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BULLETIN NO. 14

BUREAU OF EDUCATIONAL RESEARCH
COLLEGE OF EDUCATION

THE USE OF DIFFERENT
TYPES OF THOUGHT QUESTIONS IN
SECONDARY SCHOOLS AND THEIR
RELATIVE DIFFICULTY
FOR STUDENTS

by

WALTER S. MONROE,
Director, Bureau of Educational Research

and

RALPH E. CARTER
Associate Professor of Educational Psychology
Indiana University, Extension Division

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PREFACE

This bulletin is a report of one phase of a larger investigation relating to the study habits of school children. The types of questions asked by teachers of their students are important both because of the mental processes which occur in answering them and because an intimate relation exists between the questions asked and the detailed objectives toward which the students work.

Mr. Carter was consulted in the preparation of the questionnaire. He rendered valuable assistance in deciding upon the tentative list of types of thought questions. Later, advantage was taken of his presence at the University of Illinois during the Summer Session of 1922 to secure assistance in the preparation of this report. He is largely responsible for its general organization.

WALTER S. MONROE, *Director.*

February 1, 1923

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The Use of Different Types of Thought Questions in Secondary Schools and Their Relative Difficulty for Students

Recent emphasis upon questioning in instruction. The first quantitative study of the questions which teachers use in the classroom was made by Miss Romiett Stevens.¹ In this analysis of questions a distinction was made between those that required memory only and those that required thought. Miss Stevens' discussion has been widely quoted and has been very influential in causing teachers to give more attention to the types of questions asked of their students. It is altogether likely that this investigation is primarily responsible for a material increase in the percent of thought questions which are asked in our schools today. Many of the most commonly used texts on methods of teaching devote separate space to the topic of questioning. Its importance has been especially emphasized by Charters,² Strayer,³ Parker,⁴ and Colvin.⁵

Analysis of thought questions. An examination of typical thought questions from the standpoint of the mental processes which they require in answering reveals certain significant differences. Some questions require the student to "compare" two or more ideas; others ask that he "summarize;" still others demand that he "give reasons why." The probable mental processes occurring in the reflective thinking called for rather than the form of the question or the wording of the answer have been made the basis of these types of thought

¹Stevens, Romiett. "The question as a measure of efficiency in instruction," Teachers College Contributions to Education No. 48. New York: Teachers College, Columbia University, 1912.

²Charters, W. W. *Methods of Teaching*. Chicago: Rowe Peterson and Company, 1912, p. 444. (Chapter XVII).

³Strayer, G. D. *A Brief Course in the Teaching Process*. New York: Macmillan Company, 1912, p. 315. (Chapter XI)

⁴Parker, S. C. *Methods of Teaching in High Schools*. Boston: Ginn and Company, 1915, p. XXV, 529. (Chapter XX)

⁵Colvin, S. S. *Introduction to High School Teaching*. New York: Macmillan Company, 1917, p. XXI, 451. (Chapter XV)

questions. Altho there is doubtless considerable overlapping in the types of mental processes which usually occur in answering such questions, there appears to be sufficient differences to justify the recognition of a number of types of questions. In this investigation the following tentative list of types of thought questions was used. A more refined analysis would yield probably some additional types, but, on the other hand, for practical purposes it is possible that some combinations of types might profitably be made. It is recognized that the mental processes of different students doubtless vary in answering the same question. In fact a thought question for one student may be a memory question for another student, or even for the same student on the following day.

1. **Selective recall**—basis given.

Name the presidents of the United States who had been in military life before their election.

What do New Zealand and Australia sell in Europe that may interfere with our market?

2. **Evaluating recall**—basis given.

Which do you consider the three most important American inventions in the nineteenth century from the standpoint of expansion and growth of transportation?

Name the three statesmen who have had the greatest influence on economic legislation in the United States.

3. **Comparison of two things**—on a single designated basis.

Compare Eliot and Thackeray in ability in character delineation.

Compare the armies of the North and South in the Civil War as to leadership.

4. **Comparison of two things**—in general.

Compare the early settlers of the Massachusetts Colony with those of the Virginia Colony.

Contrast the life of Silas Marner in Raveloe with his life in Lantern Yard.

5. **Decision**—for or against.

Whom do you admire more, Washington or Lincoln?

In which in your opinion can you do better, oral or written examinations?

6. **Causes or effects.**

Why has the Senate become a much more powerful body than the House of Representatives?

What caused Silas Marner to change from what he was in Lantern Yard to what he was in Raveloe?

7. **Explanation** of the use or exact meaning of some phrase or statement in a passage.

8. **Summary** of some unit of the text or of some article read.

9. **Analysis.** (The word itself is seldom involved in the question.)

What characteristics of Silas Marner make you understand why Raveloe people were suspicious of him?

Mention several qualities of leadership.

10. **Statement of relationships.**

Why is a knowledge of Botany helpful in studying agriculture?

Tell the relation of exercise to good health.

11. **Illustrations or examples** (your own) of principles in science, construction in language, etc.

12. **Classification.** (Usually the converse of No. 11).

What is the principle involved here? What is the construction? To what class or genus does this individual belong?

13. **Application** of rules or principles in new situations.

14. **Discussion.**

Discuss the Monroe Doctrine.

Discuss early American Literature.

15. **Statement of aim**—author's purpose in his selection or organization of material.

What was the purpose of introducing this incident?

Why did he discuss this before that?

16. **Criticism**—as to the adequacy, correctness, or relevancy of a printed statement, or a classmate's answer to a question on the lesson.

17. **Outline.**

18. **Reorganization of facts.** (A good type of review question to give training in organization.)

The student is asked for reports where facts from different organizations are arranged on an entirely new basis.

19. **Formulation of new questions**—Problems and questions raised.

What question came to your mind?

What else must be known in order to understand the matter under consideration?

20. **New methods of procedure.**

Suggest a plan for proving the truth or falsity of some hypothesis.

How would you change the plot in order to produce a certain different effect?

Relation to educational objectives of types of questions asked by teachers. Incidentally it may be noted that the types of questions used both for stimulating and directing the mental activity of the learner and for measuring the results of teaching reflect in a subtle way the educational objectives of a teacher. The objectives thus indicated may not agree with those stated by the teacher but they nevertheless are an index of the objectives toward which the students

direct their efforts. In studying, students tend to prepare to answer the kind of questions which they think the teacher will ask. (It is altogether likely that the study objectives of students are influenced more by the kind of questions asked than by direct statements of aims in the course.)

Purpose and method of this investigation. The purpose of this study, which is Sub-project II of our investigation of the study habits of high school pupils, was announced as follows: "To determine the extent of the use of different types of thought questions in actual school practise and the relative difficulty of these types for students." The method employed was to submit a questionnaire to a large number of teachers in the seventh and eighth grades and in the high school. In this questionnaire the list of the twenty types of thought questions given on pages 6-7 was reproduced. The teachers were urged to study these types carefully before answering any of the questions. It was pointed out that an attempt to classify a question according to this plan might lead to the conclusion that it is a combination of two or three types. However, in such a case, it is probably true that part of the work of answering has been done by the author in the textbook, leaving to the student only that phase of the question which would definitely classify it as belonging to one of the above types.

Plan of summarizing data. Usable replies were received from 199 teachers representing almost every school subject and all parts of the state. A few of these replies did not give answers to one or more of the questions but they were included in the tabulation for the other questions. By subject the number of replies were as follows: English, 41; History, 48; Science, 41; Mathematics, 31; Foreign Language, 12; Geography, 11; Commercial subjects, 6; Agriculture, 4. Taking only the replies from teachers of English, History, and Science there were 26 for grades VII and VIII combined; 34 for grades IX and X; and 45 for grades XI and XII. It was thought advisable to summarize separately the replies for English, History and Science. Those received from teachers of all other subjects were grouped together. The replies to Questions I and IV obviously do not lend themselves to statistical treatment. The data yielded by the other three questions are summarized in the following tables.

Limitations of replies to the questionnaire. Several teachers took occasion to mention difficulties which they experienced in filling out the questionnaire blank. That some difficulties were encountered

is not surprising because the concept of different types of thought questions was undoubtedly new to most, if not all, of the teachers. The limitations of space prevented an extensive description of each type. Undoubtedly teachers differed in their interpretations of the various types. Furthermore, in answering Question II they were asked not only to differentiate between thought questions and memory questions but also to classify the thought questions under the various types. In doing this, they had to rely upon their memory of the questions they had asked. For these reasons the replies to Question II must be thought of as giving only a very rough indication of the practise of teachers with reference to the types of questions which they asked. A few teachers reported that their replies were based on a careful analysis of lists of questions which have been used and preserved. If these lists were reasonably complete their replies should be more accurate than those received from teachers who relied upon their memory of the questions they had asked.

It may be pointed out that other methods of ascertaining the relative frequency of use of different types of thought questions would not eliminate all difficulties. For example, if a trained investigator should visit the classes of 199 teachers in various parts of the state a sufficient number of times to obtain a fair sample of the habitual practise and should try to make a record of all types of questions asked he would encounter difficulties in definitely classifying them. It is not possible to judge accurately of the mental processes stimulated by a question unless one is acquainted with the previous experiences of the pupils in the field of this question. This has been referred to already in pointing out that what constitutes a thought question for one pupil may be merely a memory question for another. The analysis of stenographic reports of lessons would present certain difficulties for the same reason. The teacher knows better than any one else what acquaintance a student has with a topic and what the textbook states about it. For this reason he has the advantage of a casual observer.

Additional types of questions mentioned. Question I was asked in order to obtain suggestions for supplementing the list of type questions for further study in this field and also to give each teacher an opportunity to report fully his own practise in the use of different types of thought questions in case he did not consider the list adequate. The replies to the questionnaire show that the number of teachers who did not report the use of all of the types given in the list

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Types of Thought Questions

Name.....Address.....
 School Subject.....School grade.....

- I. Write in on the blanks at the bottom of the list below any additional types of thought questions you use to any great extent in the grade and subject you have chosen. (Include these additional types in answering all other questions.)
- II. What percent of *all* of your questions to the class are of each type listed? (See directions, p. 11). Put the percent of each type in the column on the right.

Types of Thought Questions	Percent of all questions
1. Selective recall—basis given.....
2. Evaluating recall—basis given.....
3. Comparison of two things—on a single designated basis.....
4. Comparison of two things—in general.....
5. Decision—for or against.....
6. Causes or effects.....
7. Explanation.....
8. Summary.....
9. Analysis.....
10. Statement of relationships.....
11. Illustration or examples.....
12. Classification.....
13. Application.....
14. Discussion.....
15. Statement of aim.....
16. Criticism.....
17. Outline.....
18. Reorganization of facts.....
19. Formulation of new questions.....
20. New methods of procedure.....
21.....
22.....
23.....
24.....

- III. In the left hand margin make an "X" opposite each of the five types for which students answers are least likely to be satisfactory. (See directions, p. 11)
- IV. Choose three of the types you marked with an "X." State for each some of the students' most common faults in procedure in answering it. Mention faults of

omission as well as faults of commission. Mention only faults peculiar to this type of question. Use other side of this sheet if necessary. (See directions below.)

- V. If we consider all unsatisfactory answers made by students in school work, what percent of them, in your opinion, are due primarily to bad habits of procedure in answering questions? Give separate replies for memory questions % and thought questions %

The following detailed directions for answering the questionnaire were given:

Before answering any of the questions, decide what subject and what grade (any from VII to XII) you will have in mind in all of your replies. Answer the questions with reference to only *one* school subject. Fill in the blanks at the top of the first page of the questionnaire.

Question I. Examine the list of types given above to see if there are not some other types of thought questions that you use to a considerable extent. Altho the given list may seem long and inclusive at first, it is not complete.

Question II. Before you put down your estimates for Question II, you should decide what is your proportion of thought questions and of pure memory questions. This question calls for a further analysis of your thought questions. It may be advisable to make rough estimates for all before you fill in the data on the questionnaire. After you have the differences between the types in mind, make the best estimate you can, even tho you may not be very sure in many cases. You are merely declaring your best judgment, not guaranteeing that it is infallible. *We want your opinion of what your practise is, not of what you think it ought to be.*

Question III. In Question III, we are concerned with the *process* of answering so we must assume that the student has the information necessary for a satisfactory answer if he will only use it as the type of the question requires. The common starting point for an informal diagnosis of a student's study faults is in his unsatisfactory answers. An unsatisfactory answer may indicate lack of information or certain faulty habits in answering questions. There are many cases in which teachers find out by other means that the student has enough information to give a satisfactory answer but has failed because he did not take the necessary steps and precautions in replying to the question. When some students correct examination papers returned to them, they are heard to say, "I knew that, but I didn't think of it," or "I knew that but I didn't know that was what the question meant." Some of the faults in procedure are common to all kinds of questions; others are peculiar to particular types. In Question III, you are asked to decide on the difficulty of the types for students. In other words, in which type do they have the worst habits of procedure?

Question IV. It will be helpful in answering Question IV to think of some particular questions of the type under consideration and then express the students' faults in fairly general terms.

Question V. As long as the unsatisfactory answer is a resultant of poor methods of preparation and poor habits of answering questions, we must correct the latter or take it into consideration in inferring what methods of study are needed. It is important to get an estimate from a large number of teachers of the percent of failures (in answers) that are due primarily to bad habits of procedure in answering questions.

is very much greater than the number mentioning additional types. Only thirty-nine teachers (19.6 percent) indicated that they used all twenty types of questions. Thirteen teachers supplemented the list, each writing in from one to three additional types. These teachers were distributed among the different subjects as follows: seven in History, three in English, two in Science, and one in Mathematics. Only four of those suggesting additional types of questions indicated that they used all twenty of the types given in the questionnaire list.

Some of the additional types of questions suggested are clearly included in the list given in the questionnaire. The following are typical: (A) "Connections between historical events," Type 4 or 6; (B) "Cause and results," included in Type 6; (C) "Application to the present time," included in Type 13; (D) "Determining the significant word in a statement," included in Type 19. Other suggested types are not so clearly included but several of them under a fairly loose interpretation may be placed with the types listed. Illustrations of these are: (A) "Imagining the results if conditions were different," a special case of Type 6; (B) "Questions on appreciation such as, which do you like best?" a fairly common form of Type 2; (C) "Identify a known character in a scene in the story when his name is not mentioned by the author," a special case of Type 12; (D) "What should you judge from these facts?" This last is broad enough to cover many types. Frequently, it would fall under Type 6. There were a few suggestive questions which are not so easily classified under the 20 types given. Some of these are: (A) "Trace the development," mentioned by two teachers; (B) "Estimate the importance of"; and (C) "Why is this statement true?" a very common question in geometry. By a very liberal interpretation these might be put under Types 9, 2, and 6 respectively but it is likely that many teachers would consider them sufficiently different to justify naming them as additional types.

The answers to the first question indicate that the list of types is reasonably complete. For practical purposes it is probably better to give a rather loose interpretation in classifying special cases than to try to extend the list. Largely for this reason the authors decided to limit the summary of the replies to the other parts of the questionnaire to the original twenty types.

Frequency of use of different types of questions. Question II of the questionnaire was asked in order to secure answers for the following:

1. Which types of questions are most commonly used by teachers in classroom instruction?
2. Which types of questions are most characteristic of the instruction in different subjects?
3. Do teachers in the more advanced grades tend to ask different types of questions from those in the lower grades?

Table I gives a detailed summary of the replies by forty-eight teachers of History. This table shows that four of these teachers did not report any use of questions requiring selective recall (Type 1); one teacher reported that this type of question formed 1 percent of all his questions; five teachers indicated that this type made up 2 percent of all the questions which they asked; eleven named 5 percent as an index of its frequency; eight teachers considered that 15 percent of their questions were of this type; and another eight teachers indicated that more than 15 percent of their questions called for selective recall. The median practise is 7.5 percent.

The outstanding characteristic of the table is the variability of practise which it indicates. In the case of each type of question there were one or more teachers who gave no indication of its use. For several of the types the number of teachers not indicating any use is surprisingly large. Furthermore, there is no type of question which did not receive an indication of at least 5 percent by one teacher. Most of the types received an indication of 10 percent or more. Thus, if we may assume that the replies to this portion of the questionnaire are a reasonably true indication of practise, it is clear that teachers of History vary widely in the types of thought questions which they ask of their pupils and hence necessarily vary widely in the detailed objectives which their pupils strive to attain.

Similar tabulations were made for English, Science and other subjects combined. The median frequencies for the four groups of subjects are given in Table II. If we consider only English, History and Science, students are most commonly required to answer the following types of thought questions: cause and effect, Type 6; selective recall, Type 1; discussion, Type 14; and evaluating recall, Type 2. The types of questions which are asked least frequently are: formulation of new questions, Type 19; new methods of procedure, Type 20; and reorganization of facts, Type 18.

Different subjects require different mental processes. An examination of Table II reveals that the frequency of use of some of the

TABLE I. TYPES OF THOUGHT QUESTIONS ASKED BY 48 TEACHERS OF HISTORY

Types of Questions	Percent of all Thought Questions															Over 15	Median	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14			15
1. Selective recall.....	4	1	5	2		11		2				6				8	8	7.5
2. Evaluating recall.....	2	1	4	4	3	7	2	3	3	2	5		3			6	3	7.3
3. Comparison—single.....	6	5	4	1	4	16			2	2	5		1		1	1		5.3
4. Comparison—general.....	4	1	8	3	2	13	2		4	1	6					2		5.5
5. Decision.....	10	11	5	4	3	10		1	1		2		1			1		2.6
6. Causes or effects.....	1		1	1	3	6	2	2	3		12					4	10	10.4
7. Explanation.....	15	4	8	8	1	5	1				3				2	2		2.6
8. Summary.....	5	1	7	1	2	15			1	1	10				1	3		5.5
9. Analysis.....	7	7	8	4	5	11		1	1	1	2					1		3.5
10. Relationships.....	13	4	7	4	5	4	4	1	4		2							3.0
11. Illustration or examples.....	25	5	3	2	4	6					1		1			1		1.0
12. Classification.....	26	4	6	2	2	6	1		1		1		1					.9
13. Application.....	24	5	7	3	3	2	3	1			2		1			6	9	10.3
14. Discussion.....	4		1		1	6	2	3	3	1	12					1		1.0
15. Statement of aim.....	24	7	6	3	4	2		1	1		2					1		2.6
16. Criticism.....	12	5	12	4	4	6	1	1			2				2		1	5.2
17. Outline.....	6	3	5	4	4	11	1		2		4					1		2.3
18. Reorganization of facts.....	14	8	8	6	6	5		2	1		1							.8
19. Formulation of new questions.....	31	3	3	7	3			1	1		1							1.0
20. New methods.....	24	5	9	2	3	3		1	1		1							1.0

TABLE II. MEDIAN FREQUENCY OF USE OF DIFFERENT TYPES OF THOUGHT QUESTIONS IN ENGLISH, HISTORY, SCIENCE AND OTHER SUBJECTS

Types of Questions	Median percent of Use			
	English	History	Science	Others
1. Selective recall.....	5.4	7.5	5.3	5.1
2. Evaluating recall.....	5.9	7.3	2.8	.96
3. Comparison—single.....	5.4	5.3	3.9	1.6
4. Comparison—general.....	5.0	5.5	3.1	1.9
5. Decision—for or against.....	4.4	2.6	1.1	1.2
6. Causes or effects.....	5.8	10.4	10.2	4.8
7. Explanation.....	10.0	2.6	3.3	5.1
8. Summary.....	5.6	5.5	2.9	2.1
9. Analysis.....	5.7	3.5	1.8	3.1
10. Relationships.....	1.8	3.0	5.7	3.4
11. Illustration or examples.....	3.6	.96	8.6	5.1
12. Classification.....	1.6	.9	5.2	5.1
13. Application.....	2.9	1.0	5.1	5.5
14. Discussion.....	5.7	10.3	5.3	1.1
15. Statement of aim.....	4.4	1.0	.7	.8
16. Criticism.....	5.2	2.6	2.9	3.9
17. Outline.....	3.8	5.2	.98	.8
18. Reorganization of facts.....	2.1	2.3	.98	.9
19. Formulation of new questions....	1.9	.8	1.7	1.8
20. New methods.....	2.1	1.0	1.5	3.6

types of thought questions varies in the different subjects. For example, Type 7 "Explanation of the use or exact meaning of some phrase or statement in a passage" is the most frequently used type of question in English but it is eleventh in frequency of use in History. Asking students to give an illustration or example, Type 11, is next to the most frequent type of question in Science but it is seldom used in History. Type 10, which asks the student to state a relationship, is frequently used in Science but is infrequently asked of students in English. Summaries and outlines are required more frequently in History and English than in the other subjects. Thus, if our assumption that different types of questions require different mental processes is valid, we have here evidence that different types of mental processes are required of students in the different subjects. Hence, we should expect to find that the problem of directing the learning of students is different in different subjects.

TABLE III. PERCENT OF TEACHERS REPORTING NO USE OF CERTAIN TYPES OF THOUGHT QUESTIONS

Types of Questions	Grades VII-VIII	Grades IX-X	Grades XI-XII
1. Selective recall.....	3	18	11
2. Evaluating recall.....	6	29	13
3. Comparison—single.....	18	9	18
4. Comparison—general.....	9	18	13
5. Decision—for or against.....	21	32	27
6. Causes or effects.....	9	6	4
7. Explanation.....	23	26	18
8. Summary.....	6	23	22
9. Analysis.....	21	23	29
10. Relationships.....	35	18	20
11. Illustration or examples.....	41	26	16
12. Classification.....	50	29	24
13. Application.....	46	35	22
14. Discussion.....	9	15	13
15. Statement of aim.....	63	46	42
16. Criticism.....	26	23	24
17. Outline.....	26	21	31
18. Reorganization of facts.....	35	41	42
19. Formulation of new questions.....	68	44	44
20. New methods.....	44	53	32

Variations in the use of type questions in different school grades.

The replies of 113 teachers have been summarized in Table III on the basis of the school grades in which they were teaching. The subjects involved are English, History, Science and Geography. Instead of giving the median frequency of use, the percent of teachers indicating no use of the given type of question has been calculated. Thus, 3 percent of the teachers in the seventh and eighth grades reported no use of selective recall. In the ninth and tenth grades 18 percent of the teachers did not use this type and in the eleventh and twelfth grades, 11 percent. The general impression prevails that students in advanced classes are asked more difficult types of questions than students in the lower grades. A comparison of the data for the three grade groups shows that the differences are not very great. In general, it appears that the variations in the use of thought questions are greater for different subjects than for the different grades.

The relative difficulty of the different types of questions for students. In Question III teachers were asked to designate the five

TABLE IV. TYPES OF QUESTIONS FOR WHICH STUDENTS' ANSWERS ARE LEAST SATISFACTORY

Types of Questions	English	History	Science	Others	Total	Rank
1. Selective recall.	5	10	8	14	37	15
2. Evaluating recall.	12	12	11	10	45	8
3. Comparison—single.	6	7	9	5	27	19
4. Comparison—general.	12	12	9	14	47	6
5. Decision—for or against	1	9	2	6	18	20
6. Causes or effects.	17	17	19	24	77	1
7. Explanation.	15	12	15	25	67	3
8. Summary.	10	14	9	14	47	6
9. Analysis.	13	15	11	21	60	5
10. Relationships.	5	17	10	20	42	10
11. Illustration or examples	5	4	10	14	33	17
12. Classification.	5	4	9	16	34	16
13. Application.	16	12	18	29	77	1 ✓
14. Discussion.	10	14	5	10	39	13
15. Statement of aim.	15	12	5	10	42	10
16. Criticism.	8	14	7	10	39	13
17. Outline.	6	12	6	9	33	17
18. Reorganization of facts.	12	19	13	19	63	4
19. Formulation of new questions.	9	6	8	18	41	12
20. New methods.	6	7	7	24	44	9

types of questions in which "students' answers were least likely to be satisfactory." A summary of their replies is given in Table IV. The first line of this table should read as follows: Questions calling for selective recall were named among the five most difficult types by five teachers of English, ten teachers of History, eight teachers of Science, and fourteen teachers of other subjects. This type of question ranks fifteenth in the frequency of mention among the five most difficult types. The two types most frequently mentioned were Type 6, causes and effects, and Type 13, application. Both of these were mentioned by seventy-seven teachers or 38.7 percent. Altho we may say that in the judgments of those answering the questionnaire these two types are the most difficult for students, it should be noted that over 60 percent of the teachers did not list them among the five most difficult types.

Here, as in other tables, the variation in the replies of teachers is very extreme. Even when we consider the teachers of a single subject we find marked variations in their judgments concerning

the difficulty of the different types of questions. No type of question is so easy that it is not included among the most difficult five by several teachers. This variation in judgment is probably due largely to the fact that teachers have not recognized the distinction in types of questions which are made here and, furthermore, they have not analyzed the responses of their students in order to ascertain the nature of the difficulties which the students encounter in answering the questions.

Common faults of procedure in answering different types of questions. In Question IV the teachers were asked to select three of the types which they considered most difficult and to state for each of these some of the students' most common faults in procedure in answering them. An examination of the replies to this question suggests that a considerable number of teachers are satisfied with telling students that the answer is wrong, or what the answer should have been, and that they fail to give much thought to the students' faults of procedure in answering the question. It may be pointed out that questions are only a means to an end and this end is the education of the student. The answer is in itself relatively unimportant. The question fulfils its function only when it stimulates educative processes in the mind of the student. If the mental processes which the question initiates are not educative the asking of the question has been largely futile. Hence, it becomes highly important for the teacher to give attention to the procedure which the student employs in answering questions in order that the faults of procedure may be corrected so that the student's mental processes will become most effective in his education.

Of the 199 teachers from whom replies to the questionnaire were received, twenty-three did not attempt to answer Question IV at all and twenty-four others discussed all three types of questions together or stopped after discussing only one or two. Furthermore, a number of other teachers gave answers which show that they failed to grasp the significance of this question. In substance they said that the difficulty in students' procedure in answering a question is inability to do what is called for. For example, one said that the fault in answering Type 2, evaluating recall, is that "pupils are not always able to evaluate." Another said that in questions on aim "they seem unable to see any motive behind the statement of the author." Still another said that the fault in Type 6, causes and effects, is that "they are unable to see causes and effects." Still others mentioned objective faults in the

answers rather than faults in procedure. For example, one teacher mentioned that "minor details are included while leading points are omitted." Another stated that "applications are not as good as could be expected." Still another teacher simply stated that "the answers are inaccurate." General faults, such as "lack of practise in answering questions," "carelessness," "lack of concentration," "pupils do not know how to study," and so on were mentioned by one or more teachers.

It may be pointed out that teachers who fail to become definitely conscious of the difficulties which their students encounter will be unable to give them much definite constructive assistance in this phase of their learning. Probably the most significant conclusion to be drawn from the answers to this part of the questionnaire is that many teachers are failing to give attention to the procedure which students use in answering questions. They appear to be concerned largely with the accuracy of the answer and when it is wrong they fail to seek the cause in the procedure which the student has used.

Several of the faults which appear to be suggestive are given below. This list is not a complete statement of the faults of students in answering questions but should prove helpful to teachers who are desirous of ascertaining the reasons why students fail to answer questions satisfactorily.

Type 2.

The pupil fails to see real basis on which evaluation should be made.

Type 3.

A student seldom stays "on a single designated basis."

Type 3 or 4.

The pupil begins to answer the question before he has thought out what points should be included in the comparison. He often includes minor comparisons and omits the important points.

Unless there is a single designated basis for comparison, pupils fail to see all of the possibilities of comparison. The slothful pupil is content with one or two obvious comparisons.

The pupil can state some information about each thing compared, but omits the comparative connection between the two things. The pupil gives comments on one thing and omits the discussion on the other thing, showing how the two are alike comparatively.

In making comparisons, students usually give characteristics of things to be compared, or describe them separately but fail to make a complete comparison.

Type 4.

In comparing two things in general the worst fault is in the students' forgetting some of the important points to be compared. Often enough suggestions must be given so that the question finally should be placed under Type 3.

Pupils frequently fail to distinguish the important from the trivial. The pupil's prejudices—likes and dislikes—influence the comparison.

Type 6.

Students confuse cause and effect. Method requires real *thinking and reasoning*—the hardest thing any student can be asked to do.

Students often know a statement is true but on account of lack of thoroughness can not give causes or reasons.

Type 6 or 7.

Pupils, when asked, "Why?" seem to forget all reasoning and usually state the first thing that comes to mind and fail also to go far enough in explanation.

Type 7.

Pupils have difficulty in finding words to express the thought without repeating word for word parts of the passage to be explained. The chief difficulty seems to be the limitations of their vocabulary.

The trouble here is that pupils seem to have failed to study the statement under question sufficiently and so have quite an indefinite notion of the words used. And too, even if they succeed in getting a fairly good understanding of the text read, they are too careless of the choice of their own words in reproducing the meaning exactly. They are too hasty in the study of the passage and have not yet been trained to go slowly and get facts one at a time.

Type 8.

A discussion, like a summary often lacks point. The student fails to organize material and grasp essentials.

Students fail to properly organize data mentally before expressing them.

Type 9.

Here pupils are often prone to feel satisfied if only a few of the factors or qualities involved in the analysis are learned and reproduced. Many times but one factor will be offered when to completely analyze the problem will require several. Being allowed to "get off" with a minimum of thinking is one of the chief causes of poor analysis.

Type 10.

Pupils often fail to get the facts correlated before they attempt to state the existing relationships.

Pupils do not stop to analyze in order to see the relationship but answer without giving much thought.

Pupils answer various separate facts instead of showing relationship. These facts are usually true and have a bearing upon the question but the actual relationship is usually missing in the answer. That is, the pupil does not seem to see how a change in one fact would influence some other related fact.

Type 11.

Illustrations or examples. This is not so difficult after the student has had some practise, but at first he always tries to find his illustrations in some field remote from his own. It takes him a while to realize that scores of illustrations come daily under his observation—if he observes.

Type 12.

In classifying, the pupils make their answers too readily without first trying one class then another or without thinking whether the one they choose actually does fit better and why.

The student's failure in Type 12 is due mainly to his failure in Type 7. He fails to decide correctly upon a construction because he has not thought out carefully the exact meaning of the sentence. This in turn is due to mental laziness or carelessness.

Type 14.

He discusses each phase at random and separately without relating it to others.

A discussion like a summary often lacks point. The student fails to organize material and grasp essentials.

Students fail to properly organize data mentally before expressing them.

Students do not group their facts together sufficiently to discuss them properly.

Type 17.

A pupil doesn't really outline into main facts with heads under them, but makes long statements one after another, or puts steps in before their time.

General.

Pupils will not read and get a thoro knowledge of the subject-matter first.

With Types 8, 14, and 17 pupils do not summarize or discuss or outline in a way to make clear to another the things under discussion. They are not logical in the arrangement of their ideas. They answer, at least 85 percent of them, only well enough so that one who knows already can tell that they know, but only about 15 percent can arrange and subordinate well enough to be clear to the uninitiated.

A common fault is careless reading of the question (or hearing it as the case may be). This is especially true in Algebra. Another fault is "saying the first thing that comes into mind" instead of carefully considering its application to the problem under discussion. In Geometry, for example, the student does not rapidly recall all theorems pertaining to the subject in hand, eliminate those inapplicable, and so discover the correct one.

Percent of unsatisfactory answers due to faulty procedure in answering questions. In Question V the teachers were requested to indicate separately for memory questions and for thought questions the percent of unsatisfactory answers which, in their opinion, were due primarily to bad habits of procedure. A summary of their replies is given in Table V. As previously indicated it appears certain that a considerable number of teachers have given relatively little thought to the faults in the procedure used by students in answering questions. Consequently, the replies to this question must be considered as representing no more than rough estimates. In the case of thought questions the median percent of unsatisfactory answers due to faulty procedure is approximately 50 for all of the subjects. In the case of memory questions faulty procedure is considered to be a less potent cause. There are two factors that probably tend to

TABLE V. PERCENT OF SATISFACTORY ANSWERS DUE TO FAULTY PROCEDURE IN ANSWERING QUESTIONS
(As Contrasted with Lack of Information)

PERCENT	THOUGHT				MEMORY					
	English	History	Science	Others	Total	English	History	Science	Others	Total
	95	1	1			2	1	5		
90	3	1	2		6	2		2		4
85			3	3	6	1			1	4
80	2	2	5	5	9	2				2
75	5	7	2	13	27	4	1	4	2	11
70			1	5	6			1	1	2
65	2		2		4					0
60	3	5	3	6	17	4	1		5	10
55					0					0
50	3	7	8	10	28	3	5	5	12	25
45	1				1					0
40		7	4	3	14	3	6	1	7	17
35	3	1	4		8		1	1	1	3
30	3	2	3	9	17				6	6
25	4	7		6	17	6	14	11	11	42
20		3	7	4	14	7	5	2	6	20
15					0	1	3	1	2	7
10	7				7	2	4	8	7	21
5	1	1		1	3	1	3	3	4	11
0				1	1					0
Median	48	48	48	51	50	40	25	25	25	26

make these estimates lower than they should be. Many teachers showed by their replies to Question IV that they had very little experience in analyzing answers for the purpose of determining the cause of faulty answers. Naturally they could not be expected to recognize the real extent of such faults of procedure on the part of the members of their classes. Other teachers use such a limited range in types of questions that they would not have a chance to observe as many faults in answer technique as teachers who use a greater variety of types of questions.

Relation between frequency of use and difficulty. There seems to be very little relation between the difficulty of a type and the frequency of its use. Type 6, causes and effects, is the most commonly used type and at the same time it, together with Type 13, application, is considered the most difficult for students. Only one of the five types reported as most difficult, Type 18, reorganization of facts, is among the five least frequently used; only one of the five types reported as least difficult, Type ~~28~~, comparison on a single basis, is among the five most frequently used. *Should be Type 3.*

Relation of frequency of use of types of questions to emphasis upon different types of learning. An earlier bulletin¹ of the Bureau of Educational Research reports the relative emphasis on different types of textbook study in the various subjects. We now have some data on the question, "How does the frequency of use of types of questions correspond with the emphasis on the different types of textbook study required of students?" Some of the types of study recognized in the report are too broad to be tested by any one type of thought question. There are, however, question types that correspond rather closely with certain of the study types.

To get a rough measure of the relation of the frequency of use of the different types of thought questions to the emphasis upon the types of learning, we may arrange the types in order of frequency of use and divide the list into quartiles (four equal parts). For instance, in English, Study Type II is in the first quartile (i. e. the three most frequently required study types); Study Type X is in the fourth

¹Monroe, Walter S. "Types of learning required of pupils in the seventh and eighth grades and in the high school." University of Illinois Bulletin, Vol. 19, No. 15, Bureau of Educational Research Bulletin, No. 7, Urbana: University of Illinois, 1921, 16. p.

TYPES OF TEXTBOOK STUDY	TYPES OF QUESTIONS
II. Summary of central ideas in the lesson studied.	8. Summary.
III. Prepare an outline of principal points and supporting details in the lesson arranged to show order of relative importance and relationship.	17. Outline.
VI. Discovery of collateral or illustrative material for topics or problem under discussion.	11. Illustration or examples.
VIII. Appreciation of the significance of each word used in a concisely expressed statement or principle.	7. Explanation of the use or meaning of some phrase or statement in a passage.
IX. A clear comprehension of the essential conditions of a problem which is to be solved.	9. Analysis.
X. Discovery of new or supplementary problems related to the topic being studied.	19. Formulation of new questions.

quartile (i. e. one of the least frequently required study types).¹ Table VI shows the extent of agreement in rank in frequency of use of some corresponding types of study and questions. The first column gives by number the corresponding types as listed above. The first number given in the columns for the separate subjects designates the quartile rank of the study type on the same horizontal line; the second number designates the rank of the corresponding type of question. It will be noted that the rank agrees in seven out of eighteen possible cases. In English the disagreement is greatest in the case of questions calling for analysis (first rank) and study requirements of a clear comprehension of the conditions of a problem (fourth rank); in History, the discovery of collateral or illustrative material ranks second in study requirements but questions calling for illustrations or examples rank fourth in use; in Science, the same study requirement ranks fourth and the corresponding question type ranks first. Thirty-three percent of the Physics and Chemistry teachers in the first questionnaire mentioned Study Type X, discovery of new or supplementary problems, as a major type of study in these subjects, yet 44 percent of the teachers of these subjects by their admission do not ask any questions of Type 19, formulation of new questions, to their

¹These facts are derived from Table II of the Bulletin referred to above.

TABLE VI. CORRESPONDENCE OF TYPES OF STUDY AND TYPES OF QUESTIONS

CORRESPONDING TYPES		ENGLISH		HISTORY		SCIENCE		AGREE	VARY	VARY WIDELY
Study	Quest.	Study Rank	Quest. Rank	Study Rank	Quest. Rank	Study Rank	Quest. Rank			
II	13	1	2	2	2	3	3	Hist.+Sci.	English	
III	17	2	3	1	2	4	4	Sci.	Eng.+Hist.	
VI	11	3	3	2	4	4	1	Eng.		Hist.+Sci.
VIII	7	2	1	3	3	3	2	Hist.	Eng.+Sci.	
IX	9	4	1	4	2	3	3	Sci.		Eng.+Hist.
X	19	4	4	3	4	2	3	Eng.	Hist.+Sci.	

high school juniors and seniors. It would seem from the data that some teachers may not be using the types of questions that would stimulate and test students' achievements in some of the types of study they are expected to use.

Conclusions. Probably the most significant conclusions to be drawn from this investigation are: (1) teachers are not sufficiently conscious of the types of questions which they are accustomed to ask and of the significance of these types, and (2) in general teachers do not analyze unsatisfactory answers to questions in order to ascertain whether such answers are due to a faulty technique on the part of the student.

A number of other conclusions are worthy of mention. (1) Teachers of the same subject vary widely in the extent of their use of different types of thought questions. (2) The frequency of the use of a given type does not seem to depend very much on (a) the school grade, (b) the subject, or (c) the supposed difficulty of the type. It is very likely that some teachers, who expect their students to use certain types of study, do not use the types of questions that are best suited to test their students' achievements due to those particular types of study. (3) Teachers individually think that certain types of questions are more difficult for students than others. However, there is no very great agreement among teachers as to the relative difficulty of the various types.

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THE CONSTANT AND VARIABLE ERRORS
OF EDUCATIONAL MEASUREMENTS

by

WALTER S. MONROE
Director, Bureau of Educational Research



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