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## Effects of Classroom Questions on the Selection of Resources and Responses by Undergraduate and Sixth-Grade Students

**FREDERICK A. RODGERS \***

THE use of questions is a major focus of some educators who are concerned with conducting and evaluating classroom instruction. However, little systematic and empirical research has been conducted on the general construction and mode of presentation of classroom questions. Further, the influence of classroom questions on the performance of students has been ignored in the literature. If the intent of professional educators is to improve the quality of instruction, these are serious omissions. Norris M. Sanders (1) implies that a teacher's instructional effectiveness is significantly related to his ability to formulate structured and sequentially patterned questions. If this is true, it seems reasonable to conclude that a systematic study of how various kinds of ques-

tions influence a group's performance of tasks associated with classroom learning should provide meaningful directions for making teacher education programs more effective.

This study is an attempt to isolate and describe some of the problems associated with the construction and presentation of classroom questions. It is also the intent of this study to illustrate how the ambiguity that is inherent in many questions influences the way students at different levels in the educational hierarchy attempt to answer them.

\* *Frederick A. Rodgers, Assistant Professor of Elementary Education, New York University, New York*

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There are many schemes that can be employed to classify and/or type classroom questions. However, in order for such a goal to be accomplished sufficiently, the writer would be forced to go beyond the scope of the intent of this study. Therefore, the discussion of classroom questions offered here will focus primarily on some of the general uses that can be made of questions in a classroom setting.

Questions can be used to assess the quality and degree of learning that children experience. It is obvious that classroom questions will vary from teacher to teacher and from subject to subject. The quality and nature of questions will also change as the environmental situations and instructional goals of the class change. Clearly, the teacher's ultimate instructional purpose will directly influence the way questions are formulated, organized, and presented. Whether teachers are concerned with interpreting a lesson, encouraging a specific kind of student response, selecting students who need more practice, or maintaining group organization in a manageable pattern, the questions they use must be structured and programmed to initiate the intended effects.

It is also possible for teachers to use questions which require students to supply specific feedback of selected data, with an expected answer indicated for each question. This latter use of questions requires students to make use of specific facts based upon a predetermined pattern. It should be noted that the uses of questions cited above are primarily illustrations of the teacher's attempt to deal with the cognitive aspects of classroom learning.

When teachers are interested in formulating questions which cover both the affective and cognitive components of learning, they must present questions which require the student to relate academic knowledge to his nonacademic experiences. Thus, the questions used in this type of pattern ascribe a significant role to the personal experiences of students. Furthermore, teachers may employ questions to control the behavior of students while maintaining an orientation toward academic activities. Questions used

for this purpose can be classified in either the affective or the cognitive domain. Regardless of the psychological domain involved, questions determine the focus and the direction for making the acquisition of skills and understandings a realistic possibility.

According to some of the implications noted in some of the professional literature, there is increasing empirical evidence which supports the conclusion stated above. A growing number of researchers have turned their attention to this problem area. For example, Professor Frank Guzzak conducted research on the relationship between classroom questions and instructional effectiveness. Specifically, his research problem was concerned with (a) a description of reading comprehension results as related to teacher questions, (b) the incidence of congruence or incongruence between teacher questions and student responses, and (c) the description of the interaction patterns involved in the two areas mentioned previously. The conclusions drawn by the researcher indicate that:

... most teacher questions called for literal comprehension and were immediately met with congruent responses. Further results revealed that teachers rarely related subsequent questions to previous questions. The total picture suggested that strategies were infrequent which would appear capable of stimulating pupils to activate higher thinking abilities about reading. Rather, the strategies found appeared to program students for a very limited response activity(2).

This study suggests that teachers tend to ask questions for which correct responses have been predetermined. This pattern of operation specifically illustrates the manner in which too many teachers have required students to deal with classroom questions. This pattern of employing questions limits the variety of resource materials, work strategies, and relevant explorations selected by students. A continuous use of such questioning techniques ultimately leads to a serious curtailment of all the children's subsequent possibilities for learning to think critically. Another study in this general area was com-

pleted by Francis P. Hunkins. The researcher:

... sought to determine whether a dominant use in social studies text-type materials of analysis and evaluation questions, as defined by Bloom's *Taxonomy*, would effectively stimulate the development of sixth grade pupils' social studies achievement(3).

The results of this study suggest that when high cognitive level questions (analysis and evaluation) are employed, significantly higher scores are evident in social studies achievement than when low cognitive level questions (knowledge) are used. Hunkins' study provides some evidence to suggest that questions which require students to consider content will help students become more skillful in the exploration of ideas and concepts. In order to use questions in this manner, teachers must not limit their questions to those for which the correct response has been predetermined.

Although both of the studies presented above are generally related to the concerns of the present study, neither study deals with specific reasons for asking questions of a class. This study takes as part of its focus the reasons outlined by Gilbert Highet for formulating questions. According to Professor Highet, classroom questions can be employed:

... to find out if each individual has done his work in preparation, and to expose the difficulties they have found collectively in preparing the work(4).

The latter reason for asking questions of a class offers a technique which could help children to learn independently. However, such learning is unlikely to occur unless the questions employed contain certain essential elements. In an interesting book, *Classroom Questions*, Norris M. Sanders suggests that the elements of effective questions are precision, clarity, and a close relationship to the subject upon which the question is based. However, experience indicates that the inclusion of these elements for the formulation of good questions is much easier to require than to achieve(1). This latter conclusion is amply supported by Hoffman's discussion in *The Tyranny of Testing*(5). If good ques-

tions are to be formulated, elements which are essential to questions must be delineated.

Some basic assumptions used to guide this study are: (a) questions are ambiguous which require subjects to use a variety of resources to locate an expected response; (b) the more a question is structured (programmed) the greater the possibility that subjects will supply the response that is expected by the teacher; (c) as students advance in grade level they will make use of a wider variety of resources to answer questions; and (d) students at lower grade levels will supply more expected responses to specific questions than do students at a higher level.

In part, this study is an attempt to describe the processes employed and the sources used by students to locate answers to specific questions; to highlight the tendency of students to furnish the answers to questions expected by teachers; and to tabulate the approximate length of time it takes for students to locate answers to certain kinds of questions. Specifically, this study attempts to study how classroom questions affect the way different kinds of students apply their skills in locating answers.

## The Sample

Subjects for this study were selected from two distinctly different groups—a sixth-grade class of 18 students and an undergraduate college class of 33 juniors and seniors majoring in elementary education. The sixth graders in this study were products of a disadvantaged environment. They had received intelligence test scores that ranged from 75 to 108 with a mean of 89.43, on the *California Test of Mental Maturity*. On the average, these sixth graders had achieved below grade level on the *California Achievement Test*. As a group they had a mean grade equivalent score of 5.1 on tests that had been administered at the beginning of the school year. Data for the present study were gathered one month before the end of the 1966 school year.

Even though the intelligence and achievement test scores of the sixth graders

were low when compared with the national norm, the subjects, given the measured intellectual characteristics of the group, appeared to be achieving about as well as could be expected. The sixth-grade class was located in a school that had a centralized library that was directed and controlled by members of the system's central office staff. Library instructions for children in the selected elementary school were supervised and taught by a roving librarian. The instructional program on the use of library facilities for the sixth graders was limited to a 40-minute period three days per week.

The undergraduates used in this study were either second-semester junior or first-semester senior majors in the elementary education department at a large midwestern university. Most of the members of this group were in the top 25 percent of their high school graduating class. The majority of the undergraduate students had a "B" average for all their previous college work. No undergraduate student had less than a "C plus"

cumulative grade point average for college work completed at the time of the study. Even though some of the undergraduates had completed or were enrolled in a course in library science, members of this group had not had any specific instruction in the use of the library since their freshman year. The freshman library orientation course was voluntary.

## Procedure

In order to obtain questions for this experiment, 15 different source materials were selected from the collection of materials in the library of the school where the sixth graders were located. These sources were used to obtain 18 answers for which questions were constructed. Some of the questions had several parts and were written in a style that allowed for a wide range of structure (some questions were programmed more carefully than others). When some questions were provided with subparts, an attempt

	Questions	Expected Answers	Sources Used
1.	A. How long is the Brazos River?	870 miles	World Atlas
	B. How long is the Indus River?	1,900 miles	World Atlas
	C. Where is the mouth of the Brazos River located?	Gulf of Mexico	World Atlas
2.	A. Who was Robert Ripley?	American cartoonist	Encyclopedia
	B. Is Robert Ripley still alive?	No	Encyclopedia
3.	A. Who is the donor of the Newberry Award?	Frederic Melcher	Anthology of Children's Literature
	B. What piece of literature won the award in 1958?	<i>Rifles for Watie</i>	Anthology of Children's Literature
	C. Who was the author of the winning literature?	Harold Keith	Anthology of Children's Literature
4.	A. What years did the 87th Congress reign?	1960-61	Illinois Blue Book
	B. How many representatives did the State of Illinois have in Congress?	25	Illinois Blue Book
	C. What was the number of Democrats present?	14	Illinois Blue Book
5.	A. At the beginning of 1961, did Delaware County in New York State have a Post Office?	No	Directory of Post Offices
	B. What was the name of the Post Office?	No name should be provided	Directory of Post Offices

Table 1. Expected Answers for Selected Questions Taken from Different Sources

was made to order subparts sequentially so that the selection of an expected answer was dependent upon the subject's performance on the previous question. In all instances, the researcher had decided on an expected response for each question.

When questions were presented to the subjects in both groups, they were asked to do three things: (a) write the correct answer(s) to each question or assignment; (b) list the steps used in finding the answers to the questions; (c) list the source(s) used to obtain answers for the questions; and (d) record the approximate amount of time required to locate the answers selected. The questions were administered to the sixth graders as part of a language arts assignment and to the undergraduates as part of a social studies assignment in a methods course.

## Analysis of the Data

Of the 18 original questions, five were randomly selected for analysis in comparing the performance of the two groups. Table 1 illustrates the questions, the expected answers, and the sources used to obtain the answers. It should be noted that all of the questions that are shown in a separate group were taken from the same source. This step ensured the consistency of the answers for related questions.

Table 2 (see page 270) illustrates the number and percent of answer choices for the five selected questions made by the subjects in both groups. For question 1, a larger percentage of the college students gave the expected answers than did the sixth graders. There was a tendency for members in both groups to select the same answer although it was not the expected answer.

In subpart B of question 1, the sixth graders selected more<sup>1</sup> different answers than did the undergraduates. This relationship was reversed for subpart C of the same question. A few of the sixth graders gave no answer at all.

<sup>1</sup> Since the total number of both groups is not the same, the phrases "more," "greater than," etc., refer to percentage.

On question 2, more sixth graders gave the expected answers than did the members of the college group. The sixth graders revealed a greater tendency to give a wide variety of answers to this question than did the undergraduates. One sixth grader gave no answer. The pattern of responses for question 3 appeared to be the reverse of the one shown for question 2. More of the undergraduates gave the expected answer than did the sixth graders. In one instance (subpart A) no sixth grader gave the expected answer. Sixth graders showed a greater tendency to give a variety of answers than did the undergraduate group. Only one college subject failed to give an answer to one of the subparts of question 3, while many sixth graders failed to give answers for all of the subparts of the same question.

The response pattern for question 4 was very unusual. For subpart A of this question, more of the sixth graders gave expected responses than did the undergraduates. However, the undergraduates were more consistent in making an alternate choice for the expected response to subpart A. For subparts B and C of question 4, the undergraduates made more expected responses than did the sixth graders. The former group selected a wider variety of alternate response choices than did the latter group. The sixth graders demonstrated a greater tendency to give no answer to question 4 than did the undergraduate group.

For question 5, the sixth graders were just as likely to indicate the expected responses as were the undergraduates. Neither group was very successful in supplying the expected answer to this question. It is significant to note that the undergraduates were more likely to select a wider variety of alternate choices than the sixth graders. The sixth graders had a greater tendency to provide no answer to question 5 than did the undergraduates.

Table 3 (see page 271) shows the number of different sources that are used by subjects in both groups. It should be noted that in every instance, the college subjects used a greater number of sources than did the sixth graders. With the exception of one question

Answers to Questions by Subparts

Answers	A				B				C			
	College		Sixth Grade		College		Sixth Grade		College		Sixth Grade	
	N	%	N	%	N	%	N	%	N	%	N	%
1. Expected	24	72.7	8	44.4	9	27.3	1	5.6	24	72.7	5	27.8
Alternate	3	9.1	3	16.6	9	27.3	5	27.8	3	9.1	4	22.2
	2	6.1	1	5.6	4	12.1	2	11.1	2	6.1	1	5.6
	1	3.0	1	5.6	2	6.1	2	11.1	1	3.0		
					2	6.1	1	5.6				
					1	3.0	1	5.6				
							1	5.6				
No Answer Given			3	16.6			2	11.1			7	38.9
2. Expected	24	72.7	15	83.3	23	69.7	16	88.9				
Alternate	3	9.1	2	11.1	6	18.2	1	5.6				
	2	6.1			3	9.1						
	1	3.0			1	3.0						
	1	3.0										
	1	3.0										
No Answer Given	1	3.0	1	5.6			1	5.6				
3. Expected	24	72.7	0	0.0	29	87.9	4	22.2	29	87.9	5	27.8
Alternate	3	9.1	3	16.6	3	9.1	1	5.6	3	9.1	1	5.6
	2	6.1	1	5.6			1	5.6			1	5.6
			1	5.6			1	5.6				
			1	5.6								
			1	5.6								
			1	5.6								
No Answer Given	1	3.0	7	38.9			10	55.6			10	55.6
4. Expected	1	3.0	4	22.2	14	42.4	5	27.8	15	45.5	5	27.8
Alternate	22	66.7	1	5.6	8	24.2	2	11.1	7	21.2	1	5.6
	3	9.1	1	5.6	5	15.2	1	5.6	4	12.1		
	3	9.1	1	5.6	1	3.0	1	5.6	2	6.1		
	2	6.1	1	5.6	1	3.0	1	5.6	1	3.0		
	1	3.0	1	5.6	1	3.0			1	3.0		
	1	3.0			1	3.0			1	3.0		
No Answer Given			9	50.0	2	6.1	8	44.4	1	3.0	12	66.7
5. Expected	2	6.1	1	5.6	1	3.0	1	5.6				
Alternate	19	57.6	7	38.9	7	21.2	1	5.6				
	2	6.1	1	5.6	4	12.1	1	5.6				
	1	3.0			2	6.1						
	1	3.0			2	6.1						
					1	3.0						
					1	3.0						
					1	3.0						
					1	3.0						
					1	3.0						
No Answer Given			9	50.0	10	30.3	15	83.3				

Table 2. Number and Percent of Answer Choices for Selected Questions by College and Sixth Grade Subjects

(the second one), in every instance there was a greater tendency for college subjects to use the same sources indicated by the researcher for each question. On the average, approximately one-third of both groups (a little less for the college subjects and a little more for the sixth graders) employed the same source used by the researcher to obtain answers for each question. The undergraduate and sixth-grade groups average approximately eleven and five different sources respectively to locate answers to the various questions.

If the results shown in Tables 2 and 3 are combined, the college subjects used nine different sources to provide fourteen different answers for question 1, ten different sources to provide eleven different answers for question 2, thirteen different sources to provide seven different answers for question 3, fifteen different sources to provide twenty-two different answers for question 4, and ten different sources to provide seventeen different answers for question 5. On the other hand, the sixth graders used five different sources to provide fourteen different answers for

question 1, seven different sources to provide four different answers to question 2, five different sources to provide fifteen different answers to question 3, six different sources to provide thirteen different answers to question 4, and four different sources to provide six different answers to question 5. Sixth graders appeared to use fewer different sources and to provide fewer alternate answers (with the exception of question 3) than did the undergraduates. The groups selected an equal number of different answers for question 1.

Data concerned with the steps taken to locate answers and the time needed to complete the tasks were not analyzed for both groups because they were not reported by both groups in a usable form. Part of the problem may be related to the lack of specificity and/or the lack of clarity in the directions provided. Although a comparative picture is not available for the two groups for these two areas (steps taken and time used), it might be instructive to present the data collected on the college subjects. These data are presented in Tables 4 and 5.

Questions	Level of Subjects	Number Using the Researcher's Source	Number of Subjects Using Sources That Differed From the Researcher's Sources															Number of Different Sources Used
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1.	College	13	17	7	6	2	1	1	1	1								9
	Sixth Grade	7	13	5	1	1												5
2.	College	14	9	3	2	2	2	2	1	1	1							10
	Sixth Grade	15	3	2	2	2	1	1										7
3.	College	1	11	6	5	3	2	1	1	1	1	1	1	1	1			13
	Sixth Grade	0	8	2	2	1	1											5
4.	College	6	5	4	4	4	4	3	3	3	2	1	1	1	1	1		15
	Sixth Grade	2	5	5	1	1	1	1										6
5.	College	10	8	3	3	2	2	1	1	1	1							10
	Sixth Grade	1	5	3	2													4
Total	College	44																
	Sixth Grade	25																
Mean	College	8.8																11.4
	Sixth Grade	5.0																5.4

Table 3. The Number of Different Sources Used by Subjects To Answer Questions

Table 4 reports the sequence of steps made by undergraduates to locate answers to the questions. In all but one instance (question 5), one-half or more of the undergraduates selected a general reference source as their first step in trying to locate answers to the questions. There is not a strong tendency (question 5 is the exception) for these subjects to consult a card catalog as a first step. In the second step of the location procedure, undergraduates continue to evidence a strong tendency to select a general reference source. The trend to select a specialized reference source becomes more pronounced in the second and third (more so in the third) procedural steps. The specialized reference source is selected by some undergraduates in every procedural step. If the percentages for each procedural step when using the reference room and card catalog were combined, there would be only one instance (first step, question 5) wherein at least half of the undergraduates consulted the index area of the library as a first procedural step. Most undergraduates appear

to have selected a reference source based on prior knowledge of the content contained in designated materials.

Table 5 shows the range and average time in minutes it took undergraduates to locate answers to each question. The significant aspect of these data is related to the fact that the most time was spent on questions 4 and 5 for which undergraduates supplied the fewest expected answers.

## Discussion

The primary focus of this study was to isolate, study, and describe how the use of different kinds of questions tend to influence the variety of sources, answers, and processes employed by students at different levels in the educational hierarchy to locate and select answers. The sample was composed of sixth graders and college students majoring in elementary education.

Generally, the study suggested that sixth graders and undergraduates are likely to make use of a number of different sources to

Percentage of Undergraduates Taking the Major Steps Reported

Questions	Order Of Steps Taken	General Source*	Specialized Source**	Reference Room	Card Catalog
I	First	62.07%	10.34%	20.69%	6.90%
	Second	66.67	33.33		
	Third	33.33	50.00	16.67	
II	First	50.00	5.88	26.47	17.65
	Second	57.89	36.84	5.26	
	Third		83.33		16.67
III	First	51.56	15.15	18.18	15.15
	Second	38.89	50.00	5.56	5.56
	Third		77.78	11.11	11.11
IV	First	67.74	12.90	3.23	16.13
	Second	30.77	53.85	15.38	
	Third	20.00	60.00		20.00
V	First	32.14	10.71	21.43	35.71
	Second	18.75	56.25	18.75	6.25
	Third	25.00	75.00		

\* A general source refers to a reference that presents information that covers the common range of knowledge across many content areas not limited to the specific area of the questions.

\*\* A specialized source refers to a reference that presents information which covers a selected and limited area of knowledge that is specific to the content area of the question.

Table 4. Steps Taken by Undergraduates to Locate Answers to Questions

locate answers for questions presented by the teacher. Both groups have a tendency to select answers for the same questions that differ from the answers selected by the teacher making use of a single source. Further, the data suggest that when the expected answers for related questions are selected from different sources, there is a greater chance that students will present answers which differ from the predetermined answers expected by the teacher.

When questions are carefully programmed and deal with a single specific fact, students at different levels are likely to give more answers that are expected by the person who presented the question. Similarly, students who use a source similar to the one used by the teacher will present more of the answers expected by him. Whether or not students will provide the expected answers to questions formulated by teachers is dependent upon how much the questions are programmed and the source selected for locating answers. A teacher must program questions carefully and must specify the sources to be used if he wants the majority of his students to give expected answers to selected questions.

The influence programming may have upon the ability of students to provide expected answers to questions is illustrated by questions that were used but not analyzed here. The questions to which I refer are: (a) How long is the Green River? and (b) Is the Green River longer or shorter than the Salmon River? At first these seem like reasonable questions to ask sixth graders in a social studies class. However, closer study

reveals that the first question is confusing and that it is not possible to answer the second question correctly if the answer to the first is not the expected one. The confusion in the first question is centered around the fact that there are two different Green Rivers in the United States. There is a Green River in Kentucky and in Wyoming and they measure 360 and 730 miles long respectively. The Salmon River is 420 miles long and is located in Idaho. The point about the confusion created by the two questions becomes clear when one notes the lengths of the rivers involved. This example becomes even more confusing when one considers the possibilities of a Green or Salmon River located in a country other than the United States. If a teacher expects specific answers to related questions, he must carefully program his questions and specify the sources students should use.

The majority of undergraduates in this study have a tendency to use a general reference source to locate answers to questions that deal with different content areas and are programmed differently. Undergraduates are not as likely to make use of the index room of the library when questions are not highly structured (programmed). There is a possibility that the use of the index room by undergraduates is related to the difficulty of the questions and the familiarity of the students with the content involved.

In conclusion, although this study illustrates how some sixth graders and undergraduates respond to questions presented to them by a third person, it does not provide direction for the teacher when several students select a number of different sources and provide answers that differ from the answers expected. The results of this study do not indicate how this situation might be handled as an instructional problem, how students might be grouped for more related and meaningful experiences, how to make decisions about teaching strategies, how to help students select appropriate sources, how to teach students the proper procedural steps of location, how to help students compare different answers for the same questions, and

Questions	Range in Minutes	Average Time in Minutes
1.	5-30	11.39
2.	2-30	8.39
3.	3-40	9.59
4.	5-60	17.59
5.	5-60	20.65

Table 5. Required Time for Answering Questions as Reported by Undergraduates

how to eliminate confusion in the interpretation of questions. There is a real need to determine to what extent the questions used in instruction affect the learning that takes place and the techniques children use to process information. This problem will be solved as more knowledge is gained about the procedures and insights students use to answer questions posed by teachers.

What should be the concern of teachers who attempt to construct questions for classroom use? Before a teacher writes a single question for a unit, a lesson or selected curriculum materials, he should be thoroughly acquainted with the subject and mentally attuned to the possible intellectual experiences that will be required of the students to be taught. It is essential for teachers to be acquainted with the wide variety of materials students are likely to use to seek answers to certain questions. The possibility of helping children to really understand the operation of a principle is remote without the flexible or unlimited use of a variety of related examples that are carefully explored with relevant questions.

A vital point to remember when planning questions is that almost any important concept can be taught in several ways while guiding learners to different levels of thinking and action. To a very large measure, the learning outcomes of any instructional effort

will depend upon the extent and quality of the questions which guide the students' involvement.

If we continue to view teaching as contributing to the constant expansion and development of the human intellect, questions selected for classroom use must provide the structure and the direction that is essential to the attainment of these goals. In this respect the proper formulation and employment of questions remain a relevant goal in the improvement of classroom instruction.

### References

1. Norris M. Sanders. *Classroom Questions*. New York: Harper and Row, Publishers, Inc., 1966.
2. Frank J. Guzzak. "Reading Comprehension Development as Viewed from the Standpoint of Teacher Questioning Strategies." Paper read at the 1967 Annual Meeting of the American Educational Research Association held in New York City, February 16-18, 1967.
3. Francis P. Hunkins. "The Influence of Analysis and Evaluation Questions on Achievement in Sixth Grade Social Studies." *Educational Leadership Research Supplement* 25(4): 326-32; January 1968.
4. Gilbert Highet. *The Art of Teaching*. New York: Vintage Books, 1950. p. 125.
5. Banesh Hoffman. *The Tyranny of Testing*. New York: Collier Books, 1964. □



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