# Effective Use of Assessment Data in Action Research

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In this era of high-stakes testing, many teachers hear the term "data," and immediately think of student performance on tests. The numbers that are generated by test scores of all kinds can be an extremely informative data source for teachers to gain insights into their action research questions and resulting changes they make in instruction as part of the action research cycle. Yet, because the process of action research honors the complexity of teaching, data collection cannot be reduced to just a collection of scores on various tests and assessments. Data collection for the teacher researcher means using a variety of ways to capture the action that occurs in the classroom.

Meaningful teacher inquiry should not "depart from" the daily work of classroom teachers, but become "a part of" their daily work (Dana & Yendol-Silva, 2003). Hence, learning about data collection strategies and selecting the strategies they will utilize for their study simply means thinking about life in the classroom/school and the ways life in the classroom/school can be "captured" as data. This article contains six common strategies teacher researchers use for capturing life in schools as data, in addition to scores on various assessment measures and performance on standardized tests.

## Strategy # 1: Field Notes

The life of a classroom teacher is quite demanding. One of the reasons the work of teaching is so demanding is that schools and classrooms are busy places, jammed packed with "action." Teachers inter*act* with students, students inter*act* with each other, teachers and students inter*act* with subject matter, and all of these inter*actions* occur within a particular context that is mediated by values (i.e., all children can learn), norms (i.e., students must raise their hands and be called on before answering a question), and rituals (i.e., each morning, the class salutes the flag during homeroom).

To capture "action" in the classroom, many teacher researchers observe and take field notes. Field notes can come in many shapes, forms, and varieties. Some of these include: scripting dialogue and conversation, diagramming the classroom or a particular part of the classroom, or noting what a student or group of students are doing at particular time intervals (every two minutes). Field notes are free of interpretations by the taker, capturing solely what is occurring without comments as to why it might be occurring or judgments about particular acts.

The form(s) that field notes take depends on the wonderings of the teacher. For instance, consider the following descriptions of teacher researchers using field notes as a part of their action research design:

- An English teacher was interested in studying her questioning techniques. Her field notes listed every question she asked during selected lessons.
- A social studies teacher was interested in minority students' attitudes toward academic achievement. His field notes involved writing down verbatim (or as close to verbatim as possible) what his learners were saying during a class discussion focused on how they felt about their recent report card grades.
- A high school chemistry teacher was interested in better understanding the relationship

between lecture demonstrations and his students' attitudes toward chemistry. He had a student videotape him each time he did a lecture demonstration. After school, he would watch these videos and take notes on what was happening.
- A general mathematics teacher researcher wished to better understand the behavior and thinking of a particular learner in her room when attacking a word problem. She enlisted a trusted colleague to come into her room during her planning period to observe and note what that learner was doing every two minutes as the teacher was delivering a lesson on solving word problems to the entire class.

As demonstrated above, field notes can be as different and varied as the individuals who take them. If a teacher cannot find a comfortable way to take field notes for himself or wish to capture action when he is an integral part of that action (i.e., giving directions, leading a discussion, asking questions, etc.), he may video- or audiotape himself and watch it later, transcribing what has occurred and/or taking notes or enlist another person to script notes for him.

What is most important is that he select an existing system or create a new system that works in practice and informs his wondering.

**Strategy # 2: Documents/Artifacts**

With field notes, data is constructed by capturing action on *paper*. Even without field notes, there already exists a tremendous paper trail that is produced as a result of much of the action that takes place in schools each day. The paper trail consists mainly of student work, but includes other "papers" such as curriculum guides, textbooks, teacher manuals, parent newsletters, progress reports, teacher plan books, written lesson plans, and correspondence to and from parents, the principal, and specialists. The litany of paper work that crosses a teacher's desk can make any teacher bleary eyed. Often the papers teachers view do not hold significant meaning when read in isolation, or when read quickly in order to be able to hand back papers in the morning. Teachers need to "get through" paperwork in order to remain sane.

Yet, when teaching and inquiry are intertwined with one another, with little extra effort, papers become data and take on new meaning. When teacher inquirers select and collect the papers that are related to their research wonderings, we call these papers, documents or artifacts. Systematically collecting papers provides them with the opportunity to look across these documents and analyze them in new and different ways. For example, as a method of tracking student productivity in the classroom, many teachers save student work, stamping dates on the work to know when it was produced. Through looking at student work over time, claims can be made that could not occur when viewing a singular piece of student work in isolation.

Documents are a naturally occurring form of data that can be extremely powerful. Teacher inquirers need only decide which papers are produced naturally in their classrooms and school, relate to their wonderings and plan a systematic way to collect, label, and organize them.

**Strategy # 3: Interviews/Focus Groups**

Teacher talk is important! As talk is crucial to the life of a teacher, capturing talk can be an important form of data collection. Notice in the examples of field notes that were shared

previously, that this data collection strategy is one way to capture talk that occurs naturally in the classroom. Some teacher inquirers take naturally occurring classroom talk one step further and interview students as well. Interviewing can be informal, spontaneous, or more thoughtfully planned.

One example of interviewing comes from the work of twelfth grade English teacher and researcher, Tom Beyer (2007), who wanted to better understand the reading habits of his students in order to more effectively differentiate the instruction for his Advanced Placement, Honors, and English IV classes. He began his work by pulling a student aside from each of these classes during homeroom and posing a few questions about what and when they read.

Focus groups also offer teachers another vehicle for collecting the talk and thoughts of students in the classroom. In many ways, focus groups occur daily in the form of whole-class or small-group discussion. The focus-group discussion can serve as a tool for understanding students' perceptions. For example, a focus group can provide insight into how students experience a new instructional strategy or what prior knowledge students possess about a particular content area. Teachers who use graphic organizers such as "What we Know, What We Want to Know, What We Learned" (K-W-L) strategies are conducting a form of focus group that can serve as a source of data that can inform inquiry. Although focus groups can serve as a quick way to obtain data, focus groups have some limitations. For example, focus groups are more likely to capture breadth of opinion since the goal is often to understand the group's perspective. Additionally, sometimes due to the presence of diverging opinions, less confident focus-group members refrain from sharing their thoughts.

**Strategy # 4: Reflective Journals**

Thus far, we have discussed ways to make data collection a part of teaching by capturing what naturally occurs in your teaching day -- action in the classroom through field notes, student progress in your classroom through document analysis, and talk in the classroom or school through interviews and focus groups. One of the ways that interviewing and focus groups serve as a powerful data collection strategy is that through the *talk* of interviewing, a teacher inquirer gains access into the *thinking* of the child or adult being interviewed. To capture "thinking" that occurs in the school and classroom, teacher researchers often also keep their own journals reflecting on their own thought processes as well as ask students to journal about their thinking related to the project at hand.

**Strategy # 5: Surveys**

Some teacher inquirers employ more formal mechanisms (such as sociograms, surveys, etc.) to capture the action, talk, and thinking and productivity that are a part of each and every school day. The most common formal mechanism I have observed in my work with teacher inquirers is surveys. Surveys can give students a space to share their thoughts and opinions about a teaching technique or strategy, a unit, or their knowledge about particular subject matter.

For example, recall the chemistry teacher whose action research focused on understanding the relationship between lecture demonstrations and student attitudes toward chemistry. This teacher researcher developed and administered a survey to his students as one form of data collection for his inquiry (Burgin, 2006):

**Demo-A-Day/Demonstration Show Attitude Assessment**

Please circle the number that matches your feeling about each statement. These questions will not be graded and there is no right or wrong answer.

| | Agree | | Not sure | | Disagree |
|---|---|---|---|---|---|
| 1. Demonstrations are an important part of learning Chemistry. | 1 | 2 | 3 | 4 | 5 |
| 2. The Demo-A-Day unit was enjoyable. | 1 | 2 | 3 | 4 | 5 |
| 3. The Demo-A-Day unit helped me better understand chemistry. | 1 | 2 | 3 | 4 | 5 |
| 4. I enjoyed practicing and or performing the demonstrations myself. | 1 | 2 | 3 | 4 | 5 |
| 5. I feel like I understood the chemistry better after I performed the demonstrations. | 1 | 2 | 3 | 4 | 5 |
| 6. The demos in this unit are something that I won't quickly forget. | 1 | 2 | 3 | 4 | 5 |
| 7. The elementary kids seemed to enjoy the demonstration show. | 1 | 2 | 3 | 4 | 5 |
| 8. I think this should be done by next year's Chemistry classes. | 1 | 2 | 3 | 4 | 5 |
| 9. Chemistry is a hard subject for me. | 1 | 2 | 3 | 4 | 5 |
| 10. I think I will take a college chemistry class in the future. | 1 | 2 | 3 | 4 | 5 |

Depending on the inquiry, some teachers survey students as the first part of their investigation and have the students complete the same survey at the end of an inquiry. This is particularly useful when surveys focus on students' understandings of content or attitude towards particular components of the school day, and a teacher inquirer wishes to capture growth or change over time.

Surveys can also be utilized with adults. For example, eighth-grade mathematics teacher, Stephanie Harrell, and Learning Support teacher, Kathryn Janicke, worked with students that performed below grade level in mathematics and noticed that these students possessed a general negative attitude toward mathematics and school. Through a collaborative action research project, Stephanie and Kathryn examined student and family attitudes towards mathematics to determine exactly what the attitudes were, how they affected student performance on class work, homework and both classroom and standardized tests, and how they could change their instruction to accommodate for student and parental attitudes. As one source of data, Stephanie and Kathryn sent a survey home to parents, asking them to recall their experiences with mathematics when they were in middle and high school (Harrell & Janicke, 2007).

**Strategy # 6: Literature as Data**

Although we often do not think of literature as "data," it is a useful way to think about how our work as a teacher inquirer is informed by and connected to the work of others. No one teaches or inquires in a vacuum. When we engage in the act of teaching, we are situated within a

context (our particular classroom, grade level, school, district, state, country. . .), and our context mediates much of what we do and understand as teachers. Similarly, when teachers inquire, their work is situated within a large, rich, preexisting knowledge base that is captured in such things as books, journal articles, newspaper articles, conference papers, and websites.

Look at this preexisting knowledge base on teaching as an existing "given" for data that will inform the study. All that is needed is figuring out which pieces of literature connect to the teacher inquirers' wonderings and will give them insights as their study is unfolding. Teacher inquirers generally collect literature at two different times – when they first define or are in the process of defining a wondering and wish to become well-informed on what current knowledge exists on their topic in the field, and as their studies lead them to different findings and new wonderings. Literature is the only essential form of data that every teacher inquirer should utilize so as to be connected to, informed by, and contributed to the larger conversation about educational practice. (needed to be parallel)

**When Do Teachers Collect Data and How Much Do They Collect?**

Now that some examples of what data collection might look like have been presented, teachers are ready to think about their own wonderings, and what forms of data collection might emanate from them and inform them. Most teacher inquirers find more than one data collection strategy will connect to their wondering, and subsequently, evoke more than one form of data collection in the design of their study. Utilizing multiple sources of data and data collection strategies can enhance their inquiry as they gain differing perspectives from differing strategies. In addition, by employing multiple strategies, they are able to build a strong case for their findings by pointing out the ways different data sources all led you to the same conclusions, a process research methodologists refer to as "triangulation" (Cresswell, 2002; Patton, 2000). Finally, by employing multiple data sources, they enhance your opportunities for learning when different data sources lead to discrepancies. It is often through posturing explanations for these discrepancies that the most powerful learning of teacher inquiry occurs, and that new wonderings for subsequent inquiries are generated.

As teacher inquirers ponder the "how" of data collection by selecting the strategies they wish to employ, they must also ponder related questions of how long they will collect the data and how much they will collect. The "when" and "how long" of data collection is often answered by natural constraints of time imposed by such things as the length of a unit if they are doing a curriculum inquiry or the due date for your paper if engaging in inquiry as a part of your student teaching or a graduate course. Optimally, data collection would proceed until they reach a state where they are no longer gaining insights into their wondering or question and no new information is emerging. This state is termed saturation by research methodologists (Creswell, 1998; Patton, 2002).

The complexities of teaching are so great, however, that in teacher research, teacher inquirers could be data collecting and waiting for saturation to occur indefinitely. Never drawing closure to an inquiry robs them of experiencing a process that is one of the most rewarding and exhilarating components of teacher inquiry --- deeply immersing yourself in your data, articulating findings, and allowing new wonderings to emerge. Therefore, it is important that they bind their study in a particular time frame. Decisions about when and how long must be made by the teachers as they balance what is feasible to do in the real world of their classroom and what is optimal for providing insights into their topic.

It is at this point that it is extremely valuable to develop a comprehensive plan for an inquiry. Hubbard and Power (1999) suggest that teacher inquirers write a research brief defined as "a detailed outline completed before the research study begins" (p. 47). A research brief may cover such aspects as the purpose of the study, the teacher's wonderings, how he will collect data, how he will analyze data, and a timeline for the study (Dana & Yendol-Silva, 2003). Through the process of developing a brief, teacher inquirers commit their energies to one idea. This commitment facilitates an inquirer's readiness to begin data collection. This article ends with one example of a research brief developed by English teacher, Tom Beyer.

**INQUIRY BRIEF**
**TOM BEYER**

**Purpose**

I love to read. I grew up with my parents reading to me at night and any other time I could persuade them to pick up a book. My love of literature and reading continued to grow throughout grade school and into high school. In college, it tapered off due to my course load, but I still found time to pick up a good book and get carried away to another world. Something has troubled me lately, and I want to gather some concrete data to either confirm my suspicions—or hopefully, prove them wrong. The rapid advances in technology have provided an increasing number of options available for students to spend their free time. As I thought about the things I had available to entertain me when I was growing up, I realized that the generation that is going through high school now has many more options than I had twelve years ago. When I was a senior, we still had regular pep rallies and a Friday night football game or basketball game was a major event where the community came together and supported the team—in other words: it was a priority. Similarly, if you weren't going to a movie, shopping, or working: reading a good book was a viable option. The internet hadn't taken a firm hold yet—libraries still served as the primary location for research (vice the family computer in the living room or a student's laptop nowadays). Hence, I want to know what the reading habits are of the high school seniors that I teach—is their interest in reading tapering off?

**Questions**

What are the reading habits of my high school seniors?

**Method**

I teach approximately 100 seniors over my 4 periods of 12$^{th}$ Grade English. I plan to begin by interviewing one or two students from each of my different classes: Advanced Placement, Honors, and English IV. Based on what I learn in the interviews, I will develop a survey to give out to all of my students and then I will analyze the results. I plan to conduct multiple sessions where the students read silently for a sustained amount of time, while I observe them. Sessions will be announced and I will take field notes on such areas as: what they are reading, how long it takes them to settle in, did they bring something to read, etc. I plan on holding a few open forums with each group to discuss their reading habits and interview a small sample of students to go beyond the survey questions. For the interviews, I will pick students from different ability groups and students who are

achieving different grades and interview them as a small group and individually.

**Data Collection**

- Observation/field notes of reading sessions, interviews, and open forums
- Survey results
- Any additional reflections from students
- Discussions with peers about this Guided Inquiry

**Calendar**

*January 2007*

- Interview a few students from each class
- Develop and Administer Survey and review answers
- Look for patterns and trends in responses
- Conduct Silent Sustained Reading (SSR) sessions

*February 2007*

- Conduct Silent Sustained Reading (SSR) sessions
- Conduct Open Forums
- Continue to collect data

*March 2007*

- Conduct small group and individual interviews
- Begin data analysis

*April 2007*

- Complete data analysis
- Write paper summarizing results to share with my peers
- Present my work at the Inquiry Showcase

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# Instructional Implications of Student Data Assessment

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According to Hubbard & Power, (1993), data analysis for the action researcher is defined as "the process of bringing order, structure, and meaning to the data, to discover what is underneath the surface of the classroom" (p.65). The good news about data analysis for the action researcher is that it can be the most rewarding, exciting, thought-provoking, and growth-oriented component of the action research cycle. The bad news is that it is also perhaps the most difficult. For this reason, the purpose of this article is to walk action researchers through the process of data analysis step by step.

Before exploring each individual step in the data analysis process, however, it is important to note that data analysis is not just something done at the end of an inquiry -- teacher researchers often move back and forth between collecting and analyzing data throughout an entire study. One example of the flip-flop relationship between the data collection and analysis steps in the action research cycle comes from the work of twelfth grade English teacher and researcher, Tom Beyer (2007). Recall that Beyer wanted to better understand the reading habits of his students in order to more effectively differentiate the instruction for his Advanced Placement, Honors, and English IV classes. He began his work by pulling a student aside from each of these classes during homeroom and posing a few questions about what and when they read. Beyer analyzed the notes he took on these interviews to determine questions he would utilize on a survey that would be given to all his students. He administered the survey, collecting the responses, and again returned to data analysis by tallying responses to survey questions and grouping narrative responses to the same questions together. The information he obtained in this portion of his study guided his observations of students during Sustained Silent Reading time. He continued to collect data for a number of weeks after the initial interviews and surveys as he observed his students and took field notes. Analysis of his field notes led him to conduct further individual interviews with students who were selected based on what he observed. In addition, Beyer held a whole-class focus group interview session toward the end of his study.

While Beyer had engaged in some data analysis to give direction to his study as it proceeded from January through March and was approaching the end of the school year in April, he placed all of his data – initial interviews, surveys, field notes, later interviews, and focus group notes into one pile. It was now time to synthesize his learning by looking at his entire data set as a whole.

While teacher researchers engage in analysis throughout their inquiries, once all planned data collection is done, it is important to pause and consider the entire data set as a whole as Beyer did. This helps teacher researchers move from an unsystematic piling up of data over time to developing a powerful representation of their learning that can be communicated to others.

## The Quest Toward Developing a Powerful Representation of Learning from Action Research

When teacher inquirers get to this point in their inquiries, they often ponder: "OK, I've collected all of this 'stuff' (I have a whole crate full of data) . . . **now** what do I do with it?" The findings and conclusions that teacher researchers make at the end of a study do not materialize out of thin air – they come from careful scrutiny of their data sets as they proceed through a systematic process of making sense of what they learned.

Research methodologists have developed, described, and named a long list of systematic processes that facilitate data analysis. Two of the processes most frequently discussed in the social sciences are coding and memoing. We turn to Schwandt's (1997) Qualitative Inquiry: A Dictionary of Terms to provide brief, technical definitions of these concepts:

> **CODING** – To begin the process of analyzing the large volume of data generated in the form of transcripts, field notes, photographs, and the like, the qualitative inquirer engages in the activity of coding. Coding is a procedure that disaggregates that data, breaks it down into manageable segments and identifies or names those segments. . . Coding requires constantly comparing and contrasting various successive segments of the data and subsequently categorizing them (p. 16).
>
> **MEMOING** – A procedure suggested by Barney Glaser (*Theoretical Sensitivity, Advances in the Methodology of Grounded Theory*, Sociology Press, 1978) for explaining or elaborating on the coded categories that the fieldworker develops in analyzing data. Memos are conceptual in intent, vary in length, and are primarily written to oneself. The content of memos can include commentary on the meaning of a coded category, explanation of a sense of pattern developing among categories, a ***description*** of some specific aspect of a setting or phenomenon, and so forth. Typically, the final analysis and interpretation is based on integration and analysis of memos (p. 89 – 90).

While the data analysis work of an action researcher does draw from the field of social sciences and borrows the processes described by the scholars in the field, it is easy to get bogged down in the *jargon* or *technical language* utilized in the definitions above that are not a part of the daily language of teachers. Phrases such as "disaggregating data," "coded categories," "phenomenon," and "final analysis and interpretation" may feel foreign to teaching practices and may set up a road block to data analysis.

In addition to the technical jargon utilized by researchers, baggage that they carry with them about *their own prior conceptions* of what research is can make data analysis difficult. Many conceptualize research and analysis as quantitative number crunching (Dana & Silva, 2001). While this may be a part of a teacher inquirer's work, particularly if he/she has utilized surveys as part of his/her study; the data analysis process described in this article is much more inductive in nature. This process may be antithetical to the ways teachers think about research, data, and data analysis. Letting go of these conceptions is an essential part of beginning the data analysis process.

A final reason data analysis can appear difficult is that the inductive process teachers are about to enter into is *uncertain*. Many qualitative researchers we have worked with have described analysis as "murky," "messy," and "creative." To help teachers understand the process and scale the three hurdles to data analysis just described (technical jargon, prior conceptions of research, and uncertainty), it is helpful to describe the process of data analysis utilizing language, phrases, and metaphors that are consonant with their life and work. As a metaphor for the data analysis process, consider the following story of a scrap-booker, whose work shares a good deal of commonality with that of a teacher researcher analyzing data:

> *In relationship to their work, a woman, her husband, and two young children had the opportunity to travel through all of Australia for two full months. Upon their return to the United States, the woman rushed to develop the ten roles of film she had shot throughout their travels. When the film was developed three days later, she whisked*

*the almost 400 pictures out of the store and went straight to her parents' house. One by one, they went through each of the pictures in the order they were taken from the envelopes. After sitting at the kitchen table for two hours, they still had three envelopes yet to open and view. The woman sensed the fatigue felt by her parents, and her heart grew heavy as she realized that laboring through every single picture did not convey to others the magnificence of their trip. The pictures were in no meaningful order, some were blurry, and in some cases, there were way too many photographs of the same things.*

*Returning home, her husband eagerly greeted her at the door and queried, "Well, how did the pictures come out?" The woman sighed as she explained that the number of pictures was overwhelming her, and while many came out great, there were some that were out of focus, and during some parts of their trip, they must have been too camera happy -- there were way too many shots that were similar. The woman feared that the pictures, that potentially held so much meaning for their family and their children's memories, would become a meaningless pile placed in a box and stored away in the attic. She imagined her young children all grown up, telling others that at one point in their lives, they had lived eight weeks in Australia, but they were so young, they hardly remembered a thing.*

*Disturbed by his wife's disappointment in the pictures, the man had an idea. He remembered that a new store had opened recently across town called, "Scrapbook Haven." He purchased a gift certificate and series of classes for his wife as a gift in hopes that this experience would help her capture their travels in a way that was meaningful and would have lasting impact on their two children.*

*The woman was grateful. At her first class, she learned that the best scrapbooks begin by sorting through pictures. "There's no need to use every single picture you brought to this class," the teacher said. "Why don't you look through every picture that was developed first, just to get a sense of what you have?" As the woman did so, she noticed she had some pictures from each stop on their itinerary. Some of the pictures were related to their work. Many of the pictures were of her two children.*

*Next, the teacher shared, "It is often helpful to group your pictures in different ways to decide how you want to proceed with the organization of your scrapbook. You might organize your scrapbook chronologically, or maybe by key events that took place during your trip, or perhaps even group pictures by individual child. Try sorting and re-sorting your pictures into piles that have some sort of meaning until you feel a sense of orderliness, commonality, and comfort with your assemblage."*

*The woman's first pass through her pictures was relatively easy. She sorted the pictures by stops on their travel itinerary, and then put the piles in chronological order. Next, she sorted each one of these piles into two subcategories – quality and non-quality photos. Quality photos were in focus, had good lighting, and were framed nicely by the photographer. Non-quality photos were out of focus, had some part of the subject being photographed cut out of the picture, or were photos she considered to be "bad" pictures of herself, her husband, or their children.*

*After looking at the piles, she noticed that three of them were of different stops on their itinerary, but were related as they were all pictures of families they had stayed with at different times during their trip. She combined these three piles together and*

*placed a post-it note on the pile that read, "Family Stays." She also noticed other piles that could be further divided up. For example, she had a pile of pictures she named "Cairns, Australia" in the itinerary sort. Within this pile, however, there were multiple pictures of their time snorkeling over the Great Barrier Reef, multiple pictures of hiking in the Daintree Rainforest, and multiple pictures of swimming in the Coral Sea. She subdivided the "Cairns" pile into these three sub-piles, and in the process, realized that she had no photographs of their first stop in Cairns – a visit to the Tjapukai Aboriginal Cultural Park, where her son learned to throw a boomerang. She would need to find the brochure from this park and add it to her Cairns pictures once she returned home. In addition, there were a couple candid shots of their children at their hotel in Cairns. She decided to remove these from the "Cairns" sub-piling and started a new pile called "Assorted Candids." She also found a few pictures of her daughter's fourth birthday party that must have been at the start of their first role of film they used in Australia. She placed these pictures aside and would not use them in the scrapbook.*

*After many iterations of the sorting process, the ways her scrapbook might take form began to become apparent to the woman. At this point, the teacher said, "It's time to create your first scrap-book page. Take one of your picture piles and arrange it on the page. Think about a statement you would like to write on this page that expresses the meaning this grouping of pictures holds for you. You also might want to add a title to your page. And remember, you don't have to use every single picture, and you might even use portions of a picture – it's OK to cut and paste."*

*The woman's class ended. She excitedly burst into her home and shared her hard work with her husband. Over time, she created a complete scrapbook of their travels. The final page contained a picture of her children back in their home in the states on the night they returned. The page was titled, "Home Sweet Home" and contained the following caption: "When we arrived home at 11:00 p.m., jet-lag had already set in as we were ready for breakfast, not bed. It took a few weeks to fully recover and reestablish our routines. It was good to be home, yet we will always fondly remember our days down under."*

*Upon its completion, the woman once again drove to her parent's house to share her new creation. As they turned each page of the scrapbook, short stories, humorous moments, and key experiences all seemed to jump out from the pages and fascinate her parents. The trip had been captured and conveyed to others in a way that never would have happened had the pictures stayed haphazardly thrown into a box labeled, "Trip to Australia." The woman knew that the process of creating this book enabled her to better understand the enormous implications this eight-week excursion had for herself, her husband, and most importantly, her children. She knew that the scrapbook would serve as an important catalyst to trigger their memories as they grew into adulthood.*

Teacher researchers are like the woman in the story who lamented over the fact that she had developed nearly 400 pictures, but did not know what to do with them so they would have meaning beyond just a big pile stored away in a box. They often find themselves overwhelmed when they get to the data analysis phase of their studies and face making sense of a huge pile of collected data. When doing teacher inquiry and searching for what they have learned, the pictures are their data, and they are putting their data together in different ways to create a scrapbook of what they have learned for themself and for others. Just as the scrap-booker

needed to be patient as she poured through her nearly 400 photos in the hopes of creating a meaningful organizational structure for her book, teacher researchers must be patient as they allow their data to "speak," for itself and to lead them to their findings. Many teacher inquirers move through the four steps of *description, sense-making, interpretation, and implication drawing* as they analyze their data.

**Data Analysis Step One: Description**

Like the scrap-booker who looked through every picture that was developed to get a sense of what she had before she began her book, action researchers begin data analysis by reading through their entire data set, with no other objective than to get a *descriptive* sense of what they have collected. They might complete the description step by talking it through with another member of their action research community, they might do this in written form, or they might choose a combined approach and take detailed notes as they talk. The following questions guide this step in the data analysis process:

> What did I see as I inquired?
>
> What was happening?
>
> What are my initial insights into the data?

**Data Analysis Step Two: Sense-Making**

After the scrap-booker looked through each picture initially, her next step was to create and play with different groupings of her photos to find a sensible way to represent them in her book. Similarly, action researchers begin the *sense-making* step by reading their data and asking questions such as, "What sorts of things are happening in my data?" "What do I notice?" "How might different pieces of my data fit together?" and "What pieces of my data stand out from the rest?" To answer these questions, action researchers may take notes in the margins of their data or may physically cut data apart and place the evidence in discrete piles or categories. Organizing data is one of the most creative parts of the sense-making process.

Sometimes inquirers get stuck at this stage and need some prompts to help begin this sense-making process. Table 1 offers some organizing units that serve as prompts for helping teachers begin analysis (Dana & Yendol-Silva, 2003).

Table 1: Examples of Organizing Units

| **Examples of Organizing Units** | | |
|---|---|---|
| Chronology | Key Events | Various Settings |
| People | Processes | Behaviors |
| Issues | Relationships | Groups |
| Styles | Changes | Meanings |
| Practices | Strategies | Episodes |
| Encounters | Roles | Feelings |

For example, teachers might look at their data and see if a story emerges that takes a *chronological form*. Teachers may notice that their data seems to be organizing itself around *key events*. Or, teachers may see some *combination of organizing units* that are helpful. This table is by no means exhaustive, and they should let the organizing units emerge from their own data rather than forcing an external set of units.

Based on answers to the questions posed above and a teacher's emerging units of analysis, action researchers identify common themes or patterns. Next, they begin a process of grouping or sorting data by theme or category, a process likened to the woman's initial sorting of her Australia pictures by "stops on the travel itinerary." One way to group data is to use a different color marker for each theme or pattern identified, and highlight all excerpts from the data that fit this theme or pattern. Another way of grouping data might be to physically cut it apart and place the data in different piles. Before scrap-bookers cut apart their photographs, they often make a second set and keep these filed with the negatives, in case they make a mistake or decide to use the same picture in a different way. For this reason, if teachers do decide to cut the data apart, it is suggested that they keep a complete set of data as a back-up.

Just as the scrap-booker found some pictures from her daughter's fourth birthday, as teachers engage in sense-making, they will notice that not all of the data they collected will be highlighted/coded or will fit with their developing patterns or themes. These diverging data excerpts should be acknowledged and explained if possible (i.e., "Those pictures must have been at the start of our first role of film and don't really belong.") Likewise, just as the scrap-booker realized she had no photographs of the Aboriginal Cultural Park and would need to find the brochure to add to her photographs, teacher researchers may find that they need to collect

additional data to inform an emerging pattern. Finally, like the scrap-booker who decided to regroup some pictures into new piles called "Family Stays" and "Assorted Candids" as teacher researchers' findings emerge, they may regroup, rename, expand, or condense the original ways they grouped their data.

**Data Analysis Step Three: Interpretation**

Just as the scrapbook teacher invited her student to create her first page by writing a statement that expressed the meaning of a group of pictures held for her, in step three of the data analysis process for the action researcher, patterns or themes yield statements about what a teacher researcher learned and what the learning means. Action researchers often construct these statements by looking at the patterns that were coded, and then ask and answer questions such as:

> What was my initial wondering and how do these patterns inform it?
> What is happening in each pattern and across patterns?
> How is what is happening connected to . . .
>
> a. my teaching?
> b. my students?
> c. the subject matter and my curriculum?
> d. my classroom/school context?

The findings from this step can be illustrated by the action researcher in a number of ways including but not limited to: themes, patterns, categories, metaphors, simile, claims/assertions, typologies, and vignettes (Dana & Yendol-Silva, 2003). Table 2 provides a definition of these possible illustrative techniques as well as examples.

**Strategies for Illustrating Findings**

1. **Themes/Patterns/Categories/Labels/Naming**- A composite of traits or features; a topic for discourse or discussion; a specifically defined division; a descriptive term; set apart from others.
   *Example: Collaboration, Ownership, Care, Growth*
2. **Metaphors**- A term that is transferred from the object it ordinarily represents to an object it represents only by implicit comparison or analogy.
   *Example: "The Illustrator," "The Translator," "The Reporter," "The Guide," "Casting the Play"*
3. **Simile**- Two unlike things are compared often in a phrase introduced by "like" or "as."
   *Example: "Music as a motivator," "Music as a confidence builder," "Music as a Context for making meaningful connections," "Writing as Conversation"*
4. **Claims/Assertions**- A statement of fact or assertion of truth.
   *Example: Inappropriate expectations discouraged many of the learners in my classroom and hindered my effectiveness as a writing teacher.*
5. **Typologies**- A systematic classification of types.
   *Example: Different uses for puppets- instructional, entertainment, therapeutic*
6. **Vignettes**- A brief descriptive literary sketch.
   *Example: "The Struggle for Power; Who is in Control"*
   *The children were engaged in conversation at the meetings, jobs were continuing to get done, but there was still a struggle centering around who was in control. With the way the class decided to make a list of jobs, break the jobs up into groups, choose the people they wanted to work with, there were breaks in communication. Conflicts were arising with the groups. Everyone was mostly aiming to get "their own" way.*

These strategies help illustrate, organize, and communicate inquiry findings to an audience. Once teacher researchers have outlined their organizing strategy, they will need to identify the data that supports each finding presented in the outline. Excerpts from these data sources will be used as evidence for their claims.

**Data Analysis Step Four: Implications**

The scrap-booker created one final page of her book entitled, "Home Sweet Home," that shared the overall impressions of the family's Australia excursion. Similarly, when action researchers complete the first three steps of the data analysis process, they ask and answer one last set of implication questions as follows:

a. What have I learned about myself as a teacher?
b. What have I learned about my students?
c. What have I learned about the larger context of schools and schooling?
d. What are the implications of what I have learned for my teaching?
e. What changes might I make to my practice?
f. What new wonderings do I have?

These questions call for teacher researchers to interpret what they have learned, to take action

for change based on their study, and to generate new questions. For, unlike the scrap-booker who can marvel at her completed book, the scrapbook for an action researcher is never quite finished, even after intensive analysis. Hubbard & Power (1999) note that "Good research analyses raise more questions than they answer" (p. 117). While teachers may never be able to marvel at a perfected, polished, definitive set of findings based on the data analysis from one particular inquiry, they can marvel at the enormity of what they have learned through engaging in the process, and the power it holds for transforming both their identity as a teacher as well as their teaching practice. Cochran-Smith and Lytle (2001) propose that:

> . . . a legitimate and essential purpose of professional development is the development of an inquiry stance on teaching that is critical and transformative, a stance linked not only to high standards for the learning of all students but also to social change and social justice and to the individual and collective growth of teachers (p. 46).

As a result of data analysis, teachers can marvel at the growth and the impact they can have as an individual teacher who has joined a larger community of teacher researchers. Through engagement in action research as a member of this community, they are contributing to the transformation of the teaching profession!

Further information and illustrations of the four step data analysis process for action researchers can be found in *The Reflective Educator's Guide to Classroom Research* (2003), by Nancy Fichtman Dana and Diane Yendol-Silva.

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## Assessment Data Collection Chart

The chart is set up with the following specifics:

- Title of chart is the main inquiry question
- Left column: What information might help answer the question?
- Right column: What data collection strategies would generate this information?

**Sample: In What Ways Do Socratic Seminars Enhance Student Understandings of (Content) Concepts?**

| Information that will help me answer my question | Data collection strategies that would generate this information |
|---|---|
| Knowing how students' conceptual knowledge develops during our unit | Collect students' (content) journals |
| Knowing what students saying during Socratic Seminar | Audio taping Socratic Seminar |
| My thinking about what happened during the Socratic Seminar after they occur | Teacher journal |
| Students opinions about Socratic Seminar | Surveys |
| Literature on Socratic Seminars and unit concepts | Do a search for other books, articles, or web researches that are connected to Socratic Seminars, unit concepts, and building conceptual knowledge, etc. |

**Learner Template:**
**Blank Data Collection Chart**

The chart is set up with the following specifics:

- Title of chart is the main inquiry question
- Left column: What information might help answer the question?
- Right column: What data collection strategies would generate this information?

**Insert Title:**

| Information that will help me answer my question | Data collection strategies that would generate this information |
|---|---|
| | |
| | |
| | |
| | |
| | |