

GRADING THE MATERIAL OF THE CURRICULUM

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After the essential material of the curriculum has been selected, the next important problem in curriculum construction is the gradation of this material. If one, for example, is working in the field of spelling, the problem is: How shall the words in the selected spelling list be assigned to the various grades? Selection of spelling words is made on the basis of frequency of usage, and since this in itself tells us nothing significant about grade location, it is evident that gradation presents an additional problem.

It may be well to state at the outset that little scientific work has been done on the gradation of material in any subject. In a very true sense it may be said that experts in curriculum making have not yet seriously attacked the problem. Their energies to date have been devoted almost exclusively to the many intricate problems involved in the selection of curriculum content. The selection problems naturally come first, but the time now seems ripe for a more critical investigation of grade allocation.

We may be pardoned, if, in the course of this discussion, we draw our illustrations rather liberally from the field of spelling, in the hope that the findings in spelling may have suggestive value for other subjects. It seems true that, in spite of the confusion and disagreement regarding the grading of words in spelling, the workers in this subject have made more progress with the problem than those in any other subject.

PRINCIPLES OF GRADING DEFINED

Although a number of different grading principles have been proposed for use in the field of spelling, there is as yet no general agreement as to which of these should be employed. We shall give consideration to four that have been used in the grading of word lists:

1. *Degree of difficulty for the child.*—The more difficult the word, the higher its place in the grades.
2. *Frequency of adult usage.*—The more frequently the word is used by adults, the lower it is placed in the grades.

3. *First usage of children.*—Grade placement is determined by the grade in which the word first appears in the writing of children.

4. *Frequency of usage in the writing of children.*—To a given grade those words are assigned which the children in that grade use most frequently in their written discourse.

It should be observed that each of these principles can be applied in a definite and objective manner. Quantitative data have been obtained for the application of the first principle by determining the percentage of misspelling on each word in the various grades. The best sources for such data are the Ayres-Buckingham Scale,¹ The Iowa Spelling Scales² and the Sixteen Spelling Scales.³ In a spelling vocabulary of 3,818 words compiled by the writer, difficulty values for 2,995 of the words were found in the three sources mentioned.

As regards the second principle, very reliable frequency data are available on the words found in the correspondence of adults or, if one prefers to use not only the frequency of usage but also the range of usage, credit numbers representing both of these factors can be obtained.

Several investigations in the childhood field provide definite information in regard to the grade of first usage of words, and at least two studies show the frequency of words by grades. Thus we are in a position to begin the job of grading material in spelling by objective methods, if we can only decide upon the principle to be employed.

One finds himself in a peculiar position when asked to decide which principle or combination of principles is best for this purpose. The problem is one in the field of instructional methodology, where the authority for many principles still resides in the opinions of experts, and not in the results of scientific investigations. One is therefore compelled to study the workings and implications of the proposed principles as best he may, and select that principle or combination of principles that seems, from all the evidence at hand, to promise the most efficacious acquisition of spelling skill on the part of the child.

¹ B. R. Buckingham, *Buckingham's Extension of the Ayres Spelling Scale*. Bloomington, Illinois: Public School Publishing Co.

² E. J. Ashbaugh, *The Iowa Spelling Scales: Their Derivation, Uses and Limitations*. Journal of Educational Research Monographs, No. 3. Bloomington, Illinois: Public School Publishing Co., 1922.

³ Earl Hudelson, F. L. Stetson and Ella Woodyard, *Sixteen Spelling Scales Standardized in Sentences for Secondary Schools*. Teachers College Bulletin, Twelfth Series, No. 19. New York: Teachers College, Columbia University, 1921.

DISCUSSION OF PRINCIPLES USED IN GRADING

The four principles mentioned above seem by no means to be of equal value for grading purposes. If it is agreed that the basic principle in gradation is psychological, it should be observed that frequency of adult usage is not a psychological principle; it is sociological. When it is employed, as it has been in one of the prominent spelling courses on the market, the grade placement of material is determined not by conditions in the mind of the child, but by conditions in the life of the adult. Material most used by adults is introduced to the child at the earliest possible date in order, apparently, that its acquisition may be the more certain and secure. The mental maturity and interests of children are not considered. The theory represents a recrudescence of the pedagogy of force, and is distinctly reactionary in its trend. It is typical, however, of the practices of the extreme sociological school in education.

The difficulty principle has much more in its favor. In the gradation of subject matter it has generally made a strong appeal. This is largely on account of its psychological character; and there seems to be no question but that the grading of present school courses could be immensely improved if this principle were rigidly and accurately applied. It may even be said that much of the advancement in the conduct of the public schools has accrued from a better adjustment of tasks to the capacity of children to do them. There are considerations, however, that tend to make one skeptical in regard to the primacy of the difficulty principle in the field of spelling. There is the factor of interest, for example, which introduces complications that cannot be ignored. In other words, there is a conflict between two psychological principles—difficulty and interest. Where the two agree in the placement of a word, there is, of course, no problem. Where they disagree, which shall be regarded as the determining factor? To illustrate, take the relatively difficult words *Santa Claus*, *Christmas*, and *Thanksgiving Day*. Children are tremendously interested in these words and use them in writing as early as the second grade, but in a difficulty gradation the study of these words would be postponed to a much later period. On the other hand, consider the following simple three-letter words: *fee*, *tax*, *tan*, *due*, *art*, *bay*, *aid*, *dim*, *ill*, *gas*, *war*, *key*, *joy*, *wed*, *per*. Most of them are as easy to spell as *cat* and *pig*, but few children exhibit a desire to use them in their writing until the sixth, seventh and eighth grades.

Shall we be guided by interest or by difficulty in the grade allocation of these words? In the opinion of the writer, there is little doubt about the answer to this question. Ease of spelling is not a sufficient reason for teaching a word low in the grades, nor difficulty for teaching it at a higher level. Placing a word at that level of maturity where the pupils are interested in using it in their written expression seems to promise greater economy in learning and hence to reflect a sounder psychological practice.

This brings us naturally to a discussion of the two remaining principles, each of which is founded on the interest motive. The question here is, which will distribute the words in the course more nearly in accord with the interests of the child—gradation according to first usage or gradation according to most frequent usage? The chief objection to the first of these principles is that it locates too many words in the early grades. Of the 3,000 words most frequently used by children in their writing, Tidyman found that 1,103 were used as early as the third grade. This principle would, therefore, lead to the assignment of many more words to the earlier grades than could possibly be taught there. Moreover, the use of a word by a single pupil in a grade is not a safe index of the readiness of the rest of the pupils in the grade for this word. It would seem much more sensible and sound to begin the gradation of the minimal list with the second grade, assigning to this grade the words most frequently used in the writing of second-grade pupils. The remainder of the list would then be canvassed for the words most frequently used in the writing of third-grade pupils, and by the same process the grading would proceed upward until all the words in the list had been located.

Data from H. J. Smith's study⁴ may be used to make this method clearer. Smith tabulated 12,500 words from the spontaneous compositions of each grade from the third to the eighth, inclusive. For each word he shows the frequency of usage in each grade. For example, the tabulation for the word *egg* is as follows:

Word	Frequency by grades					
	VIII	VII	VI	V	IV	III
Egg.....	1	2	9	13	3	19

⁴H. J. Smith, "Spelling Vocabularies of Children in the Elementary School." Unpublished Study, Department of Education, University of Wisconsin, 1913.

Suppose, now, that one desires to select 300 of Smith's 2,046 words for teaching in the third grade. The last column to the right in his table will show all the words used by third graders. By the frequency-of-usage principle, one would select the 300 words in this column that have the highest frequency values.

GRADATION ACCORDING TO CHILDHOOD USAGE

The plan just described is what is meant by gradation in accordance with frequency of childhood usage. It can be illustrated in more detail by referring to the grading of 3,818 words in a recent publication.⁵ From the investigation of children's themes made by H. J. Smith⁶ and a study of children's letters made by W. C. French,⁷ grading indices based on frequency of childhood usage were secured for many of the 3,818 words. From investigations by W. F. Jones⁸ and W. F. Tidyman⁹ two additional usage indices were derived. This was done by computing the relation between grade of first usage,¹⁰ and grade of greatest frequency of usage as defined above. The Smith vocabulary was used for this purpose, since for each word it provides data concerning grade of first usage and, as indicated above, also enables one to determine the grade of most frequent usage. The 1,205 words for which the frequency data are most nearly adequate in this study were graded by the frequency-of-usage principle, then by the first usage principle, after which the results by the two methods were compared in detail.¹¹ The data indicate that the grading by the first principle places words on an average, approximately one grade higher than that by the second. The first-usage grading obtained from Jones' and Tidyman's studies was therefore increased by one grade to obtain an estimated usage grading.

When grading data were found for a word in all four of these investigations, the record appeared like that for the word *few*, reproduced below:

⁵ F. S. Breed and W. C. French, *The Breed-French Speller*. Chicago: Lyons and Carnahan, 1927.

⁶ *Op. cit.*

⁷ W. C. French, "A Study of Children's Letters." Unpublished Study, Department of Education, University of Chicago, 1925.

⁸ W. Franklin Jones, *Concrete Investigation of the Material of English Spelling with Conclusions Bearing on the Problems of Teaching Spelling*. Vermillion, South Dakota: University of South Dakota, 1914.

⁹ W. F. Tidyman, *Survey of the Writing Vocabularies of Public School Children in Connecticut*. Teacher's Leaflet No. 15. Washington: Bureau of Education, 1921.

¹⁰ Jones assigned a word to "the lowest grade in which at least two per cent of the students used it." This was employed as the grade of first usage.

¹¹ C. B. Wood, "A Comparison of Two Methods of Grading Words." Unpublished Study, Department of Education, University of Chicago, 1925.

<i>few</i>		
French, 3		Smith, 3
Jones, 3		Tidyman, 4
Grade Index, 3.3		

The final grade position of the word was obtained by averaging the indices from the four investigations. When the data from these four investigations were inadequate for a word, supplementary data were sought in such studies as those made by Bauer¹² in New Orleans and Melcher¹³ in Kansas City. When absolutely no childhood-usage data were available, as in the case of a limited number of words used by adults only, the general rule of assignment to the eighth grade was followed, on the theory that the pupils should be introduced to such words just before discontinuing the study of formal spelling.

DIFFERENT RESULTS FROM DIFFERENT METHODS

The reader may now be ready to ask whether or not there are significant differences in the gradation of the same words when different principles are employed. To throw some light on this question the data in Table IV are presented.

TABLE IV—PERCENTAGE OF AGREEMENT BETWEEN RESULTS OF DIFFERENT METHODS OF GRADING WORDS.

Grade	Difficulty of spelling and frequency of adult usage	Difficulty of spelling and frequency of childhood usage	Frequency of adult usage and frequency of childhood usage
2.....	56.3	78.0	57.7
3.....	25.2	26.5	20.2
4.....	19.6	23.0
5.....	15.4	17.4
6.....	16.1	18.8
7.....	25.2	23.7
8.....	32.9	11.1	4.6
Average.....	27.3	28.4	27.5

¹² Nicholas Bauer, *The Writing Vocabulary of Pupils in the New Orleans Public Schools*. New Orleans, Department of Superintendence, 1915.

¹³ *Preliminary Report of the Committee on Spelling Appointed by the Elementary School Principals' Section*. Research Bulletin No. 2. Kansas City, Missouri: Public Schools, 1916.

The table shows the percentage of agreement in grading the same words when the principles mentioned above were applied as described below :

1. *Difficulty of spelling and frequency of adult usage.*—The 1,000 words in the Ayres Scale were graded, first according to the difficulty values of this scale, and secondly according to the frequency values in a compositive vocabulary of eleven investigations of adult correspondence.

2. *Difficulty of spelling and frequency of childhood usage.*—The difficulty values were taken from the Ayres Scale and the childhood-usage values from an unpublished study by the writer.

3. *Frequency of adult usage and frequency of childhood usage.*—The writer's childhood-usage gradation was compared with gradation according to the frequency values in the Andersen adult-correspondence list.

The table should be read as follows: Of the words assigned to grade 2 in accordance with the difficulty principle, 56.3 per cent were assigned to the same grade according to frequency of adult usage. It will be seen that the methods which have been compared agree in general more closely in the earlier grades than in the later ones, and that the average amount of agreement in the three comparisons is practically the same—about 28 per cent. This shows conclusively that very different results are obtained from these different principles of gradation. To some extent this difference is due, of course, to unreliability of the data employed, but inaccuracies from this source probably account for only a small part of this difference. This seems particularly true in regard to the results shown in the first column of the table. The difficulty values on the Ayres Scale and the frequency values in a composite of eleven investigations of adult correspondence are both quite reliable, yet the differences in gradation are highly marked.

COMPARISON OF DIFFICULTY AND ADULT-USAGE METHODS

One can secure a more detailed understanding of the relation between difficulty and adult-usage grading from Table V. The 1,000 words on the Ayres Scale were assigned to grades 2 to 8 according to difficulty, the 142 words of least difficulty being assigned to grade 2, and the remaining words in groups of 143 to successive grades according to increasing difficulty. The same words were then graded according to frequency of adult usage.

The frequency values in the composite of eleven investigations of adult correspondence were used. The number of words assigned to each grade was the same as before, the second grade receiving the 142 words of highest frequency, the third grade the 143 of next lower frequency, etc. The grading of each word by the one method was then compared with its grading by the other. Table V shows the results of this comparison. Grading by adult usage is indicated along the top of the table.

The second column of the table shows how the words assigned to the second grade according to adult usage, were distributed according to difficulty. Of the 142 words assigned to grade 2 by the usage principle, 80 were assigned to grade 2, 27 to grade 3, 15 to grade 4, and so on, by the difficulty principle. The most noticeable feature of the table, perhaps, is the difference between the gradings by the two methods, a fact which was indicated by the relatively low percentage of agreement noted in Table IV. In the bottom row of the table is presented the median difficulty grading for the words assigned to each of the grades on the basis of adult usage. By median difficulty grading is meant the position of the median in the difficulty scheme of gradation. For example, the words in the column for grade 8 have a median position of 7 on the difficulty scale. In no case does the general trend of the difficulty grading vary from the adult-usage grading by more than one grade. Similar medians for adult-usage grading are presented in the column farthest to the right, for comparison with the difficulty grading. Here also, a difference no greater than one grade is indicated. One should not, however, permit this use of median values to distort his interpretation. It might be better to dismiss the medians as aids to interpretation, for it is probably of more significance to note that, without exception, the words placed in any grade by one method are distributed over all the grades by the other method.

DIFFICULTY AND CHILDHOOD USAGE COMPARED

In Table VI is presented a comparison of difficulty gradation with gradation on the basis of childhood usage. The 1,000 Ayres-Scale words were graded according to difficulty. Then the difficulty grading of each of these words was compared with its childhood-usage grading in a list of 3,818 words. Here again the median gradation by one method nowhere differs from the median

TABLE V—COMPARISON OF THE GRADATION OF THE 1,000 AYRES-SCALE WORDS BY DIFFICULTY OF SPELLING AND BY FREQUENCY OF ADULT USAGE.

Gradation by difficulty of spelling	Graduation by frequency of adult usage							Total	Median usage grading
	2	3	4	5	6	7	8		
2.....	80	22	14	11	8	3	4	142	2
3.....	27	36	27	20	14	16	3	143	4
4.....	15	34	28	23	26	12	5	143	4
5.....	10	21	26	22	23	21	20	143	5
6.....	6	14	23	25	23	22	30	143	6
7.....	3	8	15	19	28	36	34	143	6
8.....	1	8	10	23	21	23	47	143	7
Total.....	142	143	143	143	143	143	143	1,000	
Median difficulty grading.....	2	4	5	5	6	6	7		

gradation by the other by more than one grade. On the whole, the results indicate that the 1,000 words tend to take a lower place in the grades when the interest principle is applied than when the difficulty principle is applied. This conclusion is suggested by the tendency of the words to cluster on the left side of the table, and also by the increasing totals of the columns from right to left. Before, however, one can conclude for a certainty that the gradation in the one case is lower than that in the other, an additional factor must be taken into consideration.

In the comparison of gradings by these two methods, there is the tacit assumption that the words on the Ayres Scale constitute a satisfactory sample of the whole range of difficulty of the minimal spelling list. This assumption is implied in the uniform distribution of the 1,000 words over the whole grade range, and is probably not valid. For example, the 1,000 commonest words are certainly of lower average difficulty than the remaining words in the minimal list. If this be conceded, the true difficulty grading of the words would be lower than that presented in Table VI. This lower grading would lessen the difference between the two types of grading exhibited, for the childhood-usage grading shown in the table represents the grade allocation of these 1,000 words when they are considered along with the rest of the minimal list. This assumption, it may be explained, does not enter as a factor in the

TABLE VI—COMPARISON OF THE GRADATION OF THE 1,000 AYRES-SCALE WORDS BY DIFFICULTY OF SPELLING AND BY FREQUENCY OF CHILDHOOD USAGE.

Gradation by difficulty of spelling	Gradation by frequency of childhood usage							Words not in both lists	Total	Median usage grading
	2	3	4	5	6	7	8			
2.....	111	19	9	1	1	0	0	1	142	2
3.....	52	38	25	10	2	0	0	16	143	3
4.....	35	40	33	18	6	1	0	10	143	3
5.....	19	30	33	25	20	6	2	8	143	4
6.....	8	29	24	21	27	24	0	10	143	5
7.....	2	8	14	27	35	34	5	18	143	6
8.....	3	8	5	11	29	47	16	24	143	7
Total.....	230	172	143	113	120	112	23	87	1,000	
Median difficulty grading.....	3	4	5	6	7	7	8			

interpretation of Table V, because in that case the same 1,000 words were graded by each method as if they constituted the entire spelling vocabulary.

In order to test the above assumption,¹⁴ a comparison was made between the difficulty and childhood-usage gradings of the same 3,818 words. The difficulty grading was made on the basis of objectively determined difficulty values, the least difficult words being assigned to the second grade, those next in difficulty to the third grade, and so on. The number of words assigned to each grade was the same in the two gradings. The childhood-usage grading was that of the writer, previously referred to.

The results of this comparison are shown in Table VII. It is evident from this table that words do not receive a lower gradation by the childhood-usage method. This is best seen in the columns entitled "Median Usage Grading" in Tables VI and VII. Whereas in Table VI the usage gradation was found to average lower than the other in five of the seven grades, in Table VII the usage grading is found to be higher in one grade, lower in two, and the same in the remaining four. It is fairly evident that one organization of the words is neither more nor less difficult than the other. An excess of difficulty in one grade is balanced by the opposite condition in another.

¹⁴ For assistance in making this comparison the writer is indebted to Olive McFadden and Ethel A. Elder.

TABLE VII—COMPARISON OF THE GRADATION OF 3,818 WORDS BY DIFFICULTY OF SPELLING AND BY FREQUENCY OF CHILDHOOD USAGE.

Gradation by difficulty of spelling	Graduation by frequency of childhood usage							Total	Median usage grading	Percentage of agreement
	2	3	4	5	6	7	8			
2.....	207	101	36	16	2	0	0	362	2	57.2
3.....	77	153	182	122	35	7	0	576	4	26.6
4.....	50	153	168	167	74	28	8	648	4	25.9
5.....	23	95	144	135	135	76	40	648	5	20.8
6.....	3	36	59	84	150	137	107	576	6	26.0
7.....	2	34	43	77	103	114	131	504	6	22.6
8.....	0	4	16	47	77	142	218	504	7	43.3
Total.....	362	576	648	648	576	504	504	3,818		Average 31.8
Median difficulty grading.....	2	4	4	5	6	7	7			

It is well to notice that the two methods of grade placement just described give identical positions to 31.8 per cent of the words, a higher percentage than has been found in any of the other comparisons.

CONCLUSIONS

It seems evident that a solution of the problem of grading curriculum materials requires (1) the establishment of the principle or principles to be applied and (2) the determination of methods for applying these principles. Although intelligent discussions will no doubt aid in the selection of principles, specific investigations of the effects of various principles and methods of applying them will be necessary before satisfactory conclusions can be reached.

Fortunately, in the case of each of the principles treated in the foregoing discussion, objective data for their application have been secured. These data, however, are not in every instance as extensive as they should be. This is especially true, for example, in regard to the data available for the application of the childhood-usage principle, and is due to the failure of many investigators to supply frequency of word usage by grades. Grading words by this method will be materially improved when more adequate data of this kind are provided.

A point has been reached in the study of word gradation where the advantages and disadvantages of several conflicting principles stand out in bolder relief. It is apparent that these principles differ greatly in the theoretic support which they can command and in the results which they produce. Frequency of adult usage has least to recommend it. Grade of first usage is unpractical and unpsychological—unpractical because of the congestion of words occasioned in the lower grades, unpsychological because it represents a standard of precocity and not of normalcy. Difficulty of spelling and frequency of usage among children are apparently the most satisfactory bases, and, of these, the second seems to be the better. That is, it seems most psychological to teach a child, in a given grade, to spell the words which he most commonly uses in his writing in that grade.

The degree to which results differ when different principles are applied in grading the same words is indicated by the small percentages representing the number of words identically located. These percentages vary from 27.3 to 31.8. Difference in results is also indicated by the fact that words located in a given grade by one method are often distributed over all the grades by another method.