
40. QUALITATIVE RESEARCH ISSUES AND METHODS: AN INTRODUCTION FOR EDUCATIONAL TECHNOLOGISTS

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INTRODUCTION*

Educational technology research is changing. Assumptions, questions, methods, and paradigms that formerly dominated research in the field are changing. Research questions and methods that might once have been deemed unacceptable are gaining acceptability; studies published using alternate paradigms may now be published. Are these “new methods” really so new? Are they based on the same perceptions of quality as the well-established quantitative methods? Are we losing the big picture in research? Are researchers really calling for the end of quantitative research, the positivistic research paradigm, all that has gone before?

It is the goal of this chapter to introduce educational technology researchers, both new and experienced, to the conceptual basis and methods of qualitative research. The goal is a modest one, due to the need for brevity in a small chapter in a large handbook. Controversy will not be sidestepped, but will not specifically be entered in to. Readers will be introduced, for example, to the “paradigm debate” currently swirling in the field and to the assumptions of various researchers who adhere to one view or another. Just as one cannot learn to conduct research by reading one book, a researcher who determines to conduct research to be labeled *qualitative* will need to study sources beyond this chapter to determine his or her own assumptions on which to base the work. The researcher must thus enter the debate, and will be responsible for describing the foundational ideas of the study. He or she will want to conduct the study with the utmost attention to quality, therefore will want to turn to more-detailed texts to learn more deeply how to apply qualitative methods. This chapter will point the researcher to such references and resources; however, we do not intend the chapter to be a definitive self-study text in conducting quali-

tative research. We intend to make the chapter a small and useful tool, a simple guide to assist educational technologists in learning and making decisions about qualitative research. It is thus intended as a beginning point, a brief tour of qualitative methods that may serve an educational technology researcher well in preparing to answer chosen questions, and serve the field in allowing new questions to be explored.

Objectives

The objectives of this chapter are listed below. It is hoped that after reading this chapter, educational technology researchers will be able to:

1. Define the term *qualitative research* and compare it with other terms, including naturalistic inquiry and ethnography.
2. Describe some of the assumptions underlying qualitative research and compare these assumptions with those underlying quantitative research.
3. Describe and select from various qualitative research methods.
4. Begin to be able to use qualitative research methods at a basic level in research studies.
5. Describe common problems in conducting—and evaluate the quality of—qualitative research studies.
6. Describe a few of the ethical issues involved in conducting qualitative research.
7. Describe issues related to analyzing and reporting qualitative findings.

40.1 INTRODUCTION TO QUALITATIVE RESEARCH

40.1.1 What Is Qualitative Research?

Qualitative research is a term with varying meanings in educational research. Borg and Gall (1989), for example,

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suggest that the term is often used interchangeably with terms such as *naturalistic*, *ethnographic*, *subjective*, or *postpositivistic*. Goetz and LeCompte (1984) choose to use the term *ethnographic* as an overall rubric for research using qualitative methods and for ethnographies.

In this chapter, *qualitative research* will be defined as research devoted to developing an understanding of human systems, be they small, such as a technology-using teacher and his or her students and classroom, or large, such as a cultural system. Qualitative research studies typically include ethnographies, case studies, and generally descriptive studies (see 41.2). They often are called *ethnographies*, but these are somewhat more specific. Goetz and LeCompte, for instance, based on the work of Spradley and McCurdy (1972), define ethnographies as "analytic descriptions or reconstructions of intact cultural scenes and groups" (1984, p. 2). A case study may indeed be viewed as an ethnography; however, the investigator may have set out to answer a particular question rather than to describe a group or scene as a whole.

Qualitative research methods typically include interviews and observations, but may also include case studies, surveys, and historical and document analysis. Case study and survey research are also often considered methods on their own. Survey research (see 37.1, 37.4, 41.2.1) and historical and document analysis (see, for instance, 41.2.4) are covered in other chapters in this book; therefore they will not be extensively discussed in this chapter.

Qualitative research has several hallmarks. It is conducted in a natural setting, without intentionally manipulating the environment. It typically involves highly detailed rich descriptions of human behaviors and opinions. The perspective is that humans construct their own reality, and an understanding of what they do may be based on why they believe they do it. There is allowance for the "multiple realities" individuals thus might construct in an environment. The research questions often evolve as the study does, because the researcher wants to know "what is happening," and may not want to bias the study by focusing the investigation too narrowly. The researcher becomes a part of the study by interacting closely with the subjects of the study. The researcher attempts to be open to the subjects' perceptions of "what is"; that is, researchers are bound by the values and world views of the subjects. (For a discussion of self-reflexivity, see 10.4.4.) In qualitative research, it is not necessarily assumed that the findings of one study may be generalized easily to other settings. There is a concern for the uniqueness of a particular setting and participants.

In the following section, we will present some of the many points of debate about the definition and use of qualitative methods.

40.1.2 Comparisons Between Qualitative and Quantitative Methods

Some authors have chosen to posit qualitative and quantitative research as diametrically opposed constructs. This may confuse a beginning researcher in that it simplistically implies

that qualitative research might never use number quantitative research might never use subjects' perceptions. [Discussion of quantifying qualitative data will follow this chapter, but for an example the reader need only the title of Johnson's (1978) introduction to qualitative research design, *Quantification in Cultural Anthropology*.

More useful, perhaps, is the comparison of B. Gall (1989) who name the two approaches *positivist* and *naturalistic* and compare them on the dimensions of vision of the nature of reality, relationship of the researcher to the research subject, issues of generalizability, disproof of causality, and role of values.

Lincoln and Guba (1985) and Denzin and Lincoln define the term *paradigm* as a systematic set of beliefs, their accompanying methods, which provide a view of the nature of reality. They contend that the history of inquiry can be divided into eras based on people's views of the world and how to study it. They argue that scientific inquiry is defined by the positivist paradigm, which prevailed until recently. They call the earliest era the *pre-positivist era*, which included human scientific endeavor about the time of Aristotle to the middle of the 1700s. This was the precursor to a more modern perspective. Lincoln and Guba say that research during this era consisted of passive observation and description. They consider the modern scientific method to have emerged in the positivist era about the middle 1700s to the present. Positivism, they say, can be identified by scientific research that involves hypotheses, manipulation, active observation of phenomena, and, thus, testing of hypotheses. These authors argue that the positivist paradigm is limited and is challenged recently by the emerging postpositivist paradigm, which they also call the *naturalistic paradigm*. [Readers unfamiliar with the evolution of paradigms in research may refer to Kuhn's (1970) seminal work, *The Structure of Scientific Revolutions*, although Lincoln and Guba (1985) appear to contradict Kuhn's views part of the positivist paradigm.]

This conception of the naturalistic paradigm is echoed by Erlandson, Harris, Skipper, and Allen (1993) who, in their book, *Doing Naturalistic Inquiry*, that naturalistic inquiry is a new paradigm as opposed to the older pre-positivist one. They say that while naturalistic research uses qualitative research methods, it cannot be equated with these methods. They mention the "paradigm wars" raging in research in general. They note that constructivism and naturalistic inquiry have evolved together. [Readers may wish to refer to Guba's (1990) book, *The Paradigm Dialog*, the first few chapters of which these points of view are explored further, as well as Chapters 7 to 10 in this handbook on newer views of educational technology research.]

The paradigm debate as it has evolved in educational technology is more recent. The introduction of critical theory issues (see 9.7), the presentation of qualitative workshops at AECT national conferences, and the discussion of alternative research techniques are all indicators of change (see Yeaman, 1994; Robinson & Driscoll, 1993; Driscoll, 1995; Robinson, 1995). One aspect of the paradigm de-

is the issue of how one's perspective directs the type of research questions studied and how methods are chosen. Some believe that researchers must declare a paradigm from which they work, and that the paradigm naturally dictates methods and questions. This is a different approach from that taken in this chapter, namely, that methods may be chosen based on questions to be studied.

Other authors, such as Goetz and LeCompte (1984), contend that it is perhaps not useful to build simplistic dichotomies of research models. They argue that dichotomies such as generative-verification, inductive-deductive, subjective-objective, and constructive-enumerative to describe research models must be examined carefully and that "all factors must be balanced in composing a research design" (p. 48).

While many of the authors above use the term *naturalistic inquiry*, it is perhaps more useful for that term to be applied to the paradigm as Lincoln and Guba (1985) and Erlandson et al. (1993) apply it. Goetz and LeCompte use the term *ethnographic* for research using qualitative methods, but ethnography is just one form that qualitative research may take. In this chapter, we will use the term *qualitative* research. This seems to be a less value-laden term and one that has come to the fore recently. (As evidence, one major publisher of textbooks for social science research, Sage Publications, California, publishes an extensive series of references for all aspects of conducting this type of research under the title "qualitative methods.") It remains to be seen whether this is the term that in decades hence will continue to be used.

In sum, we in this chapter agree that forcing a choice between using qualitative or quantitative methods limits and inhibits the quality of research. Our argument is that the questions a researcher strives to answer should drive the choice of methods. Our assumption is that there is no reason data-gathering methods cannot be combined in a study, that a researcher cannot investigate carefully and creatively any questions he or she chooses (see 11.2.4.2, 39.5.2.2). Rather than limiting our endeavors in this time of tremendous strides in technology development, this approach should enable researchers to take chances, to make leaps, to enhance development in the field by yielding both "answers" and "understanding." As will be seen in the next section, this approach has a solid tradition in educational communications and technology.

That said, given the tremendous ferment in educational research today, it behooves any researcher using qualitative methods to be aware of the "paradigm war" discussions. A researcher may choose to build a study using qualitative methods to answer certain questions, in a study that blends these methods with experimental or quasi-experimental methods. The researcher may design an entirely qualitative study to come to a deep understanding about what is happening in a setting, or how the participants perceive of their world. This study may stand on its own, or be used as a sort of pilot study to generate questions and hypotheses prior to conducting an experimental study. In any case, the researcher should be specific about how he or she defines the assumptions of the study and why what was done was done—in

short, to be able to enter into the current and upcoming discussions as a thoughtful, critical, and creative researcher.

40.1.3 How Has Qualitative Research Historically Been Defined in Educational Technology?

In educational communications and technology research, and in educational research in general, there is similar debate about the definition and purpose of qualitative methods. This can be viewed as a natural consequence of discussion in education about the utility of constructivist as opposed to positivist views of education. This discussion can be enjoyed at national and regional conferences in the field, and in the journals. It can be said that the larger debate regarding naturalistic versus positivistic research is creating a more open arena in which studies can be presented and published. Indeed, the editors of the leading journals in the field have indicated they welcome the submission of well-crafted qualitative studies. While not many such reports have been published, it is hoped that this chapter may positively influence the future. We will therefore, in this chapter, avoid the larger debate and focus on qualitative methods as tools.

It may come as a surprise to some that use of qualitative data collection methods has a long tradition in educational technology research. Early research efforts often used qualitative methods to evaluate and describe the use of media in the classroom. Experimental researchers have often used qualitative methods to collect attitude data, for instance, to yield possible explanations of students' behavior. These data are typically collected using surveys, but may be collected using interviews. It is not unusual for an experimental researcher to further inform the study by conducting observations of the subjects. Researchers often conduct a case study to unobtrusively learn more about students, teachers, and trainers who use a new technology. Case studies present detailed data that may be used to derive questions later to be investigated in an experiment. Evaluation researchers have long used qualitative methods, in particular surveys, interviews, observations, and historical and document analysis (see also 34.3, 34.6, Chapter 42).

While not researchers, per se, instructional systems designers have always used the qualitative methods of surveys, interviews, and observations during the front-end analysis and evaluation phases of development. Markle (1989), for example, contends that even in the early, more "behaviorist" days of instructional design, developers listened to their learners, watched them carefully, and humbly incorporated what learners taught them into their drafts of instructional materials. Similarly, what recent authors, especially computer scientists, are calling testing in "software engineering" (Chen & Shen, 1989), "prototype evaluation" (Smith & Wedman, 1988), "prototype testing," "quality assurance" (McLean, 1989), or "quality control" (Darabi & Dempsey, 1989-90) is clearly formative evaluation, usually incorporating some qualitative methods.

Beyond these basic uses of qualitative methods, however, there have been calls in the field to use these methods to address new research questions.

With the increasing use of computer-based interactive technologies in education and industry, opportunities, and at times the responsibility, to explore new questions about the processes of learning and instruction are evolving. Educational technologists have issued the call for the use of more qualitative research methods to explore training and school processes (Bosco, 1986; Clark, 1983; see also 6.5). Driscoll (1995) suggests that educational technologists select research paradigms based on what they perceive as the most critical questions. Noting the debate regarding paradigms, she adds that educational technology is a relatively young field in which "numerous paradigms may vie for acceptability and dominance" (p. 322). Robinson (1995) and Reigeluth (1989) concur, noting the considerable debate within the field regarding suitable research questions and methods. Winn (1989) also calls for more descriptive studies yielding information about learning and instruction. Clark agrees with Winn, calling for reconsideration of how media are studied (1983), and stating that researchers should conduct planned series of studies, selecting methods based on extensive literature reviews (1989). He recommends that prescriptive studies be conducted to determine why instructional development methods work. Qualitative methods can serve these purposes admirably.

The approach taken in this chapter, that choosing qualitative or quantitative methods need not be an either/or proposition, is similar to the approach of Hannafin and his associates (Hannafin & Rieber, 1989; Hooper & Hannafin, 1988) in their development of the ROPES guidelines for designing instruction. Their guidelines blend behaviorist with cognitive principles in what they call *applied cognitivism* (see 12.4.4).

In our field, new educational technologies are continually being developed. Recent developments have been interactive multimedia, new distance learning systems, information technologies such as hypertext databases and the Internet, interactive learning environments, micro-worlds, and virtual-reality systems. Many teachers, trainers, administrators, managers, community members, and institutional leaders contend that the evolution of new technologies will continue to change the nature of teaching, training, instruction, and learning (Ambron & Hooper, 1990, 1988; Lambert & Sallis, 1987; Schwartz, 1987; Schwier, 1987; U.S. Congress, OTA, 1988).

It is not only new technologies that require new research methods. The more recent developments in critical theory (see Chapter 9), postmodernism (see Chapter 10), and philosophical thought presented in this handbook and elsewhere (see Yeaman et al., 1994) also suggest distinctive changes and additions to our research endeavors and to the questions and problems in education with which technology is involved.

A recent study that used new technologies and combined qualitative and quantitative methods is that of Wiegmann

(1996). In her dissertation, she combined techniques to examine preservice teachers' attitudes and perceptions of efficacy regarding instructional technologies. Her quasi-experimental study used a nonequivalent control-group design to investigate the effects of presentation techniques used in a science methods class. Her data were collected using pre- and postsurveys. She also collected student artifacts in the form of student lesson plans, daily technology-use surveys, and reflective journals focusing on topics pertinent to science education and the use of technology in the classroom. Quantitative data analyses in the form of chi-square and factor analysis were combined with qualitative, more-narrative data about the student journals and lesson plans. Questions included, "Does the method used affect teachers' attitudes toward technology?" and "Does the method used to present preservice teachers with ways to use technology in instruction affect the instructional strategies they incorporate into their lesson plans?"

New technologies also enable researchers to study learners and learning processes in new ways. Computers allow sophisticated tracking of the paths that learners take through a lesson. We can view each decision a learner makes and analyze the relationship among the patterns of those decisions and their performance and attitudes (Dwyer & Leader, 1995).

New technologies may also require that we ask new questions in new ways. We may need to expand our views of what we should investigate and how. For instance, a qualitative view of how teachers and their students use a new technology may yield a view of "what is really happening" when the technology is used. Developers are well aware that instruction is not always delivered as designed, and this holds true for technology-based instruction. The history of educational technology includes records of the failures of a technological approach, often for reasons stemming from poorly planned implementation. We need to know what is really occurring when technologies or new approaches are used. Newman (1989) holds that learning environments can affect instructional technologies. He writes, "How a new piece of educational technology gets used in a particular environment cannot always be anticipated ahead of time. It can be argued that what the environment does with the technology provides critical information to guide design process" (p. 1). He adds, "It is seldom the case that the technology can be inserted into a classroom without changing other aspects of the environment" (p. 3).

A lucid discussion of the issues related to using qualitative techniques in investigating aspects of the technology of computer-based instruction is presented by Neuman (1989). She presents, for example, her findings on teacher perceptions and behaviors for integrating this type of interactive technological innovation into their classrooms. In another qualitative study of an instructional innovation, Jost (1994) investigated aspects of effective use of calculators in teaching calculus (see 12.3, 12.4.4, 14.7, 15.6, 17.7, 19.6, 20.5, 23.5, 23.6, 24.11, 26.7, and 29.7 for discussions of the impact of new technologies and research in educational technology).

40.1.4 Assumptions of This Chapter

Well-designed research is never easy to conduct. Qualitative research studies typically require considerably more time to design, collect, and analyze data and to report the results than do quantitative studies. Yet professors in the field often hear students stating that they plan to do a qualitative study because it will be easier or quicker. Unfortunately, all too often poorly conceived and conducted studies are called *qualitative* in an effort to avoid defining and describing methods used to collect data, to avoid assumptions of the study, and even to clearly describe results. At conferences, one often hears editors of the leading journals exhorted to publish more qualitative research. Editors reply that they will publish such studies, provided reviewers and editors can determine that the studies are sound and relevant. [See, for example, Smith's (1987) paper signifying that the journal *AERJ* welcomes the submission of qualitative reports.]

It should be noted that there is still some concern regarding the acceptance of qualitative research by journals. Not every editor or reviewer is an expert in identifying well-developed research reports of qualitative studies. Questions of sample size and validity may be inappropriately raised about qualitative studies, indicating that reviewers may need more experience with qualitative methods, or that reviewers with more experience with qualitative methods could be selected.

The concerns with regard to quality of research are not confined to educational technology. Lincoln and Guba (1985) note that "The naturalistic inquirer soon becomes accustomed to hearing charges that naturalistic studies are undisciplined; that he or she is guilty of 'sloppy' research, engaging in 'merely subjective' observations, responding indiscriminately to the 'loudest bangs or brightest lights'" (p. 289).

Methods for evaluating the soundness of a qualitative study, and for conducting a study ethically, will be presented in a later section. However, before discussing the methods qualitative researchers use, it is critical to illustrate the characteristics of good qualitative research. Not all will be present in any one study, as each study is designed differently to investigate different issues. However, it is worth considering what makes a study "qualitative."

In addition to the characteristics described in the earlier definition of qualitative research, in this chapter many of Lincoln and Guba's (1985) characteristics of naturalistic research will be assumed to apply to qualitative research. Qualitative research is done in a natural setting. The main data-gathering instrument is the human researcher. The researcher uses tacit, that is, intuitive or felt, knowledge, as well as propositional knowledge. Qualitative methods are used generally, but not to the exclusion of quantitative methods. Sampling is often purposive or theoretical rather than random or representative. Data analysis is typically inductive rather than deductive, but again, not exclusively. In naturalistic studies, theory is grounded in the data rather than determined a priori, although in qualitative studies theories often do drive the processes used in the investigation.

In contrast to experimental studies, in qualitative studies the design often emerges as the study progresses, with the researcher continually refining the methods and questions. Similarly, the focus of the study determines what data are collected, and the boundaries of what is studied may change during the study as new issues and questions emerge. In qualitative research, the "reality" or the meaning of a situation and setting are negotiated among the researcher and those studied, with the understanding that multiple realities are always present. Many qualitative studies use a case study approach in the report, rather than a scientific report; some, in fact, describe the results by building a narrative or sort of story. A qualitative researcher tends to interpret results of a study or draw conclusions based on the particulars of that study, rather than in terms of generalizability to other situations and settings. Similarly, such a researcher is likely to be hesitant about advocating broad application of the findings of one study to other settings (Lincoln & Guba, 1985).

A final assumption of this chapter is that qualitative studies can be evaluated for quality, and rigor is not tossed out because a study is not quantitative in nature. While some of the criteria may be different from those used in quantitative research, many criteria for evaluating what Lincoln and Guba call the "trustworthiness" of a qualitative study will be discussed, many related to the particular methods used in qualitative research.

In summary, we concur with the call of Salomon (1991) that it is time to transcend the debate about qualitative versus quantitative research. In a stronger message, Robinson (1995) suggests that, "The paradigm debate should be declared a draw. . . . [We should] accept the dual perspectives of our paradigm debate, if we are to meet the challenges of the future and be at all helpful in shaping the educational success of the next century" (pp. 332-333). Robinson continues, "All ways of knowing and all social constructs should be equally accepted and represented in our literature . . . individuals should be encouraged to question and consider how they approach the world, how they understand learning, and how they believe knowledge is achieved" (p. 332).

The range of methods we may use to conduct qualitative research will be explored in the next section. Examples of educational technology studies that use these methods will be woven into the discussion. As this chapter is an introduction, issues of analysis and reporting will be briefly introduced, but not in great detail.

40.2 QUALITATIVE RESEARCH METHODS

Designing qualitative studies is quite different from designing experimental studies. In fact, designs and methods are continually refined while the researcher conducts a qualitative study. As suggested by Jacobs (1987), the researcher initially chooses methods based on the questions to be addressed; however, the questions, issues, and topics of the study themselves may change as the researcher's concep-

tion of the reality of the "world" being studied changes. This may be uncomfortable for those experienced with more quantitative, experimental, or quasi-experimental research. However, most qualitative researchers recommend this process of continual refinement. Goetz and LeCompte (1984), for example, note that methods are "adjusted, expanded, modified, or restricted on the basis of information acquired during the mapping phase of fieldwork. . . . Only after final withdrawal from the field can researchers specify the strategies they actually used for a particular study" (p. 108).

Lincoln and Guba (1985) address the contradictory idea of "designing" a naturalistic study completely prior to beginning the study, calling this a "paradox" in that most funding agencies require specificity regarding methods, while methods in a good qualitative study may be expected to change as the study progresses. Erlandson et al. (1993) take the middle road. They say that the answer to whether a naturalistic study should be designed in advance is "Yes—to some extent" (p. 66). They recommend beginning the study by specifying a research problem, selecting a research site, developing working hypotheses, and using interactive processes to refine the research questions. They further suggest that the researcher plan for the stages of conducting the study. These may include negotiating entry to the site, planning for purposive (rather than random) sampling and for data collection, planning for data analysis, determining how quality will be ensured in the study, deciding how the findings of the study will be disseminated, and developing a logistical plan. [For further information regarding the logistical operations of field research, the reader may refer to Fiedler's book (1978), *Field Research: A Manual for Logistics and Management of Scientific Studies in Natural Settings*.] Erlandson et al. (1993) also recommend reviewing the design of the study regularly.

In determining what the research problem is, Bernard (1988, p. 11) suggests that the researcher ask himself or herself five questions:

1. Does this topic (village—i.e., setting, school, organization, institution—and data collection method) really interest me?
2. Is this a problem that is amenable to scientific inquiry?
3. Are adequate resources available to investigate this topic? (To study this population? To use this particular method?)
4. Will my research question, or the methods I want to use, lead to unresolvable ethical problems? (Ethical issues will be addressed later in this chapter.)
5. Is the topic (community, method) of theoretical interest?

Once a question or issue has been selected, the choice of qualitative methods falls roughly into the categories of observations, interviews, and document and artifact analysis. Qualitative methods, however, form continua on various dimensions, and researchers espouse many views of how methods may be categorized and conceptualized.

Pelto and Pelto (1978) in their frequently cited text on anthropological research methods remind us that the human

investigator is the primary research instrument. These authors categorize methods as either verbal or nonverbal techniques. Verbal techniques include participant observation, questionnaires, and various forms of structured and unstructured interviews. Nonverbal techniques include observations and measures of interactions; proxemics, kinesics, and research involving videotaped observations; use of various types of technical equipment for collecting data; content analysis; and analysis of artifacts and records. Pelto and Pelto (1978) add that methods may be described as having an "emic" or insider's view, as in participant observation, versus an "etic" or outsider's view, as in non-participant stream-of-behavior analyses.

Other researchers use variations of these taxonomies. Goetz and LeCompte (1984) divide methods into interactive (participant observation and several types of interviews) versus noninteractive methods (forms of nonparticipant observation, as well as artifact collection and analysis). Lincoln and Guba (1985) classify methods as those that collect data from human sources (observations and interviews) as opposed to those that collect data from nonhuman sources (documents and records).

Other authors, however, note that methods can rarely be classified as simple dichotomies, such as interactive or not, in large part because the researcher is a human being and thus involved, and plays a role even in nonparticipant observation (see Atkinson & Hammersley, 1994). Bogdan and Biklen (1992) provide the example of the "participant/observer continuum" (p. 88), describing the ways observers who refrain from being overt participants may still interact to varying degrees with those subjects. Researchers who work using an ethnographic perspective consider all methods "doing fieldwork" (cf. Bogdan & Biklen, 1992). Similarly, Bernard (1982) calls participant observation the "foundation of anthropological research" (p. 148); some would say this deep, involved method of interacting with subjects defines qualitative research.

It is assumed that educational technologists will use methods ethically and with a view to doing quality research, but may not always be bound by anthropological tradition. We are in another field with other questions to answer than those in which anthropologists or sociologists may be interested. For instance, it is now possible to design instruction using a multitude of techniques, using many delivery systems. As noted by McNeil and Nelson (1991) and Reeves (1986), many design factors contribute to the success of instruction using new technologies, such as distance education, interactive multimedia, and Internet-based delivery systems. Educational technologists may successfully use and adapt qualitative methods to investigate new and challenging questions.

In this chapter, we will discuss specific methods that may be called *observations*, *interviews*, and *document and artifact analysis*. As in all qualitative research, it is also assumed that educational technology researchers will use and refine methods with the view that these methods vary in their degree of interactiveness with subjects. Each of these methods, in their various forms, along with several research perspectives, will

be examined in detail below (see 23.6 and 41.2 in this handbook for discussion of other aspects of qualitative methods).

40.2.1 Grounded Theory

Grounded theory is considered a type of qualitative methodology. Strauss and Corbin (1994), however, in their overview of grounded theory note that it is "a *general methodology* for developing theory that is grounded in data systematically gathered and analyzed" (p. 273), adding that it is sometimes called the *constant comparative method* and that it is applicable as well to quantitative research. In grounded theory, the data may come from observations, interviews, and videotape or document analysis, and, as in other qualitative research, these data may be considered strictly qualitative or may be quantitative. The purpose of the methodology is to develop theory, through an iterative process of data analysis and theoretical analysis, with verification of hypotheses ongoing throughout the study. A grounded theory perspective leads the researcher to begin a study without completely preconceived notions about what the research questions should be, assuming that the theory on which the study is based will be tested and refined as the research is conducted.

The researcher collects extensive data with an open mind. As the study progresses, he or she continually examines the data for patterns, and the patterns lead the researcher to build the theory. Further data collection leads to further refinement of the questions. The researcher continues collecting and examining data until the patterns continue to repeat and few relatively, or no clearly, new patterns emerge. The researcher builds the theory from the phenomena, from the data, and the theory is thus built on, or "grounded" in, the phenomena. As Borg and Gall (1989) note, even quantitative researchers see the value of grounded theory and might use qualitative techniques in a pilot study without completely a priori notions of theory to develop a more-grounded theory on which to base later experiments.

A recent example of a grounded-theory approach in an educational technology study is that of Oliver's (1992). This research investigated and described the activities used in a university televised distance education system, analyzing the use of camera techniques as they related to interaction in class. Oliver videotaped hours of two-way video instruction and analyzed the amount and kind of classroom interactions that occurred. She also examined and described the various television shots and transitions used. Outside observers also coded the videotapes. Using grounded-theory techniques, Oliver used the data she transcribed and the emerging categories of data to create a theory of televised instruction. The theory involved the use of close-up camera techniques and the "clean-cut" transition to enhance interaction.

40.2.2 Participant Observation

Participant observation is a qualitative method frequently used in social science research. It is based on a long tradition of ethnographic study in anthropology. In participant

observation, the observer becomes "part" of the environment, or the cultural context. The method usually involves the researcher's spending considerable time "in the field," as anthropologists do. Anthropologists typically spend a year or more in a cultural setting in order to really understand the culture in depth, even when they begin the study with a broad overall research question. The hallmark of participant observation is interaction among the researcher and the participants. The main subjects take part in the study to varying degrees, but the researcher interacts with them continually. For instance, the study may involve periodic interviews interspersed with observations so that the researcher can question the subjects and verify perceptions and patterns. These interviews may themselves take many forms, as noted in an upcoming section. For example, a researcher may begin by conducting open-ended unstructured interviews with several teachers to begin to formulate the research questions. This may be followed by a set of structured interviews with a few other teachers, based on results of the first series, forming a sort of oral questionnaire. Results of these interviews may then determine what will initially be recorded during observations. Later, after patterns begin to appear in the observational data, the researcher may conduct interviews asking the teachers about these patterns and why they think they are occurring, or if indeed those are categories of information. Similarly, a researcher might conduct videotaped observations of a set of teachers, analyze the tapes to begin to make taxonomies of behaviors, and then conduct interviews with the teachers, perhaps while they view the tapes together, to determine how the teachers themselves categorize these behaviors. Thus, the researcher becomes a long-term participant in the research setting.

Educational researchers have come under some criticism, at times legitimately so, for observing in educational settings for very brief periods of time, such as once for a few hours, and then making sweeping generalizations about teachers, schools, and students from these brief "slices of time." Yet, educational researchers typically do not have the resources to "live" in the observed settings for such extended periods of time as anthropologists do. There are several exceptions; including, but not limited to, Harry Wolcott's studies of a Kwakiutl village and school (1967) and of one year in the life of a school principal (1973); John Ogbu's (1974) ethnography of urban education; and Hugh Mehan's (1979) collaborative study of social interactions in a classroom, done with Courtney Cazden and her cooperating teacher, LaDonna Coles.

It is reasonable that fine educational technology research can be conducted using participant observation techniques, with somewhat limited research questions. Not every phenomenon can possibly be recorded. Most qualitative observational studies rely on the researcher's writing down what occurs in the form of extensive field notes. The researcher then analyzes these notes soon after observations are carried out, noting patterns of behaviors and events and phenomena to investigate in further observations. Still, the researcher is

the instrument in most participant observations and, being human, cannot observe and record everything. Therefore, in most educational research studies, the investigator determines ahead of time what will be observed and recorded, guided but not limited by the research questions.

In an example of a limited participant observation case study, Robinson (1994) observed classes using "Channel One" in a midwestern middle school. While Robinson was not there for more than one semester, she did observe and participate in the class discussions for many hours of classroom instruction, as well as interview about 10% of the students. She did not focus on all school activities, or on all the categories of interaction within the classrooms, but focused her observations and field notes on the use of the televised news show and the reaction to it from students, teachers, administrators, and parents.

It should be noted that novice observers initially think they can avoid the observational limitations by simply videotaping everything that goes on in the setting, such as the classroom. The use of videotape and audiotape in data collection is useful, particularly in nonparticipant observational studies of particular behaviors and phenomena. However, it can be readily seen that videotaping everything is usually not a way to avoid defining or focusing research questions. For instance, without an exceptionally wide-angle lens, no video camera can record all that goes on in one classroom. If such a lens is used, then the wide view will preclude being able to see enough detail to understand much of what is going on. For example, computer screens will not be clearly visible, nor will specific nonverbal behaviors. In addition, if conversations are of interest in order to understand the types of behaviors students are engaged in, no one camera at the back of the room will be able to record all the conversations. Finally, those who have conducted microanalysis of videotaped classroom observations find it is not unusual to require 10 hours to analyze the behaviors and language recorded in 1 hour of videotape. It can easily be seen that the decision to videotape dozens of hours of classroom behaviors with one camera in the room might result in little useful data being collected, even after hundreds of hours of analysis. Videotape can successfully be used in data collection when the researcher knows what he or she wants to analyze. The preceding note of caution is just a reminder to the qualitative researcher that "shotgun" data collection is no substitute for determining ahead of time what the study is all about.

What can happen with videotape can also happen with written field notes. Trying to glean meaning by sifting through notebook after notebook of descriptions of classroom happenings, especially long after observations were made, is nearly impossible. What is needed is for observations to be at least loosely guided by purposes and questions. Even in studies using a grounded theory approach, observers generally analyze for patterns in observations throughout the entire data collection phase.

Spradley's (1980) book details how to conduct participant observations. He discusses the variety of roles the

observer might take, noting that the observer becomes to varying degrees an "insider," in line with what Peltó and Peltó (1978) call the *emic* view. Spradley suggests that the research site and setting, of course, be selected to best answer the research questions, but with an eye toward simplicity, accessibility, possibility of remaining relatively unobtrusive, permissibility, assurance that the activities of interest will occur frequently, and degree to which the researcher can truly become a participant.

Spradley (1980) provides specific techniques for conducting observations, for conducting iterative interviews with subjects, and for analyzing behaviors, especially language used by informants in interviews. In particular, he notes that cultural domains, or categories of cultural meaning, can be derived from interviews and observations with participants. Finally, he provides advice regarding how to analyze data and write the ethnography.

The stages of participant observation, from an anthropological perspective, have been delineated by Bernard (1988). He describes the excitement, and sometimes fear, of the initial contact period; the next stage, which is often a type of shock as one gets to know the culture in more detail; a period of intense data collection he identifies with discovering the obvious, followed by the need for a real break; a stage in which the study becomes more focused; followed by exhaustion, a break and frantic activity; and finally, carefully taking leave of the field setting.

Spradley (1980) advises that ethical issues be addressed throughout the study. These issues are common to most types of qualitative research methods. For instance, Spradley advises that the researcher consider the welfare and interests of the informants, that is, the collaborating subjects first. He says informants' rights, interests, and sensibilities must be safeguarded; informants should not be exploited. Subjects should be made aware of the purposes of the research study. Their privacy should be protected. Many of these issues are common to all types of research. However, Spradley adds that reports should be made available to informants, so that they too are participants in the study. In some of the interview techniques described later, in fact, verifying analyses and preliminary reports with subjects is one way to ensure the authenticity of the results and to delve deeper into the research questions. Ethical issues in qualitative research, as well as criteria for evaluating the rigor and quality of such research, will be discussed in further detail later in this chapter.

Borg and Gall (1979) discuss the types of questions one might address using participant observation techniques. These include such questions as who the participants are; what are their typical and atypical patterns of behavior; and where, when, how, and why the phenomena occur. In short, participant observation is often successfully used to describe what is happening in a context and why it happens. These are questions that cannot be answered in the standard experiment.

Another example of participant observation is described by Reilly (1994). His use of videotaping and video production instruction as a project in a California high school

involved defining a new type of literacy, combining print, video, and computer technologies. Students produced videotapes that were then transferred to disc and made available for others' use. The research involved many hours of in-school data collection and analysis, and was very action oriented, with a product from the students as well as a written report from the researcher.

The work of Higgins and Rice (1991) is another excellent example of a qualitative study with an educational technology focus. These researchers investigated teachers' perceptions of testing. They used triangulation, by using a variety of methods to collect data; however, a key feature of the study was participant observation. Researchers observed six teachers for a sample of 10 hours each. Trained observers recorded instances of classroom behaviors that could be classified as assessment.

Another exemplary study that used multiple methods to triangulate data but that relied primarily on participant observation is that of Moallem (1994). This researcher investigated an experienced teacher's model of teaching and thinking by conducting a series of observations and interviews over a 7-month period. Using a constant comparative style, she analyzed the data, which allowed categories of the teacher's frames of reference, knowledge and beliefs, planning and teaching techniques, and reflective thinking to emerge. She then built a model of the teacher's conceptions. This study may also be called a form of case study.

The study and the triangulation of data and refinement of patterns using progressively more-structured interviews and multidimensional scaling will be described in more detail later in this chapter.

40.2.3 Nonparticipant Observation

Nonparticipant observation is one of several methods for collecting data considered to be relatively unobtrusive. Many recent authors cite the early work of Webb, Campbell, Schwartz, and Sechrest (1966) as laying the groundwork for use of all types of unobtrusive measures.

Several types of nonparticipant observation have been identified by Goetz and LeCompte (1984). These include stream-of-behavior chronicles, recorded in written narratives or using videotape or audiotape; proxemics and kinesics, that is, the study of uses of social space and movement; and interaction analysis protocols, typically in the form of observations of particular types of behaviors, categorized and coded for analysis of patterns. Bernard (1988) describes two types of nonparticipant observation, which he calls *disguised field observation* and *naturalistic field experiments*. He cautions in the first case for care to be taken that subjects are not harmfully deceived. Reflecting recent postmodern and constructivist (as well as deconstructionist) trends, Adler and Adler (1994) extend paradigms of observational research to include dramaturgical constructions of reality, and auto-observation, as well as more typical ethnomethodology.

In nonparticipant observation, the observer does not interact to a great degree with those he or she is observing [as opposed to what Bernard (1988) calls direct, reactive observation]. The researcher primarily observes and records, and has no specific role as a participant. Usually, of course, the observer is "in" the scene, and thus affects it in some way; this must be taken into account. For instance, observers often work with teachers or instructors to have them explain to students briefly why the observer is there. Care should be taken once more not to bias the study. It is often desirable to explain the observations in general terms rather than to describe the exact behaviors being observed, so that participants do not naturally increase those behaviors. Some increase may occur; if the researcher suspects this, it would be appropriate to note it in the analyses and report.

As with participant observation, nonparticipant observers may or may not use structured observation forms, but are often more likely to. In this type of study, often several trained observers make brief sampled observations over periods of time, and observation forms help to ensure consistency of the data being recorded.

Nonparticipant observation is often used to study focused aspects of a setting, in order to answer specific questions within a study. This method can yield extensive detailed data, over many subjects and settings, if desired, in order to search for patterns, or to test hypotheses developed as a result of using other methods, such as interviews. It can thus be a powerful tool in triangulation. Observational data may be coded into categories, frequencies tabulated, and relationships analyzed, yielding quantitative reports of results.

Guidelines for conducting nonparticipant observation are provided by Goetz and LeCompte (1984), among others. They recommend that researchers strive to be as unobtrusive and unbiased as possible. They suggest verification of data by using multiple observers. The units of analysis, thus data to be recorded, should be specified before beginning; recording methods should be developed; strategies for selection and sampling of units should be determined; and finally all processes should be tested and refined, before the study is begun in earnest. (See 35.5 and 35.6 for a discussion of research on social interaction in cooperative learning settings.)

Examples of studies in which observations were conducted that could be considered relatively nonparticipant observation were Savenye and Strand's (1989) in the initial pilot test, and Savenye (1989) in the subsequent larger field test of a science videodisc and computer-based curriculum. Of most concern during implementation was how teachers used the curriculum. Among other questions researchers were interested in are: how much teachers followed the teachers' guide, the types of questions they asked students when the system paused for class discussion, and what teachers added to or didn't use from the curriculum. In the field test (Savenye, 1989), a careful sample of classroom lessons was videotaped and the data coded. For example, teacher questions were coded according to a taxonomy based on Bloom's (1984), and results indicated that teach-

ers typically used the system pauses to ask recall-level rather than higher-level questions.

Analysis of the coded behaviors for what teachers added indicated that most of the teachers in the sample added examples to the lessons which would provide relevance for their own learners, and that almost all of the teachers added reviews of the previous lessons to the beginning of the new lesson. Some teachers seemed to feel they needed to continue to lecture their classes; therefore they duplicated the content presented in the interactive lessons.

Developers used the results of the studies to make changes in the curriculum and in the teacher training that accompanied it. Of interest in this study was a comparison of these varied teacher behaviors with the student achievement results. Borich (1989) found that learning achievement among students who used the interactive videodisc curriculum was significantly higher than among control students. Therefore, teachers had a great degree of freedom in using the curriculum, and the students still learned well.

If how students use interactive lessons is the major concern, researchers might videotape samples of students using an interactive lesson in cooperative groups, and code student statements and behaviors, as did Schmidt (1992). In a study conducted in a museum setting, Hirumi, Allen, and Savenye (1994) used qualitative methods to measure what visitors learned from an interactive videodisc-based natural history exhibit.

Nonparticipant observations may be used in studies that are primarily quantitative experimental studies in order to answer focused research questions about what learners do while participating in studies. For instance, a researcher may be interested in what types of choices learners make while they proceed through a lesson. This use of observations to answer a few research questions within experimental studies is exemplified in a series of studies of cooperative learning and learner control in television or computer-delivered instruction by Klein, Sullivan, Savenye, and their colleagues.

Jones, Crooks, and Klein (1995) describe the development of the observational instrument used in several of these studies. Klein and Pridemore (1994), in a study of cooperative learning in a television lesson, observed four sets of behaviors. These were coded as helping behaviors, on-task group behaviors, on-task individual behaviors, and off-task behaviors. In a subsequent experimental study using a computer-based lesson, Crooks, Klein, Jones, and Dwyer (1995) observed students in cooperative dyads, and recorded, coded, and analyzed helping, discussion, or off-task behaviors.

In another study of cooperative use of computer-based instruction (Wolf, 1994), only one behavior was determined to be most related to increased performance, and that was giving elaborated explanations, as defined by Webb (1991, 1983). Instances of this behavior, then, were recorded and analyzed.

An example of using technology to assist in recording and analyzing behaviors is shown in Dalton, Hannafin, and Hooper's (1989) study on the achievement effects of individual and cooperative use of computer-based instruction.

These researchers audiotaped the conversations of each set of students as they proceeded through the instruction.

A variation on nonparticipant observations represents a blend with trace-behavior, artifact, or document analysis. This technique, called *read-think-aloud protocols*, takes the form of asking learners to describe what they do and why they do it, that is, their thoughts about their processes, as they proceed through an activity, such as a lesson. Smith and Wedman (1988) describe using this technique to analyze learner tracking and choices. Researchers may observe and listen as subjects participate, or researchers can use audiotape or videotape to analyze observations later. In either case, the resulting verbal data must be coded and summarized to address the research questions. Techniques for coding are described by Spradley (1980). However, protocol analysis (cf. Ericsson & Simon, 1984) techniques could be used on the resulting verbal data. These techniques also relate to analysis of documentary data, such as journals, discourse, recalled learning measures, and even forms of stories, such as life or career histories (see 23.6.3).

Many qualitative studies using observational techniques are case studies, and many in educational technology have involved the use of computers in schools. One such study was conducted by Dana (1994), who investigated how the pedagogical beliefs of one first-grade teacher related to her classroom curriculum and teaching practices. The teacher was an experienced and creative computer user who modeled the use of computers for her peers. Many hours of interviews and observations of the classes were made. Classroom videotapes were coded by outside reviewers who were trained to identify examples of the teacher's beliefs, exemplified in classroom practice. Her study provided insights into the methodology and teaching and learning in a computer-rich environment. She suggested changes that schools could make to encourage teachers to become better able to incorporate technology into their classrooms.

Another qualitative case study was conducted by Pitts (1993). He investigated students' organization and activities when they were involved in locating, organizing, and using information in the context of a research project in a biology class. Pitts relied on cognitive theory and information models in developing her theoretical construct. She described how students conducted their research leading to their preparation and use of video to present the results of their research.

40.2.3.1. Scope. A study using observational techniques may investigate a broad set of research questions, such as how a reorganization has affected an entire institution, or it may be much more narrowly focused. The outcome of the study may take the form of a type of "rich story" that describes an institution or a classroom or another type of cultural setting. A more narrowly focused participant observation study, however, may investigate particular aspects of a setting, such as the use of an educational innovation or its effects on particular classroom behaviors.

While some qualitative researchers might believe that only studies rich in "thick description," as described by

Lincoln and Guba (1985) (cf. Geertz, 1973), are legitimate, other researchers might choose to use qualitative techniques to yield quantitative data. This blend of qualitative and quantitative data collection is also being used in anthropological studies. An example of a more narrowly focused relatively nonparticipant observation study is the Savenye and Strand (1989) study described earlier, in which the researchers chose to focus primarily on what types of interactive exchanges occurred between students and teachers while they used an electronic curriculum.

40.2.3.2. Biases. Educational researchers who choose to do observational studies would do well to remember that although they do not spend years observing the particular instructional community, they may quickly become participants in that community. Their presence may influence results. Similarly, their prior experiences or upbringing may bias them initially toward observing or recording certain phenomena, and later in how they "see" the patterns in the data. In subsequent reports, therefore, this subjectivity should be honestly acknowledged, as is recommended in ethnographic research.

40.2.3.3. The Observer's Role. In participant observation studies, the researcher is a legitimate member in some way in the community. For instance, in the videodisc-science curriculum study mentioned above, Strand was the senior instructional designer of the materials, Savenye had been an instructional design consultant on the project, and both researchers were known to the teachers through their roles in periodic teacher-training sessions. Observers have limited roles to play in the setting, but they must be careful not to influence the results of the study, that is, to make things happen that they want to happen. This may not seem so difficult, but it may be—for example, if the researcher finds himself or herself drawn to tutoring individuals in a classroom, which may bias the results of the study. Schmidt (1992) describes an example in which she had difficulty not responding to a student in class who turned to her for help in solving a problem; in fact, in that instance, she did assist. More difficult would be a researcher observing illegal behaviors by students who trust the researcher and have asked him or her to keep their activities secret. Potential bias may be handled by simply describing the researcher's role in the research report, but the investigator will want to examine periodically what his or her role is, and what type of influence may result from it.

40.2.3.4. What Should Be Recorded. What data are recorded should be based on the research questions. For example, in a study of classroom behaviors, every behavior that instructors and students engage in could potentially be recorded and analyzed, but this can be costly in money and time and is often not possible. A researcher using a completely "grounded-theory" approach would spend considerable time in the field recording as much as possible. However, another researcher might legitimately choose to investigate more narrowly defined research questions and primarily collect data related to those questions. Again, what is excluded may be as important as what is included.

Therefore, even in a more-focused study, the researcher should be observant about other phenomena occurring and be willing to refine data collection procedures to collect emerging important information, or to change the research questions as the data dictate, even if this necessitates added time collecting data.

40.2.3.5. Sampling. In observational research, sampling becomes not random but purposive (Borg & Gall, 1989). For the study to be valid, the reader should be able to believe that a representative sample of involved individuals were observed. The "multiple realities" of any cultural context should be represented. The researcher, for instance, who is studying the impact of an educational innovation would never be satisfied with only observing the principals in the schools. Teachers and students using the innovation would obviously need to be observed. What is not so obvious is that it is important in this example to observe novice teachers, more experienced teachers, those who are comfortable with the innovation and those who are not, along with those who are downright hostile to the innovation. Parents might also be observed working with their youngsters or interacting with the teachers. How these various individuals use the innovation becomes the "reality of what is," rather than how only the most enthusiastic teachers or experienced technologists use it.

40.2.3.6. Multiple Observers. If several observers are used to collect the data, and their data are compared or aggregated, problems with reliability of data may occur. Remember that human beings are the recording instruments, and they tend to see and subsequently interpret the same phenomena in many different ways. It becomes necessary to train the observers and to ensure that observers are recording the same phenomena in the same ways. This is not as easy as it may sound, although it can be accomplished with some effort. A brief description of these efforts should be described in the final research report, as this description will illustrate why the data may be considered consistent.

One successful example of a method to train observers has been used by Klein and his colleagues in several of the studies described earlier (cf. Klein & Pridemore, 1994; Klein, Erchul & Pridemore, 1994). In the study investigating effects of cooperative learning versus individual learning structures, Crooks et al. (1995) determined to observe instances of cooperative behaviors while students worked together in a computer-based lesson. Several observers were trained using a videotape made of a typical cooperative-learning group, with a good-quality audio track and with close views of the computer screens. Observers were told what types of cooperative behaviors to record, such as instances of asking for help, giving help, and providing explanations. These behaviors were then defined in the context of a computer-based lesson and the observation record form reviewed. Then observers all watched the same videotape and recorded instances of the various cooperative behaviors in the appropriate categories. The trainer and observers next discussed their records, and observers were given feedback regarding any errors. The following segment

of videotape was viewed, and the observers again recorded the behaviors. The training was repeated until observers were recording at a reliability of about 95%. Similarly, Wolf (1994) in her study trained observers to record instances of just one behavior, providing elaborated explanations.

It should be noted that in studies in which multiple observers are used and behaviors counted or categorized and tallied, it is desirable to calculate and report interrater reliability. This can easily be done by having a number of observers record data in several of the same classroom sessions or in the same segments of tape, and then computing the degree of their agreement in the data.

Other references are also available for more information about conducting observational studies in education, for example, Croll's (1986) book on systematic classroom observation (see 41.2.4).

40.2.4 Interviews

In contrast with the relatively noninteractive, nonparticipant observation methods described earlier, interviews represent a classic qualitative research method that is directly interactive (see 41.2.2). Interview techniques, too, vary in how they may be classified, and again, most vary in certain dimensions along continua, rather than being clearly dichotomous. For instance, Bernard (1988) describes interview techniques as being structured or unstructured to various degrees. He describes the most informal type of interviewing, followed by unstructured interviewing that has some focus. Next, Bernard mentions semistructured interviewing and finally structured interviews, typically involving what he calls an *interview schedule*, which others call *interview protocols*, that is, sets of questions, or scripts. Fontana and Frey (1994) expand this classification scheme by noting that interviews may be conducted individually or in groups. Again, exemplifying modern trends in qualitative research, these authors add that unstructured interviews now may include oral histories, and creative and postmodern interviewing, the latter of which may include use of visual media and polyphonic interviewing, that is, almost verbatim reporting of respondents' words, as well as gendered interviewing in response to feminist concerns.

Goetz and LeCompte (1984) note that other classification schemes may include scheduled versus nonscheduled or standardized versus nonstandardized. However, their division of interview techniques into key-informant interviews, career histories, and surveys represents a useful introduction to the range of interviewing techniques.

An interview is a form of conversation in which the purpose is for the researcher to gather data that address the study's goals and questions. A researcher, particularly one who will be in the setting for a considerable period of time or one doing participant observations, may choose to conduct a series of relatively unstructured interviews that seem more like conversations with the respondents. Topics will be discussed and explored in a somewhat loose but probing

manner. The researcher may return periodically to continue to interview the respondents in more depth, for instance to focus on questions further or to triangulate with other data.

In contrast, structured interviews may be conducted in which the researcher follows a sort of script of questions, asking the same questions, and in the same order, of all respondents. Goetz and LeCompte (1984) consider these to be surveys, while other authors do not make this distinction, and some consider surveys and questionnaires to be instruments respondents complete on their own without an interview.

Interviews or a series of interviews may focus on aspects of a respondent's life and represent a standard technique in anthropology for understanding aspects of culture from an insider's view. Fontana and Frey (1994) call these *oral histories*. Goetz and LeCompte (1984) note that for educators such interviews, which focus on career histories, may be useful for exploring how and why subjects respond to events, situations, or, of interest to educational technologists, particular innovations.

Guidelines for conducting interviews are relatively straightforward if one considers that both the researcher, as data-gathering instrument, and the respondents are human beings with their various strengths and foibles at communicating. The cornerstone is to be sure that one truly listens to respondents and records what they say, rather than to the researcher's perceptions or interpretations. This is a good rule of thumb in qualitative research in general. It is best to maintain the integrity of raw data, using respondents' words, including quotes liberally. Most researchers, as a study progresses, also maintain field notes that contain interpretations of patterns, to be refined and investigated on an ongoing basis. Bogdan and Biklen (1992) summarize these ideas:

Good interviews are those in which the subjects are at ease and talk freely about their points of view. . . . Good interviews produce rich data filled with words that reveal the respondents' perspectives (p. 97).

Bernard (1988) suggests letting the informant lead the conversation in unstructured interviews, and asking probing questions that serve to focus the interview at natural points in the conversation. While some advocate only taking notes during interviews, Bernard stresses that memory should not be relied on, and tape recorders should be used to record exact words. This may be crucial later in identifying subjects' points of view and later in writing reports.

Ensuring the quality of a study by maintaining detailed field journals is also emphasized by Lincoln and Guba (1985). They suggest keeping a daily log of activities, a personal log, and a methodological log. They add that safeguards should be implemented to avoid distortions that result from the researcher's presence, and bias that arises from the researcher, respondents, or data-gathering techniques. They add that participants should be debriefed after the study.

Stages in conducting an interview are described by Lincoln and Guba (1985). They describe how to decide whom to interview, how to prepare for the interview, what to say to

the respondent as one begins the interview [Bogdan & Biklen mention that most interviews begin with small talk (1992)], how to pace the interview and keep it productive, and, finally, how to terminate the interview and gain closure.

One example of the use of interviews is described by Pitlik (1995). As an instructional designer, she used a case study approach to describe the "real world" of instructional design and development. Her primary data source was a series of interviews with individuals involved in instructional design. She conducted group interviews with members of the International Board of Standards for Performance and Instruction, and conducted individual interviews with about 15 others. From the data she collected, she approached questions about the profession, professional practices, and the meaning of the term *instructional designer*. Her data included interview transcripts and literature on the profession. She coded her data and found that themes that emerged described four distinct types of practitioners. Her results led to recommendations for programs that train instructional designers, as well as for practitioners.

Many old, adapted, new, and exciting techniques for structured interviewing are evolving. For example, Goetz and LeCompte (1984) describe confirmation instruments, participant-construct instruments, and projective devices. Confirmation instruments verify the applicability of data gathered from key-informant interviews or observations across segments of the population being studied. (It may be added that this type of structured interview could be adapted as a questionnaire or survey for administering to larger subject groups; see 41.2.1). Participant-construct instruments may be used to measure degrees of feelings that individuals have about phenomena, or to use in having them classify events, situations, techniques, or concepts from their perspective. Goetz and LeCompte say that this technique is particularly useful in gathering information about lists of things, which respondents can then be asked to classify.

One example of such a use of interviews is in the Higgins and Rice (1991) study mentioned earlier. At several points during the study teachers were asked to name all the ways they test their students. In informal interviews, they were asked about types of assessment observers recorded in their classrooms. The researchers later composed lists of the types of tests teachers mentioned and asked them to sort the assessment types into those most alike. Subsequently, multidimensional scaling was used to analyze these data, yielding a picture of how these teachers' viewed testing.

A third type of structured interview mentioned by Goetz and LeCompte is the interview using projective techniques. Photographs, drawings, other visuals or objects may be used to elicit individuals' opinions or feelings. These things may also be used to help the researcher clarify what is going on in the situation. Pelto and Pelto (1978) describe traditional projective techniques in psychology, such as the Rorschach ink-blot test and the Thematic Apperception Test. Spindler (1974), for example, used drawings to elicit parents', teachers', and students' conceptions of the school's role in a German village. McIssac, Ozkalp, and

Harper-Marinick (1992) effectively used projective techniques with subjects viewing photographs.

Types of questions to be asked in interviews are also categorized in a multitude of ways. Goetz and LeCompte (1984) describe these as "experience, opinion, feeling questions, hypothetical questions, and propositional questions" (p. 141). Spradley (1980) provides one of the more extensive discussions of questions, indicating that they may be descriptive, structural, or contrast questions. He further explains ways to conduct analyses of data collected through interviews and observations. In an earlier work (1972), he explicates how cultural knowledge is formed through symbols and rules, and describes how language can be analyzed to begin to form conceptions of such knowledge.

Of particular use to educational technologists may be the forms of structured interviews that Bernard (1988) says are used in the field of cognitive anthropology. Educational technologists and psychological researchers are interested in how learners learn, and how they conceive of the world, including technological innovations. Some of the techniques that Bernard suggests trying out include having respondents do *free listing* of taxonomies, as was done in the Higgins and Rice (1991) study of teachers' conceptions of testing. These items listed can later be ranked or sorted by respondents in various ways. Another technique is the *frame technique* or *true/false test*. After lists of topics, phenomena, or things are developed through free listing, subjects can be asked probing questions, such as, "Is this ____ an example of ____?" *Triad tests* are used to ask subjects to sort and categorize things that go together or do not. Similarly, respondents can be asked to do *pile sorting*, to generate categories of terms and how they relate to each other, forming a type of concept map. Bernard adds that other types of rankings and ratings can also be done.

To learn further techniques and the skills needed to use them, the reader may refer to Weller and Romney's book, *Systematic Data Collection* (1988). Also for a more in-depth perspective on analyzing verbal protocols and interview data for insight into cognitive processes, one may look to several chapters in the Spradley (1972) work mentioned earlier. For instance, Bruner (1972) discusses categories and cognition, and Frake (1972) presents uses of ethnographic methods to study cognitive systems. More recent works include work in semiotics (see 16.4.2.1; cf. Manning & Cullum-Swam, 1994).

The earlier-mentioned study by Moallem (1994) relied heavily on use of interviews along with participant observation to build the model of an experienced teacher's teaching and thinking. Another good study in educational technology which used interview techniques as one of several methods to gather data is that of Reiser and Mory (1991). These researchers investigated the systematic planning techniques of two experienced teachers. The teachers were administered a survey at the beginning of the year and were interviewed early in the year about how they planned and designed lessons. They were subsequently observed once a week while they taught the first science unit of the year.

Before and after each observation, the teachers were interviewed in depth. In addition, copies of their written plans were collected (a form of document analysis, to be discussed later in this chapter). Thus a deep case study approach was used to determine the ways experienced teachers plan their instruction. In this study, the teacher who had received instructional design training appeared to use more systematic planning techniques, while the other planned instructional activities focused on objectives.

As with observations, interviews may be conducted as part of an experimental, quantitative study in educational technology. For instance, Nielsen (1990) conducted an experimental study to determine the effects of informational feedback and second attempt at practice on learning in a computer-assisted instructional program. He incorporated interviews with a sample of the learners in order to further explain his findings. He found that some of his learners who received no feedback realized their performance depended more on their own hard work, so they took longer to study the material than did those who determined that they would receive detailed informational feedback, including the answers.

Other detailed examples of how interview techniques may be used are illustrated in Erickson and Shultz's work, *The Counselor as Gatekeeper* (1982).

40.2.5 Document and Artifact Analysis

Beyond nonparticipant observation, many unobtrusive methods exist for collecting information about human behaviors. These fall roughly into the categories of document and artifact analyses, but overlap with other methods. For instance, the verbal or nonverbal behavior streams produced during videotaped observations may be subjected to intense microanalysis to answer an almost unlimited number of research questions. Content analysis, as one example, may be done on these narratives. In Moallem (1993), Higgins, and Rice (1991) and Reiser and Mory (1991) studies of teacher's planning, thinking, behaviors, and conceptions of testing, documents developed by the teachers, such as instructional plans and actual tests, were collected and analyzed.

This section will present an overview of unobtrusive measures. [Reader's interested in more detailed discussion of analysis issues may refer to DeWalt and Pelto's (1985) work, *Micro and Macro Levels of Analysis in Anthropology*, as well as other resources cited in this chapter.]

Goetz and LeCompte (1984) define artifacts of interest to researchers as things that people make and do. The artifacts of interest to educational technologists are often written, but computer trails of behavior are becoming the objects of analysis as well. Examples of artifacts that may help to illuminate research questions include textbooks and other instructional materials, such as media materials; memos, letters, and, now, e-mail records, as well as logs of meetings and activities; demographic information, such as enrollment, attendance, and detailed information about sub-

jects; and personal logs kept by subjects. Webb et al. (1966) add that archival data may be running records, such as those in legal records or the media, or they may be episodic and private, such as records of sales and other business activities and written documents.

Physical traces of behaviors may be recorded and analyzed. Webb et al. (1966) describe these as including types of wear and tear that may appear on objects or in settings naturally, as in police tracing of fingerprints or blood remains.

In recent studies in educational technology, researchers are beginning to analyze the patterns of learner pathways and decisions they make as they proceed through computer-based lessons. Based on the earlier work of Hicken, Sullivan, and Klein (1992), Dwyer and Leader (1995) describe the development of a HyperCard-based researcher's tool for collecting data from counts of keypresses to analyze categories of choices made within computer-based instruction, such as the mean numbers of practice or example screens chosen. In a recently conducted study, Savenye, Leader, Dwyer, Jones, and Schnackenberg (1996) used this tool to collect information about the types of choices learners made in a fully student-controlled, computer-based learning environment. In a similar use of computers to record data, Shin, Schallert, and Savenye (1994) analyzed the paths that young learners took when using a computer-based lesson to determine the effects of advisement in a free-access, learner-controlled condition.

As noted earlier, the records made using videotape or audiotape to collect information in nonparticipant observation may be considered documentary data and may be subjected to microanalysis.

Guidelines for artifact collection are provided by Goetz and LeCompte (1984). They identify four activities involved in this type of method: "locating artifacts, identifying the material, analyzing it, and evaluating it" (p. 155). They recommend that the more informed the researcher is about the subjects and setting, the more useful artifacts may be identified and the more easily access may be gained to those artifacts.

Hodder (1984) suggests that from artifacts, a theory of material culture may be built. He describes types of objects and working with respondents to determine how they might be used. (Anyone who has accompanied older friends to an antique store, especially one that includes household tools or farm implements from bygone eras, may have experienced a type of interactive description and analysis of systems and culture of the past based on physical artifacts.) Hodder continues with discussion of the ways that material items in a cultural setting change over time and reflect changes in a culture.

Anthropologists have often based investigations about the past on artifacts such as art pieces, analyzing these alone, or using them in concert with informant and projective interviews. As noted in some of the current debate in anthropology or regarding museum installations that interpret artifacts, the meaning of artifacts is often intensely personal and subjective, so that verification of findings through triangulation is recommended. [The reader intrigued with these ideas may

wish to refer to some of the classic anthropological references here cited, or to current issues of anthropology and museum journals. Two interesting examples appear in the January 1995 issue of *Smithsonian* magazine. Secretary I. Michael Heyman discusses the many points of view represented in the public's perceptions of the initial form of the installation of the Enola Gay exhibit. In a different vein, Haida Indian artist Robert Davidson describes how he used art and dance and song to help elders in his tribe remember the old ways and old tales (Kowinski, 1995).]

Content analysis of prose in any form may also be considered to fall into this artifact-and-document category of qualitative methodology. Pelto and Pelto (1978) refer to analysis of such cultural materials as folktales, myths, and other literature, although educational technologists would more likely analyze, for example, content presented in learning materials. For more information about content analysis see, for instance, Manning and Cullum-Swan (1994).

This concludes our introduction to general methods in conducting qualitative research. We can look forward to other methods being continually added to the repertoire.

40.3 ANALYZING QUALITATIVE DATA

Qualitative data are considered to be the "rough materials researchers collect from the world they are studying; they are the particulars that form the basis of analysis" (Bogdan & Biklen, 1992, p. 106). As described earlier, qualitative data can take many forms, such as photos, objects, patterns of choices in computer materials, videotapes of behaviors, etc. However, words often are the raw materials that qualitative researchers analyze, and much advice from researchers discusses analyzing these words.

The need for brevity in this chapter precludes an extensive discussion of analyzing qualitative data. However, we will introduce the researcher to the issues underlying decisions to be made and provide several views of how to analyze data. As noted by Miles and Huberman (1994) in their in-depth sourcebook, beginning researchers may quake in the face of the "deep, dark question" regarding how to have confidence that their approach to analysis is the right one (p. 2). Yet we concur with the thoughtful and yet practical approach of these authors, that one must just begin and that more energy is often spent discussing analysis, and research for that matter, than "doing it." Miles and Huberman note, in a decidedly unnaïve approach, that "... any method that works, that will produce clear, verifiable, credible meanings from a set of qualitative data," is "grist" for their mill. They add, "... the creation, testing, and revision of simple, practical, and effective analysis methods remain the highest priority of qualitative researchers," adding that, "We remain convinced that concrete, shareable methods do indeed belong to 'all of us'" (p. 3). It is in this spirit that we present approaches to analyzing qualitative data.

One of the major hallmarks of conducting qualitative research is that data are analyzed continually, throughout

the study, from conceptualization through the entire data collection phase, into the interpretation and writing phases. In fact, Goetz and LeCompte (1984) describe the processes of analyzing and writing together in what they call *analysis and interpretation*. How these activities may be done will be explored below.

40.3.1 Overall Approaches to Analyzing Qualitative Data

Qualitative researchers choose their analysis methods not only by the research questions and types of data collected but also based on the philosophical approach underlying the study. For example, Miles and Huberman (1994) outline three overall approaches to analyzing qualitative data. An "interpretive" approach would be phenomenological in nature or based on social interactionism. Researchers using this approach would seek to present a holistic view of data rather than a condensed view. They might seek to describe a picture of "what is." They would generally not choose to categorize data to reduce it. Miles and Huberman note that the interpretive approach might be used by qualitative researchers in semiotics, deconstructivism, aesthetic criticism, ethnomethodology, and hermeneutics.

A second approach described by these researchers is "collaborative social research," often used by action researchers in partnerships composed of members of many, and sometimes opposing, organizations.

The final approach to analyzing data described by Miles and Huberman is that of "social anthropology," which relies primarily on ethnography. Researchers using this approach seek to provide detailed, or rich, descriptions across multiple data sources. They seek regular patterns of human behavior in data, usually sifting, coding, and sorting data as they are collected, and following up analyses with ongoing observations and interviews to explore and refine these patterns, in what Goetz and LeCompte call a *recursive approach* (1994). Researchers using a social anthropology approach also tend to be concerned with developing and testing theory. Researchers who develop life histories, work in grounded theory and ecological psychology, and develop narrative studies, applied studies, and case studies often base their analyses on this social anthropology approach. Many of the methods for, and views about, analyzing qualitative data can be seen to be based on this social anthropology approach.

40.3.2 Methods for Analyzing Qualitative Data

Depending on the basic philosophical approach of the qualitative researcher, many methods exist for analyzing data. Miles and Huberman state that qualitative data analysis consists of "three concurrent flows of activity: data reduction, data display, and conclusion drawing/verification" (1994, p. 10). Most researchers advocate that reducing and

condensing data, and thereby beginning to seek meaning, should begin as the study begins and continue throughout data collection.

40.3.2.1. Data Reduction. Goetz and LeCompte (1994) describe the conceptual basis for reducing and condensing data in this ongoing style as the study progresses. The researcher theorizes as the study begins and builds and tests theories based on observed patterns in data continually. Researchers compare, aggregate, contrast, sort, and order data. These authors note that while large amounts of raw data are collected, the researcher may examine in detail selected cases or negative cases to test theory. They describe analytic procedures researchers use to determine what the data mean. These procedures involve looking for patterns, links, and relationships. In contrast to experimental research, the qualitative researcher engages in speculation while looking for meaning in data; this speculation will lead the researcher to make new observations, conduct new interviews, and look more deeply for new patterns in this "recursive" process.

Researchers may derive patterns in many ways. They may, for example, engage in what Goetz and LeCompte call "analytic induction" (p. 179), reviewing data for categories of phenomena, defining sets of relationships, developing hypotheses, collecting more data, and refining hypotheses accordingly. As noted earlier, interpretivists would be unlikely to use this method. They would not tend to categorize, but would scan for patterns in order to build a picture or tell a story to describe what is occurring.

Another method, constant comparison, would be relied on by those using a grounded-theory approach. This method involves categorizing, or coding, data as they are collected, and continually examining data for examples of similar cases and patterns. Data collection can cease when few or no new categories of data are being encountered. Goetz and LeCompte contend that researchers using constant-comparison code data look for patterns as do those using analytic induction, but the categories are thus processed differently.

Bogdan and Biklen (1992) describe in detail practical approaches to writing up field notes, one of the main forms the "words" that make up qualitative data take. They recommend writing field notes with large margins in which to write later notes as data are later analyzed, as well as in which to write codes for these data. They also advise that text be written in blocks with room left for headings, notes, and codes.

It should be noted that virtually all researchers who use an ethnographic approach advocate writing up field notes immediately after leaving the research site each day. Observations not recorded will quickly be forgotten. Researchers may not realize the importance of some small phenomenon early on, so these details should be recorded each day. Most authors further recommend that researchers scan these data daily, analyzing thoughtfully for patterns and relationships, and perhaps adding to or modifying data collection procedures accordingly.

Field notes consist of observations and the researcher's interpretations. Bogdan and Biklen (1984) call these two

types of field notes contents the *descriptive part* (p. 108) and the *reflective part* (p. 121). They state that the descriptive part consists of detailed descriptions of the subjects and settings, the actual dialogue of participants, descriptions of events and activities, as well as descriptions of the observer's behavior, to enable determining how this may have influenced participants' behaviors. The reflective part of field notes, they add, consists of the observer/researcher's analysis. The researcher records speculations about patterns and how data can be analyzed, thoughts about methods and ethical concerns, and even ideas about his or her own state of mind at the time. These authors provide many pages of actual field notes from studies done in elementary and secondary education classrooms, which the beginning researcher will find helpful.

If researchers collect data using audiotape or videotape, written transcripts of language recorded are often prepared. Later analysis can be done, but notes should still be recorded immediately after being in the field. Such notes, for instance, will include observations about participants' non-verbal behaviors, what was occurring in the immediate surroundings, or what activities participants were engaging in. Even in the case of interviews, notes might include these descriptions, as well as what participants were doing just prior to interviews. As noted in the discussion of data collection methods, audiotapes and videotapes may be subjected to detailed microanalysis. Usually data are coded and counted, but, due to the labor-intensive nature of this type of analysis, segments of these "streams of behavior" are often systematically selected for analysis.

It is advisable to collect data in its raw, detailed form and then record patterns. This enables the researcher later to analyze the original data in different ways, perhaps to answer deeper questions than originally conceived. The researcher many weeks into data collection may realize, for example, that some phenomena previously considered unimportant hold the keys to explaining participants' views and actions. In addition, preserving the raw data allows other researchers to explore and verify the data and the interpretations.

If researchers have collected documents from subjects, such as logs, journals, diaries, memos, and letters, these can also be analyzed as raw data. Similarly, official documents of an organization can be subjected to analysis.

Collecting data in the form of photographs, films, and videotapes, either those produced by participants or by the researcher, has a long tradition in anthropology and education. These data, too, can be analyzed for meaning. (See, for instance, Bellman & Jules-Rosette, 1977, *A Paradigm for Looking*; Bogdan & Biklen, 1992; Bogaart & Ketelaar, 1983, *Methodology in Anthropological Filmmaking*; Collier, 1967, and Collier & Collier, 1986, *Visual Anthropology as a Research Method*; Heider, 1976, *Ethnographic Film*; and Hockings, 1975, *Principles of Visual Anthropology*.)

40.3.2.2. Coding Data. Early in the study, the researcher will begin to scan recorded data and to develop categories of phenomena. These categories are usually called *codes*. They enable the researcher to manage data by labeling, storing,

and retrieving it according to the codes. Of course, the codes created depend on the study, setting, participants, and research questions, because the codes are the researchers' way of beginning to get at the meaning of the data. There are therefore as many coding schemes as researchers. Still, examples of coding schemes will here be provided in an attempt to guide the reader.

Miles and Huberman (1994) suggest that data can be coded descriptively or interpretively. Unlike some authors, they suggest creating an initial "start list" (p. 58) of codes and refining these in the field. Researchers using a strictly inductive approach might choose not to create any codes until some observations and informal interviews were conducted from which codes could be induced.

Bogdan and Biklen (1992) recommend reading data over at least several times in order to begin to develop a coding scheme. They describe coding data according to categories and details of settings; types of situation observed; perspectives and views of subjects of all manner of phenomena and objects; processes, activities, events, strategies, and methods observed; and social relationships. Goetz and LeCompte (1984) describe coding to form a taxonomic analysis, a sort of outline of what is related to what, and in what ways.

In one of many examples he provides, Spradley (1979) describes in extensive detail how to code and analyze interview data, which are semantic data as are most qualitative data. He describes how to construct domain, structural, taxonomic, and componential analyses. We will discuss, as one example, domain analysis. Domains are names of things. Spradley proposes "universal semantic relationships" that include such categories as "strict inclusion," that is, "X is a kind of Y"; "spatial," "X is a place in Y, X is a part of Y"; and "cause-effect," "rationale," "location of action," "function," "means-end," "sequence," and "attribution" (p. 111). Spradley provides an example from his own research. In a study on tramps, he found from interviews that the cover term *flop*, as a place to sleep, included such things as box cars, laundromats, hotel lobbies, and alleys.

An example of the types of codes that might be developed to investigate patterns of teacher use of an educational technology innovation is presented in the Savenye and Strand observational study described earlier (1989). The researchers videotaped teachers and students using the multimedia science course in 13 physical science classrooms in four states. Samples of videotapes from three teachers were selected for approximate equivalence; in the samples, the teachers were teaching approximately the same content using the same types of lesson components. The researchers were interested not in all the behaviors occurring in the classrooms but in the types of language expressed as teachers taught the lessons.

After reviewing the videotaped data several times, the researchers developed codes for categorizing teacher language. Most of these codes were created specifically for this study. For example, the most frequent types of teacher language observed were instances of "teacher statements," which included data coded as "increasing clarity or coherence of information presented." Examples of codes in this

category included PR, for providing preview or organizers of lessons; RP, reminding students to remember prior knowledge; EL, elaborating by providing new information about a scientific concept in the lesson; and R, providing a review of lesson content. Another example of a code created for teacher statements was REL, for instances of when a teacher relates content to student's own experience with everyday examples.

Savenye and Strand were also interested in the types of questions teachers added to the curriculum to encourage their students to participate actively during the whole-class presentations of content. Along with a few created codes, the researchers developed codes based on Bloom's taxonomy of cognitive objectives (1984). Such codes included REC, for questions that asked students to recall information just presented by the multimedia system; APP, for questions that required students to apply or extend lesson content to new content or situations; and ANAL/SYN, for questions that require a student to analyze a situation to come up with solutions or to synthesize a solution. In a result similar to those of many studies of teacher-questioning strategies, but which may disappoint multimedia developers, the majority of the teachers' questions simply asked students to recall information just presented, rather than to apply or analyze or synthesize knowledge learned.

In this study, as in most qualitative studies, coding schemes were continually added to, collapsed, and refined as the study progressed. However, in some studies, only preassigned codes are used to collect and/or analyze data. As in the use of Bloom's categories by Savenye and Strand (1989), usually these codes have been derived from studies and theories of other researchers, or from pilot studies conducted by the researchers themselves. These studies may use observational coding forms or protocols on which data are recorded in the coding categories.

Another example of using preassigned codes is a study conducted to investigate how visitors to a botanical garden use interactive signs (Savenye, Socolofsky, Greenhouse & Cutler, 1995). Among other types of data collected in this study, these researchers trained observers to record behaviors visitors engaged in while they used signs. Observers recorded whether visitors stopped to read a sign at all; if so, for how long, and the level of interactivity visitors exhibited. Based on the work of Bitgood (1990), interactivity was coded as stopping briefly and glancing only; obviously reading the sign and looking at the plant exhibit near it; and, finally, engaging in highly active behaviors, such as reading the sign aloud, pointing to the plants displayed, discussing information being learned, and pulling friends and family over to the sign to read it. In a blend of coding methods typical in many studies, observers also wrote ethnographic-style notes to describe what if any content on the signs was being discussed, what misconceptions appeared, what excited visitors most, etc. In this study, visitor surveys and interviews were also used.

In any qualitative study, codes can be used to count frequencies or, as Goetz and LeCompte call it, conduct *enumer-*

ation (1984) to develop quantitative data, as was done in the studies described above. Similarly, quantitative data, such as attendance or production figures, from other sources, may be analyzed. Most researchers suggest caution when counting that the "big picture" is not lost, and also note that quantitative data from other sources can also be biased. Even what is collected in a school district, for instance, may be determined by financial, administrative, and political concerns.

For more examples of coding schemes and strategies, see Strauss (1987). (See also 41.2.4 for some discussion of coding observational data.)

40.3.2.3. Data Management

40.3.2.3.1. *Physically Organizing Data.* Analysis of data requires examining, sorting, and reexamining data continually. Qualitative researchers use many means to organize, retrieve, and analyze their data. Many researchers simply use notebooks and boxes of paper. Bogdan and Biklen (1992) describe what they call two *mechanical means* to organize and begin to review data. One way they describe is to write initial codes in margins of field notes, photocopy the notes and store the originals, then cut up and sort the text segments into piles according to codes. These coded data can be stored in boxes and resorted and analyzed on an ongoing basis. A second method they describe is to record field notes on pages on which each line is numbered, code the field notes, and then write the page number, line numbers, and a brief description of each piece of data on a small index card. These cards can then be sorted and analyzed. The authors note that this second method is better suited for small sets of data, as it often requires returning to the original field notes to analyze the actual data.

40.3.2.3.2. *Organizing Data Using Computers.* Computers are increasingly the tool of choice for managing and analyzing qualitative data. It is interesting to note that computers have long been used in anthropological analysis. (See, for instance, Hymes, 1965, *The Use of Computers in Anthropology*.) Computers may be used simply for word processing in developing field notes. However, there is now considerable software specifically developed for qualitative research, and it can be expected that many new programs will be developed in the upcoming decade. Some software uses text entered with a word processor to retrieve words and phrases or to manage text in databases. Software is also available to code and retrieve data, and some programs also allow for building theories and conceptual networks. Programs are available for IBM (e.g., QUALPRO, The Ethnograph) or for Macintosh microcomputers (e.g., HyperQual, SemNet) or multiple systems (QSR NUD-IST) (Miles & Weitzman, 1994). For much more on using computers for analysis, the reader may refer to the following books: Tesch (1990), *Qualitative Research: Analysis Types and Software Tools*, or Wietzman and Miles (1995), *A Software Sourcebook: Computer Programs for Qualitative Data Analysis*.

40.3.2.3.3. *Data Display.* Seeking the meaning in data is made easier by displaying data visually. Research data are displayed using charts, graphs, diagrams, tables, matrices, and any other devices, such as drawings, that

researchers devise. Frequency tables are typically developed for categories of coded behaviors. In the Reiser and Mory (1991) study, for example, teachers' planning behaviors were coded and tables of behaviors presented.

Miles and Huberman (1994) hold that data display is a critical and often underutilized means of analysis. They describe many forms of data display, illustrated with examples of actual data. They recommend that researchers initially create categories of data, code data, and revise codes, as do other authors. They note that increasingly qualitative research involves analyzing what they call *within-case* data, for instance, from one classroom or one school, as well as "cross-case" data, from many participants and many sites. Whereas in one case study, it may not be necessary to present visual displays—narrative descriptions might suffice—studies involving data from many cases can greatly benefit from visual displays. Miles and Huberman present many options. For example, for within-case data they show context charts or checklist matrices, but they also discuss using a transcript as a poem. They also illustrate time-ordered displays, role-ordered displays, and conceptually ordered displays. For cross-case studies, these researchers mention some of the earlier displays for reviewing and presenting data, along with case-ordered displays. They illustrate other displays for examining cross-case data and provide extensive advice for creating matrix displays.

An example of the use of matrix displays is the Higgins and Rice participant observation study described earlier (1991). The researchers analyzed teachers' conceptions of all the activities that represent "assessment." These data were derived from a series of structured interviews with the teachers, conducted in conjunction with observations of the teachers and their students. The researchers analyzed these data using multidimensional scaling and displayed the data using a matrix to show the relationships among types of assessments teachers used and how different teachers conceived of them differently.

That data analysis is woven into interpreting results and writing up the study is indicated by the fact that Miles and Huberman describe the third type of data analysis activity as drawing and verifying conclusions. Similarly, Goetz and LeCompte (1984) include writing up the study in their chapter on analysis and interpretation of data, describing the writing phase as developing an ethnographic analysis, and integrating and interpreting the study. While recognizing that analysis continues as the research report is written, and that writing should begin during analysis, in this chapter, we will present ideas and issues for writing up a study.

40.4 WRITING QUALITATIVE RESEARCH REPORTS

The report of a qualitative study may take many forms, both those common to more quantitative research and also forms likely to be unfamiliar to those who conduct only experimental research. The best advice for the beginning

researcher is to recognize that it is not unusual for even experienced researchers to feel overwhelmed by the amount of data to be analyzed and described, as well as to feel a lack of confidence that the interpretations and conclusions the researcher has drawn represent "the truth." Most authors simply advise writers to "do it," or to "begin" to write and refine, and write and refine again. A later section will discuss ethical issues and criteria for evaluating the quality of a study. As with analysis, there exist many books of guidelines and advice for writing qualitative research reports. In this section we will briefly discuss a few of the issues.

In writing up a qualitative study, researchers have many choices of presentation styles. Bogdan and Biklen (1984) consider qualitative researchers fortunate in that there is not one accepted convention for writing qualitative reports. For example, the qualitative report may take the form of a case study, as in the Reiser and Mory (1991) study. If a case study, the report may include considerable quantification and tables of enumerated data, or it may take a strictly narrative form. Recent studies have been reported in more non-traditional forms, such as stories, plays, and poems showing what is happening for these participants in that setting.

A few examples of less-traditional approaches to reporting results are the presentations by Barone and Lather at the 1995 conference of the American Educational Research Association (AERA). Barone presented an arts-based phenomenological inquiry in a narrative format (1995). Lather, in an AERA Qualitative Research SIG interactive symposium on reframing the narrative voice, discussed her study, in which she divided pages in her report into three sections in which she presented her interpretation, the participants' interpretation, and then her response to the participants (Tierney, Polkinghorn, Lincoln, Denzin, Kincheloe, Lather & Pinar, 1995).

Richardson (1995) describes other components and styles of less-traditional writing, including ways to reference historical contexts, using metaphors, documentary styles, and various experimental representations, including "narrative of the self," "ethnographic fictional representations," "poetic representations," "ethnographic dramas," and "mixed genres" (pp. 521, 522). Richardson additionally provides advice to the researcher who wishes to explore these experimental formats.

Fetterman (1989) explicates the nature of qualitative writing. As do many others, he stresses the use of "thick description" and liberal use of verbatim quotations, that is, the participants' own words to illustrate the reality of the setting and subjects. (This serves as another reminder to the researcher to record and preserve raw data in the participants' language with quotes.) Fetterman adds that ethnographies are usually written in what he calls the "ethnographic present" (p. 116), as if the reality is still ongoing. However, in educational technology research in which innovations are often described, the researcher may or may not choose to use this approach. Qualitative reports typically will be woven around a theme or central message, and will include an introduction, core material, and conclusion (Bogdan & Biklen,

1984). However, what constitutes the core of the report, of course, will vary depending on the style of the writing.

A cogent and enjoyable manual for writing up qualitative research is Wolcott's (1990). [For additional information about writing reports of qualitative studies, see Meloy (1994) and Van Maanen (1988).]

40.5 ETHICAL ISSUES IN CONDUCTING QUALITATIVE RESEARCH

In addition to the ethical issues raised by authors cited earlier in discussions of specific methodologies, there continues to be great concern that qualitative researchers conduct and report their studies in an ethical manner. Punch, in his recent work (1994), however, suggests that qualitative researchers not be daunted or deterred by ethical issues. In fact, under the heading "Just do it!" he advises that "Fieldwork is fun; it is easy; anyone can do it; it is salutary for young academics to flee the nest; and they should be able to take any moral or political dilemmas encountered in their stride" (p. 83). He describes the ethical issues that are in common with most scientific research, such as biomedical research in this country at this time. For instance, all researchers must be concerned with preventing subjects from being harmed, protecting their anonymity and privacy, not deceiving them, and securing their informed consent. In discussing recent debate about qualitative methods, however, Punch adds other issues that arise. Questions may include: Does the pursuit of scientific knowledge justify the means? What is public and what is private? When can research be said to be "harming" people? Does the researcher enjoy any immunity from the law when he or she refuses to disclose information? (p. 89). He discusses the concepts of codes, consent, privacy, confidentiality, and trust and betrayal in detail. He further describes three developments that have stirred up the debate. These include the women's movement and its attendant concern that women have been studied as subjects/objects, the trend toward conducting action research in which participants are partners or stakeholders to be empowered and therefore not to be duped, and, finally, the concern of funding agencies for ethics that has led to requirements for the inclusion of statements of ethics in proposals and reports. Croll (1986) addresses similar issues and recommends that researchers conduct their studies in good faith, and that the research should be not only not harmful to subjects but also worthwhile.

Erlanson et al. (1993), in their discussion of ethical issues, echo the previously mentioned concerns with regard to privacy, confidentiality, harm, deception, and informed consent. They add that in contracted research, situations may arise that could compromise the research by restricting freedom or encouraging suppression of negative results. From a more "action research" type of perspective, these authors add to Croll's idea that studies should be of value to subjects, that they should educate subjects (see 9.7.5). Educational technology researchers must determine for themselves their

answers to ethical questions, realizing that their work may or may not fall into the category of action research.

For a broader and more in-depth discussion about ethical issues, the reader may wish to refer to *Ethics and Anthropology: Dilemmas in Fieldwork*, by Rynkiewicz and Spradley (1976); the Beauchamp, Faden, Wallace, and Walters (1982) book, *Ethical Issues in Social Science Research*; or the Bower and Gasparis (1978) book, *Ethics in Social Research: Protecting the Interest of Human Subjects*.

Many authors blend concerns for ethics with criteria for evaluating the quality of qualitative studies, in that an unethically conducted study would not be of high quality. The criteria to use in determining whether a qualitative study is sound and strong will be illustrated in the following section.

40.6 CRITERIA FOR EVALUATING QUALITATIVE STUDIES

Criteria for evaluating the quality and rigor of qualitative studies vary somewhat, based on methods used. Most concerns, however, apply to most studies. Adler and Adler (1994) say that one of the primary criticisms of observational studies, whether participant or nonparticipant methods are used, is the question of their validity due to the subjectivity and biases of the researcher. These authors contend that this concern is one of the reasons studies based solely on observations are rarely published. They suggest that validity can be increased in three ways. Multiple observers in teams can cross-check data and patterns continually. The researcher can refine and test propositions and hypotheses throughout the study, in a grounded theory approach. Finally, the researcher can write using "verisimilitude" or "varisemblance" (p. 383), or writing that makes the world of the subjects real to the reader; the reader recognizes the authenticity of the results. Adler and Adler also address the issue of reliability in observational studies. They suggest systematically conducting observations repeatedly under varying conditions, particularly varying time and place. Reliability would be verified by emergence of similar results.

Borg and Gall (1989) listed several criteria for evaluating the quality of participant observation studies, including that:

1. Using involved participant observers is less likely to result in erroneous reported data from individuals or organizations.
2. The researcher should have relatively free access to a broad range of activities.
3. The observations should be intense, that is, conducted over a long period of time.
4. In more recent studies, both qualitative and quantitative data are collected.
5. Using a "triangulation of methodology" (p. 393), researchers can be assured that the picture they present of the reality of a setting or situation is clear and true. Multiple methods may be used to address

research questions, but also, in line with Adler and Adler's (1994) recommendations for enhancing reliability, the same data may be collected from other samples at other times and in other places.

6. Researchers should strive to gain an overall view of the issues and context, and then sample purposely in order to collect data that represent the range of realities of participants in those settings. Borg and Gall, as do others, caution that researchers be sensitive to both what is excluded as well as what is included.
7. Finally, in all observational studies they recommend that researchers should be ready to observe, record, and analyze, not just verbal exchanges but also subtle cues by using unobtrusive measures.

Ethical issues also relate to the quality of a study. Issues specific to conducting interviews are delineated by Fontana and Frey (1994). They add to the general concerns already mentioned the issues of informed consent and the right to privacy and protection. They mention that there is some debate regarding whether covert methods for gathering data are ethical although they may reflect real life. They describe the dilemma a researcher may face in deciding how involved to become with respondents and suggest some degree of situational ethics, cautioning that a researcher's participation may enable or inhibit certain behaviors or responses. Finally, they raise the issue that interviewing itself is manipulative, still treating human beings as objects.

Hammersley (1990) provides additional criteria for assessing ethnographic research, many of which will apply to most qualitative studies. He puts forward two main criteria for judging ethnographic studies, namely, validity and relevance. He discusses the validity of a study as meaning the "truth" of the study. He suggests three steps for assessing the validity of ethnographic finds or conclusions. He recommends asking first if the findings or claims are reasonable; secondly "whether it seems likely that the ethnographer's judgment of matters relating to the claim would be accurate given the nature of the phenomena concerned, the circumstances of the research, the characteristics of the researcher, etc." (p. 61); finally, in cases in which the claim does not appear to be plausible or credible, evidence of validity is required to be examined. Clearly in reports of qualitative research studies, the reader must be provided enough information about the perspective, sampling and choice of subjects, and data collected in order to determine with some confidence the validity or "truth" represented in a study.

With regard to the second criterion, relevance, Hammersley advises that studies have broadly conceived public relevance or value. On a practical level, Nathan (1979, pp. 113–115), in Abt's book on the costs and benefits of applied social research, provides what he calls rules for relevant research. A selection includes:

1. Be as evenhanded as you can.
2. Focus on the most policy-relevant effects.

3. When faced with a choice between the direct and the more elaborate expression of statistics and concepts, choose the former.
4. Get your hands dirty.
5. Be interdisciplinary.
6. Sort out carefully description, analysis, and your opinions.

Lincoln and Guba (1985) describe criteria that are frequently cited for evaluating qualitative studies. They address the criticisms leveled at naturalistic research and determine that quality rests in trustworthiness of the study and its findings. They agree with others that conventional criteria are inappropriate for qualitative studies and that there do exist alternative criteria. These criteria are: (1) credibility, (2) transferability, (3) dependability, and (4) confirmability. These authors go on to recommend activities the researcher may undertake to ensure that these criteria will be inherent in the study. In particular, in order to make credible findings more likely, they recommend that prolonged engagement, persistent observation, and triangulation be done. Further, they recommend peer debriefing about the study and its methods, opening the researcher and the methods up for review. They also recommend analyzing negative cases in order to revise hypotheses; testing for referential adequacy by building in the critical examination of findings and their accompanying raw data; and conducting checks of data, categories used in analysis, and interpretations and findings with members of the subject audience.

Lincoln and Guba (1985) provide a similar level of helpful suggestions in the area of ensuring confirmability. They recommend triangulation with multimethods and various sources of data, keeping a reflexive journal and, most powerfully, conducting a confirmability audit. In their book, they include detailed descriptions of the steps in conducting an audit and recommend the following categories of data that can be used in the audit, including raw data, products of data analysis, products of the synthesis of data such as findings and conclusions, process notes, personal notes about intentions, and information about how instruments were developed.

In the tradition of Lincoln and Guba, Erlandson et al. (1993) describe these techniques for ensuring the quality of a study:

- Prolonged engagement
- Persistent observation
- Triangulation
- Referential adequacy
- Peer debriefing
- Member checking
- Reflexive journal
- Thick description
- Purposive sampling
- Audit trail

The Association for Educational Communications and Technology (AECT) has shown strong support for qualitative research in the field. For several years, the ECT Foun-

dation and the Research and Theory Division supported the Special Research Award. The ECT Foundation has recently decided to support the creation of a Qualitative Research Award. Ann De Vaney (1995), currently the chair of this award committee, provided the following criteria, developed by numerous AECT members, which will be used to evaluate the quality of papers submitted for this award:

1. Is the problem clearly stated? Does it have theoretical value and currency? Does it have practical value?
2. Is the problem or topic situated in a theoretical framework? Is the framework clear and accessible? Does the document contain competing epistemologies or other basic assumptions that might invalidate claims?
3. Is the literature review a critique or simply a recapitulation? Is it relevant? Does it appear accurate and sufficiently comprehensive?
4. Are the theses stated in a clear and coherent fashion? Are they sufficiently demonstrated in an accessible manner? Are there credible warrants to claims made about the theses?
5. Does the method fit the problem, and is it an appropriate one given the theoretical framework?
6. Do the data collected adequately address the problem? Do they make explicit the researcher's role and perspective? Do the data collection techniques have a "good fit" with the method and theory?
7. Are the data aggregates and analysis clearly reported? Do they make explicit the interpretive and reasoning process of the researcher?
8. Does the discussion provide meaningful and warranted interpretations and conclusions?

Lest it appear that there is universal agreement about the quality criteria, it may be noted that the postmodern trend toward questioning and deconstruction have led to continued debate in this area. Wolcott, in his book about transforming qualitative data (1994, pp. 348-356), argues for rejecting validity in qualitative research, and then describes activities he undertakes to address the challenge of validity. These include "talk a little, listen a lot . . . begin writing early . . . let readers 'see' for themselves . . . report fully . . . be candid . . . seek feedback . . . try to achieve balance . . . write accurately."

40.7 LEARNING MORE ABOUT DOING QUALITATIVE RESEARCH

The preceding discussion of evaluating qualitative research, rather than being a conclusion, is a fitting beginning point for you, the researcher, to go onward and conduct your studies. It is hoped that this chapter has served as an introduction, pointing you toward more useful resources and references.

Below is a subjective list of the authors' "top" books, listed in alphabetical, not ranked, order, for learning about qualitative research in education (full citations appear, right after, in the reference list):

- Bogdan & Biklen (1992). *Qualitative research for education*, 2d ed.
- Denzin & Lincoln, eds. (1994). *Handbook of qualitative research*.
- Eisner (1991). *The enlightened eye: qualitative inquiry and the enhancement of educational practice*.
- Erlandson, Harris, Skipper & Allen (1993). *Doing naturalistic inquiry: a guide to methods*.
- Fetterman (1989). *Ethnography: step by step*.
- Goetz & LeCompte (1984). *Ethnography and qualitative design in educational research*.
- Lincoln & Guba (1985). *Naturalistic inquiry*.
- Marshall & Rossman (1984). *Designing qualitative research*.
- Meloy (1994). *Writing the qualitative dissertation: understanding by doing*.
- Miles & Huberman (1994). *Qualitative data analysis: an expanded sourcebook*, 2d ed.
- Spradley (1980). *Participant observation*.
- Strauss (1987). *Qualitative analysis for social scientists*.
- Van Maanen (1988). *Tales of the field: on writing ethnography*.
- Wolcott (1990). *Writing up qualitative research*.
- Wolcott (1994). *Transforming qualitative data: description, analysis, and interpretation*.
- Yin (1989). *Case study research*.

Additional references appear in Robinson and Driscoll's (1993) handout for their AECT workshop on qualitative methods.

The researcher is also wise to keep up with new publications in methodology, including new editions of these books and others. Several journals specialize in publishing qualitative research, including the *International Journal of Qualitative Studies in Education*, *Journal of Contemporary Ethnography*, *Journal of Visual Literacy*, and the research section of *Educational Technology*. In addition, researchers may wish to join the qualitative research bulletin board, which can be reached via Judith Preissle at the University of Georgia.

We wish you well in your explorations!

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