

CHAPTER 8

Survey Research

Research Question: *How Can We Get a National Picture of K–12 Math and Science Teaching?*

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Science and mathematics education have assumed growing importance in an age of ubiquitous computers and constant technological innovation. The performance of U.S. students on math and science tests has been criticized in comparison to other countries (Hanushek, Peterson, & Woessmann, 2010; Provasnik, Gonzales, & Miller, 2009), and there has been a push for improvement in math and science teaching. But what does math and science instruction in U.S. schools actually look like? What materials are used? What methods are common? To answer this question, the National Science Foundation commissioned the 2000 National Survey of Science and Mathematics Education (“2000 National Survey”). The survey gathered data on teacher background and experience, curriculum and instruction, and the availability and use of instructional resources (Weiss, Banilower, McMahon, & Smith, 2001).

In this chapter, we use the 2000 National Survey and other examples to illustrate key features of survey research. You will learn about the challenges of designing a survey, some basic rules of question construction, and the ways in which surveys can be administered. This is followed by issues of survey design related to diverse school populations and a discussion of ethical issues surrounding surveys. By the chapter’s end, you should be well on your way to becoming an informed consumer of survey reports and a knowledgeable developer of survey designs.

2 Why Is Survey Research So Popular?

Survey research involves the collection of information from a sample of individuals through their responses to questions. The National Science Foundation turned to survey research for the 2000 National Survey because it is an efficient method for systematically collecting data from a broad spectrum of individuals and educational settings. As you probably have observed, a great many researchers choose this method of data collection. In fact, surveys have become such a vital part of our social fabric that we cannot assess much of what we read in the newspaper or see on TV without having some understanding of survey research.

Survey research owes its continuing popularity to its versatility, efficiency, and generalizability. First and foremost is the *versatility* of survey methods. Researchers have used survey methods to investigate areas of education as diverse as school desegregation, academic achievement, teaching practice, and leadership. Although a survey is not the ideal method for learning about every educational process, a well-designed survey can enhance our understanding of just about any educational issue. The 2000 National Survey covered a range of topics about math and science teaching, and there is hardly any other topic of interest to educators that has not been studied at some time with survey methods.

Surveys are efficient in that many variables can be measured without substantially increasing the time or cost. Survey data can be collected from many people at relatively low cost and, depending on the survey design, relatively quickly.

Survey methods lend themselves to probability sampling from large populations. Thus, survey research is very appealing when *sample generalizability* is a central research goal. In fact, survey research is often the only means available for developing a representative picture of the attitudes and characteristics of a large population. To gather a representative national picture of math and science instruction, the 2000 National Survey sampled 5,765 science and mathematics teachers across the United States (Weiss et al., 2001).

Survey responses from these teachers produced a unique, national data set covering “science and mathematics course offerings and enrollments; teacher qualifications; textbook usage; instructional techniques; and use of science and mathematics facilities and equipment” (Weiss et al., 2001, p. 2). A mixture of methods was used, including interviews and questionnaires of teachers, program directors,

and principals as well as on-site observations in both math and science classrooms. The data collected allowed Horizon Research, the firm that carried out the survey, to investigate topics such as the impact of professional development on math and science teaching (Rosenberg, Heck, & Banilower, 2005), the extent to which recommended reforms have actually been implemented (Smith, Banilower, McMahon, & Weiss, 2002), leadership issues, and the change process at the school level (Weiss et al., 2001). As a result, we know much more about how academic preparation and professional development influence math

and science instruction, what teaching techniques and textbooks are being used, and how much progress has been made toward reform.

Surveys also are the method of choice when cross-population generalizability is a key concern because they allow a range of educational contexts and subgroups to be sampled. The consistency of relationships can then be examined across the various subgroups. The 2000 National Survey sampled urban, suburban, and rural teachers K–12 and across subdisciplines such as earth science, chemistry, biology, and physics (Weiss et al., 2001).

Want to Know More? You can access reports and survey instruments of the 2000 National Survey of Science and Mathematics at <http://2000survey.horizon-research.com/>.

2 Errors in Survey Research

It might be said that surveys are too easy to conduct. Organizations and individuals often decide that a survey will help to solve some important problem because it seems so easy to prepare a form with some questions and send it out. But without careful attention to sampling, measurement, and overall survey design, the effort is likely to be a flop. Such flops are too common for comfort, and the responsible survey researcher must take the time to design surveys properly and to convince sponsoring organizations that this time is worth the effort (Turner & Martin, 1984, p. 68).

For a survey to succeed, it must minimize the risk of two types of error: poor measurement of cases that are surveyed (*errors of observation*) and omission of cases that should be surveyed (*errors of nonobservation*) (Groves, 1989). Potential problems that can lead to errors of observation stem from the way questions are written, the characteristics of the respondents who answer the questions, the way questions are presented in questionnaires, and the interviewers used to ask the questions. The potential measurement errors that survey researchers confront in designing questions and questionnaires are summarized in Exhibit 8.1; we discuss each of these sources of error throughout the chapter.

There are three sources of errors of nonobservation:

- Coverage of the population can be inadequate due to a poor sampling frame.
- The process of random sampling can result in sampling error—differences between the characteristics of the sample members and the population that arise due to chance.
- Nonresponse can distort the sample when individuals refuse to respond or cannot be contacted. Nonresponse to specific questions can distort the generalizability of the responses to those questions.

We considered the importance of a good sampling frame and the procedures for estimating and reducing sampling error in Chapter 5; we only add a few more points here. We focus more attention in this chapter on procedures for reducing nonresponse in surveys, an increasing concern.

The next two sections focus on principles, including question writing, for developing a well-designed survey. Presenting clear and interesting questions in a well-organized questionnaire will help to reduce measurement error by encouraging respondents to answer questions carefully and to take seriously the request to participate in the survey.

2 Questionnaire Design

Survey questions are answered as part of a **questionnaire** (or **interview schedule**, as it is sometimes called in interview-based studies). The context created by the questionnaire has a major impact on how individual questions are interpreted and answered. As a result, survey researchers must carefully design the questionnaire as well as individual questions. There is no precise formula for a well-designed questionnaire. Nonetheless, some key principles should guide the design of any questionnaire, and some systematic procedures should be considered for refining it.

Questionnaire: A survey instrument containing the questions in a self-administered survey.

Interview schedule: A survey instrument containing the questions asked by the interviewer in an in-person or phone survey.

Exhibit 8.1 Measurement Errors Associated With Surveys

Question Wording: Does the question have a consistent meaning to respondents? Problems can occur with

- *Lengthy wording* Words are unnecessarily long and complicated.
- *Length of question* Question is unnecessarily long.
- *Lack of specificity* Question does not specify the desired information.
- *Lack of frame of reference* Question does not specify what reference comparisons should be made to.
- *Vague language* Words and phrases can have different meanings to respondents.
- *Double negatives* Question uses two or more negative phrases.
- *Double barreled* Question actually asks two or more questions.
- *Using jargon and initials* Phrasing uses professional or academic discipline-specific terms.
- *Leading questions* Question uses phrasing meant to bias the response.
- *Cultural differences in meaning* Phrases or words have different meanings to different population subgroups.

Respondent Characteristics: Characteristics of respondents may produce inaccurate answers. These include

- *Memory recall* Problems remembering events or details about events.
- *Telescoping* Remembering events as happening more recently than when they really occurred.
- *Agreement or acquiescence bias* Tendency for respondents to “agree.”
- *Social desirability* Tendency to want to appear in a positive light and therefore providing the desirable response.
- *Floaters* Respondents who choose a substantive answer when they really do not know.
- *Fence-sitters* People who see themselves as being neutral so as not to give the wrong answer.
- *Sensitive questions* Questions deemed too personal.

Presentation of Questions: The structure of questions and the survey instrument may produce errors including

- *Open-ended questions* Response categories are not provided, left to respondent to provide.
- *Closed-ended questions* Possible response categories are provided.
- *Agree-disagree* Tendency to agree when only two choices are offered.
- *Question order* The context or order of questions can affect subsequent responses as respondents try to remain consistent.
- *Response set* Giving the same response to a series of questions.
- *Filter questions* Questions used to determine if other questions are relevant.

Interviewer: The use of an interviewer may produce error.

- Mismatch of interviewer-interviewee demographic characteristics.
- Unconscious judgmental actions to responses.

Source: Engel and Schutt (2010, p. 179).

Maintain Consistent Focus

A survey should be guided by a clear conception of the research problem under investigation and the population to be sampled. Throughout the process of questionnaire design, the research objective should be the primary basis for making decisions about what to include and exclude and what to emphasize or treat in a cursory fashion. The questionnaire should be viewed as an integrated whole, in which each section and every question serve a clear purpose related to the study’s objective and each section complements other sections.

Build on Existing Instruments

Surveys often include irrelevant questions and fail to include questions that, the researchers realize later, are crucial. One way to ensure that possibly relevant questions are asked is to use questions suggested by prior research, theory, experience, or experts (including participants) who are knowledgeable about the setting under investigation.

If another researcher already has designed a set of questions to measure a key concept, and evidence from previous surveys indicates that this measure is reliable and valid, then, by all means, use that instrument. Resources such as the *Handbook of Research Design and Social Measurement* (Miller & Salkind, 2002) can give you many ideas about existing instruments; your literature review at the start of a research project should be an even better source.

But there is a trade-off here. Questions used previously may not concern quite the right concept or may not be appropriate in some ways to your population. So even though using a previously designed and well-regarded instrument may reassure other researchers, it may not really be appropriate for your own specific survey. A good rule of thumb is to use a previously designed instrument if it measures the concept of concern to you and if you have no clear reason for thinking it is inappropriate with your survey population.

Refine and Test Questions

The only good question is a pretested question. Before you rely on a question in your research, you need evidence that your respondents will understand what it means. So try it out on a few people.

One important form of pretesting is discussing the questionnaire with colleagues. You can also review prior research in which your key questions have been used. Forming a panel of experts to review the questions can also help. For a student research project, “experts” might include a practitioner who works in a setting like the one to be surveyed, a methodologist, and a person experienced in questionnaire design. Another increasingly popular form of pretesting comes from guided discussions among potential respondents. Such “focus groups” let you check for consistent understanding of terms and to identify the range of events or experiences about which people will be asked to report. By listening to and observing the focus group discussions, researchers can validate their assumptions about what level of vocabulary is appropriate and what people are going to be reporting (Nassar-McMillan & Borders, 2002).

Professional survey researchers also use a technique for improving questions called the **cognitive interview** (Dillman, 2007). Although the specifics vary, the basic approach is to ask people, ideally individuals who reflect the proposed survey population, to “think aloud” as they answer questions. The researcher asks a test question, then probes with follow-up questions about how the respondent understood the question, how confusing it was, and so forth. This method can identify many problems with proposed questions.

Conducting a pilot study is the final stage of questionnaire preparation. Complete the questionnaire yourself and then revise it. Next, try it out on some colleagues or other friends, and revise it again. For the actual pretest, draw a small sample of individuals from the population you are studying, or one very similar to it, and try out the survey procedures with them, including mailings if you plan to mail your questionnaire and actual interviews if you plan to conduct in-person interviews.

Which pretesting method is best? Each has unique advantages and disadvantages. Simple pretesting is the least reliable but may be the easiest to undertake. Focus groups or cognitive interviews are better for understanding the bases of problems with particular questions. Review of questions by an expert panel identifies the greatest number of problems with questions (Presser & Blair, 1994).

Order the Questions

The sequence of questions on a survey matters. As a first step, the individual questions should be sorted into broad thematic categories, which then become separate sections in the questionnaire. For example, the 2000

National Survey Mathematics Questionnaire contained five sections: Teacher Opinions, Teacher Background, Your Mathematics Teaching in a Particular Class, Your Most Recent Mathematics Lesson in This Class, and Demographic Information. Both the sections and the questions within the sections must be organized in a logical order that would make sense in a conversation.

The first question deserves special attention, particularly if the questionnaire is to be self-administered. This question signals to the respondent what the survey is about, whether it will be interesting, and how easy it will be to complete (“Overall, would you say that your current teaching situation is excellent, good, fair, or poor?”). The first question should be connected to the primary purpose of the survey; it should be interesting, it should be easy, and it should apply to everyone in the sample (Dillman, 2007). Don’t try to jump right into sensitive issues (“In general, what level of discipline problems do you have in your classes?”); respondents have to “warm up” before they will be ready for such questions.

Question order can lead to **context effects** when one or more questions influence how subsequent questions are interpreted (Schober, 1999). Prior questions can influence how questions are comprehended, what beliefs shape responses, and whether comparative judgments are made (Tourangeau, 1999). The potential for context effects is greatest when two or more questions concern the same issue or closely related issues. Often, respondents will try to be consistent with their responses, even if they really do not mean the response.

Whichever type of information a question is designed to obtain, be sure it is asked of only the respondents who may have that information. If you include a question about job satisfaction in a survey of the general population, first ask respondents whether they have a job. These **filter questions** create **skip patterns**. For example, respondents who answer no to one question are directed to skip ahead to another question, but respondents who answer yes go on to the **contingent question**. Skip patterns should be indicated clearly with arrows or other marks in the questionnaire, as demonstrated in Exhibit 8.2.

Some questions may be presented in a “matrix” format. Matrix questions are a series of questions that concern a common theme and that have the same response choices. The questions are written so that a common initial phrase applies to each one (see Exhibit 8.4). This format shortens the questionnaire by reducing the number of words that must be used for each question. It also emphasizes the common theme among the questions and so invites answering each question in relation to other questions in the matrix. It is very important to provide an explicit instruction to “Check one response on each line” in a matrix question because some respondents will think that they have completed the entire matrix after they have responded to just a few of the specific questions.

Exhibit 8.2 Filter Questions and Skip Patterns

3. Are you currently employed in a teaching position?
 - a. Yes
 - b. No → GO TO QUESTION 10

4. What type of educational institution is your current employer?
 - a. Public school
 - b. Private, nonprofit school
 - c. For-profit school
 - d. Other (specify)

Make the Questionnaire Attractive

An attractive questionnaire—neat, clear, clean, and spacious—is more likely to be completed and less likely to confuse either the respondent or, in an interview, the interviewer.

An attractive questionnaire does not look cramped; plenty of “white space”—more between questions than within question components—makes the questionnaire appear easy to complete. Response choices are listed vertically and are distinguished clearly and consistently, perhaps by formatting them in all capital letters and keeping them in the middle of the page. Skip patterns are indicated with arrows or other graphics. Some distinctive type of formatting should also be used to identify instructions. Printing a multipage questionnaire in booklet form usually results in the most attractive and simple-to-use questionnaire (Dillman, 2000, pp. 80–86).

Exhibit 8.3 contains portions of a telephone interview questionnaire that illustrates these features, making it easy for the interviewer to use.

Exhibit 8.3 Sample Interview Guide

Hi, my name is _____. I am calling on behalf of (I am a student at) Hamilton College in New York. We are conducting a national opinion poll of high school students.

SCREENER: Is there a sophomore, junior, or senior in high school in your household with whom I may speak?

1. Yes
2. No/not sure/refuse **(End)**

(If student not on phone, ask:) Could he or she come to the phone?

(When student is on the phone) Hi, my name is _____. I am calling on behalf of (I am a student at) Hamilton College in New York. We are conducting a national opinion poll of high school students about gun control. Your answers will be completely anonymous. Would you be willing to participate in the poll?

1. Yes
2. No/not sure/refuse **(End)**

1. (SKOLYR) What year are you in school?

1. Sophomore
2. Junior
3. Senior
4. Not sure/refuse **(do not read) (End)**

Now some questions about your school:

2. (SKOL) Is it a public, Catholic, or private school?

1. Public
2. Catholic
3. Private
4. Not sure **(do not read)**

Source: Chambliss and Schutt (2010, p. 172). Copyright © 2000 Dennis Gilbert. Reprinted with permission.

Writing Questions

Questions are the centerpiece of survey research. Because the way they are worded can have a great effect on the way they are answered, selecting good questions is the single most important concern for survey researchers.

Write Clear Questions

All hope for achieving measurement validity is lost unless the questions in a survey are clear and convey the intended meaning to respondents. You may be thinking that you ask people questions all the time and have no trouble understanding the answers you receive, but you may also remember misunderstanding or being confused by some questions. Consider just a few of the differences between everyday conversations and standardized surveys:

- Survey questions must be asked of many people, not just one person.
- The same survey question must be used with each person, not tailored to the specifics of a given conversation.
- Survey questions must be understood in the same way by people who differ in many ways.
- You will not be able to rephrase a survey question if someone doesn't understand it because that would result in a different question for that person.
- Survey respondents don't know you and so can't be expected to share the nuances of expression that help you and your friends and family to communicate.

Question writing for a particular survey might begin with a brainstorming session or a review of previous surveys. Then, whatever questions are being considered must be systematically evaluated and refined. Every question that is considered for inclusion must be reviewed carefully for its clarity and ability to convey the intended meaning. Questions that were clear and meaningful to one population may not be so to another. Nor can you simply assume that a question used in a previously published study was carefully evaluated. Adherence to a few basic principles will go a long way toward developing clear and meaningful questions.

Avoid Confusing Phrasing

In most cases, a simple direct approach to asking a question minimizes confusion. Use shorter rather than longer words: *brave* rather than *courageous*; *job concerns* rather than *work-related employment issues* (Dillman, 2000). Use shorter sentences when you can. A lengthy question often forces respondents to “work hard,” that is, to have to read and reread the entire question. Lengthy questions can go unanswered or can be given only a cursory reading without much thought.

Avoid Vagueness

Questions should not be abbreviated in a way that results in confusion. The simple statement

Residential location _____

does not provide sufficient focus; rather, it is a general question when a specific kind of answer is desired. There are many reasonable answers to this question, such as Silver Lake (a neighborhood), Los Angeles (a city), or Forbes Avenue (a street). Asking, “In what neighborhood of Los Angeles do you live?” provides specificity so that respondents understand that the intent of the question is about their neighborhood.

It is particularly important to avoid vague language; there are words whose meaning may differ from respondent to respondent. The question

Do you usually or occasionally attend our school's monthly professional development workshops?

will not provide useful information, for the meaning of *usually* or *occasionally* can differ for each respondent. A better alternative is to define the two terms such as *usually (6 to 12 times a year)* and *occasionally (2 to 5 times a year)*. A second option is to ask respondents how many times they attended professional development sessions in the past year; the researcher can then classify the responses into categories.

Provide a Frame of Reference

Questions often require a frame of reference that provides specificity about how respondents should answer the question. The question

Overall, the performance of this principal is

Excellent

Good

Average

Poor

lacks a frame of reference. In this case, the researcher does not know the basis of comparison the respondent is using. Some respondents may compare the principal to other principals, whereas some respondents may use a personal “absolute scale” about a principal’s performance. To avoid this kind of confusion, the basis of comparison should be specifically stated in the question: “Compared with other principals you are familiar with, the performance of this principal is. . .”

Avoid Negative Words and Double Negatives

Try answering, “Do you disagree that mathematics teachers should not be required to be observed by their supervisor if they have a master’s degree?” Respondents have a hard time figuring out which response matches their sentiments because the statement is written as a **double negative**. Such errors can easily be avoided with minor wording changes: “Should mathematics teachers with a master’s degree still be observed by their supervisor?” To be safe, it’s best just to avoid using negative words such as *don’t* and *not* in questions.

Avoid Double-Barreled Questions

Double-barreled questions produce uninterpretable results because they actually ask two questions but allow only one answer. For example, the question “Do you support increased spending on schools and social services?” is really asking two questions—one about support for schools and one about support for social services. It is perfectly reasonable for someone to support increased spending on schools but not on social services. A similar problem can also show up in response categories.

Minimize the Risk of Bias

Specific words in survey questions should not trigger biases, unless that is the researcher’s conscious intent. Such questions are referred to as leading questions because they lead the respondent to a particular answer. Biased or loaded words and phrases tend to produce misleading answers. Some polls ask obviously loaded questions, such as “Isn’t it time for Americans to stand up for morality and stop the shameless degradation of the airwaves?” Especially when describing abstract ideas (e.g., “freedom” “justice,” “fairness”), your choice of words dramatically affect how respondents answer. Take the difference between “welfare” and “assistance for the poor.” On average, surveys have found that public support for “more assistance for

the poor” is about 39 points higher than for “welfare” (Smith, 1987). Most people favor helping the poor; most people oppose welfare. So the terminology a survey uses to describe public assistance can bias survey results quite heavily.

Responses can also be biased when response alternatives do not reflect the full range of possible sentiment on an issue. When people pick a response choice, they seem to be influenced by where they are placing themselves relative to the other response choices. A similar bias occurs when some but not all possible responses are included in the question. “What do you like about your community, such as the parks and the schools?” focuses respondents on those categories, and other answers may be ignored. It is best left to the respondent to answer the question without such response cues.

Closed-Ended and Open-Ended Questions

Questions can be designed with or without explicit response choices. When explicit response categories are offered, we call it a **closed-ended question**. For example, the following question asked in a survey of special-needs schools is closed-ended because the desired response categories are provided:

What type of special-needs services does your school offer?

Residential

Nonresidential

Both

Most surveys of a large number of people contain primarily closed-ended questions, which are easy to process with computers and analyze with statistics. Providing response choices in the survey reduces ambiguity, and respondents are more likely to answer the question the researcher really wants them to answer. However, closed-ended questions can obscure what people really think unless the choices are designed carefully to match the range of possible responses to the question.

Most important, closed-ended response choices should be mutually exclusive and exhaustive so that every respondent can find one and only one choice that applies to him or her (unless the question is of the “Check all that apply” format). To make response choices exhaustive, researchers may need to offer at least one option with room for ambiguity. For example, school superintendents were asked how they dealt with bullying in their school system. The list of choices included five different possible responses but concluded with the category “Other (Please specify _____)” because researchers were not sure they had all the possible responses on the list. If respondents do not find a response option that corresponds to their answer to the question, they may skip the question entirely or choose a response option that does not indicate what they are really thinking.

Open-ended questions are questions without explicit response choices so that the respondents provide their own answers in their own words. This type of question is usually used when there is little knowledge about a particular topic, and you want to learn as much as possible without limiting the responses. For example, if you are interested in learning the responses that school superintendents have developed on their own to bullying, you might ask,

How has your school system responded to the increase in attention to K–12 bullying issues?

The information obtained from a question such as this could be used as response categories for closed-ended questions in future surveys.

Although open-ended questions provide a wealth of information, they also require careful consideration. Administering, analyzing, and summarizing open-ended questions can be time-consuming and difficult. Some respondents do not like to write a lot and may find open-ended questions taxing. Interviewing is not necessarily the solution. The amount of information provided by a respondent may depend on the respondent's personality—some respondents may provide short or cursory answers; others may provide extensive answers with a great deal of relevant (and irrelevant) information.

Closed-Ended Questions and Response Categories

When writing response categories for closed-ended questions, several guidelines may help improve the questions. We have already mentioned that it is important to ensure that the responses are mutually exclusive and exhaustive. We offer these additional suggestions to consider when designing questions.

Allow for Disagreement

People often tend to “agree” with a statement just to avoid seeming disagreeable. You can take several steps to reduce the likelihood of agreement bias. As a general rule, you should present both sides of attitude scales in the question itself (Dillman, 2000, pp. 61–62): “In general, do you believe that *teaching strategies* or *student effort* are more to blame for poor mathematics performance in the United States?” The response choices themselves should be phrased to make each one seem as socially approved, as “agreeable,” as the others. You should also consider replacing a range of response alternatives that focus on the word *agree* with others. For example, “To what extent do you support or oppose the new science curriculum reform?” (response choices range from “strongly support” to “strongly oppose”) is probably a better approach than the question “To what extent do you agree or disagree with the statement: ‘The new science curriculum reform is worthy of support?’” (response choices range from “strongly agree” to “strongly disagree”).

Social Desirability

Social desirability is the tendency for individuals to respond in ways that make them appear in the best light to the interviewer. When an illegal or socially disapproved behavior or attitude is the focus, we have to be concerned that some respondents will be reluctant to agree that they have ever done or thought such a thing. In this situation, the goal is to write a question and response choices that make agreement seem more acceptable. For example, it would probably be better to ask, “Have you ever been suspended for a violation of school rules?” rather than “Have you ever been identified as a troublemaker by your principal?” Asking about a variety of behaviors or attitudes that range from socially acceptable to socially unacceptable will also soften the impact of agreeing with those that are socially unacceptable.

Minimize Fence-Sitting and Floating

Two related problems in question writing also stem from people's desire to choose an acceptable answer. There are **fence-sitters** who see themselves as being neutral and whose responses may skew the results if you force them to choose between opposites. Adding an explicit neutral response option is appropriate when you want to find out who is a fence-sitter. But adding a neutral response may provide an easy escape for respondents who do not want to reveal their true feelings.

Floaters are respondents who choose a substantive answer when they really do not know. Because there are so many floaters in the typical survey sample, the decision to include an explicit “Don't know” option for a question is important. Unfortunately, the inclusion of an explicit “Don't know” response choice leads some people who do have a preference to take the easy way out and choose “Don't know.”

Use Likert-Type Response Categories

Likert-type responses generally ask respondents to indicate the extent to which they agree or disagree with statements. The response categories list choices for respondents to select their level of agreement with a statement from *strongly agree* to *strongly disagree*. The questions in Exhibit 8.4 have Likert-type response categories.

Exhibit 8.4 Matrix Questions Using Likert-Type Responses

15. In general, how well do you feel that (Please circle one response for each question)	Strongly Agree				Strongly Disagree
a. Education classes prepared me for my teaching position.	1	2	3	4	5
b. Internships, observations, and student teaching prepared me for my teaching position.	1	2	3	4	5
c. Education classes prepared me for gaining my teaching license.	1	2	3	4	5

Matrix Questions

Some question formats lend themselves to a matrix format. Matrix questions are actually a series of questions that concern a common theme and that have the same response choices. The questions are written so that a common initial phrase applies to each one (see Exhibit 8.4). This format shortens the questionnaire by reducing the number of words that must be used for each question. It also emphasizes the common theme among the questions and so invites answering each question in relation to other questions in the matrix. It is important to provide an explicit instruction to “Circle one response on each line” in a matrix question since some respondents will think that they have completed the entire matrix after they have responded to just a few of the specific questions.

2 Survey Design Alternatives

Surveys can be administered in at least five different ways: mailed, group administered, by phone, in person, and electronically (Exhibit 8.5 summarizes the typical features of each). Each approach differs from the others in one or more important features:

Manner of administration. Mailed, group, and electronic surveys are completed by the respondents themselves. During phone and in-person interviews, however, the researcher or a staff person asks the questions and records the respondent’s answers.

Questionnaire structure. Most mailed, group, phone, and electronic surveys are highly structured, fixing in advance the content and order of questions and response choices. Some of these types of surveys, particularly

Exhibit 8.5 Typical Features of the Five Survey Designs

Design	Manner of Administration	Setting	Questionnaire Structure	Cost
Mailed survey	Self	Individual	Mostly structured	Low
Group survey	Self	Group	Mostly structured	Very low
Phone survey	Professional	Individual	Structured	Moderate
In-person interview	Professional	Individual	Structured or unstructured	High
Web survey	Self	Individual	Mostly structured	Very low

mailed surveys, may include some open-ended questions (respondents write in their answers rather than checking off one of several response choices). In-person interviews are often highly structured, but they may include many questions without fixed response choices. Moreover, some interviews may proceed from an interview guide rather than a fixed set of questions. In these relatively unstructured interviews, the interviewer covers the same topics with respondents but varies questions according to the respondent's answers to previous questions.

Setting. Mailed surveys, electronic questionnaires, and phone interviews are intended for completion by only one respondent. The same is usually true of in-person interviews, although sometimes researchers interview several family members at once. On the other hand, a variant of the standard survey is a questionnaire distributed simultaneously to a group of respondents, who complete the survey while the researcher (or assistant) waits.

Cost. As mentioned earlier, in-person interviews are the most expensive type of survey. Phone interviews are much less expensive, but surveying by mail is cheaper yet. Electronic surveys are now the least expensive method because there are no interviewer costs, no mailing costs, and, for many designs, almost no costs for data entry. Of course, extra staff time and expertise are required to prepare an electronic questionnaire.

Because of their different features, the five designs vary in the types of error to which they are most prone and the situations in which they are most appropriate. The rest of this section focuses on each format's unique advantages and disadvantages.

Mailed Surveys

A **mailed survey** is conducted by mailing a questionnaire to respondents, who then administer the survey themselves. The central concern in a mailed survey is maximizing the response rate. Even an attractive questionnaire full of clear questions requires additional efforts to maximize the response rate. A response rate of 70% or higher is desirable; lower response rates call into question the representativeness of the sample.

Sending follow-up mailings to nonrespondents is the single most important requirement for obtaining an adequate response rate. The follow-up mailings explicitly encourage initial nonrespondents to

return a completed questionnaire; implicitly, they convey the importance of the effort. Dillman (2000) has demonstrated the effectiveness of a mailing process that includes the following:

1. A few days before mailing the questionnaire, send a brief letter that notifies sample members of the importance of the survey.
2. Include a personalized cover letter (see Exhibit 8.6) and a self-addressed, stamped return envelope with the questionnaire.
3. Send a friendly reminder postcard to all sample members 2 weeks after the initial mailing. The postcard is written to thank respondents and remind nonrespondents. Include a phone number for those people who may not have received the questionnaire or may have lost it.
4. Send a replacement questionnaire with a new cover letter only to nonrespondents 2 to 4 weeks after the initial questionnaire mailing and again after 6 to 8 weeks.

The **cover letter** is critical to the success of a mailed survey (Exhibit 8.6 is an example of a cover letter to principals from the 2000 Mathematics and Science Survey). This statement to respondents sets the tone for the questionnaire. A carefully prepared cover letter should increase the response rate and result in more honest and complete answers to the survey questions; a poorly prepared cover letter can have the reverse effects.

Exhibit 8.6 Cover Letter to Principals for the 2000 Mathematics and Science Survey

Dear Principal,

The purpose of this letter is to let you know that your school has been selected for the 2000 National Survey of Science and Mathematics Education and to request your cooperation in this effort. A total of 1,800 public and private schools and 9,000 K–12 teachers throughout the United States will be involved in the 2000 Survey. The survey, initiated by the National Science Foundation, is the fourth in a series of national surveys of science and mathematics education (the others were in 1977, 1985, and 1993). The enclosed *Fact Sheet* provides more information about the study.

The 2000 Survey will help determine how well prepared schools and teachers are for effective science and mathematics education, what would help them do a better job, and how federal resources can best be used to improve science and mathematics education. The survey is being conducted by Horizon Research, Inc., under the direction of Dr. Iris R. Weiss. Data collection is the responsibility of Westat, in Rockville, Maryland.

To help compensate participants for their time, the study has arranged to give each school a voucher to be used in purchasing science and mathematics education materials, including NCTM's Curriculum and Evaluation Standards, Project 2061's Science for All Americans, and NRC's *National Science Education Standards*, as well as calculators and other materials for classroom use. The amount of the voucher will depend on response rates, with each participating school receiving \$50, plus \$15 for each responding teacher. In addition, each school will receive a copy of the results of the survey.

[a few paragraphs describing an enclosed booklet have been omitted.]

Your cooperation is greatly appreciated. Please return the completed booklet for your school within the next 10 days so that we can begin the teacher selection process. If you have any questions about any of the items in the booklet or the study in general, please call us toll-free at 1-800-937-8288. Ask for the Science and Mathematics Survey specialist.

Thank you for your cooperation.

Sincerely,
Diane Ward
Data Collection Coordinator

The cover letter or introductory statement should be personalized to the respondent and signed by the researcher. The contents of the letter should establish the credibility of the research, catch the interest of the respondent, and note ethical obligations, such as confidentiality and voluntary participation. The letter should include a phone number to call if the respondent has any questions.

There are other strategies to increase the response rate (Fowler, 1988; Mangione, 1995; Miller & Salkind, 2002). The individual questions should be clear and understandable to all the respondents. There should be only a few open-ended questions because respondents are likely to be put off by the idea of having to write out answers. Having a credible sponsor known to respondents may increase the response rate. Enclosing a token incentive such as a coupon or ticket worth \$1, \$2, or \$5 may help. (To encourage principals to participate, Exhibit 8.6 outlines several incentives that will go to participating schools, including a \$15 payment for each teacher who responds.) Write an identifying number on the questionnaire so you can determine who non-respondents are. This is essential for follow-up efforts. Of course, the identification must be explained in the cover letter. Finally, include a stamped, self-addressed envelope with the questionnaire.

Group-Administered Surveys

A **group-administered survey** is completed by individual respondents assembled together. It is a common approach in classroom- or school-based surveys. The response rate is not usually a major concern in surveys that are distributed and collected in a group setting because most group members will participate. The real difficulty with this method is that it is seldom feasible because it requires what might be called a captive audience. With the exception of students, employees, members of the armed forces, and some institutionalized populations, most populations cannot be sampled in such a setting.

A special concern with group-administered surveys is the possibility that respondents will feel coerced to participate and as a result will be less likely to answer questions honestly. Also, because administering a survey in this way requires approval of the settings' administrators, respondents may infer that the researcher is not at all independent of the sponsor. No complete solution to this problem exists, but it helps to make an introductory statement emphasizing the researcher's independence and giving participants a chance to ask questions about the survey. The sponsor should also understand the need to keep a low profile and to allow the researcher both control over the data and autonomy in report writing.

A standard introductory statement should be read to the group that expresses appreciation for their participation, describes the steps of the survey, and emphasizes (in classroom surveys) that the survey is not the same as a test. A cover letter like that used in a mailed survey also should be distributed with the questionnaires. To emphasize confidentiality, respondents should be given an envelope in which to seal their questionnaire after it is completed.

Telephone Surveys

In a **phone survey**, interviewers question respondents over the phone and then record their answers. Phone interviewing is a popular method of conducting surveys in the United States because almost all families have phones. But two problems often threaten the validity of a phone survey: not reaching the proper sampling units (or "coverage error") and not getting enough complete responses to make the results generalizable.

Reaching Sample Units

Most telephone surveys use random digit dialing to contact a random sampling of households. A machine calls random phone numbers within the designated exchanges, regardless of whether the numbers are published. When the machine reaches an inappropriate household (such as a business in a survey that is directed to the

general population), the phone number is simply replaced with another. When the households are contacted, the interviewers must ask a series of questions at the start of the survey to ensure that they are speaking to the appropriate member of the household.

But the tremendous recent (since 2000) popularity of cellular, or mobile, telephones has made accurate coverage of random samples almost impossible (Tourangeau, 2004, pp. 781–792): (1) Cell phones are typically not listed in telephone directories, so they can't be included in prepared calling lists; (2) laws generally forbid the use of automated (RDD) dialers to contact cell phones; (3) close to 20% of the U.S. population now has only a cell phone (no landline) and therefore can't be reached by either RDD or many directory lists; and (4) among 18- to 24-year-olds, some 30% have cell phones only, and cell phone-only households are also more common among non-English speakers.

The net effect, then, of widespread cell phone usage is to underrepresent young people and some minority groups from most large telephone surveys, obviously damaging the results.

Maximizing Response to Phone Surveys

Even if an appropriate (for sampling) number is dialed, responses may not be completed.

First, because people often are not home, multiple callbacks will be needed for many sample members. The number of callbacks needed to reach respondents by telephone has increased greatly in the past 20 years. With increasing numbers of single-person households, dual-earner families, and out-of-home activities, survey research organizations have had to increase the usual number of phone contact attempts from just 4–8 to 20—a lot of attempts to reach just one person. Caller ID and call waiting allow potential respondents to avoid answering calls from strangers, including researchers. The growth of telemarketing has accustomed people to refuse calls from unknown individuals and organizations or to use their answering machines to screen calls (Dillman, 2000, pp. 8, 28). And since a huge number of cell phone users are minors, and so legally not available for surveys, calls made to them are all wasted efforts for researchers.

Such problems mean that careful training and direction of interviewers are essential in phone surveys. The instructions shown in Exhibit 8.7 were developed to clarify procedures for asking and coding a series of questions in the phone interviews conducted for a survey regarding youth and guns.

Phone surveying is the method of choice for relatively short surveys of the general population. Response rates in phone surveys traditionally have tended to be very high—often above 80%—because few individuals would hang up on a polite caller or refuse to answer questions (at least within the first 30 minutes or so). But the problems we have noted, especially those connected with cell phone usage, make this method of surveying populations increasingly difficult.

In-Person Interviews

What is unique to the **in-person interview**, compared to the other survey designs, is the face-to-face social interaction between interviewer and respondent. In-person interviewing has several advantages: Responses rates are higher than with any other survey design; questionnaires can be much longer than with mailed or phone surveys; the questionnaire can be complex, with both open-ended and closed-ended questions and frequent branching patterns; the order in which questions are read and answered can be controlled by the interviewer; the physical and social circumstances of the interview can be monitored; and respondents' interpretations of questions can be probed and clarified. The interviewer, therefore, is well placed to gain a full understanding of what the respondent really wants to say.

But researchers must be alert to some special hazards due to the presence of an interviewer. Ideally, every respondent should have the same interview experience—asked the same questions in the same way by the same type of person, who reacts similarly to the answers. Careful training and supervision are essential

As with phone interviewing, computers can be used to increase control of the in-person interview. In a computer-assisted personal interviewing (CAPI) project, interviewers carry a laptop computer that is programmed to display the interview questions and to process the responses that the interviewer types in, as well as to check that these responses fall within allowed ranges. Interviewers seem to like CAPI, and the data obtained are comparable in quality to data obtained in a noncomputerized interview (Shepherd, Hill, Bristor, & Montalvan, 1996). A CAPI approach also makes it easier for the researcher to develop skip patterns and experiment with different types of questions for different respondents without increasing the risk of interviewer mistakes (Couper et al., 1998).

Web-Based Surveys

The widespread use of personal computers and the growth of the Internet have created new possibilities for survey research. **Electronic surveys** can be prepared in two ways (Dillman, 2000, pp. 352–354). **E-mail surveys** can be sent as messages to respondents' e-mail addresses. Respondents then mark their answers in the message and send them back to the researcher. This approach is easy for researchers to develop and for respondents to use. However, it is cumbersome for surveys that are more than four or five pages in length. By contrast, **Web surveys** are stored on a server that is controlled by the researcher; respondents are then asked to visit the website (often by just clicking an e-mailed link) and respond to the questionnaire by checking answers. Web surveys require more programming by the researcher, but a well-designed Web survey can tailor its questions to a given respondent and thus seem shorter, more interesting, and more attractive. The U. S. Department of Education wished to use its website (ED.gov) to gather information about who uses the site, how often they use it, and for what purposes. The ED.gov survey combined several types of questions—multiple choice, Likert scale, and open-ended—to gain a picture of respondents and their needs. Exhibit 8.8 shows examples of the types of questions asked on the survey and the choices respondents were given. Question 1 is multiple choice, Question 2 is open-ended, Question 3 combines yes/no and multiple choice, Question 4 uses a Likert scale, and Question 5 is multiple choice with brief explanations of the choices.

Web surveys are becoming a popular form of electronic survey in part because they are so flexible and inexpensive. The questionnaire's design can feature many graphic and typographic elements. Respondents can view definitions of words or instructions for answering questions by clicking on linked terms. Lengthy sets of response choices can be presented with pull-down menus. Pictures and audio segments can be added when they are useful. Because answers are recorded directly in the researcher's database, data entry errors are almost eliminated and results can be reported quickly.

The most important drawback to either electronic survey approach is the large number of U.S. households—about 30% in 2009—that are not yet connected to the Internet (U.S. Census Bureau, 2011, p. 724). Households without Internet access differ systematically from those with access, tending to be older, poorer, and more likely to be in rural areas than those that are connected (Tourangeau, 2004, pp. 792–793). But there's another, almost opposite, problem with Web surveys: Because they are so easy and cheap to set up, you can find hundreds of Web surveys on a wide range of topics and for many different purposes. Among Internet users, almost anyone can participate in many of these Web surveys. But the large numbers of respondents that this uncontrolled method can generate should not cause you to forget the importance of a representative sample. Uncontrolled Web surveys are guaranteed to produce, instead, a very biased sample (Dillman, 2000, p. 355).

When the population to be surveyed has a high rate of Internet use, however, the Web makes possible fast and effective surveys (Dillman, 2000, pp. 354–355). A skilled Web programmer can generate a survey layout with many attractive features that make it more likely that respondents will give their answers—and have a

Exhibit 8.8 U.S. Department of Education Web Survey

1. How often do you visit ED.gov?

- Daily ___
 Weekly ___
 Monthly ___
 Less than once a month ___

2. Why are you visiting ED.gov today—what task did you hope to accomplish?

3. Were you successful in completing your task?

- ___ Yes, easily.
 ___ Yes, but it took some effort.
 ___ Only part of it.
 ___ No.
 ___ I was just browsing.

4. How satisfied are you with the usefulness of information on ED.gov: (1 being very dissatisfied, 5 being very satisfied)

- 1 2 3 4 5
 ___ ___ ___ ___ ___

5. Which of the following technologies do you use anywhere on the Internet (select all that apply):

- ___ Blogs (a forum for exchanging information).
 ___ Wikis (online resource where users add and edit content)
 ___ RSS (automatic alerts to product updates)
 ___ Podcasting (downloaded audio content)
 ___ Videocasting (downloaded video content from sources such as YouTube)

Source: Adapted from U. S. Department of Education Web Survey OMB #1800-0011.

clear understanding of the question (Smyth, Dillman, Christian, & Stern, 2004, pp. 4–5). Under proper conditions, electronic surveys are an excellent tool.

Mixed-Mode Surveys

Survey researchers increasingly are combining different survey designs. **Mixed-mode surveys** allow the strengths of one survey design to compensate for the weaknesses of another and can maximize the likelihood of securing data from different types of respondents (Dillman, 2007; Selm & Jankowski, 2006). For example, a survey may be sent electronically to sample members who have e-mail addresses and mailed to those who do not. Phone reminders may be used to encourage responses to Web or paper surveys.

Nonrespondents in a mailed survey may be interviewed in person or over the phone. An interviewer may use a self-administered questionnaire to present sensitive questions to a respondent.

Mixing survey designs like this makes it possible that respondents will give different answers to different questions because of the mode in which they are asked, rather than because they actually have different opinions. When responses differ by survey mode, there is often no way to know which responses are more accurate (Peterson, 2000, p. 24). However, use of the same question structures, response choices, and skip instructions across modes substantially reduces the likelihood of mode effects, as does using a small number of response choices for each question (Dillman & Christian, 2005).

A Comparison of Survey Designs

Which survey design should be used when? Group-administered surveys are similar, in most respects, to mailed surveys, except that they require the unusual circumstance of having access to the sample in a group setting. We therefore do not need to consider this survey design by itself; what applies to mail surveys applies to group-administered survey designs, with the exception of sampling issues. Thus, we can focus our comparison on the four survey designs that involve the use of a questionnaires with individuals sampled from a larger population: mail surveys, phone surveys, in-person surveys, and electronic surveys. Exhibit 8.9 summarizes the strong and weak points of each design.

The most important consideration is the likely response rate each method will generate. Because of the low response rates of *mailed surveys*, they are the weakest from a sampling standpoint. However, researchers with limited time, money, and staff (including most student researchers) may still prefer a mailed survey. Mailed surveys can be useful in asking sensitive questions because respondents won't be embarrassed by answering in front of an interviewer.

Contracting with an established survey research organization for a *phone survey* is often the best alternative to a mailed survey. The persistent follow-up attempts that are necessary to secure an adequate response rate are much easier over the phone than in person. However, the declining rate of response to phone interview calls is reducing the advantages of this method.

In-person surveys can be long and complex, and the interviewer can easily monitor the conditions (the room, noise, and other distractions). Although interviewers may themselves distort results, either by changing the wording of the questions or failing to record answers properly, this problem can be lessened by careful training and monitoring of interviewers and by audio-recording the answers.

The advantages and disadvantages of *electronic surveys* depend on the populations to be surveyed. Too many people lack Internet connections for general use of Internet surveying. But when the entire sample has access and ability (e.g., college students, school principals), Web-based surveys can be very effective.

So overall, in-person interviews are the strongest design and generally preferable when sufficient resources and a trained interview staff are available; telephone surveys have many of the advantages of in-person interviews at much less cost, but response rates are an increasing problem. Decisions about the best survey design must take into account the particular study's features and goals.

2 Combining Methods

Conducting qualitative interviews can often enhance a research design that uses primarily quantitative measurement techniques. Qualitative data can provide information about the quality of standardized case records and quantitative survey measures, as well as offer some insight into the meaning of particular fixed responses.

Exhibit 8.9 Advantages and Disadvantages of the Four Survey Designs

Characteristics of Design	Mail Survey	Phone Survey	In-Person Survey	Web Survey
Representative sample				
Opportunity for inclusion is known				
For completely listed populations	High	High	High	Medium
For incompletely listed populations	Medium	Medium	High	Low
Selection within sampling units is controlled (e.g., specific family members must respond)	Medium	High	High	Low
Respondents are likely to be located				
If samples are heterogeneous	Medium	High	High	Low
If samples are homogeneous and specialized	High	High	High	High
Questionnaire construction and question design				
Allowable length of questionnaire	Medium	Medium	High	Medium
Ability to include				
Complex questions	Medium	Low	High	High
Open questions	Low	High	High	Medium
Screening questions	Low	High	High	High
Tedious, boring questions	Low	High	High	Low
Ability to control question sequence	Low	High	High	High
Ability to ensure questionnaire completion	Medium	High	High	Low
Distortion of answers				
Odds of avoiding social desirability bias	High	Medium	Low	High
Odds of avoiding interviewer distortion	High	Medium	Low	High
Odds of avoiding contamination by others	Medium	High	Medium	Medium
Administrative goals				
Odds of meeting personnel requirements	High	High	Low	Medium
Odds of implementing quickly	Low	High	Low	High
Odds of keeping costs low	High	Medium	Low	High

Adding Qualitative Data

The 2000 National Survey used a variety of data collection instruments given to several types of participants to assemble a comprehensive and representative picture of math and science instruction in the United States. Quantitative data were collected by questionnaires from nationally representative, K–12 samples of program heads, teachers, and presidential awardees in mathematics and science. These data were complemented by qualitative measures such as classroom observations and interviews with the same groups.

The combination of qualitative and quantitative data gave a much more comprehensive picture of K–12 math and science instruction than could have been developed by using either method alone. Survey designers increasingly look to combine methods to gain a more complete answer to the questions their survey seeks to answer.

2 Survey Research Design in a Diverse Society

Diversity and the impact of differences in shared belief systems must be considered in designing questions, constructing questionnaires, and choosing a data collection method. This is especially true when surveys are aimed at students, parents, and community members—groups that are increasingly diverse in language, cultural identification, and religion. When developing individual questions, you need to be careful about your choice of language; when constructing the questionnaire, you need to ensure that the format provides the same meaning for all respondents; when deciding on a data collection method, particularly interviewing, you may find that responses to questions are affected by interviewer-respondent characteristics.

To ensure valid data, all survey respondents should attach the same meaning to a question. Therefore, you should make certain, for example, through pretesting with members of all the groups to be surveyed, that the question has the same meaning across different population subgroups. Although it is important that the wording be appropriate for different groups, it is also necessary to show that the concept being examined is equivalent across groups—that questions adequately reflect group values, traditions, and beliefs (Huer & Saenz, 2003; Tillman, 2004). For example, the wording of a question about *family* and the available response categories would need to account for cultural differences in both the boundaries used to establish membership in a family and the expectations and obligations of family members (Luna et al., 1996).

English is not the first language of some respondents, and many would prefer to use their native language as they do in their daily lives (Marin & Marin, 1991). Translating questions creates an additional challenge to ensure that the questions have the same meaning in all languages in which the survey or interview is conducted.

Another challenge arises when there are regional or national differences in a spoken language. Marin and Marin (1991) offer these suggestions to deal with regional variations for Hispanics, but in many ways, these suggestions are generalizable when a particular language is used in many different countries:

1. Use all appropriate variations of a word in a self-administered questionnaire.
2. Target vocabulary variations to each subgroup. When there are subgroups, alter the wording to conform to the vocabulary of that subgroup.

3. Avoid colloquialisms. Colloquialisms may differ from place to place and add to the confusion of a word's meaning.
4. Use alternate questions. (pp. 85–86)

2 Ethical Issues in Survey Research

Survey research designs usually pose fewer ethical dilemmas than do experimental or field research designs. Potential respondents to a survey can easily decline to participate, and a cover letter or introductory statement that identifies the sponsors of, and motivations for, the survey gives them the information required to make this decision. Little is concealed from the respondents, and the methods of data collection are quite obvious. Only in group-administered survey designs might the respondents (such as students or employees) be, in effect, a captive audience, and so these designs require special attention to ensure that participation is truly voluntary. (Those who do not wish to participate may be told they can just hand in a blank form.)

Confidentiality is most often the primary focus of ethical concern in survey research. Many surveys include some essential questions that might prove damaging to the subjects if their answers were disclosed. When a survey of teachers asks, “Do you think the administration, especially your principal, is doing a good job?” or when student course evaluations ask, “On a scale of 1 to 5, how fair would you say the professor is?” respondents may well hesitate; if the principal or professor saw the results, teachers or students could be hurt.

To prevent any disclosure of such information, it is critical to preserve subject confidentiality. Only research personnel should have access to information that could be used to link respondents to their responses, and even that access should be limited to what is necessary for specific research purposes. Only numbers should be used to identify respondents on their questionnaires, and the researcher should keep the names that correspond to these numbers in a safe, private location, unavailable to staff and others who might otherwise come across them. Follow-up mailings or contact attempts that require linking the ID numbers with names and addresses should be carried out by the researcher or trustworthy assistants under close supervision. If an electronic survey is used, encryption technology should be used to make information provided over the Internet secure from unauthorized people. Usually confidentiality can be protected readily; the key is to be aware of the issue. Don't allow principals or supervisors to collect teachers' surveys or teachers to pick up course evaluations. Be aware of your respondents' concerns and be even a little more careful than you need to be.

Few surveys can provide true **anonymity**, where no identifying information is ever recorded to link respondents with their responses. The main problem with anonymous surveys is that they preclude follow-up attempts to encourage participation by initial nonrespondents, and they prevent panel designs, which measure change through repeated surveys of the same individuals. In-person surveys rarely can be anonymous because an interviewer must, in almost all cases, know the name and address of the interviewee. However, phone surveys that are meant only to sample opinion at one point in time, as in political polls, can safely be completely anonymous. When no future follow-up is desired, group-administered surveys also can be anonymous. To provide anonymity in a mail survey, the researcher should omit identifying codes from the questionnaire but could include a self-addressed, stamped postcard so the respondent can notify the researcher that the questionnaire has been returned without creating any linkage to the questionnaire itself (Mangione, 1995, p. 69).

2 Conclusions

We began this chapter with the research question, “How can we get a national picture of K–12 math and science teaching?” The National Science Foundation set out to answer this question with its comprehensive “2000 National Survey of Science and Mathematics Education,” which questioned a representative sample of schools in the United States from the elementary grades through high school. Because of its comprehensive nature, the 2000 survey was able to draw conclusions across a wide range of grade levels and subject areas. In elementary science classes, for instance, the survey found “low frequency of technology use,” which it attributed to teachers not being “comfortable with their knowledge of how to integrate computers with instruction” (Fulp, 2002, p. 15). At the high school level, mathematics teachers reported “placing heavy emphasis on mathematics concepts and reasoning,” but observations found that their actual classes were dominated by worksheets, problem solving, homework review, and “practicing routine computation” (Whittington, 2002, p. 24).

The 2000 survey was able to reach significant conclusions such as these because survey research is an exceptionally efficient and productive method for investigating a wide array of educational research questions. In addition to the potential benefits for education, considerations of time and expense frequently make a survey the preferred data collection method. One or more of the five survey designs reviewed in this chapter (including mixed mode) can be applied to almost any research question. It is no wonder that surveys have become a popular research method in education and that they frequently inform discussion and planning about important educational questions. As use of the Internet increases, survey research should become even more efficient and popular.

The relative ease of conducting at least some types of survey research leads many people to imagine that no particular training or systematic procedures are required. Nothing could be further from the truth. But as a result of this widespread misconception, you will encounter a great many nearly worthless survey results. You must be prepared to examine carefully the procedures used in any survey before accepting its findings as credible. And if you decide to conduct a survey, you must be prepared to invest the time and effort required by proper procedures.

Key Terms

Anonymity 181	Electronic survey 176	Mailed survey 171
Behavior coding 183	E-mail survey 176	Mixed-mode survey 177
Closed-ended question 168	Fence-sitters 169	Open-ended question 168
Cognitive interview 163	Filter question 164	Phone survey 173
Confidentiality 181	Floater 169	Questionnaire 161
Context effects 164	Group-administered survey 173	Skip pattern 164
Contingent question 164	In-person interview 174	Survey research 160
Cover letter 172	Interpretive questions 183	Web survey 176
Double-barreled question 167	Interview schedule 161	
Double negative 167		

Highlights

- Surveys are a popular form of educational research because of their versatility, efficiency, and generalizability.
- Survey designs must minimize the risk of errors of observation (measurement error) and errors of nonobservation (errors due to inadequate coverage, sampling error, and non-response). The likelihood of both types of error varies with the survey goals.
- Social exchange theory asserts that behavior is motivated by the return expected to the individual for the behavior. Survey designs must maximize the social rewards, minimize the costs of participating, and establish trust that the rewards will outweigh the costs.
- A survey questionnaire or interview schedule should be designed as an integrated whole, with each question and section serving some clear purpose and complementing the others.
- Questions must be worded carefully to avoid confusing respondents, encouraging a less-than-honest response, or triggering biases. Inclusion of “Don’t know” choices and neutral responses may help, but the presence of such options also affects the distribution of answers. Open-ended questions can be used to determine the meaning that respondents attach to their answers. Answers to any survey questions may be affected by the questions that precede them in a questionnaire or interview schedule.
- Questions can be tested and improved through review by experts, focus group discussions, cognitive interviews, **behavior coding**, and pilot testing. Every questionnaire and interview schedule should be pretested on a small sample that is like the sample to be surveyed.
- **Interpretive questions** should be used in questionnaires to help clarify the meaning of responses to critical questions.
- The cover letter for a mailed questionnaire should be credible, personalized, interesting, and responsible.
- Response rates in mailed surveys are typically well below 70% unless multiple mailings are made to nonrespondents and the questionnaire and cover letter are attractive, interesting, and carefully planned. Response rates for group-administered surveys are usually much higher.
- Phone interviews using random digit dialing allow fast turn-around and efficient sampling. Multiple callbacks are often required, and the rate of nonresponse to phone interviews is rising. Phone interviews should be limited in length to about 30 to 45 minutes.
- In-person interviews have several advantages over other types of surveys: They allow longer and more complex interview schedules, monitoring of the conditions when the questions are answered, probing for respondents’ understanding of the questions, and high response rates. However, the interviewer must balance the need to establish rapport with the respondent with the importance of maintaining control over the delivery of the interview questions.
- Electronic surveys may be e-mailed or posted on the Web. Interactive voice response systems using the telephone are another option. At this time, use of the Internet is not sufficiently widespread to allow e-mail or Web surveys of the general population, but these approaches can be fast and efficient for populations with high rates of computer use.
- Mixed-mode surveys allow the strengths of one survey design to compensate for the weaknesses of another. However, questions and procedures must be designed carefully, using “unimode design” principles, to reduce the possibility that responses to the same question will vary as a result of the mode of delivery.
- In deciding which survey design to use, researchers must take into account the unique features and goals of the study. In general, in-person interviews are the strongest, but most expensive, survey design.
- Most survey research poses few ethical problems because respondents are able to decline to participate—an option that should be stated clearly in the cover letter of the introductory statement. Special care must be taken when questionnaires are administered in group settings (to “captive audiences”) and when sensitive personal questions are to be asked; subject confidentiality should always be preserved.

Student Study Site

To assist in completing the web exercises, please access the study site at www.sagepub.com/check, where you will find the web exercise with accompanying links. You’ll find other useful study

materials such as self-quizzes and e-flashcards for each chapter, along with a group of carefully selected articles from research journals that illustrate the major concepts and techniques.

Discussion Questions

1. Think of at least three experiences you have had with surveys—taking them, giving them, or reading about the results. Be sure to include Internet surveys. What observations can you make about positive and negative effects of surveys, based on the experiences you cite?
2. Each of the following questions was used in a survey that one of the authors received at some time in the past. Evaluate each question and its response choices using the guidelines for question writing presented in this chapter. What errors do you find? Try to rewrite each question to avoid such errors and improve question wording.
 - a. The first question in an Info World (computer publication) “product evaluation survey”:
How interested are you in PostScript Level 2 printers?
____ Very ____ Somewhat ____ Not at all
 - b. From the Greenpeace “National Marine Mammal Survey”:
Do you support Greenpeace’s nonviolent, direct action to intercept whaling ships, tuna fleets and other commercial fishermen in order to stop their wanton destruction of thousands of magnificent marine mammals?
____ Yes ____ No ____ Undecided
 - c. Of the students you have observed while teaching college courses, please indicate the percentage who significantly improve their performance in the following areas.
Reading ____ %
Organization ____ %
Abstraction ____ %

Practice Exercises

1. One of the authors received in his university mailbox some years ago a two-page questionnaire that began with the following “cover letter” at the top of the first page:
Faculty Questionnaire
This survey seeks information on faculty perception of the learning process and student performance in their undergraduate careers. Surveys have been distributed in universities in the Northeast, through random deposit in mailboxes of selected departments. This survey is being conducted by graduate students affiliated with the School of Education and the Sociology Department. We greatly appreciate your time and effort in helping us with our study.
Critique this cover letter, and then draft a more persuasive one.
2. Go to <http://2000survey.horizon-research.com/>, the site for the 2000 Science and Mathematics Survey. At the top of the page, click on Instruments. Open one of the survey questionnaires and read through it. Identify examples of at least three survey techniques described in this chapter (e.g., closed-ended questions, matrix questions). Analyze the appearance of the survey—do you find it attractive and easy to follow? Are the instructions clear? How long do you think it would have taken you to fill out this survey?

Web Exercises

1. Go to the Research Triangle Institute site at <http://www.rti.org>. Click on “Tools and Methods,” then “Surveys,” and then “Survey Design and Development.” Read about their methods for computer-assisted interviewing (under “Survey Methods”) and their cognitive laboratory methods for refining questions (under “Usability Testing”). What does this add to our treatment of these topics in this chapter?
2. Go to The Question Bank at <http://qb.soc.surrey.ac.uk/docs/home.htm>. Go to the “Surveys” link and then click on one of the listed surveys or survey sections that interests you. Review 10 questions used in the survey, and critique them in terms of the principles for question writing that you have learned. Do you find any question features that might be attributed to the use of British English?

Developing a Research Proposal

1. Write 10 questions for a one-page questionnaire that concerns your proposed research question. Your questions should operationalize at least three of the variables on which you have focused, including at least one independent and one dependent variable (you may have multiple questions to measure some variables). Make all but one of your questions closed-ended. If you completed the “Developing a Research Proposal” exercises in Chapter 4, you can select your questions from the ones you developed for those exercises.
2. Conduct a preliminary pretest of the questionnaire by conducting cognitive interviews with two students or other persons like those to whom the survey is directed. Follow up the closed-ended questions with open-ended probes that ask the students what they meant by each response or what came to mind when they were asked each question. Take account of the feedback you receive when you revise your questions.
3. Polish up the organization and layout of the questionnaire, following the guidelines in this chapter. Prepare a rationale for the order of questions in your questionnaire. Write a cover letter directed to the appropriate population that contains appropriate statements about research ethics (human subjects’ issues).