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A COURSE OF STUDY FOR THE PREPARATION OF RURAL SCHOOL TEACHERS

NATURE STUDY, ELEMENTARY AGRICULTURE, SANITARY SCIENCE, AND APPLIED CHEMISTRY

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
BUREAU OF EDUCATION,
Washington, D. C., January 6, 1912.

SIR: A very important problem of popular education to-day is the better adaptation of the work of the rural schools to the needs of rural life. The schools must make the people more intelligent in regard to the life they are to live. Both for culture and practical utility the course of study in these schools should conform more closely to the environment of the child and the future work of the man. This can be brought about only by teachers educated and trained for the task. "*A course of study for the preparation of rural school teachers in nature study, elementary agriculture, sanitary science, and applied chemistry*," which has been prepared by Dr. Fred Mutchler and Mr. W. J. Craig, of the Department of Science in the Western Kentucky State Normal School, is a valuable contribution toward the solution of this problem and can not fail to be very helpful to officers and teachers in normal schools and other schools in which teachers are trained. I therefore recommend its publication as a bulletin of the Bureau of Education.

Very, respectfully,

P. P. CLAXTON,
Commissioner.

THE SECRETARY OF THE INTERIOR.

A COURSE OF STUDY FOR THE PREPARATION OF RURAL SCHOOL TEACHERS.

NEED OF SPECIAL TRAINING FOR TEACHERS OF RURAL SCHOOLS.

The part of our educational system that has received least attention in the immediate past is the rural school. Much good work has been and is now being done in the reorganization of courses of study, in training teachers, in planning for material equipment, and all the various details that help make an efficient school system. While these efforts have been well directed and are in large measure being carried out, they have nevertheless been inadequate for reviving the rural school. There is still lethargy among its patrons, still in far too many instances a deplorable retirement of pupils at an early age from the country school, still a very low attendance, still a lack of school spirit in the rural community, and still a vast amount of teaching which, though ever so well done, misses the high mark of its influence. The rural school has not the influence that it should have. One of the chief reasons lies in the fact that the course of study is ill-adapted to rural life in all of its relations. We are united in believing that a school should train its pupils for life and its work while these pupils are living and working. The course of study taught in the rural school to-day is entirely too much like the course that is taught in the city school; in fact it has been modeled to fit the needs of the latter without consulting enough the ends that are to be attained in the former.

Rural interests and rural problems are not like the city's interests and its problems; and educators everywhere, especially in the South, are coming more and more to believe that the course of study adapted to securing the most efficient rural life is radically different from any other course of study. The elementary school must, if it fulfills its high purpose, minister to the needs of the community in which it resides. To do this a course of study coordinated with rural life is needed, together with a corps of teachers trained to put in operation the work that the country districts need.

It is not within our purpose to make a study of rural interests and conditions or to outline a course of study for the rural schools, but to suggest some of the lines along which the teacher should be trained who essays to teach in the country district. It is not necessary to

argue whether this training should be different from that of any other school. That fact is now generally admitted, because the problems to be solved and the interests to be encouraged, developed, and ministered unto are different from those in any other phase of elementary education. The country school will not reach the position of efficiency that belongs to it until a distinctive training is required of its teacher.

This distinctive training should give the teacher the power to answer the call of the rural community and the interests of country life will determine what should be emphasized in the country school and consequently what should be emphasized most in the rural teacher's special preparation. The country district is first of all and above all a place where the practical in education is needed, and one of the chief aims of the rural school should be the development of thrift. Thrift has always been and always will be a fundamental factor in progress, whether of the individual or of the community at large. Better homes and better household economy in every respect; better live stock and better barns; better crops and better use of them; the maintenance of the productivity of the soil and the reclamation of worn-out fields; better roads and better vehicles of travel; more good books, papers, magazines, art, and music for the boys and girls; better social conditions—these are the urgent needs of country life to-day, and they are most worthy because they all contribute so much to a happy and a useful life. Shall not the rural schools minister to these needs? And shall not the rural school teacher's training be such as to prepare him for teaching in a school whose major work is concerned with the solution of these problems? Can we do better at this time than to train the pupils of the country districts to make the most of the conditions that surround them by showing in a very definite and practical way the opportunities for a noble life that lie within their reach? Real progress can not be made without thrift. The rural teacher's preparation should not be wanting in the elements that equip him for serving this need.

POINT OF VIEW OF A STATE NORMAL SCHOOL.[1]

For the purpose of making more generally understood the proper attitude of such an institution toward the problem of elementary rural education, the following discussion and statement of work is presented. The aim of this course, it will be readily understood, is to increase the efficiency of the rural teacher.

A State normal school should prepare a large number of teachers to go out into the rural communities, there to be potent factors in bringing about the best possible rural life. The rural child is

[1] The course and methods described herein are largely those of the Western Kentucky State Normal School, Bowling Green, Ky.

entitled to a course of study and to a course of instruction that will dignify and enrich his life and make life for him in the rural environment, should he choose to remain there, not simply tolerable, but glorious. Unfortunately, teachers everywhere, with rare exceptions, have idealized city life and unwittingly have been potent factors in inducing young men and women to leave the farm and move into the city. This movement often carries some of the best blood and brain of the community into the city, often to be lost, wasted or destroyed; certainly to be lost from the rural community. It is possible and right, indeed a duty, to dignify rural life and to save to it and its interests the best blood of the country.

Since there are common interests between rural and city peoples, the courses of study in their schools and the instruction should have certain elements in common, but there are important differences in industries and in environment. Corresponding to these differences, there should be a difference in instruction, and in this difference the adjustment should be so devised as to make the school contribute most to the needs of rural life.

To prepare teachers who can meet this demand, the following course of study and training is proposed: The first year is largely given to distinctively rural problems and interests, the two succeeding years turn more toward general scholarship, in order that those taking the entire course may be able not only to teach rural schools, but to enter larger fields of usefulness.

PREPARATORY COURSE.

The subjects of this course are arranged especially for students coming from the rural schools and from the grades, and for those who have not taught. Likewise, many who have taught will find it necessary to take some of the subjects in this course before they can carry the work of the elementary course successfully. While it is desirable to have all of the preparatory course completed before beginning the elementary course, one can complete several subjects in the elementary while finishing the work in the preparatory course. The subjects suggested for the preparatory course are as follows:

Arithmetic.	Penmanship.	Civil government.
Reading and spelling.	Physiology.	Elementary history.
Grammar.	Nature study.	State history.
Geography.	Theory and practice.	General observation.

ELEMENTARY COURSE.

Students who have completed all of the work of the preparatory course and of the elementary course, and are not deficient in qualifications relating to personality, habits, and character, may be granted certificates entitling them to teach in any rural or town school.

The certificate should not be granted for less than 26 weeks of resident work. The subjects for this course should be as follows:

Physiology and sanitary science.	English (farm themes).	History.
Grammar.	Pedagogy.	Observation.
Arithmetic.	Chemistry of farm and kitchen.	Physical geography.
Psychology.	Manual arts or domestic economy.	Drawing
Music.	English.	Agriculture.
Forensics.		Rural life problems.

COURSE FOR RURAL TEACHERS.

It is now quite generally conceded that the following subjects are necessary for the proper training of rural school teachers: Nature study, elementary principles of practical agriculture, sanitary science and hygiene, domestic economy, and practical principles and problems in elementary chemistry and physics as applied in the study of these subjects. The teacher should be required to have a working knowledge of these subjects. The formal training of most country boys and girls ends with the rural school course. A fundamental knowledge of the foregoing subjects is certainly a minimum to require of the teacher who trains them for the lives that they must lead.

In the outlines which follow the topics are given with considerable detail in order to indicate what in our opinion should be incorporated in the elementary rural-school course in so far as pertains to these subjects. It is believed that teachers trained in this work will be much better prepared to do such work in rural schools, and that those schools will show a measure of efficiency that has never yet been generally attained.

NATURE STUDY.

As a starting point for the practical work in the rural school, nature study offers a very rich field, probably the best within our reach at this time. The science of living things is boundless, and life is all too short to comprehend any great part of it. No one can, however, go very far in his experience without realizing that as a living being he must cope with many other living forms, some of which are his enemies and others his friends; that some are his constant helpers, and others equally strong are constantly opposed to him; that some are making his life a pleasure and that others are tending to make it drudgery; that living things are "forces in nature" either for good or for evil; and that in order to make the most of life it is necessary to know what these living things are doing in order that a proper attitude toward each may be taken. It is the aim of nature study to reveal those living things that influence human life

most. "Nature study is learning those things in nature that are best worth knowing to the end of doing those things that make life most worth the living." (Hodge.)

It is not the idea that we shall teach all things in nature, nor that all things are of importance if taught, nor that anything that is well taught is as valuable as any other thing. As a matter of fact, many things are taught that are not worth the effort or the time required to learn them. Only weariness and discouragement come from teaching such facts, and only indifference results on the part of the learner. But there are some things that every rural school teacher should see that his pupils learn, because of their importance in shaping the conditions of rural life. The following outline of a course of study is suggested for the preparation of the teacher to teach these important things. This course is intended to lay the foundation for the work in agriculture, both in the teacher's preparation and in the work of the country schools. In the latter the proper place for nature study is in the early grades, probably through the fifth or sixth, when practical agriculture should begin.

OUTLINE OF A COURSE IN NATURE STUDY.

PURPOSE AND POINT OF VIEW.

I. To give first-hand knowledge of nature.
II. To learn the useful and harmful in nature.
III. To establish permanent helpful life relations.
IV. To form a basis for work in agriculture.

SUBJECT MATTER

I.—Bird life (the problem of establishing life relations).

1. List of helpful birds in the community. Why helpful?
2. List of harmful birds in the community. Why harmful?
3. List of nonmigratory birds.
4. List of game birds.
5. Study of State game laws.
6. General habits of birds: (*a*) Nest and nesting materials; (*b*) incubation period (observation); (*c*) migration; (*d*) notes.
7. Food and feeding tests: (*a*) Proportion of animal and vegetable food; (*b*) proportion of insect pests and noxious weed seeds in food; (*c*) groups of students (not over four in number) are asked to watch the parent birds feed their young for twelve consecutive hours, keeping a careful record of the number of feedings, and in so far as possible determining what things are fed, whether animal or vegetable matter. The following is a report made by two students of the Western State Normal School during the summer term of 1911. It is reproduced here exactly as it was handed in.

OBSERVATIONS OF A BIRD'S NEST.

July 10, 1911.

1. Length of observation.—12 hours.
2. Kind of bird.—Cat bird.[1]
3. Number of young birds in the nest.—Four.
4. Number of feedings given the young of[2] in 12 hours.

First hour (6 to 7 a. m.)	9 feedings.
Second hour (7 to 8 a. m.)	23 feedings.
Third hour (8 to 9 a. m.)	22 feedings.
Fourth hour (9 to 10 a. m.)	18 feedings.
Fifth hour (10 to 11 a. m.)	[3]11 feedings.
Sixth hour (11 a. m. to 12 m.)	16 feedings.
Seventh hour (12 m. to 1 p. m.)	[3]12 feedings.
Eighth hour (1 to 2 p. m.)	12 feedings.
Ninth hour (2 to 3 p. m.)	20 feedings.
Tenth hour (3 to 4 p. m.)	20 feedings.
Eleventh hour (4 to 5 p. m.)	30 feedings.
Twelfth hour (5 to 6 p. m.)	21 feedings.
Total	214 feedings

REMARKS.—All of the food was gathered in sight of the nest, and it seemed to consist of ants, crickets, grasshoppers, cabbage worms, plant lice, etc.; two, three, or four insects were often gathered at a time.

8. Enemies of birds and their control: (a) Snakes; (b) English sparrows; (c) cats;[4] (d) hunters. What constitutes legitimate sport?

9. Protection: (a) Boxes; (b) feeding; (c) community sentiment; (d) control of enemies; (e) bird census.

10. Value of birds to community life, based on the results of feeding tests: In order to get an adequate idea of the value of a bird's nest to the community the following computation based on the above report is suggested. Suppose 100 of the insects fed the young in a day are cabbage worms, and they feed 10 days. A thousand have been destroyed. This, however, does not nearly give the results. Suppose these worms had been allowed to mature and become cabbage butterflies, each would have laid about 500 eggs, which would have hatched into half a million cabbage worms. One can hardly estimate the damaging powers of such an array of caterpillars. Half a dozen cat-birds' nests around the home are a power for good that can easily be underestimated.

11. Field study of birds in order to become acquainted with the common species under natural conditions.

II.—The insect problem.

1. Purpose of this study: (a) Chiefly economic (enemies and friends); (b) life story—(1) egg, (2) larva, (3) pupa, (4) adult; (c) beauty; (d) mechanism; (e) adaptations.

2. Insect pests: (a) Amount of damage done annually (U. S. Dept. of Agriculture reports); (b) list of most destructive insect pests in the community; (c) life histories of above insect pests; (d) natural enemies (birds, insects, insectivorous animals, etc.); (e) other means of control (importance of spraying); (f) common farm and garden insects—their life histories and control; list; (g) common insects injurious to fruit and fruit trees—(1) gnawing insects, (a) list, (b) arsenate of lead as a means of control, (c) Paris green, etc.; (2) sucking insects, (a) list, (b) kerosene emulsion, tobacco decoction, lime-sulphur as a means of control.

3. Beneficial insects: (a) How they are beneficial, and approximate value (estimate); (b) list of helpful insects and their life stories; (c) establishment of helpful life relations.

[1] Period of incubation, 18 to 21 days; number of days that the young birds remain in the nest, 5 to 10.
[2] Old bird on the nest 30 minutes on account of rain.
[3] Bird on nest 15 minutes.
[4] In another course the cat is studied in relation to the health problem.

4. Insects injurious to health: (a) Flies—(1) life story, (2) breeding places, (3) relation to typhoid fever, (4) history of typhoid epidemic at Chickamauga, (5) foot as a germ carrier, (6) screens, (7) methods of extermination; (b) mosquitoes—(1) life story: Egg, larva, pupa, and adult, (2) breeding places, (3) relation to malaria and yellow fever, (4) history of yellow fever in Habana, (5) history of malaria and mosquitoes in Roman Campagna, (6) how they carry the germs of malaria and yellow fever, (7) preventive measures and methods of extermination.

5. Simple methods of preparing school insect collections.

6. Use of common moths and butterflies in the lower grades for studying life stories.

III.—Most important fungous pests.

1. Purpose of this study: (a) Economic importance; (b) life story.

2. List of fungous pests.[1]

3. Methods of control: (a) Lime, sulphur; (b) Bordeaux mixture; (c) the general problem of spraying (practical spray pumps and their approximate cost)—(1) its importance, (2) how and when to spray (the spray calendar), (3) comparative yield of sprayed and unsprayed crops.

IV.—Insectivorous animals.

1. Purpose of this study: (a) To find out what animal forms really do; (b) to establish helpful life relations.

2. List of insectivorous animals.

3. Food of insectivorous animals.

4. Life story of a few of the most common.

5. Value in dollars and cents to the rural community (estimated).

6. Which to encourage and which to destroy.

V.—Study of common shade and forest trees.

1. Value of a tree: (a) Economic; (b) aesthetic.

2. Trees best adapted for shade.

3. Planting about school and home.

4. Care of the trees.

5. List of species in the neighborhood.

6. Outdoor study of trees (know them in their native haunts).

7. General problem of forest preservation and reforestation.

VI.—The school garden.

1. Reasons for having a garden: (a) For practicing what has already been learned in the nature work; (b) for directed exercise and recreation; (c) for giving the pupil an opportunity to fall in love with a growing plant which he calls his own and which by his own efforts is made of most worth; (d) for the self-poise and moral fiber that come from a feeling of ownership, which is the best developer of a respect for the property rights of others.

2. Location of the garden.

3. Plan of the garden.

4. Things to plant in the garden (varies with the grade).

5. Preparation of the soil for planting.

6. Cultivation.

7. Tools.

8. General care of the garden.

[1] The bacteria in relation to the health problem are treated in the course in sanitary science.

ELEMENTARY AGRICULTURE.

Agriculture is the chief industry of the Nation, and its progress depends largely upon our ability to develop more fully and better the agricultural possibilities of the country. Inadequate systems of farming and ill-adapted agricultural practices are to-day the rule. They should be the exceptions. There is general admission that the farmer's returns from his efforts are far less than they would be if proper scientific management and principles were applied in his work. The natural conditions of soil, rainfall, temperature, and season in the South are almost ideal for a great variety of crops, and with practical farm husbandry this section can excel in the production of many staple agricultural products. That we are not excelling, or in some instances even considered competitors in producing those crops in whose growth we should be leading, is brought out in every published report either State or National. As an example, take the yield of corn in Kentucky. In 1910 the average per acre was 29 bushels. While this compares very favorably with other Southern States, it is far short of our possibilities. There is not a New England State that did not average during the same year at least 40 bushels. On the whole our soil and climatic conditions are more favorable than those of New England. The reason that we come short of a much higher production must be in our system or rather the lack of any general practical system of farm management.

The application of a few practical principles of agricultural science, carefully demonstrated in each rural community, can not help giving marked improvement as a result. It is certainly not going too far to ask that the rural school give careful consideration and attention to this important problem. If handled in the right way by a skilled teacher with the necessary training, the mastery and application of the elementary practical principles and practices of agriculture can be made. Such work would very materially increase the aggregate returns from the farm. Take, for example, instruction in corn growing. The record following taken from a bulletin of the United States Department of Agriculture gives the results achieved by farmers' boys by the application of practical instructions in this work. The results are the best proof of the value of their teaching.

Records of State prize winners in growing corn in 1910.

Names and addresses	Character of soil	Yield	Cost per bushel
		Bushels.	*Cents.*
Hughey Harden, Banks, Ala.	Sandy, clay subsoil	120	32
Ira Smith, Silver, Ark.	Sandy loam	119	8
Joseph Stone, Center, Ga.	Yellow clay	102½	29
Stephen Henry, Melrose, La.	Sandy	139½	13.6
Wm. Williams, Decatur, Miss.	Second bottom	146½	19
Ernest Starnes, Hickory, N. C.	Dark sandy loam	146½	27
Floyd Gayer, Tishomingo, Okla.	Black sandy loam	95½	8
Jerry Moore, Winona, S. C.	Gray, sandy upland	228½	43
Maurice Olgers, Sutherland, Va.	Gray upland	168	40
Norman Smith, Covington, Tenn.	Sandy, clay subsoil	125½	37
Rodger Smith, Karnes City, Tex.	Black river bottom	83½	13½
Archie Odom, Bennettsville, S. C.	Dark sandy loam	177	23
Jno. Williams, Tuscaloosa, Ala.	Dark sand, clay beneath	83½	49

Any schoolboy can equal the record of any of the above boys if he has an equal opportunity. All that is lacking is the dissemination of knowledge and the practical application of this knowledge to agriculture. This the rural school should do. Canada's rural schools increased the average wheat yield there 5 bushels to the acre in a few years' time. Suppose that our rural school teachers should set for themselves the problem of increasing the corn crop 5 bushels per acre, what would be the result? Let us see. In 1910 the farmers of Kentucky planted and cultivated 3,630,000 acres of corn, which yielded 105,270,000 bushels. An increase of 5 bushels per acre would have made the yield 18,500,000 bushels more. These 18,500,000 bushels of corn would have brought, at the average farm price December 1, 1910, approximately $10,000,000. This money would have gone directly to the rural communities where it is much needed, and would have been of vast importance in solving the problems that confront our rural people. It would have been used to build 2,000 miles of first-class pike roads, or it would have paid the expenses of our public schools for two and a half years. It would have gone far toward paying the farmers' taxes, or it would have built and furnished many a rural home. Can anyone figure the comfort and happiness that 5 bushels more of corn per acre would buy for the rural people of any State?

What the rural schools can do for improving corn culture they can do for any other farm crop, if they adopt a rational course of study and demand teachers who can teach them effectively and efficiently. Fortunately, practical principles of agriculture are neither difficult to learn nor irksome to teach. The subject appeals to rural pupils because it comes within the scope of their immediate interests. Rural life can be wonderfully improved by the united efforts of teachers to promote real, genuine, uplifting thrift through instruction in the principles and practices of agriculture. To teach these principles the

teacher must have had a thorough preparation in this special field. The course of study that follows is designed to give this preparation:

COURSE OF STUDY FOR TEACHERS OF AGRICULTURE.

I.—The plant (elementary study in relation to activities).

1. Parts: *a*. Roots and root hairs in relation to absorption of foods; *b*. stems—(1) character of each (annual, biennial, perennial), (2) uses and functions, (3) structure; *c*. leaves—(1) types, (2) structure; *d*. seed—(1) germination, (2) dispersal.

2. Constituents of plants and their characteristics. *a*. Organic; *b*. inorganic; *c*. organic and inorganic elements necessary to growth.

3. Source of plant foods and the way in which plants get them.

II.—The soil (in relation to plant growth).

1. Importance as a natural resource.

2. Principles to be mastered in order to understand the soil—geological, biological, chemical, physical.

3. Origin: Forces in nature that have produced soil—weathering, winds, water, heat and cold, etc.

4. Constituents: (*a*) Inorganic matter—(1) rock particles (body of soil), (2) chemicals (substances more or less soluble in water): (a) Lime, (b) nitrogen, (c) potash, (d) phosphoric acid. (Special study of each of these because they are most important. Mention need only be made of the long remaining list.) (*b*) Organic matter; life of soil; humus; plants and animals in a state of partial decay—(1) Importance: (a) Plant food and its availability, (b) moisture-holding capacity, (c) relation to temperature, (d) relation to physical condition, (e) relation to washing and leaching, (f) general problems of tilth, (g) origin of humus (barnyard manures, green manures).

5. Physical properties of soils: (a) Heavy soils, (b) light soils; experiments and demonstrations illustrating these properties; (c) water-holding capacity in relation to fineness; (d) effect of drying; (e) dust mulch.

6. Soil depletion: (a) Constituents that may be lost—(1) lime, (2) potash, (3) phosphoric acid, (4) nitrogen, (5) humus, (6) body; (b) amount of plant food removed from soil by various crops; (c) how constituents are lost—(1) washing, (2) leaching, (3) single cropping, (4) careless husbandry, (5) taking all off and putting nothing back.

7. Soil conservation and reclamation: (a) Importance (history of effects of loss of soil to agricultural purposes); (b) best means of preventing washing or leaching—(1) deep plowing and subsoiling, (2) cover crops, rye, wheat, winter oats, crimson clover, etc.; (c) best means of replacing humus—(1) barnyard manures, (2) green crops: (a) cowpeas, (b) soy beans, (c) clovers, (d) alfalfa; (d) best means of replacing mineral plant foods—(1) nitrogen: (a) leguminous crops (as above), fixation of nitrogen, (b) barnyard manures; (2) phosphoric acid, crushed rock phosphate, (3) potash (must be bought and put into soil), (4) lime: (a) use in agriculture, (b) caustic lime, (c) crushed limestone; (e) commercial fertilizers—(1) composition: (a) filler, (b) plant food—(1) nitrogen, (2) potash, (3) phosphoric acid; (c) uses of (a) and (b) (2) adaptation to soil and to crop, (3) guaranteed analysis, meaning and importance, (4) when it is profitable to use commercial fertilizers and when it is not, (5) price of the various plant foods in relation to the cost of commercial fertilizers, (6) use of nitrogen, potash, and phosphoric acid as a plant food, (7) effect of lime on soil: (a) physical, (b) availability of other plant foods, (c) humus, (d) sourness; (8) does it pay in the end to use commercial fertilizers? (f) rotation of crops—(1) value and importance, (2) various systems best adapted to soil, climate, and other conditions; (g) value of live stock in improving the farm; (h) careful and thoughtful husbandry of farm resources; (i) adaptation of crops to soil, climate, etc.; (j) work of animals in improving the soil.

8. Study of the various kinds of agricultural soils as to (a) components: Sand, silt, clay, humus; (b) physical properties; (c) plant food; (d) water-holding capacity; (e) endurance; (f) adaptation to various phases of agricultural pursuits.

III.—Preparation of the soil for seed.

1. Plowing: (a) Reasons for plowing; (b) depth; (c) time of plowing in relation to crop; (d) study of various types of plows; (e) subsoiling.

2. Pulverizing: (a) Relation to moisture, plant food, intertillage, etc.; (b) depth; (c) implements.

3. Intertillage: (a) Purpose; (b) effects of deep and of shallow cultivation; (c) dry farming and dust mulch.

IV.—Seed selection.

1. Importance in improving crops.
2. Methods and demonstrations of germination tests.
3. Importance of proper varieties.
4. Importance of selected strains in any variety.

V.—Study of the most common weeds and their seeds.

Best methods of their control.

VI.—Study of the most important field and forage crops.

Corn, wheat, oats, tobacco, cotton, potatoes, vegetables, small fruits, etc.—with the best methods for their profitable production.

VII.—Study of live stock as a farm resource.

1. Value of stock per se.
2. Value of stock in maintaining the fertility of the soil. (Manures.)
3. The dairy herd: (a) Types and breeds of dairy cattle (What is a good dairy cow?); (b) computing the ration; (c) the Babcock test; (d) value of manure and how to save most of it for the farm; (e) methods of applying manure to soil, and their relative values.
4. Beef cattle and their husbandry.
5. Other live stock and its importance, with a study of best types to meet conditions.
6. The stock barn: (a) Importance; (b) plans and specifications of various types most profitable in feeding stock; (c) location with reference to other buildings, drainage, convenience, water supply, etc.
7. Pastures; study of various grasses and other plants best suited for grazing, with directions for their easy propagation.
8. Feed stuff. Analysis in relation to result sought. (The balanced ration): (a) Corn; (b) hay, fodder, ensilage, peas, etc.; (c) cottonseed meal and hulls, etc.
9. Poultry: (a) Types and breeds; (b) care and management.

VIII.—The orchard.

1. Location in relation to—(a) slope; (b) drainage; (c) climatic conditions.
2. Soil. Study of kinds best adapted to various fruits.
3. Careful study of varieties of each fruit to find those best suited to locality.
4. Study of different kinds of trees, that the student may learn what a good nursery tree is.
5. Preparation of soil for planting the orchard: (a) Plowing and subsoiling; (b) pulverizing; (c) fertilizing.
6. Plan of the orchard.
7. How to properly plant a fruit tree.
8. Pruning.
9. Cultivation of orchard.
10. Study of principal insect and fungous pests of trees and fruits, with directions for their control. (Spraying and spraying outfits.)

IX.—The Corn Club.

The following directions are given after careful working out for the use of boys in competitive corn growing. (These may be modified to suit local conditions.)

DIRECTIONS FOR COMPETITIVE CORN GROWING.[1]

Breaking land.

Land, if sod, is to be plowed not less than 6 inches deep. All other land not less than 7 or 8 inches deep. (In both instances preferably deeper.)

Preparation for planting.

1. Harrow with drag harrow.
2. Double-disk both ways. (Use cultivator if you have no disk.)
3. Harrow with drag harrow again. (Repeat every 10 days or two weeks until planting time.)

Planting.

1. Check with planter 3 feet 8 inches each way.
2. If planter can not be used, lay off the ground 3 feet 8 inches each way, 3 inches deep with single-shovel plow, and cover by hand. If covered with drag, harrow immediately with tooth harrow. (No corn to be planted over 3 inches deep.)

Time of planting.

Depends upon local conditions, latitude, etc.

Cultivation.

1. Harrow 4 or 5 days after planting, if weather permits.
2. Cultivate with fine-tooth cultivator, if one is available, until corn becomes too large.
3. If no fine-tooth cultivator can be had and a disk cultivator is available, use it for first two cultivations; then use bull tongues.
4. If one-horse cultivation, use small harrow preferably, or double-shovel with bull tongues.
5. When corn is too large for two-horse cultivator, use a small harrow or drag between rows.
6. Cultivate each week until corn tassels.

Very important.

Never cultivate over 2 inches deep.

Never work in ground that is too wet.

Summary by the teacher of work and money spent by each boy in his work.

(This becomes a part of the teacher's records.)

Division No.....
Subdistrict No.....
Name of boy.....
Post office.....

1. Kind of land, bottom or high.....
2. Date of breaking ground.....
3. Depth of breaking..... inches.
4. Preparation for planting.....
5. Date of planting.....
6. Width of rows..... feet.
7. Drilled or checked?.....
8. Number of loads of stable manure.....
9. Was manure broadcast or in hill?.....
10. Kind and amount of fertilizer used.....
11. How used.....
12. Kind of tools used in cultivation from first to last.....
13. How many times did he harrow before planting?..... After?.....
14. How many times did he roll the ground?.....
    Depth of cultivation.....
15. Did he get good stand?.....
    Why not?.....
16. Was growth of corn hindered in any way?..... What way?.....
17. Did it rain enough?..... Did it rain too much?.....
18. What was the last work in cultivation?.....
19. How large was corn when worked last?.....
20. Could corn have been better?..... What hindered or prevented?.....
21. How much land in his lot?..... acres. One patch or two?.....

In this square teacher may draw plat of corn lot, giving dimensions.

[1] This is the form used by the agricultural department of the Western Kentucky State Normal School.

22. Teacher will please take line 16½ feet long and measure the plat. Draw a diagram in the square above, giving dimensions.

23. How many measures of corn gathered from his lot? . . . . . The measure to be a 5-bushel salt barrel.

24. The teacher will superintend the gathering of one patch, the trustees one, and a person selected by them the third. The barrel must be filled, then shaken well one time, then filled again level with the top. This is one measure.

25. Corn must be gathered on 4th of November.

Premiums were offered in this contest as follows: Greatest quantity of corn produced by one boy on his plot, $20 in gold; second greatest quantity, $10 in gold; third quantity, $5 in gold. For the best 10 ears exhibited at the corn show on State Normal Heights, November 18, 1911, $20 in gold; for second-best 10 ears, $10 in gold, and for the third-best ears, $5 in gold.

. . . . . *Teacher.*

X.—*Corn judging.* (What is a good ear of corn?)

Characteristics of various varieties of corn.

Corn Score Card [1]

Name of variety. . . . . .

Class . . . . . Sample number. . . . . .

		1	2	3	4	5	6	7	8	9	10
Trueness to type	15										
Shape of ears	10										
Length of ears	10										
Circumference of ears	5										
Tips of ears	5										
Butts of ears	5										
Color of kernels and cobs	10										
Uniformity of kernels	10										
Shape of kernels	10										
Spacing of kernels	10										
Seed condition	10										
Total	100										

Remarks.

XI.—*Farmers' day.*

A day set apart for the assembling of all interested in better agriculture in the community.

Features of the day: (a) Corn-judging contest; (b) awarding of prizes in corn-growing contest; (c) exhibit of best 10 ears grown by each boy; (d) demonstration of Babcock milk test by pupils; (e) demonstration of cooking, sewing, etc.; (f) lecture by a prominent citizen or other practical agriculturist; (g) any practical features that help to make the school a center of rural uplift; (h) organization of club for ensuing year.

Demonstration work: (a) School farm, under scientific management; (b) plots for each individual student for the application of principles discussed in class and laboratory work.

SANITARY SCIENCE AND HEALTH.

The thing of first importance for anyone to know is "how to live and keep well." It follows, therefore, that the subject of health and hygiene should be of first consideration, for sanitary conditions at this stage of human development are far from what they should be. The following extracts from numerous reports on vital statistics need the attention of our schools. "In civil life in the United States there is an average of 1,500,000 deaths every year, with 4,200,000

[1] Form adopted by the Kentucky Agricultural Experiment Station.

constantly sick, involving the comfort and well-being of 5,000,000 homes and 25,000,000 people." Such a condition is appalling. At any given time more than one person in every four is suffering either in body or mind or both from sickness of some sort. Many political economists have made thorough study of this matter, and all agree that Dr. Irving Fisher is right in saying that more than one-third of this annual sick and death rate, representing a tax of inordinate proportions upon the resource of the Nation, is caused by diseases that could, with a little attention and instruction in the school, be effectually prevented. Is it not a primary duty of the school which claims to prepare teachers for useful work in any community to give instruction along the lines of rational prevention of disease? It is especially important that the teacher of a rural school be so trained, for in the community where his school is located the advantages and precautions ordinarily exercised by municipalities do not exist. As a concrete example of health conditions, take Kentucky, and see what the report of the State board of health shows:

	Cases.	Deaths.
Tuberculosis	13,436	6,541
Typhoid fever	18,387	1,818
Diphtheria	10,980	2,336
Diarrheal diseases among infants	18,240	1,642
Dysentery (adults)	19,624	840
Scarlet fever	1,800	160

From the monthly report of the bureau of vital statistics for the first eight months of 1911 we find that 50 deaths out of every 100 were unnecessary and could have been prevented. I do not believe that the conditions are any worse in Kentucky than they are in any other State. Great men in diplomacy and government have caused to be shaped into universal laws this truth: "The care of the public health is the first duty of every statesman."

If this be true, is it not the teacher's first obligation?

Wise legislators long ago incorporated into statutory law this mandate: "You shall teach physiology in the public school to the end that the individual and general health of the community may be made better thereby." Had they known the nature of our course of study to-day they would have assigned a different reason or left it out altogether. How we have plunged our pupils into a maze of technical detail from which few ever emerge. And if they do, how much better are the health conditions of the community made thereby? We teach them things that often the surgeon or doctor does not care to know. Surely the elementary teacher's preparation is sorely deficient if he does not know how to prevent "preventable diseases," or understand the common laws governing sanitary conditions, and has not the enthusiasm to teach this knowledge. The

school that prepares him for his work should see to it that he gets both the academic training and the enthusiasm.

The following outline is intended to show those points in sanitary science that we think a rural school teacher should know in order to be able to do efficient work in this line:

COURSE IN SANITARY SCIENCE.

1. The health conditions in the community.
   (Study of reports of State board of health.)
2. List of preventable diseases most important to the people: (a) Tuberculosis; (b) typhoid; (c) diphtheria; (d) pneumonia; (e) diarrhoeal diseases among infants; (f) dysentery among adults; (g) scarlet fever; (h) smallpox; (i) malaria; (j) hookworm disease.
3. Cause of the above and other diseases of their kind.
   (What is a preventable disease?)
4. Study of germ life, with emphasis on forms that produce disease: (a) Biological relations; (b) structure—size, shape, motion, method, and rate of growth, etc. (lantern-slide illustrations); (c) conditions favoring growth of disease germs (warmth, moisture, food, and absence of light); (d) aërobic and anaërobic germs; (e) carriers of germs; (f) how disease-producing germs get into the human system.
5. What constitutes insanitary conditions?
6. What constitutes sanitary conditions (lantern-slide illustrations)?
7. Typhoid fever as a type study: (a) General—(1) number of cases (indicating frequency of disease), (2) number of deaths (indicating mortality of the disease); (b) cause (typhoid germs taken in food or drink)—(1) insanitary conditions conducive to typhoid, (2) examples of typhoid epidemics and discussion of conditions that caused them ("Principles of Sanitary Science"—Sedgwick); (c) carriers of typhoid germs—(1) water, how infected? (2) milk, how infected? (3) other food, how infected? the house fly (see outline under nature study, p. 11), (4) typhoid carriers; (d) prevention—(1) drinking water, (2) drainage in relation to water supply and outbuildings, (3) milk, (4) destruction of flies, (5) screens.
8. Outlines similar to the above are followed in the study of tuberculosis, diphtheria, scarlet fever, malaria, etc.
9. Best convenient ways to secure sanitary drinking water.
10. Milk and its products, from the sanitary standpoint.
11. The problem of ventilation.
12. Location and construction of dwelling houses and barns with reference to healthfulness.
13. Practical ways of securing a good water supply for domestic use.
14. Sewage and sewage disposal.
15. The problem of foods and dietetics.
16. Fundamental principles of domestic and community hygiene.

PRACTICAL CHEMISTRY APPLIED TO RURAL LIFE.

The science of chemistry is intimately connected with all of those industrial arts so necessary to the comfort, health, and general welfare of mankind. So vital, indeed, is this connection with the ordinary problems of farm life, both in the home and in that out-of-doors, that any course of study which leads to a better training along the lines of successful home building and intelligent husbandry is

incomplete without an elementary study, at least, of some of the more practical phases of the subject. This does not mean that chemistry as such is, or should be, any part of the course of study for the rural schools, but it is unquestionably true that such a course as is here outlined has a real place in the curriculum of any school that essays to prepare teachers for the richest and best service in the country schools. The teacher who would teach successfully the subjects of nature study and agriculture, or instruct efficiently in physiology from the sanitary and practical standpoint should know something of the chemistry of plant and animal life. Likewise instructors in domestic science should have more than a superficial knowledge of those elementary changes that lie at the bottom of any successful study of the problems of food, clothing, and cleanliness which mean so much to the success and happiness of the human race.

This course is planned to correlate with the courses in agriculture, nature study, and sanitary science herein given, and with any elementary course in domestic economy. The work should be given by a series of lectures with fitting illustrations, experiments, and references to standard works on the contained topics.

The aim of the work has been to approach the subject from the practical standpoint. But we believe that it is possible to give an elementary course in a practical way, and at the same time give real cultural value to the subject. Hoping that, in addition to the above aim, a completion of the course may lead the student to an appreciation of the broader fields of the subject, we offer the following:

COURSE IN CHEMISTRY FOR RURAL SCHOOL TEACHERS.

I.—General phases.

1. Properties of matter.
2. Change: (a) Physical; (b) chemical—(1) conditions, (2) aids; (c) laws of change.
3. Classification of substances: (a) Elements; (b) compounds; (c) mixtures.
4. States of matter: (a) Gases—(1) weight, (2) diffusion and pressure; (b) liquids; (c) solids; (d) changes of state; causes and effects.
5. Classification of compounds: (a) Acids—(1) organic, (2) inorganic, (3) neutralization of; (b) bases (alkalies); (c) salts; (d) neutrals.

II.—Air.

1. Physical properties.
2. Composition: (a) Nitrogen—(1) relation to plant life, (2) chief compounds; (b) oxygen—(1) relation to animal life, (2) combustion; condition, products, uses in nature and in the life of man; (c) miscellaneous material—Argon, water, carbon dioxide, etc.

III.—Water.

1. Properties—Chemical and physical.
2. Solvent: (a) Conditions; (b) amount possible.
3. Impurities: (a) Organic—test for; (b) inorganic—(1) lime, (2) magnesia, (3) potash, (4) iron, (5) chlorides, (6) sulphates; (c) hardness—causes and removal.

IV.—Soil.—General discussion only. (*See outline of course in agriculture.*)

V.—Carbon and its compounds.

1. Carbohydrates: (a) Cellulose—(1) composition, (2) properties, (3) occurrence, (4) uses in industrial life; (b) starch—(1) properties, (2) occurrence, (3) use, (4) tests, in plant life, in animal life, (5) analysis of potato; (c) sugar—(1) properties, (2) occurrence, (3) common kinds: cane, malt and milk, glucose.

2. Hydrocarbons: (a) Alcohols—kinds and uses; (b) acids; (c) fats.

3. Proteids (organic nitrogen compounds): (a) Protein in milk (casein); (b) collagen - gelatin; (c) egg albumin; (d) legumin from peas and beans.

4. Milk: (a) Composition; (b) tests for adulterations; (c) percentage of butter fat (Babcock milk test); (d) products.

VI.—Chemistry of bread making.

1. Fermentation.

2. Yeast.

3. Simple chemical reactions: (a) Baking powder; (b) cream of tartar; (c) soda; (d) requirements under pure-food-law.

VII.—Chemistry of cleaning.

1. Cleaning agents: (a) Soap—(1) kinds, (2) process of making, (3) uses; (b) organic compounds; (c) acids.

2. Stains: (a) Kinds—(1) acid, (2) alkali, (3) iron rust, (4) mildew, scorch, etc.; (b) removal—general and specific directions.

3. Disinfectants, antiseptics, and deodorizers: (a) Natural—(1) sunlight, (2) dry air, (3) heat; (b) chemical—charcoal, lime, carbolic acid, mercuric chloride, peroxide of hydrogen, etc.

VIII.—Illumination and heat production.

1. The flame: (a) Conditions; (b) structural.

2. Illuminants and fuel: (a) Coal; (b) gas; (c) wood; (d) oil; (e) alcohol; (f) acetylene.