SCIENTIFIC CONCEPTS TAUGHT OKLAHOMA VOCATIONAL AGRICULTURE STUDENTS,

By

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CHAPTER I

INTRODUCTION

Vocational Agriculture is a very important and integral part of our onal education system. It is an applied science whereby practically major sciences are brought together creating a more thorough under-ding of their relationships to each other.

Vocational Agriculture teachers are teaching many scientific con-s in their classrooms, laboratories and field work in the various s of agricultural subjects such as animal husbandry, dairy, agrono- and agricultural engineering.

Much emphasis has been placed on science, mathematics, and foreign uages the past few years. With this redirection, less emphasis has . placed on some of the other subjects. It is with this in mind that author wishes to identify the units of scientific concepts being ;ht to the all-day students of Vocational Agriculture as well as the ·ee to which these concepts are being taught.

Statement of the Problem

This study deals with the identification of the units of scientific :epts being taught to the all-day students of Vocational Agriculture ·ell as the degree to which these concepts are being taught. The ıor wishes to identify the scientific concepts in the areas of botany, Logy, chemistry, entomology, and physics that are being taught to the ıtional Agriculture boys when studying animal husbandry, dairy,

nomy, and agricultural engineering.

When it is determined what scientific concepts are being taught and degree to which they are being taught to all-day students of Vonal Agriculture, a person might use the information to determine scientific concepts should be taught and the degree to which they ld be taught.

Purposes of the Study

The purposes of this study are: (1) to find the units of scientific epts being taught to all-day students of Vocational Agriculture; (2) etermine the degree to which scientific concepts were taught; and (3) ake available the findings of the study along with recommendations more effective teaching of scientific concepts in Vocational Agri- ure.

This information might clarify questions regarding the teaching of ntific concepts in Vocational Agriculture such as: (1) Should I be hing more scientific concepts? (2) What scientific concepts might ost helpful to the students? and (3) How can I more effectively plan rogram to teach more scientific concepts which will be of greater e to the students?

It is hoped that this study will be of value to the teachers of Vonal Agriculture in planning their teaching of scientific concepts heir students.

Need for the Study

The present trend in education to empasize science and mathematics caused us to be aware of the actual scientific concepts taught in Vonal Agriculture.

Therefore, the need arises to identify and classify those areas of nce taught in Vocational Agriculture and to determine what degree of nsity they are presented.

It is further felt that many educators fail to realize the scope of ied science taught in Vocational Agriculture.

This study might be used as a guide in presenting the complete ntific educational program of the local high school.

Limitations of the Study

This study was limited to fifty Vocational Agriculture Departments cted on a random sampling basis from three hundred and sixty-eight rtments in the state of Oklahoma. It is further limited to scien- c concepts that are actually taught in various Vocational Agriculture rtments selected for this study. It does not include the total hing program as presented in each of the participating Vocational culture Departments

Methods of Procedure

This study includes the collection of data, analysis of the data, and development of the findings into a summary and recommendations. With ect to the methods or procedures the following things were accomplishe

1. A questionnaire was developed in an effort to identify scientific concepts being taught in the various areas of agricultural subjects by the Vocational Agriculture teachers of Oklahoma.
2. The questionnaire was sent to Oklahoma Vocational Agriculture teachers selected at random so as to insure a

cross section of teachers in Oklahoma.

The random sampling was made by putting the names of all the departments in the state of Oklahoma in a container and drawing out seventy-five. These seventy-five departments were sent the questionnaires developed for this study. Fifty of these questionnaires were returned on which the basis of this study was made.

Data was gathered, tabulated, and an alysis was made.

Data was summarized and recommendations were made.

Definitions

The degree to which scientific concepts are being taught was asured by the following definitions:

1. None - meaning no teaching.
2. Some - meaning at least worth mentioning.
3. Moderate - meaning the concepts were explained to a degree whereby there was a fairly good understanding.
4. Extensive - meaning the concepts were explained to the point whereby the concept has been thoroughly emphasized to the point that almost complete comprehension has taken place.
5. Scientific concept - a total understanding of an area of thought.

CHAPTER II

REVIEW OF RELATED LITERATURE

When we examine and recognize the advancement in the field of agri-
ıre we are impressed with the wonderful results of scientific re-
ch. We have come a long way since the beginning of mankind, and this
ɔe attributed to the fact that man has had the initiative, intellect,
capabilities for exploring and developing new areas of scientific re-
ch in Agriculture. Agricultural research has proven to be of vast
rtance.

George Washington told Congress on December 7, 1796,

> It will not be doubted that with reference either to individual or national welfare, Agriculture is of primary importance. In proportion as nations advance in population and other circumstances of maturity this truth becomes more apparent and renders the cultivation of the soil more and more an object of public patronage. Institutions for promoting it grew up, supported by the public purse; and to what object can it be dedicated with greater propriety.[1]

An excerpt prior to the beginning of advancement in agricultural
arch was made by Daniel Lee, M. D., Professor of Agriculture at the
ersity of Georgia. Writing for the Patent Office, in his annual
rt he said,

> Neither the earnest recommendations of the illustrious farmers of Mount Vernon, nor the prayers of two generations of Agriculturists, nor the painful fact that nearly all tilled lands were becoming less and less productive, could induce any legislature to foster the study of agriculture as a science.

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[1]George Washington, in a report to Congress on December 7, 1796.

[2]Daniel Lee, in annual report to Congress.

Isacc Newton, first Commissioner of Agriculture, in his first annual rt to Congress declared that the farmer must be enabled "To make two es of grass grow where one grew before," and he used the words in ation marks. He invoked the spirit and method of science in aid of ers. He declared that his department would

> Test by experiment the use of agricultural implements and the value of seeds, soils, and manures, and animals, undertake the chemical investigation of soils, grains, fruits, vegetables, and manures, publishing the results; promote botany and entomology and establish a library and museum.[3]

Peterson, Assistant Secretary of Agriculture, made the following re- s in a report at the fourth annual meeting of the Agricultural Re- ch Institute.

> Over the long term, technology has brought great benefits to our farm people. It has helped to double the productive capacity of the farm worker in the past forty years. Also it has lightened the physical burden of work both on the farm and in the home. It has made more money available for home and community improvements. It has enabled the young people on our farms to get a better education and to become better equipped to take part in public activities. Applied technology has enabled our farmers to provide the food and other materials necessary to sustain us through two world wars as well as to take care of the demands arising from reconstructing a large part of a war devastated world.[4]

He also indicated the technology has brought problems. It has made farmer's job more complex. Its efficient use requires a high degree anagerial skill. He said that today's successful farmer must be in- ed in all the natural sciences and practical arts that go with crop livestock production. He also said the farmer must be enough of a uction engineer to buy and operate machinery costing thousands of

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[3]Issac Newton, first Commissioner of Agriculture in his first annual rt to Congress.

[4]Irving Peterson, Assistant Secretary of Agriculture in report at th annual meeting of Agricultural Research Institute.

ırs. The farmer must be a good enough mechanic to fix machinery when reaks down. He said the farmer must keep abreast of changes in the st to sell his products advantageously, and the farmer must be an able ger to fit all of these operations into a profitable farm enterprise.

Peterson also indicated other problems brought about by technology as the boost in cost to the young man wanting to go into farming, the in the cost of operating a farm, and making the farmer's income more erable to losses from crop failures, price fluctuations, and shifting ets.

According to R. W. Thatcher,[5] the ancient Biblical writer recognized "out of the dust of the earth" was man created, and from time immeble funeral rites have declared that "dust to dust, ashes to ashes, h to earth", the human body is returned to the soil from which it came e are figurative recognitions of the scientific fact that the ultimate ce of the materials which compose the human body and energy which keep going through life is the soil transformed through the medium of farm s into human food. Either directly or indirectly all human food comes the soil through field crops as the transforming medium.

The American Society for Horticultural Science estimated that plant eases result in production losses having a value of approximately two three quarter billion dollars annually in the United States.[6]

Of this total loss a large share is due to disease organisms that li multiply in the soil. Soil borne wilts and root rots of cotton alone

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[5] R. W. Thatcher, writing on crops and soils, Chemistry in Agricultur

[6] American Society for Horticultural Science report to the NAS-NRC ision of Biology & Agriculture during the fourth annual meeting of icultural Research Institute (1955).

losses estimated at more than one hundred million dollars annually. other major crops - food, feed, fiber, and special crops like to- are seriously attacked by soil-borne diseases. Total loss from class of pathogens is several hundred million dollars annually, repre- ng the production equivalent from ten million crop acres or more. A few soil-borne diseases are being overcome to some extent by the ing of resistant varieties, but the great majority of these diseases ot being reduced drastically. In fact the problem is getting worse. According to their report the problem is two-fold: (1) to discover beneficial or non-pathogenic organisms serve to hold pathogens in under natural conditions; (2) to discover how, by cropping systems oil management, conditions can be produced in the soil that will organisms antagonistic to the pathogens or produce conditions di- y unfavorable to pathogens. The problem, according to the Society, sentially one of soil microecology. It is as broad as all crop ction. Its study and solution will require the work of teams of soil biologists, mycologists, pathologists, crop production specialists, ossibly engineers.

It is difficult to determine when measures for the control of insect and fungus diseases were first used. One of the earliest attempts is direction is described by Parkinson early in the seventeenth ry.[7] He said for the control of caterpillars, fleas, and turnips he dvised to drag the field with a rope smeared with "train oil" and tone. Through the eighteenth and nineteenth centuries many varieties bstances were tested. Many had insecticidal or fungicidal values and

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[7]Parkinson, Writing on Chemical Warfare to save Crops Chemistry in ulture, pp. 210-211.

e in present use today.

Through the advancement of scientific research in chemical warfare ainst insects we are now able to control almost any type of insect or st with new and improved chemicals.

Through scientific research man has learned a lot about digestion, nination and other processes to the extent that we know what vitamins l minerals are needed by humans and animals for living and production.

R. Adams Dutcher[8] points out that the early research done on vitamins human and animal nutrition was carried on by an English Biological emist Dr. Hopkins. Dr. Hopkins created considerable discussion by an- uncing he had fed rats on protein, carbohydrates, lard and mineral salts thout obtaining growth. When he added milk the rats almost exceeded the eed limit in their apparent desire to grow and catch up with the other ts. Since milk is eighty-seven percent water he decided it was impossi- e to attribute this growth promoting power to proteins, fats, and carbo- irates or mineral salt which is necessary for normal development. Since is time much has been done in the discovery of vitamins and animal nu- ition through scientific agricultural research.

T. Swann Harding in writing about the early experimentation done in e field of agricultural engineering said the more important and funda- ntal agricultural implements had already been invented when the Depart- nt of Agriculture came into existence.[9] Yet there remained a great deal r the department engineers to do in making adaptations and designing thods and equipment to meet special needs as they arose. Not all of the

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[8] R. Adams Dutcher, Writing on Vitamins in Human and Animal Nutrition emistry in Agriculture, pp. 260-261.

[9] T. Swann Harding, Two Blades of Grass.

work, by any means, was done in the division of bureaus, which from time to time worked in the field of agricultural engineering.

Entomologists devised sprays, nozzles, and other equipment to meet their own needs. Soil conservation workers as well as others devised equipment for their use. Nevertheless, a solid core of agricultural engineering work has been done in the department.

In summarizing research studies made concerning evaluation in Agricultural Education, Professor Kitts of Minnesota reported:

> Today, just as Hamlin indicated in 1941, program planning and evaluation are crucial and basic issues in Agricultural Education. Much more work is needed to establish objectives that are clear and well understood and develop tools of measurement that determine the extent to which these goals are approached.[10]

Again research in the field of Vocational Education in Agriculture has apparently been slow to develop and we continue to find ourselves, as Knesstrich said, "in a relatively undeveloped state." In the absence of data based on scientific research, we tend to act too often on the basis of hunches and opinions. Further research is needed in even the simple techniques of collection of materials and data.

Professor Kitts also said that Vocational Education in Agriculture has been under federal support for 35 years.[11] There have been various research studies all sincerely undertaken, to attempt to measure and evaluate the program. In the future new studies will be needed, many in areas not previously explored or old areas examined with new techniques,

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[10]Harry W. Kitts, Professor from Minnesota, "Measurement and Evaluation," What do Studies Show? Summaries and Interpretations of Research Selected Areas of Agriculture Education (Danville, Ill.), p. 53.

[11]Ibid.

; research is an indication of progress and will always be continued.

Senators Hubert Humphrey, Wayne Morse, and Congressman James Dolliver, members of the Commission on National Aid to Vocational Edu-cion, in a minority report stated their position as follows:

> The Vocational Agriculture program with the attendant program of the Future Farmers of America, forms the backbone of many high school agricultural instructor systems in rural areas. It has been one of the major contributions to the development of scientific farming. It has been a major factor in increasing our food supply. The home economics, trades and industries, and distributive education programs have to some degree brought about the same benefits.[12]

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[12]Humphrey, Morse and Dolliver, members of Commission of National Aid Vocational Education, 1955 from Federal to State Cooperative Activities Vocational Education, Arnold - Dr. Thesis 1957, p. 7.

CHAPTER III

PRESENTATION OF DATA

The purpose of this chapter is to present data relative to scientific ncepts taught Oklahoma Vocational Agriculture students. Information esented in this chapter is obtained from fifty Vocational Agriculture partments selected at random from all Oklahoma Vocational Agriculture partments.

TABLE I

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO PLANTS AND SEEDS RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

entific Concept	Rate of Teaching None %	Some %	Moderate %	Extensive %
mical constitution of seeds	14	44	32	10
mancy of seeds	4	40	52	4
poses of seed scarification	4	56	34	6
ernal factors affecting iability of seeds	8	46	32	14
ernal factors affecting iability of seeds	12	52	28	8
es of cells and tissues	22	44	30	4
es of leaf veination	18	52	20	10
cess of photosynthesis	4	24	46	26
anic compound production by lants	4	42	24	30
ctions of organic compounds, rmones, vitamins, etc.	10	18	42	30
cess of Assimilation	10	26	42	22
cess of Digestion	4	20	28	48
cess of Respiration	4	24	50	22
cess of Fermentation	6	38	50	6
ernal & internal structure f different types of stems	20	58	18	4
mical properties of wood	48	40	12	0
sical properties of wood	36	48	12	4
duction of water & minerals y stems and leaves	6	36	40	18

TABLE I (Continued)

entific Concept	Rate of Teaching None %	Some %	Moderate %	Extensive %
ernal & internal factors sociated with plant growth	4	28	54	14
cess of pollination	2	22	50	26
cess of fertilization	0	14	42	44
entific classivication of lants	6	46	28	20
ssification of plant diseases	6	50	32	12
ssification of microorganisms using plant diseases	18	52	24	6

Table I

Seeds and Plants

It is significant to note that Table I indicates 50 or more per cent the teachers are teaching the scientific concepts studied that are re- ed to plants and seeds. With the exception of the teaching of chemi- and physical properties of wood, 78% of the teachers are teaching entific concepts related to plants and seeds. All teachers are teaching process of fertilization with emphasis to a moderate and extensive de- e. Fifty per cent or more of the teachers are teaching about dormancy seeds, process of respiration, fermentation, pollination, and external internal factors association with plant growth on a moderate basis. ty-eight percent of the teachers are teaching the process of digestion an extensive degree. The teaching of the process of fertilization was ght to some degree while while other concepts under seeds and plants was

TABLE II

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO CHEMICAL PROCESSES OF SOIL DEVELOPMENT RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

	Rate of Teaching			
ntific Concepts	None %	Some %	Moderate %	Extensive %
nical actions of oxygen, water, rbon dioxide, acids on rock	4	32	48	16
nical actions of salts & bases	4	42	40	14
nical actions in neutralization f acid & basic soils	6	22	42	30
ermination of pH	4	16	42	38
fering in soils	16	50	30	4
ect of hydrogen & hydroxyl ons on plants	32	30	34	4
ect of acidity & alkalinity n microorganisms	8	28	44	20
saline & alkaline soils evelop	4	32	38	26
mical effects of organic atter in soil	0	24	44	32
ect of soluble iron & aluminum alts on plants	26	46	22	6
ctions of elements	4	28	30	38
mical effects of proper & mproper drainage	0	46	34	20
anic matter decomposition	0	10	36	54
ects of organic matter in soil	0	8	26	66

Table II

Chemical Processes of Soil Development

A large percent of all the teachers are teaching some of the scien-
c concepts listed on an extensive basis. Fifty percent or more of
teachers are teaching organic matter decomposition and effects of
nic matter in the soil on an extensive basis. Chemical effects of
nic matter in the soil, chemical effects of proper and improper drain-
organic matter decomposition and physical effects of organic matter
he soil are taught by all teachers.

Thirty-two percent of the teachers indicated they are not teaching
effect of hydrogen and hydroxyl-ions on plants. Twenty-six percent
he teachers indicated they are not teaching the effect of soluble
ı and aluminum salt on plants. Sixteen percent of the teachers indi-
:d they are not teaching buffering in soils. Of the four degrees of
:hing listed, a greater percent of the teachers are teaching scien-
:c concepts on a moderate basis which indicates that a considerable
ınt of soil chemistry is being taught.

TABLE III

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO PHYSICAL PROCESSES OF SOIL DEVELOPMENT RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

ntific Concepts	Rate of Teaching			
	None %	Some %	Moderate %	Extensive %
ical action of wind, water mperature	0	10	40	50
anical action of animals	0	26	42	32
uence of topography on ofile development	2	14	52	32
uence of drainage on ofile development	4	16	50	30
ation of zones of clay ntent at various depths	6	38	38	18
ct of climatic conditions on ached and unleached soils	2	30	38	30
ct of specific gravity and rosity on crops	20	48	24	8
ation of various colors in ils	16	40	36	8
ical effects of organic matter the soil	0	24	36	40
ical effects of microorganisms soil development	6	26	34	34

Table III

Physical Processes of Soil Development

A review of Table III indicates that a large percent of the teachers
e teaching scientific concepts related to physical processes of soil
velopment. Fifty percent of the teachers are teaching concepts of the
ysical action of wind, water and temperature on an extensive basis.
l of the teachers are teaching physical action of wind, water, and
mperature, mechanical action of animals, and physical effects of organic
tter in the soil. Fifty percent or more of the teachers are teaching
e influence of drainage and topography on profile development on a
lerate basis. Twenty percent of the teachers are not teaching the ef-
ct of specific gravity and porosity on crops, while 16% are not teaching
ısation of various colors in the soil.

TABLE IV

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO FERTILIZERS AND FERTILIZATION RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

Scientific Concepts	Rate of Teaching None %	Some %	Moderate %	Extensive %
mponents of fertilizers	0	2	20	78
fects of elements on plants	0	6	32	62
rtilizing properties of manure	0	12	36	52
mical changes occurring in manure during decay	4	24	44	28
mical changes occurring in fertilizers during decomposition	0	26	58	16
fects of fertilizers on micro-organisms	6	22	52	20
mptoms of plants denoting element deficiencies	0	20	30	50
mmercial fertilizer production	2	30	48	20
rtilizing properties of green manure crops	0	12	50	38

Table IV

Fertilizers and Fertilization

Table IV shows that of the scientific concepts listed under fertili-
's and fertilizationa, many were taught extensively. More than 50% of
: teachers are teaching components of fertilizers, effects of the ele-
nts on plants, fertilizing properties of manure, and symptoms of plants
noting element deficiencies on an extensive basis. More than 50% of
: teachers are teaching chemical changes in fertilizer during decay,
'ect of fertilizers on microorganisms, and fertilizing properties of
:en manure crops on a moderate basis.

Seventy-eight percent of the teachers are teaching components of
:tilizers extensively. All teachers indicated they are teaching to a
:tain degree all the concepts listed except chemical changes occurring
manure during decay, effects of fertilizers on microorganisms, and com-
:cial fertilizer production.

The scientific concepts taught the least is the effect of fertilizer
:croorganisms. Only 6% of the teachers are not teaching the concept.
e rating given by most teachers in regard to these concepts was moderate.

TABLE V

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO ENTOMOLOGY RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE EXTENSIVE

entific Concepts	Rate of Teaching None %	Some %	Moderate %	Extensive %
entific classification of insects	14	60	22	4
elopment & growth stages of insects	4	56	34	6
ritional factors in insect esistance to chemicals	30	56	12	2
ect predation	12	50	34	4
logical control of insects	4	40	44	12
cess of Pollination	6	30	50	14
cess of Metabolism	20	36	44	0
cess of Digestion	14	50	30	6
cess of Respiration	14	50	34	2
cess of Assimilation	20	54	26	0
cess of Fertilization	14	50	30	6
ect Genetics	40	46	14	0
es of Insecticides	0	22	46	32
ctions of insecticides as to ays of killing insects	0	14	60	26

Table V

Entomology

Table V indicates that a relatively small percent of the teachers are
hing concepts related to entomology on an extensive basis. Types of
cticides is taught on an extensive basis by 32% of the teachers.
tions of insecticides as to ways of killing insects is taught ex-
ively by 26% of the teachers. No one taught the processes of metabo-
and assimilation and genetics on an extensive basis. Only four con-
s were taught on a moderate basis by 40% or more of the teachers.
e were biological control of insects, processes of pollination and
bolism, and types of insecticides and methods of killing insects.
The highest percent of teachers indicating they were teaching any
icular concept was 40% not teaching insect genetics. Only two con-
s, the types of insecticides and functions of insecticides, were
ht by all the teachers. No teachers taught concepts related to pro-
es of metabolism, processes of assimilation, and insect genetics on
xtensive basis.

TABLE VI

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO DAIRY RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

ıntific Concepts	Rate of Teaching None %	Some %	Moderate %	Extensive %
ıcture of mammary system	0	26	34	40
:tion of mammary system	0	20	38	42
:ct of factors on composition ' milk	8	30	40	22
ımin, mineral, etc. require- :nts for dairy cattle	0	6	32	62
ıical reaction in souring of .lk and milk products	12	40	42	6
:ific gravity & density of .lk	22	52	22	4
.anation of pH of milk and .lk products	28	46	24	2
ıentation processes in ıeese and milk products	30	52	16	2
ls produced in milk and .lk products	26	56	14	4

Table VI

Dairy

Analysis of Table VI shows that three concepts were taught by all achers. These were the structure of the mammary system, functions of e mammary system, and vitamin and mineral requirements. Forty percent more indicated they are teaching structure and function of the mammary stem and vitamin and mineral requirements on an extensive basis. Forty rcent or more of the teachers indicated they are teaching on a moderate sis the chemical reactions in the souring of milk. It is interesting to te that 62% indicated they are teaching concepts related to vitamin and neral requirements extensively.

Thirty percent of the teachers are not teaching fermentation processe cheese and milk products, while 28% are not teaching the pH of milk and lk products.

TABLE VII

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO ANIMAL NUTRITION RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

ientific Concepts	Rate of Teaching None %	Some %	Moderate %	Extensive %
emical composition of living tissues	0	30	34	36
nctions of cells, tissues, organs, & systems of body	0	22	44	34
emical processes in digestion through the alimentary canal	4	24	28	44
nctions of hormones	4	22	36	38
ocess of rumination	0	16	34	50
ocess of mastication	4	18	36	42
nction of minerals, oil, water in the body	0	22	30	46
usation of bloat & other diseases	0	12	22	66
idation of nutrients in the body	0	36	42	22
stribution & uses of absorbed nutrients in the body	0	30	30	40
nctions of various internal organs	0	30	42	28
gestion coefficient	2	28	34	36
uses for differences in feed palability	2	24	40	34

Table VII

Animal Nutrition

Table VII shows that sixty-six per cent of the Vocational Agri-ltural Teachers are teaching the causation of bloat and other diseases an extensive degree while fifty per cent are teaching the process of mination extensively.

As high as 44% are teaching chemical processes in digestion through e alimentary canal to an extensive degree.

The highest per cent not teaching any particular scientific concept lative to animal nutrition was 10% not teaching processes of glycogen rmation.

Only two per cent of the teachers aren't teaching concepts of di-stion coefficient and causes for differences in feeding palability.

As low as 4% aren't teaching chemical processes in digestion rough the alimentary canal, functions of hormones, and processes of stication.

Most of the concepts relative to animal nutrition are taught on a derate and extensive basis.

TABLE VIII

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO FARM STRUCTURES AND CONVENIENCES RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE EXTENSIVE

lentific Concepts	Rate of Teaching None %	Some %	Moderate %	Extensive %
›es of structural materials	0	34	60	6
ısons for difference in strength ›f building materials	10	36	50	4
lnciples of heat & heat ;ransfer	20	54	18	8
'-water vapor mixtures	44	44	12	0
r insulation functions	16	52	30	2
;uration of heat load	46	46	8	0
ıperature gradient (condensa- ;ion in walls)	54	40	6	0
ıctions of ventilation	12	50	36	2
' to figure construction costs	6	26	46	22
nciples involved in designing ; sketching	12	40	40	8
ıper curing of concrete	6	36	46	12
ermining of rafter sizes and utting	16	40	40	4
mical makeup of paints and hinners	32	40	26	2
mical makeup of glass	60	30	10	0
nciples of crop and food reservation and storage	10	34	40	16

Table VIII

Farm Structures and Conveniences

Table VIII shows that the only scientific concept not being taught
types of structural materials. Sixty percent of the teachers are
teaching chemical makeup of glass. Fifty-four percent are not
ching condensation in walls. Fifty-four percent of the teachers are
ching principles of heat and heat transfer on a some basis. Fifty
cent are teaching functions of ventilation. Thirty to fifty percent
the teachers are teaching scientific concepts on a limited basis.

It is also interesting to note that as low as 6% of the teachers
not teaching the concepts of figuration of construction cost and
per curing of concrete. Figuring of construction costs was taught
ensively by twenty-two percent of the teachers. This is the highest
cent of teachers teaching any particular concept listed on an ex-
sive basis.

TABLE IX

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO ELECTRICITY RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

ientific Concepts	Rate of Teaching None %	Some %	Moderate %	Extensive %
derstanding of voltage, amps, watts, ohms	2	26	26	46
nds of electrical conductors	8	26	34	32
asons for differences in conductivities of conductors	16	28	38	18
oduction of electricity	16	36	30	18
ansmission of electricity in all types of motors	14	46	22	18
C and D C current	4	26	40	30
lding processes	10	10	18	62
mposition of steel, bronze, and other alloys	10	32	26	32
mposition of welding rods	10	28	22	40
nction of flux	10	24	22	44
rts of transformer and functions	18	32	24	26
w to figure electrical loads	14	20	42	24
nctions of fuses and circuits	6	28	34	32

Table IX

Electricity

It is interesting to note that as high as 62% of the teachers are aching scientific concepts of welding processes to an extensive de- ee.

Forty-six per cent of the teachers are teaching voltage, amps, tts, and ohms extensively while 44% are teaching the functions of ux extensively.

All but 2% of the teachers are teaching concepts of voltage, watts, ps, and ohms to a limited degree.

The highest per cent of teachers not teaching any particular con- pt relative to electricity was 18% not teaching the parts of trans- rmers and their functions.

Emphasis on scientific concepts relative to electricity was pretty enly distributed among some, moderate, and extensive degrees.

TABLE X

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO FARM POWER AND MACHINERY RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

entific Concepts	Rate of Teaching None %	Some %	Moderate %	Extensive %
okes of internal combustion ngines and what takes place in ach stroke	24	26	22	28
ve operation	18	34	22	26
ction of air cleaners	22	22	28	28
nciples of carburetion	18	26	36	20
ling system operation	14	22	36	28
erning & governing system	22	36	34	8
tion & ignition system	20	30	36	14
ctrical system operation	20	30	40	10
ctioning of secondary or torage cells & batteries	18	46	24	12
ctioning of electric enerators, starters, lighting	14	46	32	8
ctioning of clutches	18	48	24	10
ctioning of Differentials	18	52	24	6
ctioning of transmission	18	52	26	4
ctioning of final drives & ccessories	24	48	26	2
es of fuels & combustibility	14	42	38	6
nciples of hydraulic controls power take off drives	20	42	34	4
lage force analysis & hitching	22	44	32	2

Table X

Farm Power and Machinery

Eighty-six per cent are teaching cooling system operation, functionin electric generators, starters and lighting; and types of fuels and com- stibility.

Table X shows that the highest per cent of teachers teaching any rticular scientific concept relative to farm power and machinery to an tensive degree was 28% who are teaching strokes of the internal com- stion engine, functions of air cleaners, and cooling system operation.

As low as two per cent are teaching concepts of the functioning of nal drives and accessories; and tillage force analysis and hitching an extensive basis.

As high as 24% of the teachers aren't teaching scientific concepts strokes of the internal combustion engine and functioning of final ives and accessories.

Most of the emphasis relative to farm power and machinery was aced on a some basis, which indicates that concepts in this area obably should be emphasized more.

TABLE XI

SCIENTIFIC CONCEPTS TAUGHT VOCATIONAL AGRICULTURE STUDENTS RELATED TO PERCENTS IN THE VARIOUS AREAS OF AGRICULTURAL SUBJECTS RATED AS TO PERCENT TAUGHT - NONE, SOME, MODERATE, EXTENSIVE

entific Concepts	Rate of Teaching			
	None %	Some %	Moderate %	Extensive %
nts and Seeds	10.8	38.3	34.3	16.6
mical processes of soil evelopment	7.7	29.7	36.3	26.3
sical processes of soil evelopment	5.6	27.2	39.0	28.2
tilizers and Fertilization	1.3	17.2	41.1	40.4
omology	13.7	43.9	34.3	8.1
ry	14.0	36.4	29.2	20.4
mal Nutrition	1.8	23.6	36.5	38.1
m Structures and Con-eniences	22.9	40.2	31.2	5.7
ctricity	10.6	27.9	29.0	32.5
m Power and Machinery	18.7	38.6	29.6	13.1

CHAPTER IV

SUMMARY AND RECOMMENDATIONS

This study was undertaken with the idea in mind that Vocational ·iculture teachers are teaching many scientific concepts in the various ;as of agricultural subjects. Vocational Agriculture should be recog- ;ed as a science wherein all major sciences are brought together and ;egrated with the different agricultural subjects.

The study has revealed that the teacher of vocational agriculture teaching scientific concepts extensively in many areas of agricultural ›jects. There has been considerable data presented that indicate the ıcher of Vocational Agriculture is teaching many scientific concepts different degrees.

It is interesting to note that the teaching of scientific concepts the area of fertilizers and fertilization is more extensive than in ıer areas. Scientific concepts of animal nutrition were taught almost extensively as fertilizers and fertilization.

The areas given less consideration by the Oklahoma Vocational Agri- lture teachers were: Farm Power and Machinery, Entomology, Farm ructures and Conveniences, Dairy, and Electricity.

Vocational Agriculture teachers are teaching scientific concepts ıer some areas quite extensively, for example, 48% are teaching

ıcesses of digestion in seeds and plants to an extensive degree with
; teaching the process of fertilization in plants extensively.

As high as 66% of the teachers are teaching effects of organic matter the soil while 54% are teaching organic matter decomposition in the .l. Fifty per cent are teaching physical action of wind, water, and ıperature on soil development. All of the teachers are teaching rsical action of wind, water, and temperature; mechanical action of mals; and physical affects of organic matter in the soil.

As high as 78% are teaching chemical components of fertilizers. re than 50% are teaching the effects of chemical elements on plants l fertilizing properties of manure related to fertilizers and fer- ıization and plant symptoms denoting element deficiencies.

It is also interesting to note that the highest per cent of teachers ıching any scientific concept of Entomology to an extensive degree was ; teaching types of insecticides.

Sixty-two per cent of the teachers are teaching problems related to ıamins and mineral requirements for dairy cattle. Fifty per cent are ıching processes of animal nutrition extensively while 66% are teaching ısation of bloat and other disesases to an extensive degree.

The highest per cent of teachers teaching any scientific concept ler Farm Structures and Conveniences extensively was 22% teaching how figure construction cost.

Sixty-two per cent of the teachers are teaching welding processes an extensive degree. More than 40% are teaching scientific concepts voltage, amps, watts, ohms, and components of welding rods and

:tion of flux to an extensive degree.

The highest per cent of teachers teaching any concept related to
1 Power & Machinery on an extensive basis was 28% teaching the strokes
nternal combustion engines, functions of air cleaners, and cooling
:em operation.

The highest per cent not teaching any concept related to plants was
)er cent not teaching chemical properties of wood.

Thirty-two per cent of the teachers are not teaching effects of
:oxyl-ionson plants.

It is interesting to note that the per cent not teaching any scien-
ic concept related to physical processes of soil development was 20%
teaching effects of specific gravity and porposity on crops.

The highest per cent not teaching any particular scientific con-
: related to fertilizers and fertilization was 6% not teaching ef-
:s of fertilizers on microorganisms.

Forty per cent are not teaching insect genetics related to Ento-
)gy.

The highest per cent of teachers not teaching pH of milk and milk
ducts was 28%.

It is interesting to note that the highest per cent of teachers
teaching any particular scientific concepts related to Animal Nu-
tion was 10% not teaching the process of glycogen formation.

Fifty-four per cent are not teaching temperature gradient while
are not teaching air water vapor mixtures. Forty-six per cent are
teaching figuration of heat load; while 60% are not teaching

mical makeup of glass.

The highest per cent of teachers not teaching any particular scien-ic concept relative to electricity was 18% not teaching transformer -ts and functioning.

Twenty-four per cent are not teaching strokes of the internal com-stion engine and functioning plus the functioning of final drives and essories.

The writer feels that sufficient data has been presented so as to ble him to make a few general recommendations.

These recommendations are as follows:

(1) The teacher of Vocational Agriculture should make an evaluation of his present program with respect to scientific concepts which should be taught.

(2) The teacher of Vocational Agriculture should continue teaching scientific concepts and attempt a constant re-evaluation of his program determining which concepts should be taught which would most nearly meet the needs of students and community.

(3) The teacher should teach more concepts of entomology, dairy, farm structures and conveniences, farm power and machinery, and electricity.

(4) The teacher of Vocational Agriculture should try to set up experiments and demonstrations in conjunction with his presentations so as to allow more student participation, for example, in the area of physical and chemical processes of soil development, the testing of soil by students would provide the environme

where they would be more likely to discover and develop basic scientific concepts relative to soil chemistry.

Space does not permit the listing of all experiments and demonstrations in the various areas which could be used in the development of scientific concepts, however, and effort will be made to list one example relative to each area.

In the area of plants and seeds one might use a demonstration such as the chemical test for starch in corn and other seeds.

In the area of fertilizers and fertilization one might set up a test plot administering various amounts of fertilizer to plants checking for element deficiencies and how the plant production is affected.

In the area of Entomology one might develop a test experiment with insects with respect to resistance to different kinds of insecticides.

In the area of Dairy one might have a laboratory exercise on the testing of milk checking for butterfat, density and specific gravity. In addition, the pH of the milk could be checked plus determining acids present in milk and milk products.

In the area of animal nutrition, one could check the results of an animal on a certain diet. Feed conversion effeciency could be measured.

In the area of farm structures and conveniences the students could build model houses which would give them

experience in figuring costs, rafter sizes, insulation and so forth.

In the area of electricity many experiments and demonstrations could be effectively taught. The students could do actual wiring of houses, barns, and other buildings.

In the area of farm power and machinery the students could dissemble a motor, studying the different parts and functions of each. This would be a wonderful opportunity for them to learn about the functioning of the various parts.

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A P P E N D I X

Vocational Agriculture Teacher:

Look! What you are receiving can help you as well as help me. We all aware of the excellent job you as Vocational Agriculture teachers doing. But, how does you program fit in with this scientific area putniks and space ships?

What I want to find out is what scientific concepts in Agriculture are teaching plus the degree to which you are teaching them.

The enclosed questionnaire contains scientific concepts in the area nimal husbandry, agronomy, dairy, and agricultural engineering. se check the degree to which you are teaching each of these concepts lacing a check under none, some, moderate, or extensive. None would no teaching; some would mean at least mentioning the concept; rate would include explaining to a degree where the students have a ly good understanding, and extensive would be to the point whereby concept has been thoroughly emphasized to the point that almost com- e comprehension has taken place.

Your cooperation will be greatly appreciated.

Sincerely,

Zed F. DeVaughan, Jr.

:rtment_____ Instructor_____

:se place an x in the blocks which indicate the degree of scientific con-
:s taught your Vocational Agriculture students any time during their four
' period of instruction.

:ntific concepts taught to students of Vocational Agriculture related to
:ts and seeds:

	None	Some	Moderate	Extensive
:mical constitution of seeds				
'mancy of seeds				
'poses of seed scarification				
:ernal factors affecting :bility of seeds				
:ernal factors affecting :bility of seeds				
:es of cells and tissues				
:es of leaf veination				
:cess of photosynthesis				
;anic compound production plants				
:ctions of organic compounds 'mones, vitamins, etc.				
:cess of Assimilation				
:cess of Digestion				
:cess of Respiration				
:cess of Fermentation				
:ernal & internal structure different types of stems				
:mical properties of wood				
'sical properties of wood				
:duction of water & minerals stems & leaves				
:ernal & internal factors :ociated with plant growth				
:cess of pollination				
:cess of fertilization				
:entific classification of plants				
:ssification of plant diseases				
:ssification of microorganisms				

ntific concepts taught to students of Vocational Agriculture related hemical processes of soil development:

	None	Some	Moderate	Extensive
mical actions of oxygen, water, bon dioxide, acids on rock				
mical actions of salts & bases				
mical actions in neutralization acid & basic soils				
ermination of pH				
fering in soils				
ect of hydrogen & hydroxyl s on plants				
ect of acidity & alkalinity microorganisms				
saline & alkaline soils elop				
mical affects of organic ter in soil				
ect of soluble iron & aluminum ts on plants				
ctions of elements				
mical effects of proper & roper drainage				
anic matter decomposition				
ects of organic matter in soil				

ntific Concepts taught to students of Vocational Agriculture related hysical processes of soil development:

	None	Some	Moderate	Extensive
sical action of wind, water, perature				
hanical action of animals				
luence of topography on pro- e development				
luence of drainage on profile elopment				
mation of zones of clay content various depths				
ect of climatic conditions on ched and unleached soils				
ect of specific gravity & osity on crops				
sation of various colors in l				
sical effects of microorganisms soil development				

ntific concepts taught to students of Vocational Agriculture related ertilizers & fertilization:

	None	Some	Moderate	Extensive
ponents of fertilizers				
ects of elements on plants				
tilizing properties of manure				
mical changes occurring in ure during decay				
mical changes occurring in tilizers during decomposition				
ects of fertilizers on micro- anisms				
ptoms of plants denoting ment deficiencies				
mercial fertilizer production				
tilizing properties of green ure crops				

ntific concepts taught to students of Vocational Agriculture related ntomology:

	None	Some	Moderate	Extensive
ntific classification of cts				
lopment & growth stages of cts				
itional factors in insect stance to chemicals				
ct predation				
ogical control of insects				
ess of Pollination				
ess of Metabilism				
ess of Digestion				
ess of Respiration				
ess of Assimilation				
ess of Fertilization				
ct Genetics				
s of Insecticides				
tions of insecticides as to of killing insects				

ntific concepts taught to students of Vocational Agriculture related Dairy:

	None	Some	Moderate	Extensive
cture of mammary system				
tion of mammary system				
ct of factors on composition ilk				
min, mineral, etc. require- s for dairy cattle				
ical reaction in souring of & milk products				
ific gravity & density of				
anation of pH of milk & products				
entation processes in cheese lk products				
s produced in milk & milk ucts				

ntific concepts taught to students of Vocational Agriculture related nimal Nutrition:

	None	Some	Moderate	Extensive
ical composition of living ues				
tions of cells, tissues, ns & systems of body				
ical processes in digestion ugh the alimentary canal				
tions of hormones				
ess of rumination				
ess of mastication				
ess of glycogen formation				
tion of minerals, oil, r in the body				
ation of bloat & other ases				
ation of nutrients in the				
ribution & uses of absorbed ients in the body				
tions of various internal ns				
stion coefficient				
es for differences in feed bility				
eption to birth				
tics				

ntific concepts taught to students of Vocational Agriculture related
arm Structures & Conveniences:

	None	Some	Moderate	Extensive
s of structural materials				
ons for differences in strength uilding materials				
ciples of heat & heat transfer				
water vapor mixtures				
insulation functions				
ration of heat load				
erature gradient (condensa- in walls)				
tions of ventilation				
to figure construction costs				
ciples involved in designing etching				
er curing of concrete				
rmining of rafter sizes & ing				
ical makeup of paints & ners				
ical makeup of glass				
ciples of crop & good preser- on & storage				

ntific concepts taught to students of Vocational Agriculture related
lectricity:

	None	Some	Moderate	Extensive
rstanding of voltage, amps, s, chms.				
s of electrical conductors				
ons for differences in con- ivities of conductors				
uction of electricity				
smission of electricity in types of motors				
& D C current				
ing processes				
osition of steel, bronze, other alloys				
osition of welding rods				

	None	Some	Moderate	Extensive
tion of flux				
s of transformer & functions				
to figure electrical loads				
tions of fuses & circuits				

ntific concepts taught to students of Vocational Agriculture related arm Power & Machinery:

	None	Some	Moderate	Extensive
kes of internal combustion nes and what takes place in stroke				
e operation				
tion of air cleaners				
ciples of carburetion				
ing system operation				
rning & governing system				
tion & ignition system				
trical system operation				
tioning of secondary or age bells & batteries				
tioning of electric rators, starters, lighting				
tioning of clutches				
tioning of differentials				
tioning of transmission				
tioning of final drives & ssories				
s of fuels & combustibility				
ciples of hydraulic controls wer take off drives				
age force analysis & hitching				

VITA

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