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Title of Study: USE OF GREEK AND LATIN DERIVATIVES IN TEACHING HIGH SCHOOL BIOLOGY

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Scope and Nature of Report: In the realization that the vocabulary of first year biology students is extremely large and that past experience has shown that teaching vocabulary by use of Greek and Latin derivatives makes the study considerably easier, a survey of the extent of its use was made. Questionnaires were sent to more than 1400 biology teachers in Oklahoma and six surrounding states in an effort to find out how many teachers used this method of teaching vocabulary. The survey form requested information regarding college major and minor, years teaching experience, list of foreign languages taken in college. Also included was a list of 185 words of Greek and Latin origin. The recipient was asked to check those words taught by the derivative method.

Findings and Suggestions: In general, the survey results show that teachers using the derivative approach to teaching vocabulary are those having majors in biology, have had Greek and/or Latin in college and have had a greater length of teaching experience. It is suggested that preparatory teaching courses include work in Greek and Latin derivatives and that suitable lists of words be made readily available to teachers.

ADVISOR'S APPROVAL Ingrid Holt

USE OF GREEK AND LATIN DERIVATIVES IN TEACHING HIGH SCHOOL BIOLOGY

By

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USE OF GREEK AND LATIN DERIVATIVES

IN TEACHING HIGH SCHOOL BIOLOGY

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CHAPTER I

INTRODUCTION

It has been stated that a first year biology student will need to develop a vocabulary, similar in size, to that of a student taking his first year of French.

Realizing that the vocabulary is immense, any method which will facilitate better comprehension will lessen the work for the student and make the course more enjoyable for both teacher and the student. From past experience, it has been found that the use of derivatives in teaching the vocabulary has been one of the best methods.

This report has been written as the result of a survey to find out to what extent teachers are using derivatives of Greek and Latin origin in teaching word meaning. Any other factors which an analysis of the returns showed as being pertinent to this report also has been discussed.

One of the writer's purposes through this study has been to acquire an increased knowledge of Greek and Latin terminology for use in improving his teaching methods.

SURVEY OF LITERATURE

The study of Greek and Latin derivatives should be important to us in understanding the English vocabulary, since about "55-60 per cent of English words have their origin in Latin."[1] More than 8 per cent are derived from Greek.[2] Approximately 75 per cent of words comprising our present-day medical vocabulary have Greek derivation.[3] This would include many of our biological terms.

In contrast to vast usage of Greek and Latin terms, we find that the teaching of Greek and Latin in our public schools has diminished extensively during the past half century. In 1900, 50 per cent of our high school students were studying Latin. By 1955, only 7 per cent were enrolled in Latin classes.[4] One half of the nation's schools offer no foreign language whatsoever.[5] "It seems that only 2% of the pupils working for the school certificate study Greek, and that these are mostly boys. The English language needs reviewing in the light of our rapidly increasing

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[1]K. A. Sarafain, "Latin in the Curriculum," School and Society, LV (February 14, 1942), pp. 173-177.

[2]F. W. Gingrich, "The Greeks - We Take Their Word for It," Scholastic, XXXIV (May 13, 1939), pp. 25-26.

[3]Edmund Andrews, A History of Scientific English (New York, 1947), p. 130.

[4]"Sign of Life in Latin," Newsweek, LII (July 21, 1958), p. 84.

[5]S. D. Atkins et al., "Status of Latin in Public Schools," School and Society, LXXXIV (November 10, 1956) p. 166.

scientific vocabulary, which is almost entirely derived from Greek."[6] Further indication of the importance of Latin is shown in a statement by Franklin P. Adams: "Teachers of English in colleges and universities have told me that most of the boys who enter without Latin can't write an English sentence. They don't even know the meaning of words. . . ."[7] To emphasize this point: ". . . . pupils who had studied Latin, for but a single year, when compared to those who had not studied it at all, proved to be two to three times as likely to recognize the meanings of the words like parental, potent, ... and what is a more practical everyday accomplishment than to be able to manage a good English vocabulary. . . ?"[8]

One of the objectives of Latin, as stated by Mary Louise Jackson, is "the development of a working vocabulary, both in terms of realization of clusters of English meanings around a particular Latin word and in terms of recognition and use of derivatives."[9]

Students are capable of enlarging their vocabularies in this way without actually taking the usual courses in Latin and Greek. It can be accomplished through the study of Latin and Greek prefixes, suffixes, and root clusters. Caution in method and degree of presentation is offered in the statement, "Teachers are specially requested to confine their pupils

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[6]"An English Investigation of the Value of Greek as a School Study," School and Society, LVI (August 1, 1942), p. 95.

[7]Franklin P. Adams, "Is Latin Useless," Time, IL (April 14, 1947), p. 9[illegible].

[8]Karl P. Harrington, "Why Latin," School and Society, LIII (March 15, 1941), pp. 321-326.

[9]Mary Louise Jackson, "Expanding Concepts in Latin," School Review, LVI (May, 1948), pp. 275-279.

to the prefixes and suffices, till these compound parts are learned in a most thorough manner."[10] This may then be supplemented by the learning of primatives or roots to gain the foundations of a good vocabulary. The following passage indicates this quite well. "A knowledge of 25 Latin prefixes and 50 Latin suffixes in combination with about 50 Latin primatives will give one a command of English vocabulary such as can be gained in no other way. . . . Latin is an economical way of gaining mastery of English vocabulary."[11] The author of this passage does not give a suggested list of the 125 words which he had in mind.

The literature to be found in the field of this report was extremely limited. Most of the literature compiled in this Survey of Literature is not previous work done in this specific field, but, rather, the last final progressional efforts prior to the report.

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[10]Salem Town, An Analysis of Derivative Words in the English Language (New York, 1852), p. 9.

[11]Fred S. Dunham, "Why Latin Teachers Teach Derivation," School Review, LII (June, 1944), pp. 356-61.

PREPARATION OF SURVEY FORM

A survey of previous literature in this field showed very little evidence that any work had been done in the area of determining to what extent Greek and Latin derivatives were being used by high school biology teachers to ease the work of the student.

It was originally decided to send a survey form questionnaire to about two hundred biology teachers to find a partial answer to the stated topic of the report. Realizing that the returns would be so small that validity of conclusions would be negligible, it was later decided to mail the form to approximately fourteen hundred high school biology teachers in Oklahoma and surrounding States.

A replication of the form sent to the teachers is included in the appendix of this report. Information was sought concerning teaching experience and foreign languages taken in college. In addition, they were requested to select from a given list of words those most often used in the teaching of derivatives.

The following is a list of sources from which the words were selected:

Walter P. Agard and Herbert M. Howe, Medical Greek and Latin at a Glance (New York, 1955)

Robert M. Boles, Principles of Biological Terminology (1957)

Dale E. Braungard and Sr. Reta Buddeke, Biology the Study of Living Things (Garden City, 1957)

Edmund C. Jaeger, A Source-Book of Biological Names and Terms (Springfield, 1950)

Lorus J. Milne and Margery J. Milne, Biotic World and Man (Englewood Cliffs, 1958)

John W. Ritche, Biology and Human Affairs (Yonkers on Hudson, 1948)

Ella Thea Smith, Exploring Biology (Chicago, 1949).

A majority of the terms came from the text by Braungard and Buddeke which has excellent lists of biological terms and their origins, prefixes, and suffixes, and root words and their derivatives. Other sources proving quite useful were the publication of Robert J. Boles and A Source-Book of Biological Names and Terms by Edmund C. Jaeger.

More than two-thirds of the terms on the survey sheet were those commonly found in biology texts. In most cases, however, the terms were placed in the original Greek or Latin form.

These survey forms were mailed to 1,426 high school biology teachers in a seven-State area including Arkansas, Colorado, Kansas, Louisiana, New Mexico, Oklahoma and Texas. Names were secured from the National Science Teachers Association.

CHAPTER II

TABULATION AND ANALYSIS OF RETURNS

As the returns were received, all the information from each return was tabulated on master sheets. This was done on a State-by-State basis. Twenty-five days after the forms had been mailed, the incoming mail had dropped to an average of two letters per day. At this time, 310 returns had been received, and receipts after this date were not included on the master sheets. However, these late returns were filed, and data of exceptional value, i.e., correspondence included with the return, was added to this report.

According to statisticians working in the survey field, a survey conducted by mail brings relatively poor results--not, primarily, because of the number received, but because of the type of individual completing the form. The persons returning this survey form were generally considered those interested in biology, and, more specifically, those biology teachers interested in vocabulary building. As a result of this, the survey is considerably biased. The writer was not aware of the extensiveness of this factor until most of the returns had been received.

Table I shows the number of forms mailed, number of returns, and percentage of returns by States. "Other States" indicated in this table are Delaware and Connecticut (six mailings to Delaware and seventeen, to Connecticut). "Unknown" returns were those in which it was impossible to determine from which State they had come. (First sheet of survey which

has been removed, and the postmark could not be identified.)

The average percentage of returns was slightly more than 20 per cent. The higher percentage from the State of Kansas may be due partially to the greater number of mailings to that State, but principally to the fact that the writer is a Kansan, and better acquainted with biology teachers in that State. The writer, however, took no part in selecting the teachers to be placed upon the mailing list.

The relatively poor response from Oklahoma and Arkansas probably can be attributed to the small over-all sampling in those States, thus reducing validity of conclusions drawn from these returns.

TABLE I

NUMBER OF MAILINGS COMPARED WITH RETURNS
(NUMBER OF RETURNS AT THE END OF THREE WEEKS)

State	No. Mailed	No. Returns	% Returns
Arkansas	153	17	11
Colorado	188	47	25
Kansas	278	85	31
Louisiana	240	51	21
New Mexico	76	18	24
Oklahoma	251	40	16
Texas	217	46	21
Other states	23	4	17
Unknown	---	2	--
Total	1,426	310	Approx. 21

TABLE II

COMPARISON OF NUMBER OF RETURNS WITH THOSE TEACHERS REPORTING A FOREIGN LANGUAGE IN THEIR COLLEGE TRAINING*

State	Returns	Number Reporting Foreign Langage	Number Not Reporting In This Category	% Reporting Foreign Language
Arkansas	17	10	0	59
Colorado	47	20	0	43
Kansas	85	48	2	56
Louisiana	51	29	3	57
New Mex.	18	14	0	78
Oklahoma	40	22	6	55
Texas	46	31	0	67
Misc.	6	6	0	100
Average % reporting foreign language - - - - - - - - - -				63

*Credit is given in this report for two years of a specific language in high school.

Table II compares the number of returns (by States and total) to the number of teachers reporting a foreign language in their college training. If the teacher reported at least two years of high school credit in a specific foreign language, this was tabulated as college credit. (Foreign language in high school was not included in the information requested on the survey form). The "Miscellaneous" group includes the returns from Delaware, Connecticut and other States not identified.

TABLE III

PERCENTAGE OF TEACHERS REPORTING HAVING TAKEN LATIN AND/OR GREEK IN COLLEGE*

State Reporting		No. Latin	% Latin	No. Greek	% Greek	No. Both	% Both
Arkansas	17	5	29	0	0	0	0
Colorado	47	8	17	3	6	2	4
Kansas	85	17	20	4	5	2	2
Louisiana	51	9	18	1	2	1	2
New Mexico	18	4	20	0	0	0	0
Oklahoma	40	11	28	4	10	3	8
Texas	46	7	15	2	4	1	2
Misc.	6	4	68	0	0	0	0

*Credit is given in this report for two years of a specific language in high school.

Table III is a comparison by State of the number and percentage of teachers reporting having studied Latin and Greek in college. Tables II and III indicate that more than three-fifths of them have had courses in Latin and/or Greek. The very small percentage reporting Greek coincides with information found in the survey of previous literature.

Table IV deals with the 185 words on the last two pages of the survey form. Teachers were asked to place a 1 before the terms they used frequently when teaching derivatives and a 2 in the blank before the words which they seldom used. The total "ones" and twos" were added together from the master sheet as one number for each teacher

TABLE IV

COMPARISON OF NUMBER OF TERMS USED BY TEACHERS HAVING HAD LATIN AND/OR GREEK AND THOSE NOT HAVING HAD LATIN OR GREEK

State	Average Number of Terms Used By Teachers Having Had Latin and/or Greek	Average Number of Terms Used By Teachers Not Having Had Latin or Greek
Arkansas	116	63
Colorado	82	72
Kansas	97	81
Louisiana	108	55
New Mexico	92	78
Oklahoma	99	79
Texas	93	59
Average Number	98	69

reporting Latin and/or Greek. The same was done for teachers that had not taken Latin or Greek. The average number in both categories was also found.

Indications here are the teachers having had Latin and/or Greek in college taught, on the average, 42 per cent more terms using the derivatives method.

There were two returns which indicated courses in Latin and Greek derivatives. This was not a large enough number for comparative study. This, however, is the type of course from which one would derive the greatest benefit in teaching by the derivative method.

TABLE V

COMPARISON OF TEACHING EXPERIENCE OF THOSE REPORTING LATIN AND/OR GREEK AND OF THOSE REPORTING NO LATIN OR GREEK

State	Average Teaching Experience in Years of Those Reporting Latin and/or Greek	Not Reporting Latin or Greek
Arkansas	20	6
Colorado	14	12
Kansas	17	12
Louisiana	18	13
New Mexico	22	11
Oklahoma	22	12
Texas	22	12
Average	20	11

Table V shows the average years of teaching experience of those teachers reporting Latin and/or Greek as compared with those reporting no Latin or Greek. This is, also, although to a lesser degree, an indication of the age of the reportee. The average of the sum of all States is also indicated.

The table exemplifies what one might expect to find. Initially, a greater length of teaching experience shows that these people were going to school at a time when a majority of students was taking Latin--a ratio of 2:1. Secondly, longer teaching experience better acquaints a teacher with the subject.

Table VI is a comparison by State of the number of individuals having biology majors or minors and those teachers reporting neither a major or

TABLE VI

NUMBER OF TEACHERS REPORTING HAVING EITHER A MAJOR OR MINOR IN BIOLOGY

State	No. Reporting	No. Reporting Biology Major or Minor	No. Not Reporting In This Category	% Reporting Biology Major or Minor
Arkansas	17	13	0	77
Colorado	47	42	0	89
Kansas	85	66	4	78
Louisiana	51	34	3	67
New Mexico	18	12	0	67
Oklahoma	40	22	6	55
Texas	46	35	1	76
Misc.	6	6	0	100
Average % reporting biology major or minor - - - - - - - -				76

minor in biology. Several returns failed to contain this information, and were, therefore, deleted from the calculations. The average per cent of those reporting either a biology major or minor is also noted.

More than three-fourths of the biology teachers have either a biology major or minor. In Oklahoma, slightly more than half the teachers can be thus categorized. In comparing Table I with Table VI, the low percentage in both tables may be a coincidence; but it might also warrant further study. At present, additional information is needed for further study.

Table VII indicates the average number of terms used by teachers having a biology major or minor as compared to those not reporting a

TABLE VII

COMPARISON OF THE NUMBER OF TERMS USED BY TEACHERS HAVING BIOLOGY MAJOR OR MINOR AND TEACHERS WITHOUT BIOLOGY MAJOR OR MINOR

State	No. of Terms Used By Teachers Having Biology Major or Minor	No. of Terms Used By Teachers Not Having Biology Major or Minor
Arkansas	89	64
Colorado	85	49
Kansas	89	69
Louisiana	80	46
New Mexico	77	77
Oklahoma	88	79
Texas	69	52
Average Number of Terms Used	82	62

biology major or minor. The "Number of Terms" is the total of the "ones" and "twos" checked on the survey form for each teacher. Teachers reporting that they did not use these derivatives were also included in this calculation. The average number of terms used by each group is also shown.

Teachers having backgrounds with emphasis in biology teach nearly one-third more terms by the derivative method than those without this background.

Table VIII serves the purpose of comparing the years of teaching experience in biology with the average number of terms used. If the teacher left blank the experience category on the survey form, his form

TABLE VIII

AVERAGE NUMBER OF TERMS USED COMPARED WITH NUMBER OF YEARS OF TEACHING EXPERIENCE IN BIOLOGY

State	Years Taught: Average Number of Terms Used 1-3	4-5	6-10	11-up
Arkansas	49	77	148	86
Colorado	95	47	67	103
Kansas	79	64	77	108
Louisiana	52	84	82	53
New Mexico	96	55	67	88
Oklahoma	72	95	85	100
Texas	65	77	40	81
Average Number of Terms Used	78	71	81	89

was not included in this table. The average number of terms for all States has also been calculated for each column. The returns were nearly evenly distributed among the four groups listed.

The general tendency is that those with more teaching experience used more terms. This does not hold true in the second column figure for 4-5 years' experience in biology teaching. Doubtless, this is due to an inadequate number of returns.

Only 85 out of the 310 returns (24 per cent) indicated that they had been teaching at lease one section of biology each year of their teaching experience. Specific questions as to the reason for this were not asked.

Table IX is a composite sheet of information pertinent to each term.

Column one indicates the number of the term as it appeared on the master copy and survey form.

Column two indicates the term--in most of the cases, appearing in an original Greek or Latin form.

Column three indicates an "L" for Latin, and a "G" for Greek origin.

Column four gives one of the definitions of the term.

Column five shows the average percentage of times this term was reported; the "(#1)" means the term occured often in teaching derivatives.

Column six shows the average percentage of times this term was reported; the "(#2)" means the term seldom appeared in teaching derivatives.

Column seven indicates whether the term is used generally as a prefix, suffix, or root.

Column eight shows whether the term generally appears in the form shown in column two.

Column nine indicates (if answer in column eight is no) the form in which the term generally appears. In most instances where the endings varied, no change was made.

Column ten notes other terms for which the term is easily mistaken.

Column eleven indicates yes or no as to whether or not the term generally appears in at least two different words in high school biology texts.

Column twelve gives an example word using the term in column two.

Approximately two-thirds of the terms in the survey form are those which appear in at least two different words in most high school biology texts. Source of all terms has been stated previously in the report.

TABLE IX

Composite Sheet of Information Pertinent to Each Term

No.	Word	Origin	Meaning	%general use (#1)	% general use (#2)	Usually as prefix suffix, root form	Word generally used in this form	Common form used	Other words for which word may have been mistaken	Generally used in 2 or more terms in biology texts	Example
1.	a-,an-	G	not	52	32	prefix	yes	---	---	yes	aseptic
2.	ad-	L	to	46	14	prefix	yes	---	---	yes	adrenals
3.	adenos	G	gland	25	4	root	yes	---	---	yes	adenoid
4.	allelon	G	of one another	5	14	root	yes	---	---	no	allelomorph
5.	angeion	G	vessel	3	19	root	yes	---	---	no	sporanguim
6.	anthos	G	flower	28	13	root	yes	---	---	no	antheridium
7.	anthropos	G	man	52	12	root	yes	---	---	no	anthropology
8.	anti-	G	against	80	4	prefix	yes	---	---	yes	antigen
9.	appendare	L	to hang to	29	15	root	yes	---	---	no	appendicular
10.	arteria	G	artery	30	18	root	yes	---	---	yes	artery
11.	arthron	G	joint	13	10	root	yes	---	---	yes	Arthropoda
12.	autos	G	self	49	11	root	yes	---	---	yes	autonomic
13.	axilla	L	armpit	28	19	root	yes	---	---	no	axillary
14.	ballein	G	to throw	2	11	root	no	bolus	---	no	embolus
15.	bi-	L	two	83	2	prefix	yes	---	---	yes	bilateral
16.	bios	G	life	89	1	root	yes	---	---	yes	biology
17.	blastos	G	sprout	22	19	root	yes	---	anglo-saxon blaest- violent gust of wind	no	blastula

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
18.	botane	G	plant	27	13	root	yes	---	---	yes	botany
19.	bryein	G	to swell	4	11	root	yes	---	---	yes	embryology
20.	calor	L	heat	24	17	root	yes	---	---	yes	calorimeter
21.	cata	G	down	19	16	root	yes	---	---	yes	catabolism
22.	chloros	G	light green	40	12	root	yes	---	---	yes	chlorophyll
23.	chole	G	bile	5	12	root	yes	---	---	no	cholestorol
24.	chroma	G	color	52	13	root	yes	---	---	yes	chromosome
25.	cide	L	kill	40	15	root	yes	---	---	yes	germicide
26.	-cle	L	small	19	15	suffix	yes	---	---	yes	particle
27.	co, com-, con-, cor	L	with	38	14	prefix	yes	---	---	yes	cooperate
28.	corpus	L	body	41	17	root	yes	---	---	yes	corpuscle
29.	cortex	L	bark	49	21	root	yes	---	---	no	cortisone
30.	cospis	L	point	17	18	root	yes	---	---	no	bicuspid
31.	cutis	L	skin	19	15	root	yes	---	---	no	cuticle
32.	de-	L	down	43	12	prefix	yes	---	---	yes	deciduous
33.	[1]demos	G	people	24	16	root	yes	---	---	no	endemic
34.	derma	L	skin	72	10	root	yes	---	---	yes	epiderm
35.	di-	G	two	60	7	prefix	yes	---	---	yes	dicotyledon
36.	dis, dys	L	apart	28	15	root	yes	---	dys,(G) ill, bad	yes	dislocation

[1]Edmund C. Jaeger, A Source Book of Biological Names and Terms, C. C. Thomas Pub., Springfield, Ill. 1950, 574.03 J22S

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
37.	dorsum	L	back	26	15	root	yes	—	—	yes	dorsal
38.	ducare	L	to lead	13	8	root	no	duct	—	yes	reproduction
39.	dys, dis-	G	bad	17	12	root	yes	—	dys (L) apart	yes	[1]dysentary
40.	ect- ex- exo-	L	off, out of	66	6	prefix	yes	—	—	yes	external
41.	ena-, en- endo-	G	in	57	6	prefix	yes	—	—	yes	endoderm
42.	-eidos	G	like	3	12	suffix	no	-oid	—	yes	euglenoid
43.	epi-	G	upon	61	9	prefix	yes	—	—	yes	epidermis
44.	emia	G	blood	6	10	root	yes	—	—	yes	anemia
45.	erythos	G	red	23	20	root	yes	—	—	yes	erythocyte
46.	ferra	L	to bear	24	15	root	no	-fer	—	yes	conifer
47.	-fy	L	to make	9	15	suffix	yes	—	—	yes	identify
48.	game	G	to marry	15	16	root	yes	—	anglo-saxon gamen-play	yes	gamete
49.	gastro	G	stomach	59	14	root	yes	—	—	yes	gaster
50.	-gen	G	to be	24	13	suffix	yes	—	—	yes	oxygen

[1]Walter P. Agard & Herbert M. Howe, Medical Greek & Latin at a Glance (New York, 1955) Hoeber-Harper Pub. 610.14, A26lm

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
51.	genos	G	breed	25	14	root	yes	---	---	yes	gene
52.	genere	L	to carry	10	11	root	no	gest	---	yes	digestion
53.	glossa	G	tongue	17	13	root	yes	---	---	yes	hypoglossal
54.	gone	G	seed	5	11	root	no	gonium	---	yes	oogonium
55.	halo	L	breathe	17	14	root	yes	---	greek halos-salt	no	inhalent
56.	haima	G	blood	4	9	root	no	emia	---	yes	anemia
57.	helmis	G	worm	14	12	root	no	helminth	---	no	Nemahelminthes
58.	hemi-	G	half	65	13	prefix	yes	---	---	yes	Hemiptera
59.	hepar	G	liver	10	11	root	no	hepat	---	yes	hepatitis
60.	herb	L	soft plant	47	17	root	yes	---	---	yes	herbaceous
61.	heteros-	G	other	37	14	prefix	yes	---	---	yes	heterocyst
62.	hippos	G	horse	16	13	root	yes	---	---	yes	hippopotamus
63.	homo-	G	one and the same	71	12	prefix	yes	---	homo (L) man	yes	homogenize
64.	homo	L	man	69	8	root	yes	---	homo (G)	yes	Homo sapiens
65.	humus	L	earth	37	20	root	yes	---	one	no	humus
66.	hybris	G	outrage	24	12	root	yes	---	---	no	hybrid
67.	hydra	L, G	water	58	19	root	yes	---	---	yes	hydrotropism
68.	hyper-	G	above	70	11	prefix	yes	---	---	yes	hypersensitive
69.	hypo-	G	lower	69	11	prefix	yes	---	---	yes	hypodermic
70.	-ic, -oic	G	pert. to	21	16	suffix	yes	---	---	yes	Mesozoic

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	% gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
71.	ichthys	G	fish	30	16	root	yes	—	—	yes	ichthology
72.	ileum	L	groin	24	23	root	yes	—	—	no	ileum
73.	-ism, -ismos	G	condition	29	18	suffix	yes	—	—	yes	parasitism
74.	ite	G	div. of body	28	14	suffix	yes	—	—	yes	dendrite
75.	-itis	G	inflam-ation	36	13	suffix	yes	—	—	yes	appendicitis
76.	inter-	L	between	63	9	prefix	yes	—	—	yes	internode
77.	intra-	L	within	60	13	prefix	yes	—	—	yes	intracellular
78.	kardia	G	heart	12	14	root	no	cardia	—	yes	cardiac
79.	karpos	G	wrist	8	14	root	no	carpos	—	no	carpal
80.	kephale	G	head	5	16	root	no	cephale	—	yes	cephalopod
81.	kinein	G	to move	3	13	root	no	kin	—	yes	kinetic
82.	kolla	G	glue	3	11	root	no	colla	—	no	colloid
83.	kotyledon	G	cup shaped	41	18	root	no	cotyledon	—	no	cotyledon
84.	kytos	G	hollow vessel	10	9	root	no	cytos	—	yes	cytoplasm
85.	latus	L	side	12	14	root	no	lateris	—	no	lateral
86.	lac	L	milk	26	15	root	yes	—	—	yes	lactation
87.	labium	L	lip	42	23	root	yes	—	—	no	labium
88.	-let	L	dimin-utive	14	9	suffix	yes	—	—	yes	platelet
89.	lipos	G	fat	13	11	root	yes	—	—	no	lipoid

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
90.	logos	G	science of	63	8	root	yes	---	---	yes	biology
91.	lysis	G	loosening	17	12	root	yes	---	---	yes	hemolysis
92.	makros-	G	large	8	13	prefix	no	macro	---	yes	macronucleus
93.	mamma	L	breast	41	16	root	yes	---	---	yes	mammal
94.	maxilla	L	jawbone	45	23	root	yes	---	---	no	maxilla
95.	mensis	L	month	16	12	root	yes	---	---	no	menstruation
96.	mesos-	G	middle	28	11	prefix	yes	---	---	yes	mesoderm
97.	meta-	G	several	56	12	prefix	yes	---	---	yes	metaphase
98.	mikros-	G	small	21	12	prefix	no	micro	---	yes	microscope
99.	mono-	G	one	72	6	prefix	yes	---	---	yes	monocyte
100.	morphos	G	form	38	17	root	yes	---	---	yes	morphology
101.	mucus	L	secretion from nose	33	21	root	yes	---	---	no	mucous
102.	mutare	L	change	13	13	root	yes	---	---	yes	mutation
103.	mykes	G	fungus	3	10	root	no	myco	---	no	mycelium
104.	myos	G	muscle	8	13	root	yes	---	---	yes	myocarditis
105.	nema	G	thread	26	13	root	yes	---	---	yes	Nemahelminthes
106.	nephros	G	kidney	26	17	root	yes	---	---	yes	nephritis
107.	neuron	G	nerve	53	23	root	yes	---	---	yes	neuron
108.	nodus	L	knot	18	16	root	yes	---	---	yes	nodule
109.	nutrire	L	nourish	7	12	root	yes	---	---	no	nutrition
110.	oculus	L	eye	27	14	root	yes	---	---	no	oculist
111.	oikos	G	house	5	11	root	no	eco	---	no	ecology
112.	oion	G	egg	6	11	root	no	oon	---	no	oogonia

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
113.	opsis	G	appear-ance	9	12	root	yes	—	—	no	pteropsid
114.	optikos	G	pert. to sight	6	13	root	no	opticos	—	no	optical
115.	organon	G	instrument	14	15	root	yes	—	—	no	organ
116.	-osis,	G	condition of	26	17	suffix	yes	—	—	yes	metamorphosis
117.	osmus	G	pushing	12	11	root	yes	—	—	no	osmotic
118.	ovi ovo	L	egg	54	18	root	yes	—	—	yes	oviparous
119.	palaios	G	old	4	11	root	no	paleo	—	yes	paleontology
120.	parere	L	bring forth	6	10	root	no	parous	—	no	oviparous
121.	para-	G	beside	41	20	prefix	yes	—	—	yes	parasite
122.	pathos	G	suffering	34	19	root	yes	—	—	yes	pathogenic
123.	pellis	L	skin	7	12	root	yes	—	—	no	pellegra
124.	peptein	G	to cook	10	22	root	yes	—	—	yes	pepsin
125.	peri-	G	around	39	16	prefix	yes	—	—	yes	pericardium
126.	phagein	G	to eat	7	10	root	yes	—	—	yes	phagocyte
127.	pharynx	G	chasm	50	21	root	yes	—	—	no	pharynx
128.	pherein	G	to carry	2	9	root	no	phore	—	no	chromatophore
129.	phobos	G	fear	20	13	root	yes	—	—	yes	hydrophobia

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
130.	phyllon	G	leaf	7	10	root	yes	---	---	yes	chlorophyll
131.	phylon	G	tribe	15	11	root	yes	---	phyllon	no	phylum
132.	physis	G	nature	16	14	root	yes	---	---	yes	physiology
133.	phyton	G	plant	20	12	root	yes	---	---	yes	Bryophyte
134.	pithecus	G	ape	9	11	root	yes	---	---	no	Pithecantropus
135.	platys	G	flat	30	13	root	yes	---	---	yes	Platyhelminthes
136.	pleura	G	a rib	43	23	root	yes	---	---	yes	pleurisy
137.	pneuma	G	breath	40	18	root	yes	---	---	yes	pneumonia
138.	pollen	L	fine dust	44	21	root	yes	---	---	no	pollen
139.	poly-	G	many	64	8	prefix	yes	---	---	yes	polycotyledon
140.	ponere	L	to place	6	10	root	no	position	---	no	ovipositor
141.	pulmo	L	lung	35	15	root	yes	---	---	yes	pulmonary
142.	poros	G	pore	17	11	root	yes	---	---	yes	Porifera
143.	pus, pes ped, pod	G	foot	45	12	root	yes	---	---	yes	pseudopod
144.	protos-	G	first	32	14	prefix	yes	---	---	yes	protoplasm
145.	pteron	G	wing	20	9	root	yes	---	---	yes	pterodactyl
146.	pulmo	L	lung	33	13	root	yes	---	---	yes	pulmonary
147.	rachis	G	spine	18	16	root	no	ric-	---	no	rickets
148.	renal	G	kidney	40	26	root	yes	---	---	yes	renal
149.	sacrum	L	lowest bone of spine	39	22	root	yes	---	---	no	sacrum

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf., sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
150.	schizein	G	to split	9	10	root	yes	---	---	no	schizont
151.	secare	L	to cut off	5	12	root	no	seg	---	no	segment
152.	sepein	G	to make putrid	4	10	root	no	sepsis	---	no	antisepsis
153.	seta	L	stiff hair	41	15	root	yes	---	---	no	seta
154.	sitos	G	food	6	11	root	yes	---	---	no	parasite
155.	solvere	L	to dissolve	11	12	root	yes	---	---	no	solvent
156.	soma	G	body	27	14	root	yes	---	---	yes	chromosome
157.	spirare	L	breathe	13	11	root	yes	---	---	yes	respiration
158.	stamen	L	thread	45	22	root	yes	---	---	no	stamen
159.	steros	G	solid	13	13	root	yes	---	---	no	progesterone
160.	stoma	G	mouth	52	17	root	yes	---	---	no	hypostome
161.	streptos	G	twisted	19	15	root	yes	---	---	no	streptococcus
162.	sub-	L	blow	57	8	prefix	yes	---	---	yes	subnormal
163.	sym-, syn-	G	with	38	12	prefix	yes	---	---	yes	symbiosis
164.	tarsos	G	flat of foot	24	8	root	yes	---	---	no	metatarsal
165.	temnein	G	to cut	2	9	root	no	tom	---	yes	anatomy
166.	terra	L	land	57	12	root	yes	---	---	no	terrain
167.	testes	L	witness of virility	40	24	root	yes	---	---	no	testis

TABLE IX (Cont'd)

No.	Word	Origin	Meaning	%gen. use (#1)	%gen. use (#2)	Usly. as prf.; sufx. root form	Word gen. used in th. form	Com. form used	Other wds. for which word may have been mistaken	Gen. used in 2 or m. terms in B. texts	Example
168.	therme	G	heat	23	10	root	yes	---	---	yes	thermometer
169.	thrix	G	hair	5	11	root	no	trico	---	no	trichocyst
170.	thyreos	G	shield	3	11	root	no	thyro	---	no	hyperthyroidism
171.	tomos	L	to cut	6	10	root	yes	---	---	yes	anatomy
172.	toxicon	G	arrow poison	15	13	root	yes	---	---	yes	toxic
173.	trachys	G	rough	16	13	root	yes	---	---	no	trachea
174.	trans-	L	across	55	11	prefix	yes	---	---	yes	transportation
175.	trophos	G	feeder	15	12	root	yes	---	---	yes	atrophy
176.	tropos	G	to turn	19	14	root	yes	---	---	yes	tropism
177.	tri-	G	three	69	8	prefix	yes	---	---	yes	tricuspid
178.	vacca	L	cow	23	7	root	yes	---	---	yes	vaccination
179.	vas	L	vessel	30	19	root	yes	---	---	yes	vascular
180.	vena	L	vein	45	18	root	yes	---	---	yes	vein
181.	venter	L	belly	14	12	root	no	ventr	---	yes	ventral
182.	vita, viva	L	life	36	17	root	yes	---	---	yes	vitamin
183.	volvere	L	to turn	19	13	root	no	valv	---	yes	univalve
184.	vorare	L	devour	6	9	root	no	voro	---	yes	carnivore
185.	zoon	G	animal	32	11	root	yes	---	---	yes	zoology

It may be of interest to note that the percentage of times the term was used infrequently (those terms marked with a #2) has a narrow range for the entire list of 185 terms; generally, between 10-20 per cent. This may be seen on Table IX. Naturally, those terms appearing in the same form as commonly found today--those in the average individual's vocabulary, etc.--showed greater percentage of use.

TABLE I

PERCENTAGE USE OF PREFIXES

Survey Form No.	Prefix	% Use	Survey Form No.	Prefix	% Use
1	a-, an-	85	76	inter-	72
2	ad-	60	77	intra-	73
8	anti-	84	92	makro-	21
15	bi-	85	96	mesos-	39
27	co-, con-, com-,	52	97	meta-	68
32	de-	55	98	micro-	33
35	di-	67	99	mono-	78
40	ect-, ex-, exo-	72	121	para-	61
41	en-, em-, endo-	63	125	peri-	55
43	epi-	70	139	poly-	72
58	hemi-	78	144	protos-	29
61	heteros-	51	162	sub-	65
63	homo-	83	163	sym-, syn-,	50
68	hyper-	81	174	trans-	66
69	hypo-	80	177	tri-	77

Average percentage use for all prefixes - 68%

TABLE XI

PERCENTAGE USE OF SUFFIXES

Survey Form No.	Term	% Use	Survey Form No.	Term	% Use
26	-cle	34	74	-itc	42
42	-eidos	15	75	-itis	49
47	-fy	24	88	-let	23
50	-gen	37	90	-logos	71
70	-ic,-oic	37	113	-opsis	21
73	-ism	47	116	-osis	43

Average percentage use is 36%

Prefixes generally show the highest percentage of use--an average of 68 per cent by Table X; next are suffixes which show an average of 36 per cent use, as shown in Table XI.

In cases where the original Greek term was of a different form from the form it takes today, the percentage was notably lower. A good example of this is in the suffix, "-eidos" (Term No. 42), meaning "like," which is used in words today as "-old." The term is possibly as well known as most other suffixes, but would probably be familiar in the form listed only to those teachers having a background in Greek.

Again, this can be illustrated in the Greek term for blood, "haima" (Term No. 56), which had 13 per cent usage, as compared to the form "emia" (Term No. 44), with which we are more familiar, which had 16 per cent usage. In this case, the same word was listed twice, in two different forms.

The Greek term, "temnein" (Form No. 165), meaning "to cut"--11 per cent, and the Latin term, "tomus" (Term No. 171), meaning "to cut"-- 16 per cent, are both generally used in the form, "tom," today. This is an example of how two terms having different spelling but the same meaning from different languages are used as one term today.

"Homo," a Greek term meaning "one and the same"--83 per cent, and "homo," today, but have different meanings. Although the percentage of usage was high, it is doubtful if this number of teachers realized both meanings, as indicated from over-all percentages of all terms.

The use of the letter "k", as found in "kardia," instead of "cardia," seemed to be quite confusing to many people. This term, (Term No. 78), was marked by only 26 per cent of the teachers. This common term being listed by so few seemed to indicate a lack of knowledge of Greek. More than half of our biological terms are of Greek derivation.

The duplication of the term, "pulmo" (Term No. 141), meaning "lung"--50 per cent, and "pulmo" (Term No. 146)--46 per cent, was not intentional; but it might indicate that the majority of teachers had tired by this point. The over-all picture of percentages shows a considerably larger number of terms checked among the first twenty-five terms than in the last twenty-five. The last eight terms of the list (on the survey form sent to the teachers) were placed on a separate sheet. A noticeable number of teachers who had checked many terms on the first page left the second page blank.

CHAPTER II

RESUME OF COMMENTS INCLUDED WITH RETURNS

Although the writer had not specifically asked for comments, he received a wide variety of them on approximately 20 per cent of the returns. Feeling that many of these were pertinent to the report, the writer has taken the liberty to include some of them.

The identity prior to each quotation has the following meaning:

Bi. Major or Bi. Minor	No. of Yrs. Teaching Experience	No. of Yrs. H.S. Biol. Teaching	For. Lang. Taken In College*	No. of 185 Survey Derivatives Which He Teaches In Class

Example: Yes - 4 - 2 French-German - 75

*If return indicated two or more years of a specific language were taken in high school, it is recorded here.

First, a comment from a former biology teacher, presently the head of the science department in a large school, who completed the return in lieu of a biology teacher:

Yes - 7 - 4 - German - 70 - "Knowing the poor rate of returns one sometimes gets on surveys of this nature, I am taking the liberty to complete this form, . . . hope that it may be of value."

Numerous similar comments were received.

Concerning comments from proponents of the plan, the following is possibly the most emphatic:

Yes - 35 - 16 - Latin-Spanish-French - 182 - ". . . there should be a State law that any child who has an I.Q. of 110 or over be forced to

take at least one semester of Latin and one of Greek--just to learn derivation of words."

Additional comments from teachers using derivation follow:

No data - 98 - "Am delighted that you are doing this study. . . find study of roots an indispensable method of vocabulary building in high school."

No - 33 - 25 - German-Latin - 127 - "Ilike your report and am happy to check what I use in learning meaning and spelling of new words."

Yes - 11 - 11 - 0 - 82 - " . . . definitely sold on using prefixes and suffixes to explain meanings of words--particularily for better students who go to college."

Yes - 7 - 5 - German-Latin-Greek - 136 "Am a firm believer in teaching terminology from the root words."

- 11 - 6 - Latin - 11 "Was very interested in your topic. I do try to stress the Latin and Greek derivation. . . . It seems that today so few high school students take Latin . . . . constantly feel that I should stress it more."

No - 19 - 5 - Latin-French-Greek - 86 - ". . . find that my limited study of Greek has helped me tremendously. It is the difference between understanding the descriptive meaning of the terms and simply memorizing them. . . . if we could get more help from spelling teachers so that by the time students get to second year high school they would know common prefixes-roots-suffixes."

No - 12 - 12 Latin-French - 158 - "I have five biology students who are also taking Latin this year. I find that I get much more interest and motivation in relating root words to the word derivatives which they

use in their work. It makes the vocabulary work much more meaningful and I'm sure it adds interest to their Latin when they discover how it helps them in their other classes. It certainly helps them build a fine vocabulary which has meaning."

Yes - 18 - 10 - German-Latin-Spanish-French - 184 - ". . . would do much better had I not dropped the only Greek course I ever started . . . . believe strongly in using words and building new ones in the lesson period."

No - 4 - 3 - 0 - 131 - ". . . . am an English teacher and I use words (derivatives) to teach meanings and usage, and to build vocabulary. I couldn't teach any subject without presenting word meaning and significances first."

No - 6 - 3 - Spanish - 42 - "This (list) is difficult to do, because we probably use many more roots, prefixes, and suffixes than we are aware of while we are explaining terms. . . . this method is just one of any number of means of teaching meanings."

No - 5 - 4 - Greek-Hebrew - 37 - ". . . I think that a glossary of root words (Greek and Latin) would help in teaching biology as well as other sciences."

Yes - 2 - 2 - 78 - "In my two short years of teaching biology, . . . I used these prefixes and suffixes to a great extent. . . ."

Yes - 23 - 23 - French - 53 - ". . . seldom use of roots in beginning biology, but I usually do in advanced--especially in anatomy."

Yes - 11 - 11 - Norwegian-French-Greek - 98 - ". . . an appreciation of the basic structure is important. . . . It might be of interest to you to know that Latin and Greek vocabulary are my hobby."

Yes - 4 - 2 - Latin-French - ". . . not a class period goes by that we do not discuss derivation of some term--with the help usually of Webster's dictionary. . . . I notice a marked "carry over" particularily in those students studying Latin. . . . I only wish that our text books included derivatives in the glossaries."

Yes - 4 - 4 - Latin - 83 - "I use meaning of words in Greek and Latin for all phylum and class--and most of the examples. . . . It seems students get a better concept of classification and retain them longer."

Yes - 13 - 10 German-Latin - 79 - "Most times the Greek or Latin word is not given directly but a statement such as: 'This comes from the Latin word which means "life"' and the use of the word as in 'vital,' 'vitamin' or 'vitality' often brings forth the word from a pupil then taking Latin or who has taken it.

"Another technique is to take the prefix, etc., as it is commonly used, indicate the meaning and illustrate various words in which it may be found, i.e., micro = small, microscope, micrometer, microtome, microptera (Romalea).

"I think teaching vocabulary by use of word derivatives very useful and frequently wish I had studied Greek."

Yes - 9 - 6 - German-Spanish - 185 - "I am rather pleased someone is doing work such as this. . . . Biology has long suffered a bad name by having so many 'long' words--they, in turn, not being taught through their real meaning--this is the way they should be taught."

Examples of individuals carrying on more extensive programs than that requested in survey are as follows:

Yes - 8 - 7 - Spanish - 74 - "I use the derivatives even now in other classes (English and Spanish)."

Yes - 41 - 36 - Spanish-French - 137 - ". . . emphasize derivatives of words, both Latin and Greek, for general science and biology, also in 'environs', French - 'surroundings,' and 'grosbenk,' German for 'large bill' meaning ' cardinal.' Youngsters usually like such explanations."

There were many persons who did not use the derivative method of teaching vocabulary--most of those that made comments did not seem to understand how to use this method, as evidenced by some of the following quotes:

Yes - 21 - 12 - French - ". . . do not teach derivative . . . too much when you have six classes a day--five other than biology."

Yes - 7 - 7 - 60 -". . . have enough trouble with students trying to understand English. I use strange words as little as possible. Only two to three students of my 150 will ever go into biology work. I would be spending time teaching something of little importance to the majority."

Yes - 40 - 30 - French - "It seems to me you are wasting your time. . . . My biology teaching has all been done at the secondary level, very successful and happy classes. But I keep it on that level. Far too many who are teaching biology are ruining it for high school youngsters. ..."

Yes - 7 - 3 -". . .regret to say that I do not emphasize this approach to vocabulary as I cannot convince myself of its import."

Yes - 8 - 1 -". . . Seldom use any Latin or Greek words in any of my classes and therefore do not use derivatives in teaching meanings of words."

Tes - 8 - 6 -". . . don't teach vocabulary by use of derivatives except that some word derivatives may come up in class discussion- thats all!"

No - 8 - 5 - "I do not spend much time on teaching vocabulary for teaching word derivatives for the simple reason I do not know much about it myself. I do have a collection of words that I hand out for reference. . . ."

No - 9 - 3 - "Since I have had no foreign language, I don't use any of the above derivatives."

No - 12 - 2 - ". . . teach vocabulary and spelling, but teaching derivation is time consuming."

Yes - 8 - 4 - French - 27 - ". . . feel that the time spent in memorizing them could be spent to cover more of the many interesting phases and specimens related to biology. . . . Naturally, I'm hoping you are trying to help rid our courses of Latin and Greek terms, but have a feeling you are not."

Yes - 46 - 35 - German-Latin-French-Spanish-". . . very few teachers who teach Latin or Greek teach them so that they have any connection with biology. I doubt that one Greek or Latin teacher in a thousand ever took a course in biology unless it was forced upon him. . . I approve of a course in Greek and Latin roots. . . It is just as easy to teach the words that come from the Latin or Greek in biology to high school students in other ways. Most high school students have had neither Latin or Greek, so in most cases it is lost effort to introduce a second or third unknown to them. . . ."

Yes - 36 - 36 - Spanish - 53 - "For sophomore high school students,

many of whom are C or sub-C quality and have never studied a foreign language, it is a bit difficult to get across to them anything other than 'so what'!"

The following selections are from teachers not using derivations, but emphasizing vocabulary.

Yes - ____ - 2 - 2 - "We do not teach word origin to any extent; however, with regard to scientific names, we do try to emphasize word recognition based on use of ancient Latin and Greek origin of the roots. . . Beyond this we teach structure, relationship and function with considerable emphasis on recognition."

No - 1 - 1 - German-French - 13 -". . . teach very little vocabulary by use of word derivatives. I teach a lot of vocabulary because it is important for high school students; however, most of this is done by association of a name with some object, function, etc.

Several teachers made reports comparable to the following statement:

Yes - 3 - 2 - Latin - 148 - "You are conducting a very interesting study. Since I have never made a special study of Greek and Latin derivatives, I would like very much to read the results of your study."

In several instances, lists of terms used by the reportee in his classes were returned with the completed survey form. In addition to this, the following references were made to lists available.

Yes - 2 - 2 - 74 - "Enclosed you will find a copy of a paper prepared by Mr. Robert Boles (OSU graduate student) a few years ago to be used by our high school classes. We find the list of great value in building a working science vocabulary."

There were three other returns which made reference to the work of

Mr. Boles. Two references to Dr. Featherly's work were also listed.

Yes - 28 - 25 - Latin - Spanish - French - "I have found it (Taxonomic Terminology of Higher Plants by H. I. Featherly) to be very good."

Possibly the greatest number of letters received were from teachers having an inquiring nature into the subject since it was not familiar to them. Following are some examples of this:

Yes - 7 - 3 - German - 59 - "This is an idea I may be able to use. Perhaps I'm missing something by not teaching derivatives. Thanks for the idea."

Yes - 22 - 5 - 7 - "Many of them have no meaning to me at all. I only wish I knew Latin derivatives."

These and similar statements, in themselves, would have made the report worth while.

CHAPTER III

CONCLUSIONS

Results of the survey indicate that teachers having majors in biology, Greek and/or Latin in college and greater length of teaching experience taught more word meanings, by use of derivatives, than teachers not having these qualifications. The over-all percentages of terms used seem to be relatively low, as compared to the number which are found in biology texts.

Since only two individuals reported specific courses in Latin and/or Greek derivatives, probably biological terminology was not stressed in these two language studies. At best, the biology and language courses would have had a few common prefixes and suffixes.

The survey indicates that many teachers realize their inadequacy in this field and have professed an interest in learning more. The following suggestions are propounded, not only on behalf of the biology teacher (and his students), but also, for other science teachers or all teachers.

1. That teachers take a course in Greek and Latin derivatives while in college.

2. That lists of prefixes, suffixes and roots be placed in the hands of each biology teacher. (List compiled by Robert J. Boles is among the best.)

This could be accomplished through:

1. Departments of Education in the various states.
2. Biological journals.
3. National educational journals to which most teachers subscribe.

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APPENDIX

COPY OF SURVEY FORM

1106 West Scott
Stillwater, Oklahoma
December 19, 1959

Dear

By way of introduction - I am a high school biology teacher attending O. S. U. this year under a grant from the National Science Foundation.

As a required report I have chosen the topic "Use of Greek and Latin Derivatives in the Teaching of High School Biology."

Noting that you are a biology teacher, I am requesting your assistance in completing the attached survey form and hope that you will return it to me at your earliest convenience.

Thanking you for your kind consideration, I remain

Sincerely,

W. W. Lohrentz

Questionaire:

Use of Greek and Latin Derivatives in Teaching High School Biology.

I. Please check the appropriate space or write out the better descriptive word for each category.

Major in college - biology_____non-biology_____
Minor in college - biology_____non-biology_____
Number of years teaching experience_____
Number of years teaching biology_____
Number of sections of biology taught per day_____
What foreign language did you take in college
Germanic - Norweigian_____Swedish_____German_____
Italic - Latin _____Spanish_____Portuguese_____
French_____Italian_____Roumanian_____
Baltic - Lithuanian_____
Slavic - Russian_____
Greek_____
Other - please name_____

II. Purpose of the survey is to determine the degree to which teachers teach vocabulary by use of word derivatives.

The list of words has been selected primarily from a series of high school biology texts.

Some of the words are "root" words, while others are normally used as prefixes or suffixes. The letter "G" and "L" behind the term indicates Greek or Latin origin.

Instructions - Place a 1 in the blank preceeding the word if you use the derivative as the principal method of teaching the meaning of the word.

Place a 2 in the blank if you seldom use the derivative for teaching word meaning.

Do not mark those words that you either do not know the meaning of or that you do not use.

Example - The word biology is derived from the Greek words "bios" meaning life and "logos" meaning speak. If you teach the derivatives of this word extensively you would mark 1 bios G and 1 logos G.

II continued:

___a-, an- G
___ad- L
___adenos G
___allelon G
___angeion G
___anthos G
___anthropos G
___anti- G
___appendere L
___arteria G
___arthron G
___autos G
___axilla L
___ballein G
___bi- L
___bios G
___blastos G
___botane G
___bryein G
___calor L
___cata G
___chloros G
___chole G
___chroma G
___-cide L
___-cle L
___co-, com-, con-, cor-, L
___corpus L
___cortex L
___cuspis L
___cutis L
___de- L
___demos- L
___derma L
___di- G
___dis-, dys- L
___dorsum L
___ducere L
___dys- G
___ect- ex-, exo-, L
___em-, en-, endo-, G
___eidos G
___epi- G
___emia- G
___erythros G
___fera L
___-fy L
___game G
___gastro G
___-gen G
___genos G
___gerere L
___glossa G
___gone G
___halo L
___haima G
___helmis G
___hemi- G
___hepar G
___herb L
___heteros G
___hippos G
___homo G
___homo L
___humus L
___hybris G
___hydra G, L
___hyper- G
___hypo- G
___-ic, -oic G
___ichthys G
___ileum L
___-ism, -ismos G
___-ite G
___-itis G
___inter L
___intra L
___kardia G
___karpos G
___kephale G
___kinein G
___kolla G
___kotyledon G
___kytos G
___latus L
___lac L
___labium L
___-let L
___lipos G
___logos G
___lysis G
___makros G
___mamma L
___maxilla L
___mensis L
___mesos G
___meta G
___mikros G
___mono G
___morphe G/or ___morphos
___mucus L
___mutare L

II continued:

____mykes G
____myos G
____nema G
____nephros G
____neuron G
____nodus L
____nutrire L
____oculus L
____oikos G
____opsis G
____optikos G
____organon G
____-osis, -sis, G
____ovi, ovo, L
____palaios G
____parere L
____para- G
____pathos G
____pellis L
____peptein G
____peri- G
____phagein G
____pharynx G
____pherein G
____phobos G
____phyllon G
____phylon G
____physis G
____phyton G
____pithecus G
____platys G
____pleura G
____pneuma G
____pollen L
____poly- G
____ponere L
____pulmo L
____poros G
____pus, pes, ped, pod G
____protos G
____pteron G
____pulmo L
____rachis G
____renal G
____sacrum L
____schizein G
____secare L
____sepein G
____seta L
____sitos G
____solvere L
____soma G
____spirare L
____stamen L
____steros G
____stoma G
____streptos G
____sub- L
____sym-, syn- G
____tarsos G
____temnein G
____terra L
____testes L
____therme G
____thrix G
____thyreos G
____tomus L/or____tomos G
____toxicon G
____trachys G
____trans- L
____trophos G
____tropos G
____tri- G
____vacca L
____vas L
____vena L
____venter L
____vita, vivi L
____volvere L
____vorare L
____zoon G

Suggestions for additional root words, prefixes and suffixes_____

VITA

Walter Wollmann Lohrentz

Candidate for the Degree of

Master of Science

Report: USE OF GREEK AND LATIN DERIVATIVES IN TEACHING HIGH SCHOOL BIOLOGY

Major Field: Natural Science

Biographical:

Personal Data: Born in Peking, China on November 17, 1922, the son of Abraham M. and Marie Lohrentz.

Education: Attended elementary school at McPherson, Kansas; graduated from McPherson High School in 1941; received Bachelor of Arts degree from Bethel College, North Newton, Kansas, in 1944, with majors in Biology and Chemistry; completed the requirements for Master of Science degree in May 1960.

Professional Experience: Taught biological and physical sciences for three years at Coldwater High School, Coldwater, Kansas; taught biological and physical sciences at Burns Consolidated Schools, Burns, Kansas, for nine years.