

# PSYCHOLOGICAL ASPECTS OF LANGUAGE

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## PURPOSE AND METHOD

*Purpose.* The investigation discussed in this article was undertaken for the purpose of contributing some data upon the question of the relation of language to general intelligence. It is hoped that the material presented may aid in a small degree in answering the following questions: What is the relation between the extent of a pupil's vocabulary and his scholastic attainments? What correlation exists between accuracy and precision in the knowledge and use of words, and vocabulary range? What are the chief factors in the acquisition and use of words? To what extent does present-day school room practice facilitate the pupil's linguistic development?

*Method.* From a series of preliminary investigations it was decided that the following principles were valid for a vocabulary test: (1) The best test as to whether a word is sufficiently well known by a pupil to be credited to him is his ability to use it correctly in a sentence. (2) The range of vocabulary varies so much within any group that a pupil must be tested upon approximately the entire list of words used, and this list must range from the most simple to the most difficult. (3) The list of test words should be short enough to be completed by the average pupil at one sitting of thirty or forty minutes. Accordingly the final test was arranged containing 200 words, one for every 140 in Webster's Academic Dictionary. The words were selected at equal intervals throughout the dictionary. The test was printed in the form of a four page folder, the words being arranged as nearly as possible in order of difficulty, and each pupil was furnished with a copy. The test was given to 2000 pupils of 68 different classes from the second to the twelfth grades, in 16 schools of six different school systems located in Wisconsin, Iowa, Missouri and Colorado. The places in which the tests were given vary in size and character from an agricultural town of 1200 people to a small modern city of 30,000. The author supervised personally the giving of 800 of the tests; the remainder were given under the direction of the various principals of these schools. The tests were all given during the month of May so that the results show the rankings and averages of the various

grades at the end of the school year. The instructions to the pupils which were placed at the top of the first page of the folder were as follows: "In the blank space after each word that you know, write a sentence using the word correctly. Place a cross before each word that you do not know. For seventh grade pupils and above omit the first 25 words." On the last page of the folder were spaces for the pupils' grades in English, manual training, oral expression and average scholarship, with a request that these grades be supplied by the teacher.

With respect to scoring results any such test is, to a certain extent, defective, since it is not always possible to decide from a pupil's use of a word in a sentence whether he knows the word or not. The principle which was followed in grading the papers was that the attempted use of a word is an indication in itself that the word is known, and unless the use in the sentence was such as to indicate that it was not known, the pupil was given credit for it.

#### GRADE AVERAGES AND VARIATIONS IN VOCABULARY

In a study somewhat similar to the present one Kirkpatrick (7) attempted to find the average size of the vocabulary for each grade, and, while the method used was different, the results did not differ materially from those found here. His averages were as follows: Grade II, 4480; Grade III, 6620; Grade IV, 7020; Grade V, 7860; Grade VI, 8700; Grade VII, 10660; Grade VIII, 12000. Comparing these results with those in Table I, it will be seen that the increase in size of vocabulary from year to year appears much more uniform here than Kirkpatrick found it to be. The averages for Grades II and III and for those above the eighth in Table I cannot be regarded as reliable on account of the small number of pupils tested. It will be noted that the average of the three tenth grades tested is larger than either the eleventh or twelfth grade average. No explanation of this can be offered except that in the case of two of the tenth grades the principals remarked that they were unusually strong classes. The average gain from year to year for Grades II to VIII is approximately 1400 words. It appears that the gain in the seventh grade is greater than that for any other year, being 371 above the average. This is seen to be the case also in Kirkpatrick's results, disregarding Grades II and III which are admittedly unreliable. It was found by Dr. Jones, in a study of pupils' compositions that the greatest gain in the number of words

used by pupils of one grade over those of the preceding grade was in the seventh grade. It is quite likely that this unusual increase in linguistic ability in this grade is due to the fact that a large number of dull pupils drop out of school at the end of the sixth year. This

TABLE I

*Average Size of Vocabulary for the Various Grades as Determined by All the Tests Which Were Completed*

Grade	No. of classes	No. of pupils	Av. vocabulary	Gain over preceding year	A. D. of classes	Per cent deviation
II	1	22	4000			
III	3	78	5429	1429	453	6 5
IV	8	228	6887	1458	453	6 5
V	10	245	8207	1320	717	8 7
VI	13	378	9613	1406	754	7 8
VII	11	300	11445	1832	581	5 0
VIII	10	255	12819	1374	779	6 0
IX	3	72	13504	685		
X	3	71	15340	1736		
XI	3	71	13974			
XII	3	41	14975			

A. D., average deviation.

would seem to explain the fact that there is a smaller percentage of variation among seventh grades than among the classes of any other grade. Some rather surprising facts are discovered when we compare the grades of different schools: The highest fourth grade had an average vocabulary of 8806, being larger than the average of the fifth grades and almost as large as the average of the sixth. The best eighth grade with a vocabulary of 14218 apparently had a better knowledge and command of words than the poorest senior high school class, and almost as good as the average of the three senior classes. These cases are typical of the overlapping in vocabulary ability throughout. In a later section dealing with the causes of individual variation in vocabulary an attempt will be made to explain these variations in grade averages, since whatever factors operate to cause individual differences would also tend to cause differences between grades.

#### AVERAGES FOR BOYS AND GIRLS

The differences between boys and girls in the matter of vocabulary do not appear to be great as will be seen from the following table, and not uniformly in favor of either.

TABLE II

Grade	Boys	Average	Girls	Average
III	38	5527	40	5372
IV	126	6546	102	7308
V	114	8165	131	8320
VI	210	9886	168	9327
VII	146	11363	154	11472
VIII	113	12914	142	12627
IX	38	13357	34	13659
X	45	15112	26	15738
XI	41	14294	30	13352
XII	21	15634	20	14273
Average	892	10232	847	10156

The girls average 76 words less than the boys, an entirely insignificant difference. The boys rank higher in five grades, while the girls are higher in the other five.

#### THE RELATION OF SCHOOL ABILITIES TO RANGE OF VOCABULARY

The grades of approximately 1500 pupils were returned on the test sheets sent to teachers, about 500 papers being returned without the grades. For about 200 pupils the grades in average scholarship and language were given in figures, the remainder being in letters or words. It was not expected that the grades in oral expression would be very reliable since teachers, generally, pay little attention to grading this ability. It was thought, however, that the estimates thus secured would aid in discussing the proposition that there are many persons who have large vocabularies and are still unable to give clear expression to their thoughts.

*Language Grades and Vocabulary Ability.* Table III contains a summary of the results of the test in the classes in which the language grades were returned in figures. The vocabulary index is the number of words correctly used from the 200 word list. The coefficient of correlation is represented by  $r$ , and was calculated by the Pearson formula. The average deviation is indicated by A. D.

TABLE III

School	Grade	No. pupils	Vocabulary Indices				Language Grades			A. D.	$r$ .
			Av.	Highest	Lowest	A. D.	Av	Highest	Lowest		
X	IV	26	48	65	26	6 1	83 8	91	72	4 0	.73
II	V	17	60 7	77	46	6 6	80 3	91	70	5 2	.90
IX	VI	35	72	89	43	9 7	83 7	95	70	6 6	.54
X	VI	20	59.2	70	43 6	6 8	79 5	88	67	5 5	.85
VI	VII	40	80 5	109	48	7 8	80 5	95	60	4 9	.82
XI	VII	18	84	106	66	7 7	85	95	70	6 6	.66
I	VIII	26	84	114	63	12 8	83 4	91 5	72	3 6	.72
XV	X	21	110 5	128	82	11 7	86 5	95	70	5 6	.81

In this table two features stand out prominently: (1) The marked deviations from the average in vocabulary ability and the absence of such deviations in the language grades; (2) the high degree of correlation between the two abilities considered. The latter is of considerable significance to the teacher since it indicates that she could by a vocabulary test estimate the language ability of her pupils in an objective and impersonal manner, accurately and easily. The fact that all the pupils of a certain group, as for example, Grade VIII, School I, are using the same text book, doing the same outside reading, are expected to write the same sort of compositions, in short, are subject to the same linguistic requirements, when certain individuals in the group understand and are capable of using almost twice as many different words as are certain others, points strongly toward the conclusion that there is something fundamentally inadequate in the basis for the grouping.

It is somewhat surprising, considering the various factors tending to produce abnormal results, which are usually present in giving such a test, that the degree of correlation should be so high. The lowest coefficient is .54, the highest .90, while the average of the eight coefficients is .76.

Table IV shows the relation between the vocabulary abilities and the language grades of 1000 pupils whose grades were given in letters or words.

TABLE IV

Language grade	No. pupils	<i>Distribution on Basis of Vocabulary Ability</i>							
		Excellent		Good		Fair		Poor	
		No.	%	No.	%	No.	%	No.	%
Excellent	146	86	59	56	38.3	4	2.7	0	0
Good	459	55	12	295	64.3	94	20.5	15	3.2
Fair	291	5	1.7	100	34.4	144	49.4	42	14.4
Poor	104	0	0	6	5.8	43	41.3	55	52.8

In order to make clear the method by which these correlations were worked out let us consider a group in which the teacher had marked 5 pupils E; 22, G; 8, F and 1, P. Assuming this apportionment for the group, we then divided the class as to vocabulary scores in the same proportions. We then find that three of the E pupils in language fall within the E division in vocabulary, and two in the G group; that 16 of the G pupils in language fall within the G group in vocabulary, two in the E group, and four in the F group; that three of the F pupils in language fall within the F group in

vocabulary, four in the G, and one in the P group; that the one P pupil falls in the F group in vocabulary. The scores of the 1000 pupils were distributed relatively to the grades in this manner.

The fact that the correlation is higher in the "Excellent" and "Good" divisions probably indicates that teachers grade more accurately here than in the "Fair" and "Poor" groups. That is, they probably tend to raise the grades of fair or poor pupils above what they should be.

*Oral Expression and Range of Vocabulary.* When the grades in oral expression are compared with vocabulary abilities we find about the same relationship as existed between language grades and vocabulary ability. The average tendency of grades in oral expression

TABLE V

Oral Expression grades	No. pupils	<i>Distribution on Basis of Vocabulary Ability</i>							
		Excellent		Good		Fair		Poor	
		No.	%	No.	%	No.	%	No.	%
Excellent	180	110	61.1	58	32.2	12	6.7	0	0
Good	418	62	14.8	283	67.7	62	14.8	11	2.6
Fair	260	7	2.7	75	28.9	128	49.2	50	19.2
Poor	142	0	0	7	4.9	52	36.7	83	58.4

to fall within their proper or corresponding groups in vocabulary ability is seen to be slightly above 59%. It will be noted that no pupil who was excellent in vocabulary was poor in oral expression and that no pupil who was poor in vocabulary was graded excellent in oral expression. Here again we have evidence of the better grading by teachers in the "Excellent" and "Good" groups. From the material presented here we are forced to the conclusion that there are relatively few persons who have large vocabularies and are not good in oral expression. The fact that about 5% of the pupils who were marked poor in oral expression are in the good division in vocabulary indicates that there probably are such individuals.

*Range of Vocabulary and Average Scholarship.* The average scholarship grades, in most cases, represent the teachers' estimates of the quality and quantity of pupils' achievements in all their studies except manual training. These grades were given in figures for only five classes. It will be noted that the coefficients of correlation vary from .39 to .85, the average of the five being .63.

TABLE VI

School	Grade	No. pupils	Vocabulary Indices			Average Scholarship Grades					r
			Av.	Highest	Lowest	A. D.	Av.	Highest	Lowest	A. D.	
X	IV	26	48.2	65	26	6.1	81.5	91	75	4.1	.85
IX	VI	35	72	89	43	9.7	80	90	65	6.9	.60
XI	VII	18	84	106	66	6.6	84.7	95	70	5.9	.64
VII	VII	20	84.4	118	65	16.3	79	84	74	1.9	.39
XV	X	21	110.5	128	82	11.7	87	94	80	4.3	.70

TABLE VII

Average Scholarship Grade	No of pupils	Distribution on Basis of Vocabulary Ability							
		Excellent		Good		Fair		Poor	
		No.	%	No.	%	No.	%	No.	%
Excellent	163	93	57	65	39.8	5	3.1	0	0
Good	427	60	14	270	63.2	82	19.2	15	3.5
Fair	277	10	3.6	82	29.6	140	50.6	45	16.1
Poor	133	0	0	12	9	48	3.6	73	55.

It would seem from Table VII that there is as high a correlation between average scholarship and size of vocabulary as there is between oral expression and vocabulary ability. The average per cent. of exact correspondence in groups is approximately the same in both cases, a little above 56 per cent.

In view of the above results we may safely say that the opinion sometimes ventured, that there are certain individuals who have a large fund of words at their command and are very proficient in the use of words generally but are mentally weak and inefficient, is by no means well founded. The only other alternative is that average scholarship grades are not indicative of mental capacity; it would be difficult, indeed, to defend such a proposition.

*Manual Training Grades and Range of Vocabulary.* The theory that motor ability and verbal capacity do not tend strongly to coincide is supported by the following table.

TABLE VIII

Manual Training Grade	No. pupils	Distribution on Basis of Vocabulary Ability							
		Excellent		Good		Fair		Poor	
		No.	%	No.	%	No.	%	No.	%
Excellent	66	23	34.8	35	53	8	12.1	0	0
Good	248	39	15.7	179	72.2	20	8	10	4
Fair	70	4	5.7	31	44.3	32	45.7	3	4.2
Poor	36	0	0	6	16.7	15	41.6	15	41.6

It will be noted that more of the E pupils in manual training come in the G rank in vocabulary than come in the E rank; that about as large a percentage of the F pupils in manual training come in the G rank in vocabulary as come in the F rank; while just as many of the P pupils in manual training come in the F

group in vocabulary as come in the P group. It is significant, however, that no E pupil in manual training is found in the P group in vocabulary.

As a check upon these results a personal study was made of a group of 48 high school pupils. After securing the instructor's grades upon these pupils in manual training, they were given the vocabulary test, and the correlation between the two abilities was found to be .21. It was found by inspection of the details that the pupil who ranked highest in vocabulary was marked 2% below the average in manual training, and that the pupil who ranked lowest in vocabulary was graded 5% above the average of his class in manual training. On the other hand, all the pupils who had marks as low as 60% in manual training were found in the lower half of the group in vocabulary ability.

### DIFFICULTIES AND ERRORS IN THE USE OF WORDS

The list of test words is here given arranged in order of their relative difficulty upon the basis of results of the test.

Orange	heart	seek	direct	charity
cup	hour	balance	favor	reclaim
penny	worse	beetle	shaft	unfortunately
light	stump	kernel	49 psalm	crinkly
frog	grain	skeleton	text	insure
storm	report	*	revolution	landman
week	roast	failing	gill	loneliness
twenty	important	somerset	partition	ferry
flat	shiny	39 childhood	ye	69 bower
third	remain	rate	hippopotamus	tubber
place	foamy	labor	betrayed	bred
square	absent	diving	triangle	inclined
be	barehead	sup	morsel	everlastingly
east	29 camera	content	59 foremost	vail
frame	snuff	gaily	crackle	numbness
82 downcast	polygamist	potent	circularity	anastrophe
observation	picklock	interposer	de capo	epicarp
inkhorn	grievance	municipality	saline	papilionaceous
sycamore	abate	complexity	quayage	mellifluous
pavilion	spawn	proportionateness	unbias	palestra
pleurisy	winebibber	tuffany	marline	arrogate
discrown	slightness	putnd	tocsin	apothecize
bloat	phenomenal	debauch	preclusive	embracery
determination	messieurs	rotunda	transcendentalist	milt
spinster	aquarium	dissension	immaterialism	templet
copperhead	centiped	coequal	gastromomist	tump
external	restriction	tactical	anodyne	decortication
savory	banker	vestige	trivet	homunculus
buckboard	Finnish	caprice	conservancy	vitri-facture
surpassing	msgotten	proboscis	comatose	pretermitt
sickishness	er	cosmetic	carpologist	deltoid
92 upholster	jade	cajolery	monetization	algoid
reexport	leniency	hyperbolic	tatterdemalion	stannary
alternate	layering	whitlather	indium	endemical
dromedary	abduction	attainability	wady	neris
jugular	deplorably	binnacle	malleate	ryot
nobby	venom	sere	henna	magian
infidel	overmaster	scholasticism	materia medica	gymnotus
Olympic	humanitarian	effusiveness	bole	acescent
agate	subsist	clearstarch	autonomic	adytum

\*Through an error in printing the word *skeleton* occurs twice.



The number of words which any grade should know from the list is found by dividing the average vocabulary of the grade by 140. Accordingly grade II should be able to use 29 words; grade III, 39; grade IV, 49; grade V, 59; grade VI, 69; grade VII, 82; grade VIII, 92.

None of the last 25 words were used correctly by any pupil; that is, 12½ per cent. of the words in Webster's Academic Dictionary are entirely foreign to high school pupils. There were, naturally, many errors made in the attempted use of words which were not due to real inability to use the words. The following examples taken from the test sheets are suggested as explanatory of such mistakes: (1) Those due to imperfect visual imagery; *e. g.*, "They sold the lubber from the whale," "Psalm trees grow here." (2) Errors due to imperfect auditory imagery; *e. g.*, "Our you a boy?" "I will potent I am dead." (3) Errors due partly to both imperfect auditory and visual imagery; *e. g.*, "The horse is a cosmetic animal," "I pulled the spinster out of my foot." (4) Errors due partly to confused auditory and visual imagery, and partly to lack of familiarity with the word; *e. g.*, "She made her debauch at the party" "It is an autonomic gun." Of course, there is no hard and fast line between these four types of errors. It may seem strange that any errors should be due to auditory imagery since the words were not pronounced to the pupil; but in such cases as the confusion of "our" and "are," since there is little similarity in the appearance of the two words, it seems probable that the pupil images the sound of the word and thus confuses it with a word similar in sound.

#### POSSIBLE FACTORS IN THE ACQUISITION OF A VOCABULARY

Of the two factors operating in a greater or less degree in practically all mental processes, native endowment and environment, it is generally held that the latter is more important so far as the acquisition of a good vocabulary is concerned.

The most prominent environmental factors are, the home, the community, reading facilities, and travel. An effort was made by means of a personal study of two groups of children to determine what part each of these factors had played.

*Home.* It is apparent at the outset that the task of grading homes as one grades examination papers is an exceedingly complicated one. Each home represented in the first group of children, called Group A, was visited in order to arrive at an estimation of the home

life on the basis of such characteristics as, occupation of parents, economic status, books and magazines, and general intellectual tone. The homes were then graded as "Excellent," "Good," "Fair," and "Poor." Of the 32 homes, 7 were graded E. Two of the seven children from these homes had vocabularies at, or below the average for the group, while four were in the highest 25 per cent. of the group. In 82 per cent. of the cases the correspondence between groups was close; that is, the pupils from "Excellent" homes had "Excellent" or "Good" vocabularies and those from "Poor" homes had "Poor" or only "Fair" vocabularies. In 18% of the cases there was entire lack of correspondence. For example, the pupil having the third highest vocabulary in the group came from a "Fair" home and the pupil who ranked eighth in vocabulary came from the poorest home in the whole group.

With reference to Group B the fact that all but two of the 25 children were from homes of professors or instructors in the University is sufficient characterization of the homes from which they came. Combining this with the fact that eight of the pupils in the group had vocabularies below the average of their respective grades, we see that the correspondence here between the character of the home and size of vocabulary cannot be close.

So far as the evidence here goes, it points to the conclusion that, while the home is generally an important factor in the acquisition of a good vocabulary, it is not in all cases the determining factor.

*Community.* With the community, as with the home influence, we are dealing with a number of factors instead of with a single one. Probably the school is the most important element, for the child, of community influence. Since, however, it operates upon all the pupils within a grade in a uniform manner, it would tend to eradicate rather than produce individual differences. The size of the community in which pupils lived was investigated in a number of cases. It was found that the pupil who ranked highest of all the pupils tested, had always lived in a city of several thousand population; while the eighth grade pupil ranking highest of the eighth grade pupils had always lived in a small town. This was typical of the conditions and relations. In other words, the size of the community does not appear to be an important matter so far as vocabulary is concerned.

It might be supposed that the general intellectual tone of a community would have much to do with a child's vocabulary, but in-

asmuch as there were in Group B, in a highly intellectual community, a number of children with inferior vocabularies, it would seem that this factor is not, unless in a very general way, significant.

*Reading.* It can hardly be doubted that both the quality and quantity of a child's reading has much to do with his verbal ability. Frequently, in explaining a pupil's remarkable performance in the vocabulary test, the teacher would remark that he or she was a great reader. Through a study of group B in which the time spent in reading, the kind of reading, the reading and the enjoyment in reading, were considered, the following facts were ascertained:

- (1) The boys read a greater variety than did the girls.
- (2) The girls read more than did the boys.
- (3) The boys read more humorous material, the girls more light fiction.
- (4) No pupil ranked high in vocabulary who was not a great reader.
- (5) No pupil ranked high who did not read a variety of literature.
- (6) Some who were great readers ranked low in vocabulary.
- (7) No one ranked low in vocabulary who read a great variety of literature.

It thus appears that there is a close relation between a child's reading and his command of words; but it is not so much the quantity as the quality that counts.

*Travel.* The published discussions of childrens' vocabularies stress the matter of travel as a productive source of new words. Travel is so invariably associated with a good home that it was impossible to determine even its approximate effect. It is reasonable to suppose that during the early stages of linguistic development, travel is an important agency in enlarging the vocabulary. After the child begins to read, however, if he has access to an abundance of good literature, it is doubtful whether he gains many words from travel that he would not get from reading. Yet it is not unlikely that his word images become more rounded out, more perfectly defined, and more definitely fixed through travel.

*Accuracy in Recognition of Words and Size of Vocabulary.* The recognition of a word, no doubt, depends largely upon the distinctness with which the image of the word has been created in the mind; hence an individual in whose mind clear and accurate images are constantly formed will, other things being equal, build up a vocabulary faster than one whose mentality does not function so precisely

in this respect. In order to test the validity of this theory the percentage of error in 500 test papers, selected by chance, except that boys and girls were equally represented, was calculated. Table IX gives the distribution of the 250 boys and 250 girls according to the per cent. of error in the use of words.

TABLE IX

	Less than 10% of error	From 10% to 24% of error	From 25% to 49% of error	Over 49% of error
Boys. . . . .	7.6%	51.6%	40.4%	.4%
Girls . . . . .	18.4%	51.2%	28.8%	1.6%
Total. . . . .	13.0%	51.4%	34.6%	1.0%

The results here lead one to believe that girls are more accurate in the recognition and use of words than are boys. Now if the tendency to greater accuracy on the part of girls is a sex trait we should expect the girls to have larger vocabularies than the boys. We have seen that they do not. The explanation of this is probably found in the differences in environmental conditions of boys and girls. The boys having a wider range of contact with things, persons, and situations, experience a greater number and variety of images together with the various verbal symbols of these images. At the same time, on account of a greater number and variety, they necessarily experience each of these images with its verbal symbol a less number of times than they would if they came into contact with fewer things and with each thing a greater number of times. Hence the images are less accurately fixed and defined. This would be true of experience gained in reading as well. We have seen that boys read less than do girls, but that they read a greater variety of literature; *i. e.*, they come into contact with more different words in reading than do the girls, but necessarily with each fewer times. Consequently they tend to be more uncertain of their words than do the girls. Environmental conditions, then, rather than innate qualities, seem adequate to explain the greater accuracy of the girls.

Coefficients of rank correlation between size of vocabulary and accuracy in recognition of words were calculated for five groups of pupils and the results varied from .18 to .49. The fact that girls are more accurate, as is shown in Table IX, and that boys have slightly larger vocabularies, as is indicated in Table II, accounts for the low degree of correlation. The very fact, however, that

there is a fair degree of correlation between the two capacities, in spite of the influence of environment, tends to substantiate the theory that the vocabulary of an individual does depend in a considerable degree upon the readiness and accuracy with which he forms verbal images.

#### GENERAL INTELLIGENCE AND VERBAL ABILITY

The three views extant, with regard to the relation of thought to language are summarized by Professor Dewey (5) thus: "First, that they are identical; second, that words are the garb or clothing of thought, necessary not for thought but for conveying it; and third, that while language is not thought it is necessary for thinking as well as for its communication." The first view has had little support among eminent thinkers since the time of Müller. One of the foremost advocates of the second is Professor Preyer, who, after making an extensive study of the mental development of his child, Axel, concluded that the child did not need "words or looks or gestures or any symbol whatever in order to arrange in time and space the sense of perceptions." The third view is the one to which Professor Dewey subscribes and the one which is most generally held.

One of the first difficulties which confronts one in a discussion of the question is the lack of a generally accepted definition and understanding of the term, intelligence. Stern's definition, "Intelligence is a general capacity of an individual consciously to adjust his thinking to new requirements; it is general mental adaptability to new problems and conditions of life," (17, p. 3) is probably the most satisfactory statement for the present state of knowledge.

A second obstacle with which one has to deal is the absence of adequate means of measuring intelligence. Since there is no single test of intelligence against which serious objections have not been raised, it was thought that the most valid results would be secured by using a number of tests. The tests were given to the two groups, A and B. Group B will be discussed first as the results are more complete for it. There were 25 pupils present for all the tests given, the others being absent so much that the results were not considered. The following table shows the rankings of the pupils in each of the tests together with the final rank of each pupil in all the tests. The final rank was determined by adding together a pupil's ranks in all the tests except the vocabulary test. The smallest sum would then represent the highest rank.

TABLE X

Vocabulary	Knox Healy	Binet- Simon	Courtis Arith.	Starch Reading	Starch Spelling	Final Rank
1	17	1	5	4	1	2
2	8	3	1	1	14	1
3	23	8	7	2	3	5
4	14	2	12	7	2	4
5	5	6	8	9	5	3
6	6	23	23	13	10	18
7	15	15	21	10	4	13
8	21	7	15	11	9	12
9	22	10	4	6	8	7
10	4	9	10	5	16	6
11	18	4	14	17	6	9
12	12	13	16	20	23	21
13	20	22	21	3	24	23
14	16	5	8	8	13	8
15	13	14	3	24	7	11
16	11	11	10	23	19	16
17	19	19	18	25	21	25
18	10	12	19	16	11	14
19	1	20	19	15	20	18
20	25	24	2	22	17	22
21	9	17	13	19	12	15
22	3	16	16	21	18	16
23	2	18	6	12	22	10
24	24	25	23	14	15	20
25	7	21	25	18	25	24

The Knox-Healy\* tests consist of a series of form boards, pictures, blocks, combination locks, jig saws, etc., designed to test the general intelligence of an individual as it functions in observation of form and details of a situation, in observation and memory of a series of movements, and in general manipulative and motor ability. The coefficients of rank correlation between the vocabulary test and the other tests were as follows: Binet-Simon, .66, Knox-Healy, -.11, Courtis Arithmetic, .36, Starch Reading, .67, Starch Spelling, .69. The coefficient for the vocabulary test and final rank is .69, and for average scholarship .59. The fact that there is a negative correlation between the Knox-Healy and the vocabulary test probably bears out the belief that there is little relation between verbal and motor ability. Naturally, the most significant correlation is that between final rank and vocabulary ability since the final rank in intelligence is based upon five, rather than one test.

Only 20 of the 25 in the second group were present for a sufficient

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\*This test was applied by Mr. Clifford Granger, a graduate student in Professor O'Shea's seminary in Education, and to him the author is indebted for the results.

number of the tests to make their results worth using, and a number of these were not present for all the tests.\* It thus happens that the final ranks for a few had to be determined upon the basis of three or four different tests. The rank for each pupil in the Courtis tests is his rank in the four tests in the fundamentals. The "A" test was given once a week for a period of eight weeks and the rank is indicative of the rate of improvement during the period. The two composition tests were given to discover the range of words for each pupil in writing a fifteen minute composition on a familiar topic. In the association test twenty simple words were pronounced at intervals of one minute, the pupil writing down during the time all the words which came to his mind. His rank depends upon the number of different words which he wrote.

The coefficient of rank correlation between the vocabulary test and the final ranks in Table XI is .60. It is not felt that this coefficient is so significant as was the corresponding one in the former group since the tests are predominantly verbal tests.

TABLE XI

Vocabulary	Comprehension in reading	Speed and Comprehension in reading	Courtis Arithmetic	"A" test	First Composition	Second Composition	Association test	Final rank
1	1	2	.	2	4	1		1
2			17			8	4	12
3	2	4	4	1	7	5	5	3
4	15	11	18	5			8	16
5	5	7	8		5	6	5	5
6	10	12	15				3	13
7	5	3	2	7		2	2	2
8	4	1	13	11		17	1	7
9	2	8	3		6	3		4
10	7	5	6		11	7	12	9
11	.		10	3	8	10	9	8
12	12	10	1	4	1	14	7	6
13	16	15	9			13		20
14	13	16	6	10	12	9	11	14
15			15	9	10	16	10	17
16	8	13	10	6	2	11	14	11
17	19	13		8	3	12	13	15
18			4		9	4	15	10
19	14	9	12	12	13	15	16	19
20	10	5	13		14	18		18

\*For the privilege of making the studies of this group, as well as for some of the material here used, the author is indebted to Professor V. A. C. Henmon.

It is now possible to make a sort of survey of the whole study and note some of the prominent indications. It has been shown that there is a large degree of correlation between a pupil's ability in oral expression and his vocabulary ability. It frequently happens that a child who is quiet and reserved does not get credit for a good vocabulary when he possesses one, while the child who talks freely is rated by the casual observer as a better linguist than the former though he may have a meager fund of words. In Group A, for example, the pupil ranking 19 in vocabulary is an incessant talker, but the number of words used in a given time, either in speaking or writing, is relatively small. Moreover, her expression, when carefully analyzed, is neither meaningful nor elegant. In Group B the pupil who ranks tenth in vocabulary is also of this type. The teacher experiences continual difficulty in keeping him from talking constantly in the recitation; while the pupil who ranks first in vocabulary is quiet, reserved and reflective. In speaking, the former is impulsive, inaccurate and inelegant while the latter is accurate, careful and discriminating.

With written expression the case is fairly similar. A number of regular school compositions from Group B were examined and, with very few exceptions, in which the deviations were not large, it was found that the pupils ranking high in vocabulary expressed their thoughts in more and better chosen words than did those whose vocabularies were below the average.

The main question with relation to the correspondence between language ability and average scholarship grades is, in what degree are average scholarship grades indicative of general intelligence? Some psychologists maintain that school performance is to no extent, or at least only to a very small extent, indicative of intelligence. Naturally, it cannot be affirmed that school grades are absolute and accurate measures of intelligence. The fact that practically all mental tests agree in indicating much greater individual differences than school grades show, is good evidence that school grades are not finely discriminating. This fact; however, does not mean that school activities do not test intelligence, nor that school grades are not, on the whole, indicative of mental capacity. School grades are to some extent determined by matters of expediency and economy in school administration and organization; but the statement so often made, that regular school activities are too narrow to test the various phases of the child's mental



capacity, lacks verification under present day school conditions. The facts already established by this investigation, of the high correlation between size of vocabulary and average school grades on the one hand, and between size of vocabulary and various mental tests on the other, tend to substantiate the assertion that average scholarship grades are indicative of general intelligence.

Now if this is established, it follows that the size of one's vocabulary under normal conditions is also a fairly accurate measure of his general mental capacity. This conclusion is supported by the results of studies of groups A and B, where it is found that, if several types of tests are given and the estimates of intelligence based upon the results, there is a good correlation between these results and verbal ability.

What, then may we conclude as to the exact relation between language and thought? We have referred to Preyer, who contends that the child shows evidence, through various activities, of extensive thought processes or deliberation before he acquires the use of language. As opposed to this view, it has been shown by Morgan (11) that animals often carry on activities which apparently imply just as complex thought processes as are necessarily connected with the cases cited by Preyer. Is it not then probable that whatever mental activities the child performs before he learns the use of language are precisely comparable to those which are common to the higher types of animals? Morgan says, "Language, and the analytical faculty it renders possible, differentiates man from the brute" (11, p. 374). Baldwin makes a similar statement when he says that with the getting of concepts "as opposed to the receipts of the animals . . . goes the development of speech, which some psychologists consider the source of all man's superiority over the animals" (1, p. 42). It cannot be doubted that animals have extensive processes of imagery and associations, but it is also true that there is a distinct difference between them and the mental processes of a rational human mind. Now this difference seems to be due to the capacity of the human mind for generalization, a capacity which is quite dependent upon symbols. And just to the extent to which these symbols make generalization possible, will this generalization be able to extend itself. Evidently then, the degree of intelligence which an ordinary person would manifest in consciously thinking out his reaction to any given stimulus, depends upon just how extensively the process of generalization has been

carried out. Without language, which is a highly refined system of symbolism, the generalizing process certainly cannot proceed. The child before learning to use words, and to some extent man throughout life, carries on the same sort of deliberation that the lower animals do, that of a very simple, direct, and concrete association. After he begins to learn words and, in fact, coincident with the word learning process, comes the conceptual activity. Morgan would even deny the child mind without language real percepts, preferring the term "mental products of a perceptual order." It is, however, quite certain that he does not account for the difference between child mind and brute mind which is apparent before the child begins to use language directly, that is, the manifest tendency of the child mind to generalization of experience, shown in anticipatory conduct. This is pointed out by Baldwin. This anticipatory conduct, which is the process or tendency of the mind in predicting results or acts through apperception, simply implies the indirect use of the language the child hears in organizing his own experience before he is able to make the speech organs function properly. This, then, leads to the conclusion that a "vague and confused" sort of generalization is taking place in the child mind before he uses language in a direct manner; whence it becomes perfectly clear that speech and thought are developing side by side in the child, each aiding and reinforcing the other. Just this lack of the indirect speech element is what seems to distinguish the brute mind from the human mind without language.

Now it seems perfectly rational, to repeat our former statement, that in any individual intelligence is conditioned by the extent to which he has carried out the generalizing of his experience, the building up of his conceptual order, which is, as we have just seen, almost wholly dependent upon the degree in which he is able to use highly refined symbolism. We may say, then, that language becomes a kind of filing case in which experience is sorted out, classified, and organized, and that without it, mental associations must remain of a primitive, direct, and simple type.

#### PEDAGOGICAL ASPECTS

From a number of investigations (6, p. 117; 2; 3) it has been determined that normal children from three to five years of age utter, under ordinary circumstances, from 1000 to 1400 words per hour during the entire day. In the author's study of child language

this has been verified both in the case of a three-year-old child and in that of one four and one-half years. In this particular study it was also found that the child of four and a half years, if allowed perfect freedom in talking, was not linguistically inactive for a period exceeding three minutes at any one time during the entire day. From the very nature of our present school system such freedom and continuity of oral expression is impossible, even if desirable. To discover in what degree children in the school room do have opportunity for oral expression and what the character of the expression is, the author spent 70 hours observing this phase of language work in the various grades. In a fourth grade, where 15 hours were spent, the highest number of words spoken per hour by pupils was 992, the lowest 416, and the average 705. The average number of pupils present during the time was 25. These words include words uttered in oral reading, although periods were chosen in which there was comparatively little of this. Ten periods were spent in kindergarten or primary grades with similar results as to number of words spoken; the remainder of the time was spent in the upper grades. In all grades under normal conditions the rate of speaking for hour periods seemed to be about the same as that given above. In the upper grades, naturally, there were longer periods of silence and the rate of speaking by pupils was at times much greater. It seems obvious that the number of words spoken by pupils cannot greatly exceed these estimates since the teacher generally talks at least one-half the time. Now if the number of words spoken per hour, as indicated here, be divided by 25, the number of pupils in the room, it is seen that the average for each pupil is, at most not over 40 words per hour. What happens is, of course, that a few pupils talk a great deal while several say little or nothing. The question at once arises, if there is an expressive instinct, or a natural tendency to expression which prompts the child to tell his experiences to his associates, to respond verbally to all sorts of stimuli continually, to what extent may the school without danger repress this tendency. Teachers often ask why pupils become timid at a certain period and reluctant to get up and speak or recite. The explanation appears to be found largely in this continual repression of the natural impulse to communication. The timidity does not appear suddenly or at any definite period but is the result of a gradual growth which is fostered and nourished from the day the child enters school. The child is reproved re-

