

## CHAPTER 4

### MEANING-MAKING SPACES

#### *Data Collection, Description, Analysis, and Interpretation*

As part of your plan of action, you will need to select data collection methods that will allow you to answer your research questions. As you collect data, you will start the processes of data description, analysis, and interpretation. In other words, you will create spaces for attaching meaning to your data. This chapter will introduce you to different data collection methods and sources, and give you insight into how to organize, describe, analyze, and interpret your data.

#### GATHERING DATA

The use of data collection techniques allows for the systematic gathering of information about the participants and/or context of a study. While there are many ways to collect data, methods need to be chosen that are appropriate for answering your research questions. While research designs in action research may involve quantitative or experimental approaches, many projects utilize qualitative data collection methods. Qualitative approaches are appropriate for understanding the specific contexts of classrooms and capturing the natural life of a classroom. Data collection methods generally fall into one of three categories:

- Experiencing (Using our senses to observe)
- Enquiring (Asking others about their beliefs, ideas, thoughts, and experiences)
- Examining (Looking at documents and artifacts) (Wolcott, 1994).

The remainder of this section will highlight several of the most common data collection methods used by teacher action researchers.

#### *Observation (Experiencing)*

Observing is a natural process, and much can be learned from recording observations and making judgments about those observations. Observations may involve participant observation where the observer is part of the context, or it may involve nonparticipant observation where the observer watches actions and interactions in a classroom and is not involved in the activity. For example, a colleague sits at the back of classroom taking notes. Recording observations may

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take many forms, such as recording verbatim the conversations of students, diagramming the layout of a classroom, or describing the interactions of a small group of students who are the focus of your study. Observation may also involve the use of published or teacher-designed rating scales or checklists. For example, Figure 2 shows a checklist that was developed by a school-based group of action researchers (seven teachers of grades 1-3), that I worked with for two years, integrating curriculum using outcomes from social studies, language arts, mathematics, and science.

Skill	Student name	Date	Comment
Listens to others			
Asks questions during group activities			
Offers advice and suggestions to others			
Accepts advice and suggestions from others			
Participates in group decision-making			
Assumes various roles in groups			
Helps group meet goals			

*Figure 2. Checklist of participation skills during science activities (Grades 1-3).*

They used this checklist over a period of several weeks to observe students' participation skills as they engaged in science activities. Regardless of the form, observation needs to be structured carefully, and the format needs to be determined by the nature of the research question. During the planning stage of action research, the location, frequency, and duration of observations should be determined. If one colleague is observing the classroom of another colleague, then coordination will need to occur to plan for the observation and to determine a time when debriefing and reflection about the classroom observation can occur.

Recording observations as teaching occurs may be challenging for teachers, thus the use of video-recording devices may be a better-suited data gathering technique. Video recording allows one to observe the action of the classroom after the fact and to "zero in" on specific aspects of classroom activities. It should be noted that classroom observation can initially be inhibiting and distracting for students if this is new for them. This may dissipate with subsequent visits as students become

accustomed to having a visitor in the classroom or having their behavior videotaped.

### *Interviewing (Enquiring)*

Interviewing is a means to gain in-depth insight into the beliefs and perspectives of others. For example, you may want to ask a student to explain how she conducted her science fair project, or to ask a student why he classified particular items as living or nonliving. According to Patton (2002), interviews may be informal and conversational, semi-structured, or structured. The informal or conversational interview is the most open-ended of the three; the interviewer takes the opportunity to ask interviewees about particular topics without using predetermined questions. The interviewer aligns his/her questions with the responses being provided by the interviewee (“going with the flow”). In the semi-structured interview, the same topics are explored with all interviewees, thus there is more guidance provided by the interviewer. The structured interview involves the use of pre-planned questions to which interviewees respond. The latter approach is quicker and allows the responses of the interviewees to be compared more easily. Also, this type of data is amenable to statistical analysis using quantitative software. Responses to interviews may be written during the interview process, although audio-taping allows the interviewer to listen to what is said later and/or to have the conversation transcribed. The following is a set of open-ended questions which Katrina (Chapter 6) used at the end of her action research project to find out how her grade one students felt about learning about penguins and learning through webquests:

- What do penguins eat?
- Where do penguins live?
- How do penguins take care of their babies?
- Why couldn't PB the Polar Bear find any penguin friends?
- Did you like learning about penguins using the webquest?
- What did you like about the webquest?
- What didn't you like about the webquest?

When planning for interview questions, the nature of questions needs to be considered. Are you asking about behaviors? Are you probing what a person thinks or feels? In addition to these two areas, questions may focus on knowledge or facts about a topic, sensory experiences (what was seen, touched, etc.), or demographic information (e.g. age, education). The following list offers suggestions for planning for and conducting interviews:

- Check equipment before the start of the interview if audio-taping.
- Explain the purpose of the interview at the beginning and start the interview with simple questions.

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- Ask questions that are neutral, avoiding wording that might influence responses.
- Ask one question at a time.
- Provide a transition between topics (e.g. Ok, now I want to ask you about how you feel about some things we did in the unit).

While interviews can provide powerful insights into what students are thinking and feeling, they can also be quite time-consuming to conduct and especially to transcribe.

#### *Artifacts and Documents (Examining)*

The third category of data collection involves a variety of artifacts and documents, many of which are naturally-occurring. Schools generate many types of documents that can provide insight into the culture of schools and classrooms. One example includes archival data sources, such as attendance rates, discipline referrals, standardized test scores, memos, and meeting minutes, to name a few. Student materials (written texts or passages, pictures, presentations, art work, graphic organizers, etc.) are also natural products that are generated in classrooms. As Fichtman-Dana and Yendol-Silva (2003) suggest, when “teaching and inquiry are intertwined with one another . . . papers become data and take on new meaning” (p. 71). As described in the later chapters of this book, the teacher action researchers used student artifacts as a key source of data. Katrina (Chapter 6) worked with very young children; thus, both their written responses to journal questions and their drawings revealed insight into their understanding of penguins and their habitats. Concept maps were one source of data for Arlene, Ernie, and Lisa (Chapter 7) as they used both individual and collaborative maps to track changes in students understanding of scientific concepts. Lana and Sonja (Chapter 8) utilized student journal entries, sketches of solutions to design challenges presented to students in learning centres, sculptures, and an end-of-unit written test. Student research notes became a source of data for Nancy as she implemented problem-based learning in her classroom (Chapter 9). Student journal reflections about their understanding of the problem (How can Ms. Bartlett keep her garden plants healthy and prevent caterpillars from eating the leaves?) and final presentations of their solutions were also sources of data. Other types of data that may be examined include:

- Artifacts  
These may also include audiotapes, videotapes, and photographs, allowing teachers to capture classroom happenings and interactions that may not be evident while they are engaged in teaching.

- Technology  
Newer forms of technology, such as web tools (e.g. blogs, e-mails, podcasts, text messages, wikis) that promote interactivity and collaboration, can provide rich sources of data.
- Literature as data  
During the action research process, action researchers typically review literature at two points – while they are formulating the research focus, and as new insights and developments emerge during the unfolding of a project. Gathering and understanding information about the area of focus are critical to project design and implementation, and later to inform data analysis and interpretation.

#### DATA ANALYSIS AND INTERPRETATION

##### *Data Analysis*

While there are several challenges associated with conducting action research (e.g. lack of time, finding a research focus), data analysis can also be challenging. Dana-Fichtman and Silva-Yendol (2003) identify three reasons why they believe data analysis may present hurdles. First, the technical jargon, such as analytic induction, axial coding, in vivo codes, to name a few terms, used to describe the many strategies and approaches to data analysis can be confusing. Furthermore, many of our own prior conceptions of what constitutes research may be associated with quantitative design and, hence, we may feel that data analysis is more about dealing with numbers than extracting meaning from qualitative data in the form of themes, metaphors, or vignettes. While quantitative methods may be used in action research, areas of focus and questions lend themselves more to qualitative sources and methods. Teachers usually focus on a single classroom and small groups of individuals; thus, context is of utmost importance. A third reason why perceptions of analysis are challenging is the nature of qualitative data analysis itself; it can be messy and uncertain as you mine the data in search of emergent themes and patterns. In my own experiences as a facilitator of action research, teachers have found this stage to be intimidating and time-consuming. Reflecting on the overall data collection process and data analysis, one of my teacher colleagues, Nancy (Chapter 8) posed several questions about data analysis during a planning meeting: “How should we approach this? How will we interpret the feedback, interviews and questionnaires? How can we make sense of all this data?” This stage in the action research process necessitates the adoption of a critical lens and the creation of a meaning-making space for answering the questions posed at the beginning of your action research project.

Data analysis should occur as soon as you start the implementation of the project. It is the process of ordering, organizing, and thinking about the raw data you have collected. Stringer (2007) refers to data analysis as the “process of

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distilling large quantities of information to uncover significant features and elements that are embedded in the data” (p. 95). As data analysis is ongoing, you will start to find meaning in the data, linking themes, patterns, and categories into a story that communicates the significance.

There are many ways to approach data analysis and interpretation. While a formula cannot be followed for this process, guides are available that can be helpful. Drawing upon the work of Marshall and Rossman (2006), Creswell (2009), Miles and Huberman (1994), and Wolcott (1994), I offer the following suggestions for how to engage in the data analysis/interpretation process.

### *Organizing the Data*

While data organization will occur during implementation, at the end of implementation you will need to conduct a careful review of all the data. Creating a log of research activities and sources will provide an overview of the dataset. This should include the date and place of the data collection activities, the types of data collected, and how the data was collected. For example, you may have collected questionnaires from 25 students on October 30, in your classroom, to determine their views on learning in science class. It would also be useful at this point to review any memos you recorded about emerging themes and patterns as data was being collected during implementation. You may be considering whether you will use a qualitative software program to assist with data organization and analysis (Weitzman & Miles 1995; Weitzman, 2000). Consider the following in making your decision to use a software program: Do you have large amounts of data that might not be manageable without the assistance of a program? Do you have the technical background to use the program? Is it user-friendly? Do you have the resources to purchase a program?

### *Immersion in the Data*

This phase should start by revisiting the area of focus and your research questions. Next, you need to read and reread the entire dataset. This allows you to view the data holistically and to get a sense of what data has been collected. Furthermore, insights into the data may start to emerge. You may wish to record some notes at this point or to discuss your initial impressions with someone in your action research group or a critical friend. For example, as a facilitator of action research, I have often assumed the role of critical friend, offering feedback to teacher colleagues as they begin to examine their data and what it means.

### *Coding*

Another strategy that is used very frequently when analysing qualitative data is coding. This involves the process of assigning labels or descriptors to units of data

(phrases, sentences, or paragraphs), breaking down the data into manageable units. For example, Ernie, one of the teachers described in Chapter 7, administered a post-study survey to his students to determine whether or not they liked learning through concept mapping. The survey included both closed questions and open-ended items. Students provided different reasons for liking or disliking concept mapping, and their responses became the basis for using concepts or labels (e.g. likes concept mapping; reasons – enhances organization, seeing connections, etc.). Coding is one of several analytic strategies that helps in “relating our data to our ideas about the data. Because codes are thus links between locations in the data and sets of ideas or concepts, they are in that sense heuristic devices” (Coffey & Atkinson, 1996, p. 27). Often, the process of generating themes and categories relies on the coding of the data first.

#### *Identifying Themes and Categories*

One starting point for data analysis involves identifying themes and categories. This entails identifying recurring ideas or patterns in the data. This may be approached in an inductive manner where patterns and themes (e.g. understands habitats; enjoys concept mapping) emerge from what the research participants say and do. Conversely, a deductive approach may be adopted by returning to the literature that informs your study and applying pre-existing frameworks and typologies. During this process, you may physically cut and paste chunks of coded text from your data and place it into various categories and themes. Color coding may be another option, assigning a specific color to each category or theme and highlighting appropriate excerpts from the data. Depending on the area of focus, the themes or categories may be teaching strategies, feelings, events, changes in participant beliefs, etc. Creating an organizational chart or a graphic organizer, such as a web or concept map, based on the categories and themes generated can help you in visually seeing relationships and connections. As you work through this process, you will find that it is iterative in nature. You may rename categories and themes or combine others before you make final sense of your data.

#### *Data Interpretation*

The processes of analysis cannot be separated from interpretation. The strategies of analysis help us in understanding the implications of our research or going beyond the data to develop ideas and determine how we might use those ideas in our teaching and in schooling. In considering the outcomes of your study, several authors (Fichtman-Dana & Yendol-Silva, 2003; Stringer, 2007; Sumaras, 2011) suggest that you consider questions such as:

- What did you learn about yourself as a teacher?
- What successes did you experience?

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- What contradictions arose during the research process or in analyzing the data?
- What new insights did you develop about how children learn?
- What role did critical friends or colleagues play in supporting your research?
- What changes will you make to your practice as a result of what you learned?
- What new questions have arisen that need to be answered?
- How will your research inform the work of other practitioners and education in general?

Interpretation allows you to bring coherence to the analyzed data. It involves “attaching significance to what was found, making sense of the findings, offering explanations, drawing conclusions, extrapolating lessons, making inferences, considering meanings, and otherwise imposing order” (Patton, 2002, p. 480). In the last four chapters of this book, the interpretations of the teacher researchers, based on the data collected during their action research projects, are presented.

#### QUESTIONS FOR REFLECTION

- In Chapter 6, one of Katrina’s research questions is, “How does using a webquest influence the role of both the teacher and the student in the science classroom?” How did she answer this question? How did her role change?
- In Chapter 7, Ernie wanted to find out how the concept mapping strategy would impact student learning in science. How did students feel about the approach?
- In Chapter 8, what did Lana and Sonya discover about student learning in the unit? How did implementing the project impact their classroom practice?
- In Chapter 9, the experiences of Nancy are described. Did she answer her research question? Please explain.