, to eliminate all such items from consideration on the assumption that professional instruction at the collegiate level should teach fundamental concepts rather than the doing of superficial tasks of work.

It proved to be a difficult task to isolate the important from the superficial duties. Some activities, such as travel, were obviously superficial in

1Administrative Forest Work Plan R–6, Mimeographed, U. S. Forest Service, Portland, Oregon, pp. 1-142.
nature; others were but partly superficial, and some, such as plan making, were obviously complex jobs requiring a broad understanding of the factors involved, a complete understanding of the whole project, and the ability to select the most feasible plan of action. This fact made it necessary, therefore, to determine an organizing principle which could be used to classify the activities in the job list.

The organizing principle selected was an adaptation of the job level descriptions used by the U. S. Forest Service in rating their men into salary classes in accord with the regulations of the U. S. Civil Service Commission. Specifications for various grades of professional and subprofessional work are available. It is likely that similar descriptions for jobs below the subprofessional level will be developed as civil service status spreads to such jobs. Selected excerpts of the job descriptions are given for selected positions so as to indicate the general nature of the classification throughout the range of the classes.1

1. Professional grade 8. "Under most general administrative direction and with widest latitude for action or decision requiring highest order of originality and leadership."

2. Professional grade 7. "Under administrative direction with practically complete latitude for independent or unreviewed action or decision to organize, direct and coordinate the work of the division for which he is responsible and to furnish independently or for final executive action critical or expert advice on the most important problems or policies."

3. Professional grade 5. "Under only general administrative supervision with the exercise of independent judgment, . . . Shall be responsible for the preparation, the devising and adaptation of methods and the efficient conduct of the work . . . ."

4. Professional grade 3. "Under general administrative supervision with considerable latitude for the exercise of independent judgment and following definite plans prepared by a superior officer. . . . Shall be responsible for the execution of approved working plans . . . ."

5. Professional grade 1. "Under immediate supervision and following detailed instructions. . . . Responsibilities in this grade involve the simpler processes of administration and preliminary securing of data for plan making . . . ."


7. Subprofessional grade 4. "Under immediate supervision, with limited latitude for somewhat independent work in carrying out the more routine details . . . ."

These activity descriptions indicate that the work of the forester becomes more and more that of plan making and supervision and less and less the personal performance of jobs as he progresses upward in his profession.

1"Class Specifications," Field Survey Division, Personnel Classification Board, U. S. Civil Service Commission, PCB Form 18, (1928), pp. 119-125.
In consequence, the following four types of activities were recognized:

1. Those which require personal performance of work.
2. Those which are essentially the supervision of a single phase of forestry work.
3. Those which are essentially the planning and coordinating of the single phases into a unified whole.
4. Those which revolve around the relationships of the service of the forestry profession to the rest of the activities of the nation.

Once these four groups were decided upon, it was necessary to set the line of demarcation in the first group between those activities to be considered in the curriculum and those which could best be learned on the job. In accord with the guiding criteria adopted, it was decided that complete instruction should not be given in the actual skills required in doing particular tasks. On the other hand, a thorough understanding of the more complex tasks should be taught. This would presuppose a limited amount of instruction in the actual arts and skills in order that the student might most effectively gain a thorough understanding of the tasks involved. Thus in map making, for instance, the objective would not be to train skilled mappers, but would be, on the other hand, to teach students an understanding of the fundamentals involved. Obviously, instruction in map making would include practice in the art of making maps. The emphasis in this phase of the instruction, however, would not be upon requiring the student to produce an accurate and highly polished map but would be upon having him demonstrate a thorough understanding of the principles of map making, of the operation of the necessary measurements, and of the relative accuracies as required by the problem assigned. In accord with the principles involved, it was decided to allocate to the field, training in the art of doing the tasks, and to the school, training in the underlying theory. Obviously only fairly complex tasks would have sufficient theory behind them to warrant their inclusion in the forestry curriculum.

In attempting to list the actual tasks in accord with the classifying criteria selected, it became apparent that a clear-cut classification was not possible. It was decided, consequently, to state the job activities functionally and thereby to allow a certain amount of grouping and simplification which, in turn, would allow a better organization of subject matter for instructional purposes. This procedure was selected in accordance with the principle of making the curriculum functional in nature. It also tended to eliminate the danger of having the resultant functional curriculum a mere task of job training.
The selected plan of procedure gave the following classification of the job list:

I. Those activities in which the forester actually does the task or acts as a foreman thereon:
   A. Timber Management
      1. Making a forest inventory
      2. Marking trees
      3. Reforestation
      4. Building timber trespass cases
   B. Range Management
      1. Making range inventories
      2. Making range improvements
   C. Wild Life
      1. Making wild life inventories
      2. Building wild life improvements
   D. Recreation
      1. Making surveys of recreational possibilities
      2. Laying out recreational facilities
      3. Building recreational facilities
   E. Lands
      1. Surveying the areas involved
   F. Engineering
      1. Surveying and mapping the forest area
      2. Locating roads, trails and other facilities
      3. Constructing improvements
   G. Education and Information
      1. Writing news articles
      2. Making public talks
      3. Contacting individuals
      4. Contacting groups
   H. Fire Control
      1. Detecting and suppressing small fires
      2. Making field inventories for damage appraisals
   I. General Administration
      1. Caring for equipment
      2. Caring for building and grounds
      3. Office routine work
   J. Control of Disease and Insects
      1. Making inventory of damage areas
      2. Supervising control projects
Having completed the classification on a functional basis, the next step was to unify items whenever the work was of a similar nature. Here again the criteria used were arbitrarily set in accord with an organizing principle; namely, that as long as the fundamental principles involved were uniform, separate courses should be avoided. The results of this step gave the following classification:

I. Those activities in which the forester actually does the task or acts as a foreman thereon:
   A. Making Inventories
      1. Inventories of the land
         Mapping
         Surveying
      2. Inventories of the forest
         Scaling
         Cruising
         Valuation
      3. Inventories of the range
      4. Inventories of wild life
      5. Inventories of recreational resources
      6. Inventories of damage
         Fire
         Insects
         Disease
   B. Making Improvements
      1. Roads and trails
      2. Recreational improvements
      3. Buildings
   C. Preventing Trespass
      1. Law enforcement
         Timber
         Fire
      2. Public education
   D. Detecting and Suppressing Small Fires
   E. Reforesting Lands
   F. Making Speeches
   G. Writing News Stories
   H. Meeting the Public Graciously. (This is mainly a matter of tact and social poise. As such it is not taught as fundamental principles and should, therefore, be relegated to training outside the classroom.)
I. Caring for equipment, buildings and grounds, and the routine of office procedure. (These activities are largely in the nature of skilled labor or of routine work. They can, therefore, be best learned outside the collegiate classroom.)

II. Those activities which are essentially the supervision of a single phase of activity:
   A. Timber Management
      1. Supervision of timber sales
   B. Range Management
      1. Supervision of range use
   C. Wildlife
      1. Supervision of procedures for managing wildlife
   D. Recreation
      1. Supervision of recreation
   E. Education and Information
      1. Making plans and surveys to develop public relations
   F. Personnel
      1. Managing the short-term force so as to do the assigned work efficiently
   G. Fire Control
      1. Supervision of fire protection

III. Those activities that are essentially the planning and coordinating of the single phases into a unified whole:
   A. Timberland Management
      1. The coordination of all the uses of a tract of land
   B. General Administration
      1. The coordination of the financial, personnel, equipment, and technological phases of the work in a comprehensive plan of action

IV. Those activities which revolve around the relationships of the service of the forestry profession to the rest of the activities of the nation:
   A. Leadership activities in which the general plans, the method of carrying out the plans, and the spirit of the forestry organization are focused toward the proper ideal of the “greatest good to the greatest number for the longest period of time.”

THE NECESSARY PERSONAL QUALITIES

The determination of the necessary personal qualities was based upon a study of expert opinion on the subject. A wide variety of qualities was
listed as essentials to success in forestry. Graves and Guise\(^1\) list personal interest in the problems of forestry, adaptability, self reliance, initiative, active imagination, mental alertness, resourcefulness, and executive ability. Kelley\(^2\) lists personality, physique, interest, virility, intelligence, straight thinking, quick mindedness, mental balance, courage, self starter, versatility, honesty, sincerity, temperance, interest in human welfare, yen for rendering service, love of the soil, reverence for things natural, never-satisfied inquisitiveness, keen powers of observation, sportsmanship, confidence with freedom from egotism and complacency, tolerance, and open-mindedness. A federal publication\(^3\) lists industry, honesty, soundness of character, liking for the sort of life which he must lead, the health and constitution to stand the work, foresight, broadmindedness, thoroughness in details, administrative and executive ability, teaching ability, ability to meet people and gain the confidence of the public, and a spirit of service. Other recent authors give varying lists of characteristics but without an attempt to validate any of the items in the list given. Blackerby\(^4\), however, has tabulated the qualities listed by eighteen references and has classified them into six groups as follows:

1. Intelligence:
   - Quick-mindedness
   - Mental alertness
   - Inquiring mind
   - Ability to learn and to reason
   - Ability to meet new situations
   - Adaptability
   - Active imagination
   - Resourcefulness
   - Capacity to see the point
   - Capacity to sense relationships
   - Capacity to put "two and two" together
   - Ability to recognize salient points

2. Personality:
   - Habits
   - Dress

\(^1\)Graves and Guise, op. cit., chapters 4, 5, and 6.
\(^2\)Evan W. Kelley, Lecture delivered at Conclave of Western Forest Schools, School of Forestry, University of Montana, Missoula, Montana, February 2, 1939.
\(^4\)Alva W. Blackerby, A Method of Rating Forest Service Employees, a thesis presented as partial fulfillment of the requirements for a master's degree, Oregon State College, 1939, pp. 92-98.
3. Character:
- Temperance
- Sincerity
- Honesty
- Loyalty
- Tolerance
- Sympathy
- Courtesy
- Firmness
- Broadmindedness
- Dependability
- Faith
- Courage
- Self-reliance
- Sportsmanship
- Teamwork
- Cooperation
- Ability to work with others
- Spirit of public service
- Love of nature and things natural
- Interest in human welfare
- Interest in rendering service
- Reaction to criticism
- Willingness to make personal sacrifices
- Integrity
- Reliability

4. Physical and nervous energy:
- Industry
- Initiative
- Self-starter
- Perseverance
Aggressiveness
Physically strong
Certain ruggedness of spirit and body
Willingness to endure hardships
Outdoor man
Virility
Drive
Endurance
Vigor of body and mind
Quality that begets zeal and enthusiasm
Will to win
Dynamic emotion
Abounding energy
Robust

5. Scientific trend of mind or common sense:
   Use of good judgment
   Vision
   Foresight
   Mental balance
   Straight thinking
   Open-mindedness
   Decision
   Executive ability
   Firmness
   Confidence
   Ability to reprimand
   Ability to direct
   Ability to plan
   Ability to coordinate
   Sense of purpose and direction

6. Skill and knowledge:
   Technical training
   Knowledge
   Specialized education
   Broad training
   Powers of observation developed
   Versatility
   Ability to train others
   Ability to understand and follow a plan
   Thoroughness in details
Personal interest developed in problems of forestry
Technical mastery
Technology and processes by which purposes are realized

This list was submitted to four high ranking U. S. Forest Service officials who indicated that all the items on the list were important personal qualifications for foresters to have. Accordingly, this list was accepted as the basis for further development of this phase of the forestry curriculum.

**DESIRABLE MENTAL AND PHYSICAL ABILITIES**

The physical abilities required of a forester constitute nothing more than good health and a physique capable of withstanding rigorous outdoor work. The physical examination given young foresters as a prerequisite for entry into federal employment makes no special requirements other than that of normal health. An examination of the literature in which qualifications of foresters are discussed gives no inkling of special physical abilities other than normal health and physique. The job list of work which a forester does contains no items which require a delicate muscular control or coordination of any sort. It follows, therefore, that the only physical requirement is a normal physique.

The field of forestry is so broad that there is room for men of varied mental aptitudes. The pyramidal structure of the work of the forester in which men must “start at the bottom and work their way up” results in an integration of unskilled, skilled, and professional work which makes it difficult to analyze the essential mental aptitudes involved.

The procedure used in analyzing the mental abilities needed was to characterize the work of those at the bottom of the pyramid and also of those at the top, thereby allowing a maximum of contrast. The items selected by this process were then discussed with administrative officers in the U. S. Forest Service in order that the final list might represent a consensus of opinion of men actively directing the work of professional foresters. At the same time, attention was given to the possibility of trends in the abilities required as the foresters are advanced in their professional work. In accordance with this process, the following conclusions were made.

1. Men in the lower brackets are mainly interested in their individual welfare. Working conditions, salary, promotion possibilities, and similar items are important. As they are promoted from job to job, their interest changes to major concern for the welfare of the organization. Men in the higher positions are mainly interested in seeing that the organization functions efficiently and properly.

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1Graves and Guise, *op. cit.*, p. 6, p. 301.
2. Men in the lower brackets are essentially “boss” motivated. They receive their directions as to what to do, when to do it and how it is to be done from the men in charge. The men at the top, on the other hand, are job motivated, it being the requirements of the tasks of the organization which motivates them and in turn causes them to motivate the men in the lower brackets.

3. The men in the lower brackets are concerned with doing specific tasks which they repeat over and over. They are interested in mastering specific techniques, often with little or no interest in other types of work or in the relationship between the work they are doing and that of the rest of the organization. The men in the upper brackets, on the other hand, seldom do specific tasks. The work is that of so timing and otherwise synchronizing the work of the various individuals and groups that the total work of the organization can be efficient and effective in reaching the goals set for the organization.

4. The work load of the men in the lower brackets is regular and definitely limited as to time, place, and type. The work load of the men in the upper brackets is irregular with no particular limits as to time, place, and type.

It became apparent, in the light of the foregoing analysis, that the work of the forester changes materially as one moves from a position in the lower bracket to a position in the upper bracket. This gradual change is evidently one of the reasons for the diversity found in the work of the forester. It therefore became desirable to characterize the work of the forester in relation to his position in the professional pyramid. Only three divisions were used for this purpose which resulted in the following characterization.

<table>
<thead>
<tr>
<th>Position in Pyramid</th>
<th>Major Characteristic of Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bottom</td>
<td>1. The ability to do the tasks assigned.</td>
</tr>
<tr>
<td>2. Middle</td>
<td>2. The ability to understand the tasks and their relationships</td>
</tr>
<tr>
<td>3. Top</td>
<td>3. The ability to develop an integrated plan of action</td>
</tr>
</tbody>
</table>

A check of this characterization against individual job specifications indicated that it is essentially true. It was noted, however, that all jobs apparently have some elements of all three of the major characteristics. It was concluded, therefore, that the mental abilities required of a forester vary only in degree but that in the lower brackets the major emphasis is upon skills, in the middle bracket upon perception, and in the upper brackets upon conception.
INTEGRATION OF THE CORE IN PROFESSIONAL FORESTRY

The integrated core in professional forestry was developed in order to synchronize the three essential attributes, job competency, attitudes, and mental aptitude. In so far as the steps in the professional pyramid are correlated with the necessary job competency and mental attributes of the forester, this sequence was selected as the basic organizing principle. Accordingly, the core was arranged to provide for instruction in the simple tasks in the first years of college and for progression to instruction in the most complex tasks in the final year. Instruction in the necessary knowledge areas was provided for during the first two years.

Instruction in the necessary character and attitude attributes did not lend itself to organization on the basis of the professional pyramid. In consequence, it was decided to include these items later under the work of the instructor—the assumption being that instruction in this area would be an adjunct to every course.

This method of integrating the core in professional forestry requires that each course have three objectives; namely, the subject-matter desirable for job competency, the mental attributes to be emphasized, and the personal qualities to be developed. The objective having to do with job competency was selected as the basic one in determining the sequence of the course. The data obtained from the questionnaires were used to set the scope while the analysis made of the work of the forester was used to determine the sequence. It was assumed that the instructor, as an expert workman, would determine the knowledges, skills, and understandings necessary for the student to obtain in each course. Once the exact course content was determined, the necessary mental attributes would become apparent. Likewise it would be possible to select the personal qualities which might be best developed. It follows, in consequence, that the instructor is expected to perfect the functional curriculum by carefully developing each course in accord with the general framework developed in this study.

A trial integrated core for the job competency phase of the curriculum was made by listing a course for each of the items which was checked by more than 50 per cent of those who replied to the questionnaire. These courses were arranged roughly by placing the underlying knowledge and skill groups first and by then including the job list in order of growing complexity. This gave the core as particularized in Table 6.

A comparison between the rough core and the job load analysis of the activity of the forest officers in the U. S. Forest Service was made so as to check the tentative weights given the several divisions. For this purpose the proposed courses in the core were grouped into the same classes of work as
Table 6. **Trial Core in Professional Forestry**

<table>
<thead>
<tr>
<th>Area of learning</th>
<th>Term</th>
<th>Number of courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td><strong>Knowledge—Basic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest Forestry</td>
<td>Botany</td>
<td>Geology</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td>Accounting</td>
</tr>
<tr>
<td></td>
<td>Economics</td>
<td>Psychology</td>
</tr>
<tr>
<td></td>
<td>Trees</td>
<td>Forest plant life</td>
</tr>
<tr>
<td></td>
<td>Wood Products</td>
<td></td>
</tr>
<tr>
<td><strong>Skills and Arts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Forestry</td>
<td>Typing</td>
<td>Report writing</td>
</tr>
<tr>
<td></td>
<td>First Aid</td>
<td>Landscaping</td>
</tr>
<tr>
<td></td>
<td>Suppression of small fires</td>
<td>Handling Trespass</td>
</tr>
<tr>
<td><strong>Making Inventories</strong></td>
<td>Mapping</td>
<td>Surveying (Land and Improvements)</td>
</tr>
<tr>
<td></td>
<td>Scaling</td>
<td>Cruising</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>Wild life and recreation</td>
</tr>
<tr>
<td><strong>Supervision of a Single Activity</strong></td>
<td>Timber Sales</td>
<td>Range</td>
</tr>
<tr>
<td></td>
<td>Public Relations</td>
<td>Personnel</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>Management of Timber</td>
<td>Wild Life</td>
</tr>
<tr>
<td></td>
<td>Recreation</td>
<td>Production Control (Financial)</td>
</tr>
<tr>
<td></td>
<td>Working Plans (Technical)</td>
<td></td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>Land Economics</td>
<td>Forest Economics</td>
</tr>
<tr>
<td></td>
<td>Forest Sociology</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
were found in the job load analysis. Courses in basic knowledge and skills outside of forestry proper were listed separately. The percentage of the forestry courses falling in each work class was computed so as to allow a ready comparison with the百分比 given in the job load analysis data. A similar computation was made for the present courses in the Oregon State College curriculum so as to allow a comparison between the present and the proposed curricula. Table 7 shows the results of these computations.

Table 7. Comparative Weights Assigned to Divisions of Job Load

<table>
<thead>
<tr>
<th>Division at present</th>
<th>Courses</th>
<th>Job load analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At present</td>
<td>Proposed</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>No.</td>
</tr>
<tr>
<td>Nonprofessional Skills (nonforestry)</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>Professional</td>
<td></td>
<td>Per cent</td>
</tr>
<tr>
<td>Fire Control</td>
<td>3</td>
<td>13.0</td>
</tr>
<tr>
<td>General Administration</td>
<td>6</td>
<td>31.0</td>
</tr>
<tr>
<td>Engineering</td>
<td>4</td>
<td>6.9</td>
</tr>
<tr>
<td>Travel</td>
<td></td>
<td>10.3</td>
</tr>
<tr>
<td>Range Management</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>Timber Management</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>Recreation</td>
<td>8</td>
<td>3.4</td>
</tr>
<tr>
<td>Education and Information</td>
<td></td>
<td>3.4</td>
</tr>
<tr>
<td>Wild Life Management</td>
<td></td>
<td>3.4</td>
</tr>
<tr>
<td>State and Private Forestry</td>
<td></td>
<td>3.4</td>
</tr>
<tr>
<td>Personnel</td>
<td></td>
<td>3.4</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>99.9</td>
</tr>
</tbody>
</table>

These data, which allow comparisons to be made between the proposed and the present curricula and the job load analysis of Federal Forest Service work, indicate the importance of the following comments:

1. The proposed core is roughly correlated with the job analysis. The greatest differences are found in the case of Fire Control, General Administration, and Timber Management. The lack of perfect correlation between the proposed organization and the requirements of the present job load is explained and justified on a twofold basis. First, some fields are much broader than others, thereby necessitating more instructional time if the material is to be taught with the same degree of thoroughness. This is particularly well illustrated in the field of general administration as compared with that of fire control. Second, the historical and ultimate importance of given fields of activity may vary, thereby making it desirable to weigh certain fields of activity out of proportion to the present work load. Timber
management, for instance, which has been the principal task of the forester by heritage from European forestry, has not been the main activity of the Federal Forest Service because the stands of timber under their management are the more inaccessible ones and have not, consequently, reached the period of exploitation which will be true in the future. Because of this situation, it has been necessary to develop roads in these areas, thus emphasizing the engineering phases of forestry work. Third, the variation in forestry practice in various regions of the United States is essentially a difference in the relative importance of the phases of the work. A precise weighting of curricular items is therefore not desirable for a major framework. It appeared desirable, in consequence, to make no further adjustments in the weights given various items in the proposed core but to assume that as all the courses are developed adjustments can be made by variations in their scope and content.

2. The proposed core emphasizes breadth in comparison with the present curriculum. Aside from the field of general administration, the increases occur in the attention given to the management of products of the forest other than the timber resource. In no case are the present technical fields increased in weight. This same tendency is noted in the knowledge areas of learning. While the total number of courses in this area is reduced, the number of basic fields covered is increased from six to nine.

3. The types of courses indicated differ from the present courses in organization of subject matter. The proposed plan, for instance, lists two writing courses; namely, report writing and letter writing. The present curriculum contains courses in English Composition. Similar differences are found between the courses in professional work—silviculture, for instance, appears in courses in reforestation, in timber sales, and in management of timber. It is contemplated, therefore, that the fundamental principles involved will be grouped in accord with the functions or objectives of the courses and that the teaching emphasis will be placed on the application of these principles to lifelike situations. It is apparent, in consequence, that the proposed core is not a mere rearrangement of the usual university courses as taught at present.

4. The proposed organization affords a reasonable opportunity to make provision for general education. General education, according to the guiding criteria selected, is an important element of the functional curriculum. This would require as a minimum a course each term throughout the five years if a provision is made for the continuous growth of the student throughout his college course.

A check made with the present requirements for basic and elective
courses by the forest schools of the nation indicated that on the average eighteen such courses were given.¹ The function of these eighteen courses is to supply basic knowledge as well as to cover the general education phase of the curriculum. Those schools which list elective courses, in no case allow the equivalent of nine courses as electives. It is assumed, therefore, that not more than half of the eighteen courses are allotted for the purposes of general education. In consequence, a functional curriculum which assigned a total of nine courses or more to general education would not weaken this phase of the instruction in comparison with present practice. However, to obtain continuous growth of the individual student, it is necessary to provide a minimum of a course throughout each of the five years. Accordingly the amount of time allotted to general education was set at fifteen courses, as this amount compared favorably with present practice and it is sufficient to allow a continuous growth of the individual student in this phase of the curriculum.

In so far as sixty courses constitute the total number on a basis of four courses a term for the fifteen terms covered, it became necessary to reduce the proposed courses from forty-eight to forty-five in order to allow ample time for the fifteen courses in general education. This was accomplished by reducing the weight given to Typing and First Aid to one-half a full course, on the assumption that the skills represented were comparatively simple and could be sufficiently mastered with a relatively small amount of instruction. Similar weights were assigned the skill course, Handling Trespass, and the inventory course, Damage, since these two courses represent new elements. The final reduction was made by combining the two planning courses, Working Plans and Production Control, since these courses represent subject matter which can be dovetailed successfully.

The final arrangement of the core was made in accord with the organizing principle which underlies the promotional scale of the professional pyramid. It was assumed the necessary knowledge areas should be covered early in the program. Accordingly, the proposed courses were grouped so as to include the basic knowledge areas and the skill and art courses in the first two years; the courses dealing with the inventory processes in the third year; the courses dealing with the supervision of a single activity during the fourth year; and the remainder of the courses during the fifth year. This grouping was then modified in order to obtain a uniform pattern of three courses during each term of each year. The basic knowledge and skill courses were arranged so as to provide at least one forestry course each term thereby giving the student an opportunity to grow in his principal field.

¹Chapman, op. cit., p. 10.
throughout his college career. Upon this basis, the final integration of the courses for the forestry core gave the sequence of courses shown in Table 8.

Table 8. Proposed Arrangement of Courses in Professional Forestry Core

<table>
<thead>
<tr>
<th>Area of learning</th>
<th>Fall term</th>
<th>Winter term</th>
<th>Spring term</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>Botany</td>
<td>Entomology</td>
<td>Accounting</td>
</tr>
<tr>
<td></td>
<td>Forest trees</td>
<td>Forest plant life</td>
<td>Forest animals</td>
</tr>
<tr>
<td></td>
<td>Typing (‡)</td>
<td>Report writing</td>
<td>Letter writing</td>
</tr>
<tr>
<td></td>
<td>First Aid (‡)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills and arts</td>
<td></td>
<td>Forest animals</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>Mathematics</td>
<td>Geology</td>
<td>Soils</td>
</tr>
<tr>
<td></td>
<td>Economics</td>
<td>Psychology</td>
<td>Law</td>
</tr>
<tr>
<td></td>
<td>Wood Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills and arts</td>
<td></td>
<td>Suppression of small</td>
<td>Reforestation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>fires</td>
<td></td>
</tr>
<tr>
<td><strong>Third Year</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills and arts</td>
<td></td>
<td>Landscaping</td>
<td>Making improvements</td>
</tr>
<tr>
<td></td>
<td>Making inventories.</td>
<td>Handling trespasses (‡)</td>
<td>Range</td>
</tr>
<tr>
<td></td>
<td>Mapping</td>
<td>Damage (‡)</td>
<td>Value of timber</td>
</tr>
<tr>
<td></td>
<td>Scaling</td>
<td>Cruising</td>
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<td>Surveying</td>
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<td><strong>Fourth Year</strong></td>
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<td>Wild life and recrea-</td>
<td>Range</td>
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<td>Inventory</td>
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<td>Supervision of</td>
<td>Wild life sales</td>
<td>Wild life and recrea-</td>
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<td>a single activity</td>
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<td>tion</td>
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<tr>
<td>Planning</td>
<td>Fire</td>
<td>Personnel</td>
<td>Public relations</td>
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<tr>
<td><strong>Fifth Year</strong></td>
<td></td>
<td>Management of watersheds</td>
<td>Wild life</td>
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<tr>
<td>Planning</td>
<td>Management of</td>
<td>Recreation</td>
<td>Range management</td>
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<td>timber</td>
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<td></td>
<td>Working plans (‡)</td>
<td>Production control (‡)</td>
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<td>Forest sociology</td>
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<td>Leadershi</td>
<td>Land Economics</td>
<td>Forest economics</td>
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<td>Forest policy</td>
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</table>

Further improvement of the proposed core was not attempted since the next step would be to perfect the weighting of the courses more accurately than merely by assigning a course for each division. Similarly, the perfection of the core affords an opportunity to include instruction in those divisions left out because the checking of the questionnaires placed the division in the "Desirable" or the "Least Desirable" group. Obviously accurate judgment in regard to the breadth and depth of the instruction to be given in each course requires a detailed knowledge of the aims to be reached and of the course content available.

\[^{1}\text{Supra, p. 41.}\]
INSTRUCTION IN GENERAL EDUCATION

It was assumed that any staff in forestry interested in developing a functional curriculum would proceed with the organization of course syllabi and the perfection of the core. An opportunity is thereby afforded each staff to limit its curriculum in accord with the objectives of the school. Thus, a school could, if it so desired, limit its curriculum to preparing foresters for any given region or for a particular phase of forestry such as industrial forestry. Inasmuch as the perfection of the core rests upon the particular objectives of each school, it was decided that the practical limits of the general framework, as set up in the objectives of this study, had been reached. Accordingly the development of the section in general education was next attempted and perfected to the same degree as is true of the core for job competency.

INSTRUCTION IN GENERAL EDUCATION

The function of general education is to educate the citizen for effective participation in all those common understandings and cooperations which are necessary to sustain the best in our complex contemporaneous civilization which is American. Instruction in general education, therefore, applies to that portion of the curriculum designed to give the student a background for that segment of his activities not a part of his professional work.

Educators have consistently advocated the value of a sound educational background at the college level as an essential element in developing the individual. The professions have likewise consistently advocated that student professionals be given instruction continuing their general education in addition to their training in the profession concerned. Thus the Commission on Medical Education says, "A sound general education is of more value to students of medicine than a narrow technical training in premedical sciences." In a similar vein, Graves and Guise indicate that "the collegiate forest schools are presumed to give the students a general education as well as to train them in forestry." The provisions for general education are, in consequence, in keeping with the opinions of educators and of professional foresters. They are also in accord with the criteria which have been established as basic guides to the functional curriculum being developed in this study.

1Infra, pp. 68-80.
4Medical Education, op. cit., p. 267.
5Graves and Guise, op. cit., p. 112.
CHARACTERISTICS OF GENERAL EDUCATION

The specifications for general education have not been standardized. Of the professional groups, no one has agreed as to the best program for general education,¹ nor is there to be found a consistent practice among the colleges and universities in the United States.

The organization and the underlying concepts of general education vary with the professions. In medicine, as in law and dentistry, the student presumably completes his general education before entering the professional school. The Medical Commission on Education advocates a type of general education which orients the student in the major fields of knowledge and yet gives a reasonable mastery of a single field.² It is felt that general education should develop intellectual self reliance and broad cultural interests in the student.³ In engineering, the general education phase of the curriculum is integrated with the professional phase.⁴ In forestry, Graves and Guise view general education as instruction in subjects other than forestry which is designed to develop knowledge and interest in human affairs and to inculcate breadth of view and width of sympathies based on thorough yet diversified scholarship.⁵

The development of programs of general education in the colleges and universities has followed a twofold pattern as follows:⁶

1. Neo-formalism wherein the major function is to train the mind or intelligence. A disciplined and trained intelligence, it is assumed, is a generalized power capable of guiding and controlling all other departments of man's nature. The Experimental College of the University of Wisconsin, the General College of the University of Chicago, and St. John's College of Maryland are schools of this type.

2. Education for adjustment wherein an attempt is made to make the curriculum fit the needs of the student in his preparation for adult life. In some cases, this type of general education has resulted merely in the introduction of survey courses. In others, as at Stephens College and the University of Minnesota, the curriculum has been developed from studies of

³Ibid., p. 272.
⁵Graves and Guise, op. cit., p. 111.
student needs and teaching methods have been used which cause the students
to grow from their own background and experience.

The development of general education at the University of Minnesota has
been upon the basis of useful knowledge to the students for daily living now
as adults in the American scene.\(^1\) It developed originally by selecting tradi-
tional subject matter and adapting the teaching procedure to a broadened
concept of the course. The procedure was to select from the subject matter
fields the most pertinent information for the general course and to place the
emphasis on teaching the relationships that are present.\(^8\) Instruction was
offered in ten fields, each student being required to pass a comprehensive
examination in six of the ten fields with one, current affairs, being required.
Instruction in these fields was later organized into four areas.\(^3\)

At the University of Florida, all freshmen and sophomore students are
registered in the general college. The courses, each of which extends
throughout a year, are called: Man and the Social World, Man and the Physi-
cal World, Man and His Thinking, Man and the Biological World, The Hu-
manities, and Reading, Speaking, and Writing. The teaching procedure at
Florida varies the methods of presentation and the subject matter so as to
stimulate the student's intellectual curiosity, to encourage independent study,
and to cultivate the attitudes necessary for enlightened citizenship.\(^4\)

The objective of the general education phase of a functional curriculum
is to develop young people into vital, sensitive, and awakened persons in
order that they may live more richly and, in consequence, serve their society
better.\(^5\) It should prepare the student to generalize experience and to meet
problems effectively in all fields.\(^6\) It should fit the student to understand
himself as an adult and to adjust himself to the world in which he will live.
The subject matter should contain that particular material in any field that is
useful and of wide application for a layman. Courses should not be of the
survey type or be composed of advanced work in any specific field.\(^7\)

\(^2\) Ibid., pp. 21-42.
\(^3\) Malcolm S. MacLean, General Education in American Colleges, 38th Yearbook,
School Publishing Co.), pp. 150-152.
\(^4\) University of Florida Record, XXXII, Series 1, No. 7, July 1, 1937, p. 323.
\(^5\) M. S. MacLean, Winston L. Little and Geo. A. Works, in General Education in the
American College, 38th Yearbook, Part II, National Society for Study of Education,
\(^6\) E. J. McGrath, in General Education in the American College, 38th Yearbook, Part
II, National Society for Study of Education (Bloomington, Ill.: Public School Publish-
ing Co., 1939), p. 221.
\(^7\) John D. Russell, in General Education in the American College, 38th Yearbook,
Part II, National Society for Study of Education (Bloomington, Ill.: Public School Publish-
The method of teaching employed in general education should be one which develops in the student the ability to think. The teaching should be philosophical and integrative in character and in a spirit which makes it synonymous with cultural education. The teacher should employ situations and problems of direct concern to the individual in such a way as to develop careful thinking, significant interests, insights, attitudes and appreciation, values and standards, emotional control, creative activities, and a philosophy of life.

In accordance with the prevailing concepts of general education it is evident that this phase of the curriculum should:

1. Have as its objective the orientation and fitting of the student for adult life in a democracy.
2. Be general, not specific, in nature. The objective is a broad cultural background, not a thorough knowledge of any particular phase of learning.
3. Be taught so as to develop the student's thinking ability and his interest in the society of which he is a part.

The amount of time allotted to general education in the total curriculum must be arbitrarily set. Most of the specially organized general colleges are on a full two years' basis. Leaders in the junior college movement recommend a like period. Graves and Guise recommend at least a quarter of the work of the first two years as a desirable minimum for work in general education. In view of these opinions, the time allotted to general education was set at a course throughout each of the five years.

DETERMINATION OF THE GENERAL EDUCATION SECTION OF THE CURRICULUM

The method used in developing the section of the curriculum devoted to general education followed the standard job analysis technique of:

1. Writing a description of the situation
2. Making a rough classification
3. Outlining the main points
4. Checking results by additional observations
5. Drawing up final job specifications

The initial description was based upon observations of current adult

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1E. J. McGrath, op. cit., p. 221.
2John D. Russell, op. cit., p. 179.
3S. R. Powers and Chas. Hoban, in General Education in the American College, pp. 325-334.
5Graves and Guise, op. cit., p. 117.
INSTRUCTION IN GENERAL EDUCATION

life. It was supplemented by discussions with foresters as to the scope of their activities outside their professional duties. A further source of material was found in an examination of the curricula in general education at the General College of the University of Minnesota and at the University of Florida.

The initial description was then simplified by grouping similar observations. This classification process required the development of basic criteria to be used as organizing principles. The guiding criteria adopted for the functional curriculum demanded also that these principles be stated as functions of living in our current American civilization. Accordingly, the following five organizing principles were evolved.

1. To use or consume
2. To produce
3. To live together cooperatively
4. To maintain and develop
5. To lead

A resume of the principal items under each of the five basic functions was written and presented to four administrative officers of the Federal Forest Service and to members of the staff of the School of Forestry at Oregon State College for their comments and suggestions. The final step of dividing the curriculum in general education into fifteen parts so as to provide a course each term for each of the five years was accomplished by classifying the material under each of the five basic criteria into three parts. These parts were then stated functionally and arranged in the following outline.

GENERAL EDUCATION CONTENT IN THE CURRICULUM

First Year

Theme: To Consume

a. To purchase and use wisely. Course to include instruction in consumer education, public health, recreation, and the use of leisure time.
b. To appreciate the fine arts. Course to comprise material selected from the fields of music, art, and architecture.
c. To appreciate the world’s greatest thoughts. Course material to be selected from the fields of philosophy and literature.

Second Year

Theme: To Produce

a. To operate a business and to fit in on the job as an individual.
b. To operate an industrial order and to locate industrial enterprises properly.
c. To understand the location and operation of world wide productivity.
Third Year  

Theme: To Live Together Cooperatively  

a. To fit into the family and the community, i.e. the fundamentals of a contented family and the regulation of the community so as to have a good town from the standpoint of morals, public health, and recreation.

b. To operate socio-economic-political systems, i.e., the ideology of the people and its application in the current situations of today.

c. To understand civilization and its general organization, i.e. the social pyramid and the "rules of the game" which bring about its form and its mobility.

Fourth Year  

Theme: To Maintain and Develop  

a. To rear youngsters and to educate the young and the mature.

b. To conserve the agencies of production and to develop new techniques.

c. To develop communication and understanding between peoples.

Fifth Year  

Theme: To Lead  

a. To direct family and community welfare.

b. To plan and direct the activities of the nation.

c. To plan and direct international relationships.

The development of the individual course is, in accordance with the basic criteria being used, a function of the instructor. Each instructor should be particularly careful to adapt the subject matter to the student. This will require not only the building of each course on a functional basis but also surveying the educational background. In this manner, the general education phase of the curriculum can be used to continue the growth of each student as he prepares for his career in professional forestry.

THE WORK OF THE INSTRUCTOR

In so far as the success of a functional curriculum depends upon the changes which take place in the mind of the individual student, the work of the instructor is of paramount importance. His task is so to train the student that a thorough understanding of the fundamental principles of forestry is obtained, that essential knowledges are absorbed, that necessary skills and arts are developed and that desirable attitudes are inculcated. The mere teaching of subject matter is an unsatisfactory means of accomplishing the objectives set by a functional curriculum. Neither can satisfactory outcomes
be obtained by a mere mastery of individual principles on the part of the individual students in the area of learning assigned.\(^1\)

It is the duty of each instructor, in accordance with the principle that he is a master workman, to plan and develop each of the courses which he teaches. In order to obtain a consistent and unified growth on the part of the student, it is necessary to plan each element in the course as a recognized part of a unified whole. It is also necessary to give each course a recognized part in the entire curriculum. In consequence, the objectives or aims of the course must be set in keeping with those of the entire curriculum, these objectives must be divided into unit objectives arranged in order of presentation, course materials selected and presented, and the separate units and the entire course validated.

**DETERMINATION OF OBJECTIVES**

The objectives of any one course are threefold in nature, thereby making it necessary for the instructor to consider the aims or the outcomes to be obtained from the standpoint of subject matter mastery, the desirable type of mental activity to be exercised, and essential attitudes to be developed.\(^2\)

Subject matter objectives are fixed by the requirements of the curriculum. In so far as the course is to be broken into units, it is necessary to make each unit objective an integral part of the entire course and to make the sum of the unit objectives equal the course objective.\(^3\) Each unit objective should be stated functionally since subject matter objectives might tend to make the course the traditional type.

The determination of unit objectives can be accomplished by analyzing the area of learning covered by the course and forming steps or units of the work. The correctness of the analysis should be validated by a detailed job analysis. Thus, a course designed to teach the basic knowledge necessary in any field should receive validation from two sources; namely, the faculty teaching the professional courses and practicing foresters. The faculty would be expected to validate that portion of the basic course necessary as prerequisite material, and the practicing foresters would validate that portion of the basic course necessary for field practice. In each case, the instructor should develop a tentative list of units, keeping them sufficiently broad so as to allow fundamental principles to be evolved and yet narrow enough so as to allow a definite statement of the aims proposed. This tentative list should be submitted to a few qualified advisers for their suggestions. A final list

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\(^1\) Caswell and Campbell, *op. cit.*, p. 32.

\(^2\) *Supra.*, pp. 55-56.

\(^3\) Caswell and Campbell, *op. cit.*, p. 118-120.
should then be submitted to the validating individuals and scored. The validation of courses in general education and in professional practice would follow the same procedure except that general education courses would be validated by the opinion of instructors in the fields covered and also by foresters or other members of society. Strictly professional courses would be validated by professional foresters working at or above the level of employment which is synchronized with the course in question. Once the subject matter objectives are determined, it is possible to select the objectives which have to do with attitudes and with mental abilities.

The personal qualities that are to be developed in any course must be determined by the instructor upon his personal judgment. It is sometimes true that certain subject matter lends itself well to the indirect teaching of particular qualities. On the other hand, the personal experiences, attitudes, and abilities of the instructor govern the effectiveness of teaching attitudes.\(^1\) In consequence, the attitude objectives for any course or unit thereof must be based upon a selection of the instructor from the list of necessary personal qualities for successful foresters.

The mental abilities required of a forester appear in all professional work which he does. However, the relative proportion of the various mental abilities varies from job to job. Thus, each job is composed of some combination of "doing ability," or "technical knowledge" and of "job judgment."\(^2\) The task facing the instructor in the selection of mental abilities is therefore one of determining which mental abilities are to be emphasized in each unit. The judgment of the instructor in this regard should be validated by the judgment of foresters in high administrative positions because they understand the abilities they prefer in men working under them. These listings should then be submitted to the faculty of the school or to a curriculum committee in order to emphasize duly the principle that professional training should be a training in fundamentals and not merely in the doing of professional tasks.

Once the selection of unit objectives is complete, the separate units can be arranged in a preferred order. It is desirable in this step that careful consideration be given to the organizing principle used, in order to maximize the opportunity to combine units and thereby avoid the danger of developing a plethora of aims. It is also desirable to include one or more units designed to insure the student an opportunity to grasp the interrelationships and the

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integration of the units of the course into a whole so as to minimize the chance that the main objectives of the course will not be reached.

The general organization of a functional course, developed in the foregoing manner, is illustrated in Table 9. The particular course selected is the one on cruising listed for the winter term of the third year. It has to do with the work of the forester in making inventories of stands of timber. The course work has been broken into eight units. The first and the last units are designed to allow a presentation of a bird's-eye view of the course material and its relation to the work of the professional forester. The skills and arts covered appear in the first units presented while the job judgment features are found in the later units. The emphasis of the course is placed upon the gaining by the student of an understanding of the technical knowledge involved. A limited list of personal qualities has been indicated to suggest, for each unit, a probable choice. Specific suggestions have been listed for each unit merely to emphasize the importance of definitely planning ways and means of teaching personal qualities. It should be recognized that one instructor might choose a different list of qualities whereas another teacher might prefer to emphasize a smaller number. The objective is to select essential qualities and seek opportunities in the classroom for adequate emphasis throughout the course.

PRESENTATION OF COURSES TO STUDENTS

It is the task of the instructor to present the course to the students when the general framework of the course has been adequately developed. The instructor should be well versed in his subject matter, adroit in manner of presentation and sympathetic with the viewpoint and abilities of his students. There is no one correct manner of teaching, hence the instructor should be a student of teaching as well as of subject matter and be able to vary his approach with the mental ability to be developed. For this reason, principles are suggested for the teaching of skills and arts, and of perceptual and conceptual data. A similar list of principles is given for the development of essential personal qualities.

TEACHING SKILLS AND ARTS

The learning of skills and arts requires that the student give a high degree of attention during the period of learning so that he may become progressively aware of the various elements involved. Also, repetition, practice, or drill is necessary in order that the student may become proficient in the skill or the art. Teaching the skills and arts therefore requires four steps.

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1Graves and Guise, op. cit., pp. 276-282.
<table>
<thead>
<tr>
<th>Unit</th>
<th>Skills and Arts</th>
<th>Technical Knowledge and Understanding</th>
<th>Job Judgment</th>
<th>Personal Qualities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruiser's report</td>
<td>Writing reports</td>
<td>The relationship between the cruiser's work and the rest of the forestry operation.</td>
<td></td>
<td>Active imagination.</td>
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<td></td>
<td></td>
<td>The outcomes of the cruising activity.</td>
<td></td>
<td>Straight thinking.</td>
</tr>
<tr>
<td>The volume of trees</td>
<td>Measuring the volume of felled trees.</td>
<td>The relationship of each part of cruising to the whole procedure.</td>
<td></td>
<td>Inquiring mind.</td>
</tr>
<tr>
<td></td>
<td>Recognizing rots and other defects.</td>
<td>The means of getting to the gross volumes of trees in the various units of volume as employed in cruising.</td>
<td></td>
<td>Thoroughness of details.</td>
</tr>
<tr>
<td></td>
<td>Observing breakage factors.</td>
<td>The methodology of computing the loss due to breakage and defect.</td>
<td></td>
<td></td>
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<tr>
<td>Tree measurements</td>
<td>Measuring diameters, heights, and form of trees.</td>
<td>The relationship between measurements taken and the cruising process.</td>
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<tr>
<td></td>
<td></td>
<td>The efficiency of the instruments used.</td>
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</tr>
<tr>
<td>Volume tables</td>
<td>Using a volume table.</td>
<td>The function and operation of volume tables in cruising work.</td>
<td>Selecting a volume table for a specified task.</td>
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<tr>
<td></td>
<td></td>
<td>The accuracy of each of the types of volume tables and the factors pertinent to their proper application.</td>
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</tr>
<tr>
<td>Volume of an acre of timber</td>
<td>Obtaining the volume of an acre of trees by selected techniques.</td>
<td>The common methods of obtaining the volume of an acre of trees.</td>
<td>Developing a method of obtaining the volume of an acre of trees that has a consistent accuracy throughout.</td>
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<table>
<thead>
<tr>
<th>Unit</th>
<th>Skills and Arts</th>
<th>Technical Knowledge and Understanding</th>
<th>Job Judgment</th>
<th>Personal Qualities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The science of statistics as applied to obtaining the volume of an acre of trees.</td>
<td></td>
<td>Sense of purpose and direction</td>
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<tr>
<td></td>
<td></td>
<td>The relative accuracy of the different methods of obtaining the volume of an acre of trees.</td>
<td></td>
<td>Self reliance.</td>
</tr>
<tr>
<td>Quantity cruising ..........</td>
<td></td>
<td>The theory of sampling as applied to cruising work.</td>
<td>Selection of an efficient and effective cruising system.</td>
<td>Capacity to sense relationships</td>
</tr>
<tr>
<td>Quality cruising ..........</td>
<td>Recognizing the quality</td>
<td>The relative accuracy and efficiency of the common methods of cruising.</td>
<td>Selection of an effective and efficient quality cruising system.</td>
<td>Reliability.</td>
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<tr>
<td></td>
<td>value of trees.</td>
<td>The relationship between the quality of the tree and the resultant wood product.</td>
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<td></td>
<td></td>
<td>The methodology of making graded log rules and tree quality volume tables.</td>
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<tr>
<td></td>
<td></td>
<td>The methodology of making quality cruises.</td>
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<tr>
<td>Administration of cruising</td>
<td></td>
<td>The basic principles of selecting, training, and managing men for cruising work.</td>
<td>Making project instructions for cruising a given tract of timber under specified condition.</td>
<td>Teamwork.</td>
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<td>work .......................</td>
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<tr>
<td></td>
<td></td>
<td>The essentials of planning the cruising work for a large tract of timber.</td>
<td></td>
<td>Ability to plan.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The effectiveness of cruising work in relation to the remainder of the work in a forestry enterprise.</td>
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</tbody>
</table>
1. Attracting the interest and attention of the student and providing a base on which to develop the instruction. The purpose of this step is to prepare the student for the learning process and to bring all students in the class to the same point of view and approach.

2. Showing how and explaining why. This is the presentation of the course material.

3. Having the student do the assigned task under supervision. The purpose of this step is to develop efficiently the desired skill or art. The instructor should give any additional assistance necessary in pointing out errors and inefficient techniques. He should also ask a few questions to determine whether the student understands the reasons for doing the job.

4. Having the student do the job without supervision. This step should determine whether the training has been sufficient.

**Teaching Knowledge**

Perceptual learning is basic to all other types of ideational learning. It originates with sensory stimulation, and results not only in understanding the perception but also in the ability to understand abstract ideas. Perceptual learning should result in quick and accurate recognition of the items taught and in an understanding of the items as comprising a unitary whole. "The past and present seem to fuse in consciousness and to produce the percept as a single product of the consciousness."

"On the whole, perceptual learning occurs most readily and satisfactorily when objects and symbols are made pleasant and attractive to the learner." It is essential that close attention be given the items to be learned. The teacher should present the course material so as to attract attention and induce the students to give sustained or active attention. The learner should be ready physiologically, in set of mind, in background material, and in motivation. The learning process is stimulated through repetition and by application of the principle that contiguous objects tend to develop associations. It follows, therefore, that the items to be learned should be presented through as many avenues as feasible. Instruction in the perceptual field may be undertaken upon a basis of the following principles:

1. Arrange the course material carefully into logical groupings on a basis of similarity.

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THE WORK OF THE INSTRUCTOR

2. Assign definite units; have all course materials in each unit definitely labeled and accurately specified. A variety of course material is desirable. It is also desirable that students work with the course materials as individuals.

3. Test often. Objective tests are the preferable form to use as they allow an adequate sampling of course material and an accurate measurement of accomplishment.

4. Insist on accuracy. Discover errors and diagnose defects for each student.

TEACHING JOB JUDGMENT

Conceptual learning is a process of thinking and as such is much more complex than perceptual learning. "It implies the apprehension of a meaning arising from the observation and consideration of a variety of particular ideas specifically related to each other." It is well adapted to the problem method of teaching and is basic to the teaching of job judgment.

The objective of problem teaching is to enable the student to prepare himself and situations around him so that insights will emerge. It must cover the stages of locating the problem, of defining the problem, of development of meanings, of achieving insight, and of verification.

Problem teaching should be socialized in nature since the pooling of ideas and experiences of the group enhances the learning of each individual in the group. Hence, it follows that the school procedure should be an appropriate one for the peculiar needs of the students.

Conceptual learning may proceed either on a basis of trial and error or on a basis of insight. In trial and error learning, it is necessary for the instructor to devise a means of informing the student of correct performance since repetition is helpful only if right procedures are followed and since rewards for successful performance lead to predictable action.

Insight learning requires that problems be assigned in accord with the maturation level of the student, that they be made meaningful to the student and that the problems be so arranged that the solution of one problem prepares the learner for the next one. Motivation is inherent in the task and

2Ibid., p. 318.
4Ibid., pp. 476-488.
6W. T. Herron, in E. A. Moss, Comparative Psychology (New York: Prentice Hall, 1934), Chapter X.
ordinarily should not be increased as emotion or excitement may interfere with the learning process.¹

Conceptual learning may be directed in accordance with the following suggestions:

1. Divide the class into groups suitable for socialized study. Whenever feasible, individual assignments should also be made.

2. Assign problems rather than subject matter. Arrange the problems from the simpler to the more involved. Stress the objective to be attained and the overview features. Make the necessary materials for the solution available to the students.

3. Diagnose difficulties by checking the activities of each group. Expose errors but do not furnish the solution of the problem.

4. Check the completed solution for its adequacy in reaching the objective assigned. Students should be expected to understand the significance of each item as it relates to the objective sought in the problem rather than to obtain any one particular solution of the problem.

**Teaching Personal Qualities**

Desirable character traits may be taught either directly or indirectly but are most satisfactorily taught indirectly.² Means of developing attitudes indirectly are by controlling the environment, developing extracurricular activities, and emphasizing viewpoints in class work, particularly in social science.³ Teachers should set examples and should realize that the group tends to take on the attitudes of the leader and new members tend to take the group attitudes.⁴ Personal qualities may therefore be developed through disciplinary activities, personal contacts, and classroom activities and procedures which are consistently in keeping with the desired characteristics.⁵ Curricular activities may also be used to develop attitudes.⁶

Attitude instruction in the classroom is approached by building up understandings of conduct from examples. In all cases the available material should be capitalized immediately, reasoning stressed, excessive moralizing

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³Coleman Griffith, *op. cit.*, p. 140.
⁶Ibid., Chapter 8.
THE WORK OF THE INSTRUCTOR

avoided, and solutions to particular problems applied and generalized from the student point of view.¹

The teaching of desirable personal qualities may be facilitated by conforming to the following suggestions.

1. Each instructor should so deport himself that he is a living example of the traits to be taught.

2. Each instructor should make sure his classroom is conducted in such a manner that the actions therein are in accord with the attitudes selected.

3. Opportunity for the presentation of course material which allows an indirect approach to the teaching of attitudes, should be planned for from time to time as the course is presented to the students.

4. The personal relations between the instructor and the students should be such that they seek his advice in matters concerning the environment and extracurricular activities in which they participate.

TESTING PROGRAM

In recognition of the principle that a functional curriculum is student centered, the testing program must also be designed primarily as a means of measuring the degree to which the individual has reached desired goals.² The results of the examination should be interpreted to the student in terms of accomplishing desired goals. While individual tests may be designed in reference to a particular minor goal, the total testing program should cover all objectives of the course.³

An examination should enhance instruction.⁴ It has for its purpose the determination of the level of achievement for the individual student in order that he may perfect his scholarship.⁵ It also should so measure the nature of the student's responses and his method of learning that the instructor will have available data upon which improvements in instruction can be based.⁶

There is a variety of ways of testing student accomplishment. The early tests were statements of the judgment of the instructor based upon observation. Later oral and essay type tests were added and, more recently,

¹Ibid., pp. 160-162.
⁶Ibid., pp. 26-27.
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objective type tests have been developed. Each type of test has certain advantages and disadvantages. The observational technique is a simple and useful tool in the hands of a master workman, but it lacks objectivity and often reflects the prejudices of the instructor. Its main function is to furnish data in areas in which a formal testing program is too time consuming or to give supplemental data in cases where the formal testing program is incomplete.

The essay test provides an opportunity for the student to reveal reasoning procedures, initiative, originality, and ability in the organization of material. It gives an opportunity for the exercise of discrimination and judgment in the selection of preferable facts. However, it is difficult to score accurately, it is time consuming, and has a restricted range, particularly if irrelevant factors are included.

Objective type examinations are particularly well adapted to testing the student's mastery of information. They can be graded quickly and accurately, and they allow an ample coverage of the course material. Much learning that is now measured by essay tests can also be measured by objective examinations although their effectiveness is limited at the present time to the testing of knowledges and skills.

Since the teaching techniques and testing procedures largely determine the nature of the actual curriculum, it is necessary that testing be comprehensive in scope and functional in nature. A complete testing program should include a number of short tests and a few longer ones given at more or less irregular intervals. In addition to measuring growth in information and growth in power to reason, the ideal testing program should measure the growth in attitude and powers of application. It should have as its major role the furnishing of enough information concerning the students in the

3Joseph Starr, Committee on Educational Research, Studies in College Examinations (Minneapolis: University of Minnesota Press, 1934).
4Alvin C. Eurich and Francis S. Appel, Committee on Educational Research, Studies in College Examinations (Minneapolis: University of Minnesota Press, 1934).
5J. Stanley Gray, op. cit., p. 141.
7C. W. Odell, Traditional Examination and New Type Tests (New York: Century Co., 1928).
class so that their educational efforts can be guided wisely. It follows, therefore, that the effective testing program should be composed of all types of tests and so integrated that the desired evaluations can be attained efficiently. This requires that the instructor study and improve his testing program and that he synchronize it carefully with his teaching objectives.

In order that each individual examination may be valid, reliable, and efficient, it is necessary that it be carefully constructed. The first step in constructing an examination is to define clearly the outcomes to be tested in terms of student behavior. The second step is to create a situation in which the students will be able to demonstrate their mastery of the objective. The students are next exposed to the situation and their behavior recorded. The results are then evaluated and reported back to the students.

The evaluation of an examination, in some cases, is most effective if accomplished through the direct help of the student. This is particularly true in testing attitudes.

The testing program should serve as an inventory of student accomplishment. As such, it will furnish valuable information for the judging of the effectiveness of the teaching technique, the rate of the classwork, and the adequacy of the subject matter included in each unit. The testing program, in consequence, becomes a valuable aid to the teacher not only in judging student accomplishment, but in judging his teaching procedure as well.

1. The testing program should be student centered and designed to measure the degree to which students have reached desired goals.

2. The examinations should enhance instruction.

3. The program should use the type of test most effective for the particular situation. A complete testing program, therefore, commonly uses all types of examinations.

4. The testing program must be synchronized with the teaching techniques used to the end that the entire curriculum will be functional in nature.

5. A carefully constructed and evaluated program of testing would result in the use of a variety of tests such as:

   a. objective type tests for evaluating knowledges and skills.
   b. Essay and problem tests for application phases.

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2 Eugene D. Carstater, in Studies in College Examinations, Committee on Educational Research, University of Minnesota, 1934, p. 32.

c. Recorded observations of student performance in supervised study sections particularly in the solution of problems.

d. Use of self appraisal tests for measuring attitudes.

SOURCE BOOK

The development of a source book for each course is an essential task for each instructor. The source book constitutes a written aid to the instructor in the given field of learning. It contains descriptions of group and individual activities found to be useful for instructional purposes. It also contains the accumulated data and ideas necessary for the progressive development of the course. The function of the source book is to furnish a reliable record of experiences to which students and faculty may turn for ideas and assistance in carrying out their plans. As such it is a necessary attribute for courses which are rich in subject matter and which are being constantly changed and developed.¹

The form of the source book is immaterial as long as it is systematic in arrangement. In most cases, the simplest arrangement is to follow the outline of the course and to arrange the units in the source book in conformity with the units of the course. In this manner each unit might consist of one or more activity descriptions, each sketch covering the following:²

1. A short characterization of the activity.
2. A statement of the abilities, knowledge, understandings, and appreciations of value which have been achieved by the activity, together with such other discussion of purpose as may seem necessary.
3. Detailed suggestions as to procedure in carrying out the activity.
4. A list of books and materials, people and any other sources which may help in carrying out the activity.
5. An appraisal of the activity, including a statement as to its advantages as compared with others, its effectiveness in achieving the desired outcomes, and any undesirable outcomes to be avoided.

The sections of the source book which deal with individual activities should be supplemented by a general section which shows the general structure of the course and which contains the data and ideas essential for the improvement of the course. This latter section should contain the observations, opinions, and data collected for the purpose of considering changes in teaching techniques, in testing procedures, in aims and course content, and in sources of information. The availability of such materials will allow a systematic consideration of changes, particularly if the instructor will carefully consider the available material at the end of each term's work. In this manner the courses will be dynamic in nature with less probability of changes being made merely upon the whim of the instructor.

¹Kenneth L. Heaton and G. Robert Koopman, op. cit., p. 149.
²Ibid., p. 87.
ADMINISTRATION

The function of administration is to obtain the efficient operation of the organization toward the accomplishment of the desired goals. Administration requires the continual clarification of goals and policies in order that the progress of the enterprise can be guided and controlled properly. Administration coordinates and keeps in proper balance all the factors of the enterprise which are necessary to its success. It provides the agencies and paths of action but delegates the action to others. Finally, administration must hold the subordinate staff responsible for the maintenance of satisfactory performance.1

The general principles of administration which apply to the guiding of a functional curriculum are similar to those for any enterprise. The peculiarities of an educational enterprise and particularly of one concerned with establishing a functional curriculum make it necessary, however, for special attention to be given to certain phases of the administrative process.

In considering the peculiar aspects of a functional curriculum which influence its administration, it should be remembered that educational activities are conducted more in accordance with the principles of psychology than with those of physics or economics. This is particularly true in the case of functional student-centered curricula. In this case the student undergoes change largely through self activity—activity which is guided by the instructional staff. The student at graduation time is not a completed product but one fitted for further self development. The instructor, therefore, has the dual function of promoting the development of the individual student in the field of instruction and also of challenging him so that he will continue to grow professionally after graduation.

The complex nature of the individual student and the variation among students as well as the variety of changes which take place as the student progresses through his college course must be recognized. The difficulties of measuring accurately the characteristics and development of the student are apparent. In consequence, it is desirable to avoid those features of administrative practice which have resulted in completely standardized human products.

The continual flow of students through a school must be guided by an intelligent and forceful staff. The character of the staff determines the degree of success of a forest school.2 The staff members should not be regarded as mere cogs in a machine but as individuals of varying backgrounds

2Graves and Guise, op. cit., p. 6.
and interests. Hence it is necessary that they be considered as the heart of any college and that the development of the curriculum be a recognized function of the faculty. Authority for curriculum making and revision should rest with the faculty. The administrative policies must therefore center around the staff and its development in order that harmonious teamwork will be obtained.

The administrative policies and procedures adopted must provide for continuous change in the curriculum. "There must for this reason be a carefully laid-out plan for participation of the faculty in curriculum reorganization, and similarly well-laid plans for faculty orientation and growth."

**ADMINISTRATIVE PROCEDURES**

The functional curriculum requires an administrative procedure which stimulates the growth and development of each individual staff member. Other types of control, while successful for short periods of time, fail to achieve the most desirable long term results. Autocratic control "sooner or later is likely to reap a harvest of hatred if not a St. Helena." It seldom secures the full and intelligent cooperation of the group except in situations where rigid administrative controls can be used effectively. Paternalistic controls limit the leadership of the group to the man in charge to the extent that the individual members are not stimulated to stand alone and to justify their decisions. On the other hand, proper control evolves from the needs of the group. It seeks to define these needs and to stimulate each man to study and to understand the operation of the enterprise. Its success depends upon the development of an educated group of participants capable and willing to work together as a team.

A proper administrative procedure demands that:

. . . the group comes as rapidly as it will to a condition of awareness of itself as a working entity and imposes by itself those standards of individual and group behavior which it finds it necessary to impose in the interests of group effectiveness in carrying on its work.

This points to the necessity of developing workmen on the job, hence, in-

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5Ibid., pp. 20-23.
service training becomes a necessary adjunct to successful administration.\textsuperscript{1}

In-service training should be designed to make each man proficient in all phases of his work. Under the proper system of control it should make the individual group conscious, willing to share his experience with the group, and to cooperate with the group in its decision.\textsuperscript{2} This requires tolerant, open-minded staff members, who are willing to study the issues involved and to change classroom techniques in accord with the findings of their study. It should be remembered, however, that rapid acceptance of new ideas and new procedures is not to be expected, since change is resisted by most men. It is necessary, consequently, to acquaint staff members with the newer approach to the functional curriculum and to provide constantly ways for the continuous education of staff members if the curriculum is to be made dynamic. Many improvements are curtailed by faulty preconceptions. All too often, men fail to have a precise knowledge of the objectives. Then, too, there is the constant danger of becoming so accustomed to routine that progress is stifled. In consequence, the in-service training program must be planned upon a basis of obtaining slow consistent progress toward the desired improvements.\textsuperscript{3}

\textbf{IN-SERVICE TRAINING OF STAFF MEMBERS}

The stimulation of faculty growth is the primary purpose of the in-service training program. Devices which have proved valuable in this regard include work in reorganizing the curriculum, experimentation with current educational problems, student ratings, encouragement to do research, and the granting of sabbatical leave.\textsuperscript{4} Other practices recommended as desirable include faculty meetings for studying methods; questionnaires to students, faculty, and alumni; inter-class visitation; visitation of outside schools; administrative encouragement in the use of new methods; encouragement to do summer study; attendance at professional meetings and summer teaching at different institutions; teacher-student conferences; providing advisers for young instructors; and the issuance of faculty bulletins.\textsuperscript{5} The most effective provisions reported were the periodic restatement of objectives, joint conferences with other department members or faculties, recognition of teach-
ing efficiency, departmental conferences, graduate study, student contacts, and adequate library facilities.¹

An adequate in-service training program for staff members in forestry should include some provision for contact with practice in the solution of problems commonly encountered in field operations. In engineering education it is recommended that the schools should not only encourage their staffs to do professional engineering work but also should insist that all staff members have adequate contacts with such work. The usual means of giving staff members the necessary contacts with field practice is through summer employment on such work and through performance of professional work during the school year.² An insistence that teachers in medical schools keep in touch with the practice in their field is also noted. Thus, "there is no satisfactory substitute for a teacher who is a master clinician in medical education."³ Likewise, the keystone of medical education is clinical instruction preferably involving actual patients in hospitals and outpatient services.⁴ A similar recommendation that forestry instructors be experienced in field practice is noted.⁵ From the above evidence it is apparent that any in-service training program for a staff developing a functional curriculum in forestry should make adequate provision for the members concerned to keep in contact with professional forestry work.

The in-service training program recommended as a necessary adjunct to the successful development of a functional curriculum in forestry has two major divisions. One division is concerned with improving the staff members as teachers; the other is designed to develop the instructors as professional foresters.

DEVELOPING TEACHERS

The growth of the men on the staff as teachers is a function of the staff itself. It is expected that each individual member will be interested in increasing his proficiency as an instructor and accordingly will plan to improve himself as opportunity permits. The requisite for staff development in this regard reduces itself to the provision of an efficient means whereby each person may improve continuously as a teacher and to the development of an environment wherein good teaching is recognized and expected.

A most effective means of promoting development of teachers is through the creation and functioning of staff committees. Each committee would

³Final Report of the Commission on Medical Education, op. cit., p. 244.
⁴Ibid., pp. 197-213.
⁵Graves and Guise, op. cit., p. 6.
have the dual function of educating the staff and of administering the cur-
riculum through a cooperative discussion with each member of the problems
encountered in his work. The committees recommended are:

1. Committee on Curriculum. The function of this committee should
be to study systematically the objectives of each course; to examine critically
the general curricular pattern and to recommend changes whenever it fails
to accomplish the desired general aims or whenever the general aims should
be revised in accord with changed professional practice; and to recommend
a desirable weighting for each course in order that minor items may not be
overemphasized at the expense of the major items.

2. Committee on Teaching. The function of this committee should be
to review continually the teaching techniques used in each course; to recom-
mend new or changed procedures designed to accomplish the course objectives
better; to study and recommend the organization of the class periods into
laboratory, discussion, lecture or other types of periods; and to recommend
the improvement in facilities necessary for more effective instruction.

3. Committee on Testing. The function of this committee should be
to review continually the testing techniques used in each course; to recom-
mend procedures designed to improve the appraisal program of each course;
to study and recommend any general system of examinations thought neces-
sary to improve instruction; and to study and recommend testing procedures
designed to promote honesty and accurate grading.

4. Committee on Student Personnel. The function of this committee
should be to administer the student personnel system by stimulating each
staff member to do adequate and high quality personnel work; to study and
improve the devices used to select and guide students in their school pro-
grams; to study and make recommendations concerning the selection and
classifications of students; to see that the personnel records kept are ade-
quate, pertinent, and in efficient form; and to improve the personnel work
and to synchronize it with the instructional program of the school.

5. Committee on Environment. The function of this committee should
be to supervise student activities directly connected with the forestry school
and to cooperate with the general college or university administrative authori-
ties in developing the most desirable general environment for students. This
committee should develop extracurricular activities and traditions designed
for the improvement of the students in forestry.

The chairman of each committee should be interested in the field of
service his committee covers, he should study and become well versed in the
literature and practices of other institutions in the field of the committee,
and he should educate the committee members by assigning or recommending
reading material and by discussion with the committee of the materials and problems involved. The committees would, through study, become proficient in their respective fields and thereby be able both to carry out their work intelligently and effectively and to inspire the remainder of the staff members because they could indicate the importance, the outcomes expected, and the better procedures to follow.

It is important that each committee do its work thoroughly. Committees should be given definite assignments and ample time for a full consideration of the assigned tasks. Schools with small staffs will find it expedient, consequently, to rotate the committee work year by year rather than to overload the staff with a complete program of committee work each year.

Developing Professional Forestry Background

The development of a background in professional forestry is a function of each individual staff member. The function of the administrative agency is to create conditions wherein each staff member will have a maximum opportunity for personal development. The essential elements consist of the following:

1. The division of the field of forestry and the assignment of each staff member to a division. The divisions selected might be made either horizontally or vertically. Horizontal division would parallel the divisions on the promotional ladder and would therefore synchronize directly with the basic separations of the curriculum into areas of learning. Vertical division would be accomplished by grouping the courses on the basis of type of subject matter. Thus, courses which were essentially technical would be separated from those essentially social in background. In a like manner the technical courses could be classified in accordance with the type of product or work dealt with—i.e. into timber, recreation, fire, and range courses. Although it is possible to have logical divisions on either a horizontal or vertical basis, it is quite likely that a combination of the two will prove most advantageous. Accordingly, it is recommended that the initial division be made on a vertical basis wherein technical and social areas are separated from each other. The remainder of the divisions may then be made on a horizontal basis.

2. Provisions whereby each staff member shall have an opportunity to keep abreast of the important developments in each of the other divisions made. The teaching of the knowledge courses, the development of a seminar course participated in by the staff as a group, and the assignment to committee membership—particularly to the committee on curriculum—are suggested as a means of keeping the staff members informed of important developments outside their special division.
3. Encouragement of desirable contacts with professional forestry work. Summer employment in professional practice, provided such employment gives promise of developing professional experience of value in the classroom, is a valuable factor in this regard. Leave of absence, for the purpose of carrying out a high type of professional forestry work, is desirable. Professional work during school time should be encouraged with caution as it may disrupt class progress and influence the instructor to sacrifice instructional time in the interests of such other professional employment. Each staff member should be expected to have interviews from time to time with professional foresters in key positions who are capable of advising as to professional practice. Attendance at professional meetings and an active participation therein should also be promoted. Research work, particularly in the applied or professional field, should be helpful. It is apparent therefore that the program for encouraging desirable contacts with professional forestry work may be variable. It should, in any event, be so designed that all staff members will have ample opportunity to make satisfactory contacts with field work.

4. Encouragement of further study. A library well supplied with recent books and periodicals in forestry is essential. Graduate study on the part of the individual staff members is to be encouraged both in the field of forestry and in fields of learning basic to or closely connected with the specialty of the staff member concerned. Personal reading programs and faculty study groups also furnish excellent means for individual staff members to obtain a broad basic knowledge essential to a good teacher. Once facilities are provided for encouraging further study, each staff member should be expected to continue his scholastic development by taking advantage of the facilities provided.

A comprehensive in-service training program for staff members is essential for a dynamic functional curriculum. It is also in keeping with the principles of democratic control on the part of the administrative officers. It is necessary, however, to supplement the in-service training program with administrative measures designed to insure the actual operation of the training program in such a way that maximum effectiveness may be secured therefrom.

ADMINISTRATIVE CONTROLS

Administrative controls are necessary if good performance is to be recognized and rewarded and if failure is to be remedied before it becomes serious. Every unit must be helped to function properly in order that the

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1Graves and Guise, op. cit., p. 6.
entire program may progress smoothly. The objective is not to force each individual staff member into a rigidly controlled plan but to develop a system of administrative control which is cooperative in nature and effective in preventing serious breakdowns in the operation of the functional curriculum.

The administrative controls must be flexible. Controls which are entirely feasible once a functional curriculum has become fully operative may not prove at all desirable during the period of adoption of such a program.

A functional curriculum should not be adopted hurriedly. Both staff and student body should be willing and ready to accept the changes contemplated. It is desirable, therefore, that a program for gradual adoption be followed. In consequence the following sequence of procedure is suggested as a means of obtaining the final adoption of a fully functional curriculum:

1. A general discussion of this type of curriculum from the standpoint of its general objectives and outcomes. This discussion should be presented before the entire staff in forestry and should be designed to create added interest in the functional approach.

2. The appointment of a committee of the staff to study and to report on the functional curriculum, its characteristics and its possibilities. Selected bibliographical material should be made available to this committee in order that they may become fully informed concerning the principles and operation of such a curriculum.

3. Report of the special committee to the staff. As a result of the discussion following the report of the committee, the staff either decides to drop the matter permanently or to try out certain phases of it experimentally. If the latter course is adopted, it will be necessary to select the staff member or members who will be given the opportunity to conduct the experiment and to secure the cooperation of the students involved.

4. The gradual development of individual courses on a functional basis. Individual staff members should be urged, when interested, to convert their courses into ones using the functional approach. In this manner teaching procedures can be evolved from staff experience. Shortly after the teaching phase is attempted, the testing may be placed upon a functional basis.

5. The appointment of a staff committee having the functions of the committees discussed above on teaching, on testing, and on student personnel work. The committee should be composed of those staff members most active in developing individual courses on a functional basis. The work of this committee would be to advise with interested staff members concerning their courses, to create interest in the student body and to secure the cooperation of the students in the functional program, and to suggest for staff

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members study programs and research projects bearing on the functional curriculum.

6. The appointment of the five committees previously described with the power given to supervise the development of all phases of the functional curriculum. The chairman of each of the committees should be appointed from the membership of the foregoing committees and the five committees should supplant all other staff committees dealing with the functional curriculum. The appointment of the five committees must be delayed until the staff and student body are ready to accept the functional curriculum. The committees are then in a position to work effectively and to develop the curriculum upon a functional basis as completely and as quickly as facilities will permit.

The development of effective administrative controls must parallel the development of the functional curriculum. In so far as the progress made in perfecting the curriculum depends upon the activity of individual staff members, it is necessary to know, to reward, and to recognize in the teaching load those individuals who are active in developing the desired approach. For this reason, it is necessary to have some means of identifying the productive activities of each staff member.

The criteria used in judging the progress of each staff member include the following:

1. Reports of the various functional curriculum committees. Lack of activity on the part of any staff member indicates a probable source of failure which should be carefully studied and watched by the administrator. Activity, but of a non-cooperative nature, might indicate the need of educating the staff member concerned as to the objectives desired and the nature of the program. Cooperative and intelligent activity upon the committees would indicate satisfactory performance.

2. Requests for facilities on the part of individual staff members. Functional courses and teaching require a wider variety of teaching materials, and frequently, a different type of facilities than are needed for the customary classroom procedure. Accordingly, the teacher who is actively developing his courses on the new basis will usually request facilities in keeping with aids found most desirable for functional courses and in keeping with his own source book for the course.

3. Changes suggested. An active and intelligent teacher should from time to time notice items which should be changed with the purpose of improving the school of forestry of which he is an integral part. The nature of these suggestions might indicate the educational philosophy upon which he

\[^{1}\text{Supra., pp. 84-86.}\]
acts, while the lack of such suggestions might be due to an unsatisfactory background or to limited interest.

4. Professional contacts. The functional curriculum requires that each staff member keep in close contact with field operations in his specialized field. Men who make adequate field contacts will indicate the fact by a record of professional employment, by interest in professional meetings, and by an acquaintance with professional foresters active in the field.

5. The nature of the written work assigned and the tests given. Since the functional curriculum attempts to make the student job-competent rather than a mere master of subject matter, the written assignments and the tests given should be in harmony with this purpose. An analysis of such materials will therefore give some indication as to the nature of any specific course.

Once a difficulty is located in regard to any particular staff member, it is necessary to take desirable remedial steps in the way of education or discipline in order that the individual may be able to progress in a reasonable manner.

The development of individual staff members is intimately connected with efficient and intelligent action on the part of each of the committees. It is necessary, therefore, in the interest of good administration, to have some means of judging the effectiveness of the work of each committee. Accordingly, it is desirable to ask each committee to submit an annual report of its activities. This report should be presented to the staff in an abbreviated form for discussion. It should contain a fairly comprehensive account of the activities of the committee for the year and a list of suggested changes, with the reasons for the changes. Active and intelligent committees will be able to produce reports clearly, thus indicating the ability of the committee to carry out the functions assigned to it. Poor committee action would be indicated by lack of pertinent activity and by recommendations based upon reasoning incompatible with the philosophy of a functional curriculum.

Staff members on an active committee must have some means of growing in the work of the committee. For this reason, the type of graduate work taken, the requests for library and other facilities, and the ability of the committee to defend its recommendations when presented to the staff are indicators of the type of committee to which the men belong. Whenever committees fail to function fully, it is necessary to encourage the individuals in the committee to study the literature and practices concerning the work of such committees. Persistent failure of committee action must result in the removal of the chairman and perhaps others from the committee.

The most effective committee action requires not only intelligent and active committee members but also the availability of research facilities in
order that the problems facing the committee can be thoroughly studied. Provision should be made for administrative research in all phases of the school's program. Lack of demand for research in any area of the program of the school would indicate a possible danger spot. On the other hand, the results of well-planned research projects would allow committee action to be taken on a basis of factual data rather than of opinion and would also do much toward educating the staff as to the outcomes and as to better procedures.

Administrative controls must be applied with due regard for the principles of obtaining teamwork. The essence of such control is securing improvement by educating the individuals concerned and developing cooperative procedures. Arbitrary pressures are to be avoided. It is highly desirable, therefore, for the administrator to discover "danger spots" early and to take remedial measures of an educational nature whenever possible. Suggestions and cooperation from an administrator well acquainted with the successful practices of educators, active in administrative research, and tolerant and cooperative in attitude, will aid the staff materially in developing a functional curriculum.

A staff composed of men who are good scholars, interested in professional forestry and professional education, and sympathetic to the student viewpoint will do much to make a functional curriculum a success. Such a staff plus proper guidance on the part of the administrator will develop a student centered curriculum with outcomes definitely fixed on the job and life competency of the graduates. Such in essence is the functional curriculum in forestry.

**SUMMARY AND CONCLUSION**

A functional curriculum in forestry is desirable in order that the instruction given student foresters shall be in keeping with the changes made in educational theory and practice, thereby minimizing the lag between professional practice and instruction given in the various fields of activity of professional foresters. The development of research work in forestry and the potentialities of further developments in this work make a critical analysis of the relationship between forestry instruction and forestry practice highly desirable. The development of a forestry practice that is typical of American conditions indicates the necessity of a continual realignment of instruction with field practice if the profession is to render the maximum service to the country. In so far as a functional curriculum is dynamic in nature, its

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adoption affords a means whereby instruction given student foresters keeps pace with developments in field practice.

The functional curriculum is derived from an analysis of the expected future life and work of the student forester. The danger in such a curriculum is that it will revert to a training in the skills of forestry and neglect the necessary instruction in the more permanent fundamental principles of professional forestry practice. For this reason, a functional curriculum in forestry should consist of a general framework with ways and means provided for the staff to select and develop course materials in accord with the general aims to be accomplished. It is typical of the functional curriculum that reliance is placed on the staff to devise and continually change and improve the detailed course material as well as the teaching and testing procedures used. The ability and training of the staff members, their interest in curricular matters, and the type of administrative controls used form the key to the proper implementation of a functional curriculum. Given these items, a functional curriculum will afford a means of giving high quality instruction in professional forestry.

A functional curriculum should be developed only after a careful study has been made of the entire curriculum situation. Guiding criteria, as obtained from the theory of education, are necessarily general in scope. Such criteria afford a means of particularizing a cogent philosophy of education as it applies to the curriculum. Criteria procured from professional society sources provide pertinent guides for a functional curriculum in forestry. A curriculum, sound in concept and consistent in philosophy, must unfold only in accordance with the general guides established with the adoption of the guiding criteria.

Guiding criteria adopted in this study as selected from recent authoritative writings on the curriculum are four, epitomized as follows:

1. The curriculum should be a dynamic whole with special emphasis upon the aims or objectives to be accomplished.
2. The curriculum should be student centered.
3. The curriculum should be derived from the expected environment of the student.
4. The teacher must be an expert workman who acts as a guide.

Guiding criteria selected from specific professions were obtained from engineering, medicine, and forestry. These criteria follow:

1. The curriculum must be designed to train individuals to do competent, professional work.
2. The curriculum must be practical in the sense that the student is given access to real professional problems and theoretical in the sense that the
major emphasis is placed on obtaining an understanding of the fundamental principles.

3. The curriculum should cover the entire field in five years with specialization attempted only after a student has completed the five year curriculum.

4. The staff should be men qualified as professional foresters and as educators and be provided with ample facilities and teaching aids.

The development of specific portions of the functional curriculum rests upon the analysis of the curriculum into its component parts. The organizing principles used act merely as tools to obtain a classification that is integrative in character. The major classification of the curriculum into that part which deals with job competence and that part which deals with competency for life permits a functionalized approach to the general framework of the curriculum and indicates the way toward a more detailed analysis.

The portion of the curriculum designed to give the student instruction that will allow him to become job competent must have its aims arise out of the nature of the work of a professional forester. The complex nature of the forester's work makes it necessary to recognize three general types of objectives: training in job proficiency, in the necessary personal qualities, and in the desirable types of mental abilities.

The scope of the work of the professional forester was determined through the use of a questionnaire and a job load analysis of work in the Federal Forest Service. These data were grouped in accordance with the promotional ladder of the U. S. Forest Service thereby giving a sequence for the job competency phase of the curriculum that is particularly well adapted for giving the desired training in mental abilities. Accordingly, the framework of the core phase of the curriculum places the instruction in the underlying knowledge and skill groups first and lists the remainder of the work in accord with the promotional ladder.

The desirable mental abilities of a forester vary with his position in the professional pyramid. Those at the bottom of the pyramid need the ability to do the tasks assigned. Those in the middle of the professional pyramid are mostly concerned with the ability to understand the tasks and their relationships. Those at the top of the pyramid find it necessary to develop an integrated plan of action. All professional forestry work has some elements of all the mental abilities which are desirable for a forester to have. However, there is a variation in degree of the essential mental abilities necessary for tasks performed by foresters at different levels in the professional pyramid. Thus, in the lower brackets the emphasis is upon skills, in the middle bracket upon perception, and in the upper brackets upon conception.
This correlation between mental abilities and position in the professional pyramid allows the instructor to coordinate readily the aims of any course in giving training in subject matter and in mental abilities—particularly when the sequence is based on the professional pyramid.

The personal qualities which are necessary for success in professional forestry are constant regardless of the position in the professional pyramid. In consequence, it is necessary for the instructor to select from a list of personal qualities, the particular qualities to be emphasized in any one course.

An analysis of the job list activities, of the necessary personal qualities, and of the desirable mental abilities allows the development of courses having a threefold objective. The arrangement of the course work upon a basis of the promotional ladder in the profession makes it possible to develop threefold course objectives in keeping with the work of the professional forester. It is therefore possible to change the requirements of the core phase of the curriculum whenever an analysis shows that the work requirements of the professional forester change. An opportunity for staff members to keep in touch with professional work, in consequence, becomes a necessary adjunct to the proper implementation of the functional curriculum in forestry.

The general education phase of the curriculum is designed to give the student a background for that segment of his activities that is not a part of his professional work. The section of the curriculum dealing with general education was developed by dividing contemporary living into five functionalized groups; namely, to use or consume, to produce, to live together cooperatively, to maintain and develop, and to lead. By assigning a course throughout a year to each functionalized group, a major framework in general education was developed that will give the student a comprehensive grasp of adult living.

The success or failure of the functional curriculum must rest, in the end, upon the work of the instructor. The skill with which he develops unit objectives, guides his students in obtaining their subject matter understandings, helps his students develop desirable mental attributes, and inspires them to grow in desirable personal qualities is the keystone to good outcomes from the classroom. For this reason, the administrator should be particularly concerned with the proper development of each of the staff members involved.

The function of the administration is to obtain the efficient operation of the organization toward the goals set by the functional curriculum. The administration should stimulate the growth of each staff member because of the peculiarities of the functional curriculum and the teaching processes involved. The administrative controls used must recognize good performance yet not hinder the development of the individual staff member and his work.
SUMMARY AND CONCLUSION

It is necessary therefore to emphasize an in-service training program for staff members in order to develop to a maximum their potentialities as teachers and as professional foresters. It is essential that staff members be given an opportunity to participate in the building of the functional curriculum so that they may understand their role in the classroom and the manner in which their work dovetails with the work of their colleagues. In a properly administered school, suggestions and cooperation from an administrator who is well acquainted with the successful practices of educators, active in administrative research, and tolerant and cooperative in attitude will aid the staff materially in developing properly the functional curriculum.

The essence of a functional curriculum in forestry is a student centered curriculum with the outcomes definitely fixed on the job and life competency of the graduates. Under proper guidance on the part of the administrator, a staff composed of men who are good scholars, interested in professional forestry and professional education, and sympathetic to the student's viewpoint will do much to make the functional curriculum a success.
**APPENDIX**

The following is a copy of the questionnaire mailed to 234 graduates of the School of Forestry of Oregon State College. A total of 110 returns were received. The figure recorded for each item is the number of checks received.

<table>
<thead>
<tr>
<th>Name</th>
<th>Attended O. S. C. to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Present Position</td>
</tr>
</tbody>
</table>

**ALUMNI QUESTIONNAIRE**

Check the following items if a good knowledge of them has proved necessary in the professional tasks which you have done. List any other activities not specifically mentioned in the spaces provided.

I. **KNOWLEDGE OF THE PHYSICAL THINGS ABOUT THE FOREST**

<table>
<thead>
<tr>
<th>Item</th>
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</thead>
<tbody>
<tr>
<td>110 Trees</td>
</tr>
<tr>
<td>91 Plants other than trees</td>
</tr>
<tr>
<td>65 Animals</td>
</tr>
<tr>
<td>51 Scenic attributes</td>
</tr>
<tr>
<td>62 Wood Products</td>
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</table>

II. **SCIENCES**

<table>
<thead>
<tr>
<th>Science</th>
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</thead>
<tbody>
<tr>
<td>7 Bacteriology</td>
</tr>
<tr>
<td>84 Botany</td>
</tr>
<tr>
<td>72 Entomology</td>
</tr>
<tr>
<td>62 Geology</td>
</tr>
<tr>
<td>84 Mathematics</td>
</tr>
<tr>
<td>55 Physics</td>
</tr>
<tr>
<td>60 Soils</td>
</tr>
<tr>
<td>20 Zoology</td>
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<tr>
<td>2 Chemistry</td>
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III. **SOCIAL SCIENCES**

<table>
<thead>
<tr>
<th>Social Science</th>
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<tbody>
<tr>
<td>64 Economics</td>
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<tr>
<td>35 Geography</td>
</tr>
<tr>
<td>24 History</td>
</tr>
<tr>
<td>15 Philosophy</td>
</tr>
<tr>
<td>26 Political Science</td>
</tr>
<tr>
<td>69 Psychology</td>
</tr>
<tr>
<td>40 Sociology</td>
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</table>

IV. **ARTS AND LETTERS**

<table>
<thead>
<tr>
<th>Art</th>
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<tbody>
<tr>
<td>39 English Literature</td>
</tr>
<tr>
<td>7 Germanic languages</td>
</tr>
<tr>
<td>13 Greek or Latin</td>
</tr>
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V. **BUSINESS ADMINISTRATION**

<table>
<thead>
<tr>
<th>Administration</th>
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<tbody>
<tr>
<td>66 Accounting</td>
</tr>
<tr>
<td>28 Production Management</td>
</tr>
<tr>
<td>18 Merchandising</td>
</tr>
<tr>
<td>28 Secretarial Science</td>
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</table>

VI. **AGRICULTURE**

<table>
<thead>
<tr>
<th>Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Agricultural Economics</td>
</tr>
<tr>
<td>27 Animal Industries</td>
</tr>
<tr>
<td>22 Plant Industries</td>
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VII. **HOME ECONOMICS**

<table>
<thead>
<tr>
<th>Economics</th>
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<tbody>
<tr>
<td>28 Nutrition and Foods</td>
</tr>
<tr>
<td>2 Clothing and Textiles</td>
</tr>
<tr>
<td>2 Household Administration</td>
</tr>
<tr>
<td>3 Institutional Economics</td>
</tr>
</tbody>
</table>

VIII. **ENGINEERING**

<table>
<thead>
<tr>
<th>Engineering</th>
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<tbody>
<tr>
<td>5 Chemical</td>
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<tr>
<td>100 Civil</td>
</tr>
<tr>
<td>13 Electrical</td>
</tr>
<tr>
<td>33 Mechanical</td>
</tr>
<tr>
<td>10 Mining</td>
</tr>
<tr>
<td>16 Industrial Arts</td>
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IX. **PHARMACY**

<table>
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<tr>
<th>Pharmacy</th>
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</tbody>
</table>

97
X. MEDICINE
90 First Aid
12 Physiology
4 Anatomy
48 Hygiene and Public Health
0 Biochemistry
16 Pathology

XI. FINE ARTS
1 Art
2 Music
17 Architecture
58 Landscape Architecture

XII. JOURNALISM
53

XIII. LAW
64

The following is a list of jobs. Check all that you have actually done in part or in whole. Add any other jobs not mentioned.

I. TIMBER MANAGEMENT
104 Timber Resource Plans and Surveys
85 Reforestation
78 Timber Stand Improvement
85 Utilization of the Timber re: sales, etc.
71 Timber Trespass
53 Administrative Research

II. STATE AND PRIVATE FORESTRY
50 Forest practices on private or state lands
30 Promotion
28 Owners
15 Legislation
21 Special Studies

III. RANGE MANAGEMENT
59 Forage Resource Plans and Surveys
59 Utilization of the Range
62 Range Improvements
71 Cooperations with Users

IV. WILD LIFE
62 Wild Life Resources Plans and Surveys
40 Food and Shelter
49 Cooperation with Others

IV. WILD LIFE
62 Wild Life Resources Plans and Surveys
40 Food and Shelter
49 Cooperation with Others

V. RECREATION
62 Recreation Plans and Surveys
54 Supervision
64 Improvements
5 City and Park Forestry
8 Games
22 Administrative Studies

VI. LANDS
74 Special Uses
50 Land Planning
59 Soil Conservation
34 Watersheds
70 Ownerships
35 Administrative Studies

VII. ENGINEERING
62 Transportation
73 Plans and Surveys
68 Field Location
64 Construction

VIII. EDUCATION AND INFORMATION
46 Plans and Surveys
84 Contacts with Individuals
85 Contacts with Groups
# APPENDIX

## IX. Personnel
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>Hiring</td>
</tr>
<tr>
<td>89</td>
<td>Training and Instruction</td>
</tr>
<tr>
<td>87</td>
<td>Inspection</td>
</tr>
<tr>
<td>77</td>
<td>Discipline</td>
</tr>
<tr>
<td>66</td>
<td>Promotion and Records</td>
</tr>
<tr>
<td>83</td>
<td>Safety and Accidents</td>
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</table>

## X. Fire Control
<table>
<thead>
<tr>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>76</td>
<td>Plans and Surveys</td>
</tr>
<tr>
<td>93</td>
<td>Prevention</td>
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<tr>
<td>76</td>
<td>Improvements</td>
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<tr>
<td>100</td>
<td>Suppression</td>
</tr>
<tr>
<td>68</td>
<td>Damage Appraisals</td>
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<tr>
<td>46</td>
<td>Administrative Studies</td>
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## XI. General Information
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<tr>
<td>90</td>
<td>Work Plans, Work Loads and Job Standards</td>
</tr>
<tr>
<td>71</td>
<td>Budget Making</td>
</tr>
<tr>
<td>93</td>
<td>Reports on Projects</td>
</tr>
<tr>
<td>77</td>
<td>Accounting of Expenditures and Maintaining Allotment Controls</td>
</tr>
<tr>
<td>92</td>
<td>Equipment—its care and accountability</td>
</tr>
<tr>
<td>81</td>
<td>Building and Grounds</td>
</tr>
<tr>
<td>82</td>
<td>Office Procedures and Routine</td>
</tr>
<tr>
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<td>Administrative Studies</td>
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</table>

## XII. Control of Diseases
<table>
<thead>
<tr>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>30</td>
<td>Plans and Surveys</td>
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<tr>
<td>24</td>
<td>Supervision</td>
</tr>
<tr>
<td>15</td>
<td>Improvements</td>
</tr>
<tr>
<td>27</td>
<td>Control Projects</td>
</tr>
</tbody>
</table>

## XIII. Control of Insects
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Plans and Surveys</td>
</tr>
<tr>
<td>35</td>
<td>Supervision</td>
</tr>
<tr>
<td>12</td>
<td>Improvements</td>
</tr>
<tr>
<td>32</td>
<td>Control Projects</td>
</tr>
</tbody>
</table>

## XIV. Other Items (List)
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Photography</td>
</tr>
<tr>
<td>1</td>
<td>Merchandising</td>
</tr>
<tr>
<td>1</td>
<td>Seed Germination</td>
</tr>
<tr>
<td>2</td>
<td>Rodent Control</td>
</tr>
</tbody>
</table>

Check the following skills, the possession of which would have been a material aid to your getting started well on your first professional job as secured after leaving college. Add any skills not mentioned.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>80</td>
<td>Typing</td>
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<tr>
<td>83</td>
<td>Report Writing</td>
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<tr>
<td>80</td>
<td>Letter Writing</td>
</tr>
<tr>
<td>13</td>
<td>Horse Shoeing</td>
</tr>
<tr>
<td>5</td>
<td>Welding</td>
</tr>
<tr>
<td>15</td>
<td>Auto Mechanics</td>
</tr>
<tr>
<td>42</td>
<td>Filing (in office)</td>
</tr>
<tr>
<td>35</td>
<td>Horse Packing</td>
</tr>
<tr>
<td>26</td>
<td>Saw Filing</td>
</tr>
<tr>
<td>53</td>
<td>Telephone Repairing</td>
</tr>
<tr>
<td>49</td>
<td>Filling out Forms</td>
</tr>
<tr>
<td>40</td>
<td>Photography</td>
</tr>
<tr>
<td>51</td>
<td>Teaching</td>
</tr>
<tr>
<td>47</td>
<td>Conversation</td>
</tr>
<tr>
<td>53</td>
<td>Manners</td>
</tr>
<tr>
<td>28</td>
<td>Writing Stories</td>
</tr>
<tr>
<td>52</td>
<td>Drawing and Lettering</td>
</tr>
<tr>
<td>26</td>
<td>Falling Trees</td>
</tr>
<tr>
<td>27</td>
<td>Bucking Logs</td>
</tr>
<tr>
<td>13</td>
<td>Public Speaking</td>
</tr>
<tr>
<td>3</td>
<td>Radio</td>
</tr>
<tr>
<td>4</td>
<td>Shorthand</td>
</tr>
<tr>
<td>2</td>
<td>Lumber Grading</td>
</tr>
<tr>
<td>2</td>
<td>Office Machines</td>
</tr>
<tr>
<td>3</td>
<td>Personnel Management</td>
</tr>
<tr>
<td>2</td>
<td>Cooking</td>
</tr>
<tr>
<td>2</td>
<td>Tact</td>
</tr>
</tbody>
</table>
GLOSSARY OF TERMS

CORE. This consists of those common student activities that are essential in the training of a professional forester for job competency.

COURSE OF STUDY. A written guide which sets forth the objectives and content of a given subject.

CULTURAL EDUCATION. The training, improvement, and refinement of the mind in reference to the essentials of adult living today.

EDUCATION. The process of continuous growth throughout meaningful experiences.

FUNCTIONAL CURRICULUM. A curriculum so selected, organized, and operated as to prepare the student forester for the work and life he is expected to follow. It looks to the life and work of the forester for its guide rather than to past or present educational practice.

GUIDING CRITERIA. Standards for judging the desirability of facts, principles, and opinions.

INDUSTRIAL ORDER. A system of economic enterprises necessary in order to convert completely a raw resource into consumer goods.

INTEGRATION. Integration is the combining of the individual parts into a unified whole.

KNOWLEDGE. Knowledge is interpreted as facts required and understood in relationship to certain situations.

OBJECTIVES. Objectives or aims are the goals which the school assists the student to achieve.

OUTCOME. An outcome is that which the student actually learns.

PRINCIPLE. A principle is a fundamental truth which acts as a guiding rule.

SKILL. Skill is the ability to act in such a manner as to be able to secure results in recurring, similar situations.

SUBJECT MATTER. Subject matter is any material used in a learning situation.

UNIT OF WORK. A unit of work is composed of various experiences and activities of a group which center around some one interest or purpose.
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By Ira N. Gabrielson, Sc.D., Chief, Bureau of Biological Survey,
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