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QUALITATIVE APPROACHES TO THE VERBAL PROTOCOL ANALYSIS OF STRATEGIC PROCESSING

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In this chapter, we examine qualitative approaches to verbal protocol analysis and their role in constructing detailed accounts of strategic processing. To that end, we draw from diverse studies in the area of reading in which qualitative protocol data is extensively used to catalog and describe the readers' strategies engaged with a variety of texts, tasks, and goals. Thus, our discussion is situated within the domain of reading in an effort to illustrate the potential of qualitative verbal protocol analysis to a wider range of domains of knowledge, problem, and learning through examining the versatility of strategic processing in reading. In the sections that follow, we first argue for the importance of investigating strategic processing in reading. Then, we examine the scientific merits of qualitative verbal protocol analysis in examining such strategic processing. Finally, we discuss critical issues in the qualitative analysis of verbal protocol data and suggest possible means of addressing the issues to undertake rigorous analyses of strategic processing.

THE IMPORTANCE OF ANALYZING STRATEGIC PROCESSING TO UNDERSTANDING THE CONSTRUCT OF READING

Our conception of reading is grounded at the intersection of research literature on *readers* (e.g., knowledge, skills, attitudes, identities), *texts* that they access and process (e.g., genres, structures, purposes, modes), and the *contexts* in which reading takes place (e.g., social influences, task environments) (McNamara & Magliano, 2009; Snow, 2002). We note that these variables interact distinctively in accordance with

readers' goals. When reading is successful, the *goals* that readers establish help guide strategies—as text, task, and context comprise the problem space that is demanding of strategic processing. Reading goals are not static. They may change as readers gain knowledge from constructing meaning from text, and as readers reflect on their needs and opportunities related to goals. That is, acts of reading are situated with the specific goals that are planned, revisited, and reformulated along the course of making meaning (Brown, Collins, & Duguid, 1989; Kintsch, 1988).

Readers use cognitive and metacognitive strategies to achieve goals. This process is dynamic, as readers select, adjust, and coordinate different strategies to construct meaning. The use of specific strategies is not a stand-alone cognitive activity. Rather, strategies are interrelated and mutually supportive as reading progresses under control of reader metacognition (McNamara, 2007; Pressley, 1995; Veenman, 2015). Hence, reading is better understood when we identify and describe how strategies are chosen and orchestrated by readers. Verbal protocol analysis is well-suited to the task of providing detailed data related to such strategic reading.

Strategic reading, in particular, involves chains of intentional cognitive actions focused on building a coherent understanding of text (Alexander, Graham, & Harris, 1998; Cho, 2014). Of course, not all reading behaviors are necessarily strategic, neither are all strategies successful (Afflerbach, Pearson, & Paris, 2008). However, cognitive work must be initiated and assessed by the reader for utility and effectiveness in each iteration of strategy use (Afflerbach, Cho, & Kim, 2015). Due to this situational intentionality, determining the nature of strategies in specific reading situations is a challenging task that demands contextualized inferences about the enactment of those processes.

That said, qualitative studies provide a common ground for research that seeks to describe the types and sequences of strategic processes in reading. Research on accomplished reading describes some common features that may distinguish strategic actions from non-strategic behaviors. In their meta-analytic work, Pressley and Afflerbach (1995) reexamined the numerous cognitive and metacognitive strategies taken from the verbal protocols of accomplished readers (e.g., librarians, historians, scientists) observed in 38 primary research studies. Their analysis yielded a compendium of reading comprehension strategies, which were grouped into three categories: (a) identifying and learning text content, (b) self-monitoring of thinking processes, and (c) evaluating different aspects of reading.

For example, Pressley and Afflerbach (1995, pp. 31–62) describe the array of strategic actions that accomplished readers carry out for *identifying and learning text content* in the following manner:

- Before reading, accomplished readers attempt to *construct a goal for reading*. They *overview the content and structure of text* and *determine what to read and where to start* as informed by the overview as well as the goal. Accordingly, these readers *activate prior knowledge* that may help them to better understand text. These prereading activities help readers *generate an initial hypothesis about text*.
- Initially, accomplished readers tend to read text from front to back to *test their text hypotheses*. As reading progresses (once their initial testing of hypotheses tell text relevance), however, they opportunistically *adjust attention and effort by according to the priorities and needs for information processing*, getting involved in a more active and focused reading of text ideas. For example, these readers *use*

both *literal and inferential reasoning* using text information, *analyze and integrate* different parts of text, and *interpret* text ideas and hidden meanings.

- After the initial reading, accomplished readers *reread* selected parts of text with an eye out for particular information. Rereading and reflection leads them to *construct a cohesive summary of text* (i.e., situated mental representation). They *self-question over text content*, reflecting on text with the possibility of reflection leading to shifts in text interpretation. Consequently, these readers continually *evaluate and reconstruct an understanding of text, change their responses to text* as the understanding is reconstructed as a result of reading and reflection, and *think further* on the mentally represented text in *anticipation of using it later* for real-life purposes.

Strategic processing is a window on our understanding of how reading works. Verbal protocol studies of reading describe successful readers who employ a set of strategic thoughts and processes (*italicized* in the above descriptions from Pressley & Afflerbach, 1995). Although not all strategies are equally prominent in their text processing, these accomplished readers regulate their use of strategies in relation to the construction of meaning and the goals they seek to achieve. In stark contrast, ineffective strategy use is observed in novice readers. These readers might intend to be strategic, but their actions may not be goal-relevant due to multiple challenges such as a lack of domain knowledge, ineffective self-reflection, unspecific (or no) goals, a shortage of metacognitive awareness, and uninformed perspectives on what reading “is.” Therefore, observing and evaluating one’s strategy use, such as that inferred from verbal reports, is a litmus test for the performance and accomplishment of the reader.

We note that the bullet points above offer only a tangential summary of many strategies for identifying and learning text content—Pressley and Afflerbach (1995) documented a total of 204 interrelated strategies in this category only. That is, a considerable degree of variety, complexity, and uniqueness must be anticipated in the examination of how readers choose and organize among these strategies in different, extended, or novel tasks. We also reiterate that reading is understood in a particular coordination of reader, text, and context, and it is important to consider how manifold interactions among these components may play out in the analysis of readers’ goal-directed engagement in strategic processing.

In short, our stance toward reading supports the importance of investigating the nature of strategic processing situated in this complex coordination that must count as an essential consideration for that investigation. It also calls for attention to qualitative analysis of process-oriented data, specifically reader-generated verbal reports, from which detailed accounts of readers’ strategies, and their relationship to text, context, and goal that interplay in meaning making, are constructed. Such work can contribute to increasingly fine-grain understandings of the complexities and nuances in strategic reading which might not be revealed otherwise.

THE VALUE OF ANALYZING READER-GENERATED VERBAL DATA IN INQUIRY INTO STRATEGIC READING

In-depth examinations of verbal reports have contributed to advancing theories of learning that cut across diverse traditions of inquiry. Theoretical support for the veracity of verbal report data is fairly broad-based—and this data can inform us critically

about strategic minds. So as our common sense tells us, for example, vast literature in linguistics suggests that language offers a window into the mind of the speaker (Chomsky, 1975; Lakoff, 1987). The generative language of a person has also long been a major subject for philosophical and psychological investigations to complicate how the mind works in reasoning (Boring, 1953; James, 1890). The language of a learner may be seen as (inner) speech, a form of mediated action through culturally internalized higher-order mental functions (Vygotsky, 1962; Wertsch, 1998).

In cognitive science, however, an initial articulation and defense of verbal reports as data for the scientific studies of human cognition was provided by Ericsson and Simon in 1980. Their motivation reflects reactions to uninformed practices in cognitive studies at that time and their reevaluation of verbal data in the interrogation of cognitive processing:

For more than half a century, and as the result of an unjustified extrapolation of justified challenge to a particular mode of verbal reporting (introspection), the verbal reports of human subjects have been thought suspect as a source of evidence about cognitive processes ... verbal reports, elicited with care and interpreted with full understanding of the circumstances under which they were obtained, are a valuable and thoroughly reliable source of information about cognitive processes. It is time to abandon the careless charge of “introspection” as a means for disparaging such data ... To omit them [verbal data] when we are carrying the “chain and transit of objective measurement” is only to mark as terra incognita large areas on the map of human cognition that we know perfectly well how to survey.

(p. 247)

Ericsson and Simon (1980) noted that the verbal reports of human subjects historically have been discredited due to the overgeneralized labeling of such language data as a product of introspection, which was denigrated to be a form of informal report that is useful at best for glimpsing a subject's internal state of mind (Nisbett & Wilson, 1977). As a result, such misconception of verbal reports and uninformed research practices (e.g., measuring human thinking exclusively with standardized self-report measures) could not provide authentic information on a subject's cognitive processes in action. Alternatively, Ericsson and Simon argued for the value of verbal reports of human subjects as sense-makers, urging reconsideration of such data as a reliable source of scientific evidence that supports both the exploration and the verification of cognitive theories.

Along with emerging methodological discussions in reading (e.g., Afflerbach, 2000; Afflerbach & Johnston, 1984; Kucan & Beck, 1997; Magliano & Graesser, 1991; Pressley & Afflerbach, 1995; Smagorinsky, 1998) since the work of Ericsson and Simon, verbal protocol analysis has been gaining trustworthiness and popularity as a means of assessing the cognitive processes involved in text comprehension. Pressley and Afflerbach (1995) reached a conclusion that it is valuable to consider the merits of analyzing verbal reporting data, despite several considerations that must be addressed methodologically, because of the theoretical advancement made in part by the studies of readers' verbal protocols:

On the one hand, the protocol analyses do support various models of comprehension that have been proposed. That is, the processes specified by each of these

models are represented in the think-aloud reports ... On the other hand, the verbal report data ... does more than provide partial verification of theoretical models. In fact, the verbal report data extend these models, leading to a complex description of reading than specified by any of the previously existing models.

(p. 83)

As supported by Pressley and Afflerbach (1995), as well as by Ericsson and Simon (1980), verbal protocol analysis may not only assist in exploration of yet-to-be-examined cognitive processes in novel tasks and contexts of reading, but it can contribute to verification of pre-existing theories by adding evidentiary (counter) examples in detail. Informed analysis of verbal protocols facilitates reasoned judgments concerning what extent of congruence or idiosyncrasy could be found between models of text processing and the aggregate insights from the verbal data.

We endorse the scientific merits of verbal protocol analysis, suggesting that analysis of reader-generated verbal data has several promises for advancing reading theories. Verbal protocol analysis foremost can help the investigation of the architecture of reading—even though it is an unobservable construct (e.g., when, where, and how reading begins, goes on, and ends). A particular strength of verbal protocol analysis relates to detailed description of the cognitive and metacognitive mechanisms through which mental representations are elaborated during text comprehension. Further, the investigation of verbal report data can provide the opportunity to integrate contextualized accounts of strategic processes into a coherent theory that explains the interplay of individual differences, text features, and situational influences.

ACKNOWLEDGING THE INFERENTIAL GAPS BETWEEN WHAT IS HEDED IN MIND AND WHAT INDEED IS VERBALIZED

As much as we value the scientific merits of verbal protocol analysis, we also acknowledge several limitations that need to be addressed with care. Pressley and Afflerbach (1995) portrayed verbal protocol analysis as a “maturing” methodology (p. 1). We agree with their point that, while much interesting work has been already accomplished with varied verbal protocol analysis approaches, the ongoing development of the methodology parallels the evolution in our understanding of acts of reading. A result can be continued refinement of both.

Perhaps the most difficult task is to identify and narrow the inferential gap that exists between what we desire to understand (describe, reveal, or verify) and what we can do with data (Messick, 1989). Verbal protocol analysis is not free of this concern because what is inferred from verbal data might neither fully nor accurately represent thoughts and processes of readers (Ericsson & Simon, 1998; Smagorinsky, 1998). For example, it is obvious that what we desire to know is a “pure” form of situated processes (i.e., cognitive strategies) and thoughts (i.e., mental representations by the strategy use) which are heeded in mind (i.e., short-term memory) during an authentic cognitive task. These processes and thoughts—namely, first-level cognition “C1” in this discussion—could be those that are not intervened by any additional construct-irrelevant tasks imposed by others. However, psychological realities of C1 processes and thoughts may not be explicitly observed by any research technologies currently

available. To address the issue, alternative ways of collecting data which are assumed to best characterize the genuine C1 processes and thoughts are necessitated.

However, this situation (i.e., with the goal of better understanding authentic cognition by adding a somewhat unnatural task or mechanism in order to observe that cognition) may cause researchers to be in a dilemma where the additional data-gathering task, especially when involving extra language generation, may facilitate modifications of strategic processing and thinking at the very moments of data generation—namely, second-level cognition “C2” here. That is, verbal reporting inevitably influences the operation of C1-level processing and thinking and what it captures may be those at the C2-level because language mediates cognitive work (e.g., Davis, Carey, Foxman, & Tarr, 1968; Posner, 1982; Smagorinsky, 1998). Such influences are oftentimes indicated by readers slowing down the reading speed or being disoriented in repeating surface-level comments on thoughts. Also, there is a chance that some of the chains of strategic thinking and related action are non-verbalized for a particular reason (e.g., personality, motivation, verbal proficiency, working memory at capacity, relational factors) and are consequently excluded from the analysis. What matters at this point is with what rigor and in relation to what context the investigator can account for the involvement of task demands, as well as the unexpectedly modified acts of reading, in describing the C2 thoughts and processes to the greatest extent.

In a worst scenario, verbal reports may be an inaccurate and unreliable source of data when participants’ verbalizations significantly change the course of thinking and processing. Such uncontrolled interruptions may, in turn, entirely disrupt what readers normally do and think in a task that would otherwise be authentic and ecologically valid. What is verbalized in this case are of third-level cognition “C3,” which might not be in our best interests because what we are striving for is to estimate and fill in the data-reality gap while maintaining the substance and sequence of strategic processing and thinking that best resemble those for authentic reading.

Nonetheless, we believe that the major events of strategic text processing, as well as the mental representations that emerge across the moments of processing, can be generally accessible and reportable in a well-designed research task (Fox, Ericsson, & Best, 2011). Figure 23.1 illustrates that it is highly possible that, despite the influences, to some extent, the task of verbal reporting would not significantly change the course of reading strategy use and the properties of represented thoughts (Norris, 1990). It means that the inferences we propose to make from verbal reports should represent the course of cognitive actions, metacognitive controls, and evolving representations at the C2 level without much losing the integrity of C1-level authentic reading.

It is important to note that the integrity of verbal protocols is the result of text- and task- appropriate design. Such design accounts for all relevant experimental variables (e.g., prompts, waiting time, text familiarity, task impressions) as well as the contextual factors (e.g., reading goals, materials and resources, settings and situations, textual scopes and boundaries). A carefully designed verbal-reporting task minimizes the likelihood of over-involvement of automatic processing (e.g., if a reading task is familiar and easy enough for the reader to complete it quickly without much effort) or unnecessary facilitation of vague self-explanations (e.g., the task is too difficult to complete so the reader becomes constantly relying on the help of self-talk without a clear focus and deep engagement in text understanding). When conducting data analysis,

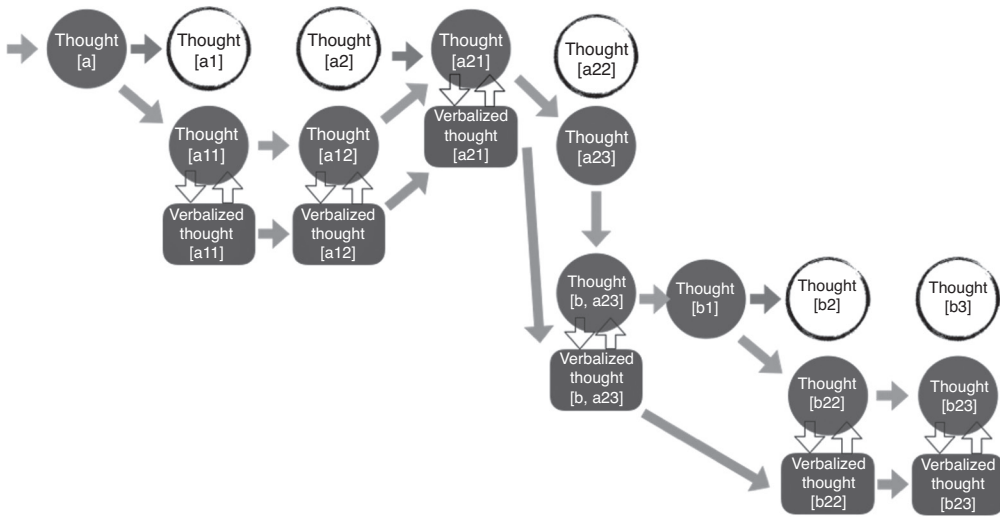


Figure 23.1 A Flow of Thinking in Verbal Reporting during Reading

the investigator should carefully examine the data, progressing into a better situated understanding of the verbalized thoughts while self-questioning whether data makes sense in relation to a particular coordination of reader, text, and context. Depending on the focus of the particular study, researchers may also conduct grounded theorizing (Glaser & Strauss, 1967) in which new insights into reader-text-task-context interactions can be generated from verbal report data.

Opportunity is that acknowledging limitations of a method may fuel the action to design a rigorous research task and data analysis. For verbal protocol analysis, the inferential gap in the verbal data analysis would make it difficult to evaluate the proximity and disparity between what is heeded in mind and what indeed is verbalized. However, considering taken-for-granted challenges seriously may create a new opportunity to generate, test, and apply alternative principles and means to address manifold issues in verbal protocol analysis. When researchers challenge commonplace assumptions, develop alternative strategies, and explore new approaches, informed research processes may contribute to constructing a contextualized account of strategic processing as close as possible to that which is carried out in an authentic task of reading.

In what follows, we focus on the specific merits and major issues in verbal protocol analysis and possible means of addressing the issues, as we seek to undertake rigorous and situated investigations of the strategic processing involved in complex reading tasks. We draw on our own previous work, and that of others, to discuss theoretical and practical considerations for qualitative analysis of verbal report data. Specifically, we focus on:

- how the contextual knowledge of the investigator creates new opportunities for verbal protocol analysis,
- how data saturation contributes to understanding the phenomena being interpreted and is judged in ways that inform the progress of qualitative analysis, and
- how evidentiary reasoning is undertaken rigorously throughout the analysis and contributes to the unique conceptual contributions that a qualitative approach holds.

CONTEXTUAL INFLUENCES IN VERBAL REPORTING AND THE CONTEXTUAL KNOWLEDGE OF THE INVESTIGATOR IN VERBAL PROTOCOL ANALYSIS

As is true in any disciplined investigation, the collection of verbal reports and the analysis of such data are carefully planned and closely related. It is therefore important to develop an understanding of the ways that analysis is intertwined with measurement, and the influence of the context of the study on the data being generated. To illustrate the contextual influence of the research task on the analysis of verbal report data, we present two of our own prior studies that share the same context, but differ because the research questions and subsequent data analyses were guided by different research questions, although both studies were intended to contribute to understanding of strategic processing during reading.

To begin with, the first study (Cho, Woodward, Li, & Barlow, 2017) was informed by literature on strategic processing of internet sources (e.g., Afflerbach & Cho, 2009) and explored how adolescents' internet reading strategies contribute to the quality of their generated questions about a given topic. The research task involved participants thinking aloud during a one-hour information searching session to learn about mountaintop mining, a controversial issue, with a variety of types and sources of text available on the internet. An important element of the research design for this study (Cho et al., 2017) was recognizing the affordances and obstacles created by authentic and unconstrained textual environments. One example is participant-directed source selection, as compared to a more conventional situation of reading in a controlled environment where participants interact with predetermined texts, such as a replication of a search engine with selected texts available. A review of the methods used in previous studies of internet reading strategies indicated that there was potential in creating a task which utilized an unconstrained search environment with an open-ended task in order to best capture how students read in an internet setting (Cho, 2014; Coiro & Dobler, 2007; DeSchryver, 2015).

Therefore, our research design sought to increase ecological validity in the study of strategic processing during internet reading, which involved controlling particular elements of the task (e.g., predetermined task, prompt, and time) in order to collect data that would respond to our research questions while leaving others open (e.g., unconstrained textual space, navigation, choice of text) in order to replicate an authentic reading space. We used analytical rubrics to judge the qualities of individual students' use of four major strategies (i.e., information location, meaning making, self-monitoring, and source evaluation) that are prominent features in internet reading. This scoring procedure allowed us to gain "quality scores" to build a structural model that statistically accounts for the association of those strategies with the outcomes of internet reading such as knowledge gain and question generation on the topic they read about.

During our analysis of verbal protocols, however, it became apparent that there were additional influences, other than the cognitive strategies used by participants, on the information sources chosen by the participants and the related information they learned. We encountered many instances in which readers verbalized their stances, positions, or attitudes toward the task of internet reading, beyond what information

they were attending to and how they were comprehending it. For example, while accessing a website run by a group of environmental scientists in the mining-affected Appalachian states, one high school reader reported:

I'm a science person, not political expert or any ... I prefer to use the website of these scientists and the articles here, or whatever it has me to look at ... something that is objective and looks scientific. I would not invest my time reading some of the previous articles I found, which were mostly authored by people from interest groups.

Options for coding the above verbal protocol data include self-monitoring, source evaluation, or a hybrid strategy that subsumes both. However, the complicated and idiosyncratic nature of strategy use can evoke further questions about the motivation of the reader pursuing a particular kind of source authority as informed by the reflection of *how I come to know* and *what source to be chosen for my learning*. Although such imposing of personal dispositions toward source authority was not the primary focus of the current study, we, as the investigators, understood that the unconstrained online task setting not only affords the reader freedom of information access but also encourages her to be held accountable in seeking more reliable sources. We cataloged numerous instances of such verbal reports that were deserving of further attention. Consequently a consideration of the task environment, in which adolescent readers were verbalizing their thoughts in an unconstrained setting for locating and processing varied internet sources on a controversial issue, led to our further investigation of the data from an alternative theoretical approach that we believe can assist in examining different aspects of strategic online reading.

Our contextual interpretation of particular verbal protocols extended the scope of the strategic processing we analyzed in online reading. Therefore, in order to better understand why participants engaged in the cognitive processing documented in our first study, we decided to conduct a further qualitative verbal protocol analysis for a subset of the original data. We focused on how verbal report data could demonstrate the enactment of readers' orientations and attitudes toward knowledge (what counts as knowledge) and knowing (how one comes to know) in the vast information space on the internet (Greene, Muis, & Pieschl, 2010; Hofer, 2004). Accordingly, verbal protocol analysis was driven by a research question generated in part by the initial analysis of data which revealed readers' epistemic beliefs: how do adolescent readers activate and engage epistemic beliefs when performing a critical online reading task? That is, we focused on what we refer to as *epistemic processing* in online reading (Cho, Woodward, & Li, 2018).

Because the verbal report data was generated in an authentic space (i.e., participants' internet moves were not restricted, and they could engage in self-selected strategies in relation to their beliefs), our data analysis reflected the richness of the context itself. For example, Figure 23.2 draws on excerpts from two contrasting cases that imply how readers' verbal reports could be interpreted in relation to the context in which they were given. In the first example, the student demonstrated an emotional connection to the topic throughout the session (e.g., "is upsetting"). As she encounters new information—the influence of mountaintop mining on streams—she recalls previously learned information about the mining practices, deforestation, and the greenhouse

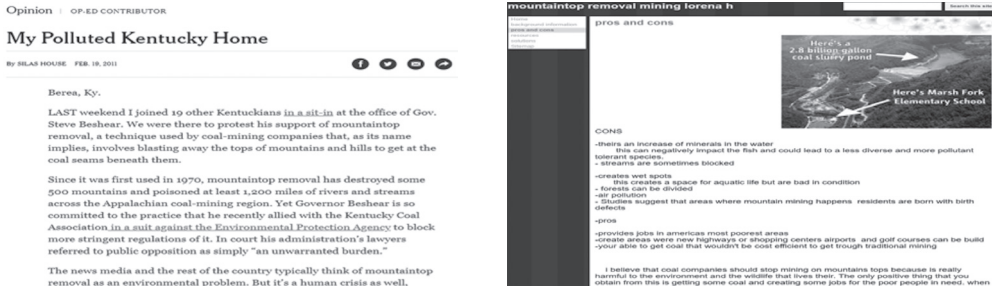


Figure 23.2 Contextualized Coding and Analysis of Verbal Protocols

effect (e.g., “I’m thinking about the sites that I’ve read today”). She then connects the two ideas, making a knowledge claim that there is a connection between the greenhouse effect and the disappearance and polluting of streams. The ongoing dialogue that this participant created among multiple internet sources and herself contributed to understanding her epistemic engagement in interrelating and reconciling different perspectives. A similar contextual relevance is found when examining the second excerpt in Figure 23.2, but the comment therein is representative of the epistemically naïve process that this participant engaged in throughout his session. Above all things, this reader gets lost in his text-selection (e.g., “I have no idea ... where I have to start”). While he does engage in several strategic approaches, the actions taken fail to demonstrate the depth of knowledge investigation required to learn from the selected texts. This pattern of reading is explained through the epistemic processing analysis, which identifies the confusion he expressed in identifying high-quality sources.

When conducting an analysis of verbal report data, there are a number of influences that the study design and methods employed have on both the data generated and the subsequent data analysis. As glimpsed from our work, however, with the nuanced knowledge of the investigators about the context of research task, verbal protocol analysis may evolve and create a new opportunity to examine different aspects of strategic processing. To highlight, the analyses of verbal reports using different lenses provided by affiliated paradigms can inform our understanding of the broad range of factors that operate with strategic processing at the intersection of cognitive and epistemic engagement.

DATA SATURATION AND DECISION MAKING ABOUT WHEN TO STOP OR GO FURTHER IN VERBAL PROTOCOL ANALYSIS

Analyzing verbal protocols is an iterative process. In particular, a critical aspect of verbal reporting data analysis relates to choosing, revising, or creating a coding framework that is best suited to describing the data (Bogdan & Biklen, 2007). That said, typically, a first consideration is determining how a particular coding framework may be effective in helping to decide the units of analysis that will be used. Chi (1997) recommended the following when considering verbal reports: “(a) the grain size of the segment, (b) the correspondence of the grain size to the questions one is asking, (c) the characteristics in the data used for segmenting, and (d) when it may not be necessary to segment” (p. 284). While it is important to draw on existing literature and the data

collected to inform the nature of analysis, the units of analysis may need to be adjusted once coding has begun if the unit used is not sufficient to determine whether or not a particular code describes certain strategic processes underlying the corresponding verbal reports.

Coding frameworks in qualitative data analysis are either established a priori from existing literature or theoretical frameworks, or they are informed by existing theory but emerge from the data itself, typically drawing on grounded theory analysis approaches (Corbin & Strauss, 2015; Glaser & Strauss, 1967). It is important to refine the coding framework until it sufficiently describes the data, especially when verbal reports involve “discovery”—aspects of a phenomenon that have not been previously cataloged. We take an example of this process again from our study of epistemic processing in online reading (Cho et al., 2018). Figure 23.3 shows the structure of epistemic processes involved in online reading that were operated at multiple levels, grounded in the verbal report data of the participating high school students.

In this structure, the top-level categories (i.e., epistemic judgment, epistemic monitoring, epistemic regulation) were not related only to dimensions found in previous literature (Barzilai & Zohar, 2012; Greene, Yu, & Copeland, 2014; Hofer, 2004) but were also supported by our data. The next level of category (e.g., acritical, surface-level, and critical processing within epistemic judgement) describe the qualities of strategy use in relation to judgments of internet sources. The third level categories (e.g., noticing authority and probing authority within surface-level processing) identify specific actions or dispositions and their qualities found in the data. This multilayered structure of coding depicts how the initial framework was further refined, interrelated, and reorganized to best describe the data collected in our study.

This process can be described as data saturation, which Corbin and Strauss (2015) outline as having the following characteristics: “no new or relevant data seem to emerge regarding a category, the category is well developed in terms of its properties and dimensions demonstrating variation, and the relationships among categories are well established and validated” (p. 212).

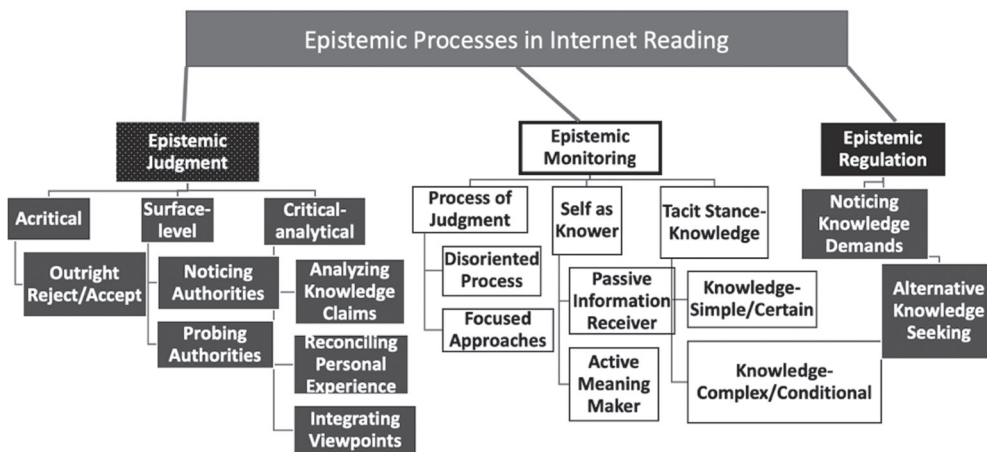


Figure 23.3 Multilayered Coding Structure of the Epistemic Processes in a Critical Internet Reading: A Grounded Theory

In our example, the existing literature and the recursive analysis of our data worked together to inform a robust coding scheme that sufficiently captured the multilayered and multifaceted structure of the epistemic processing apparent in our data set. Therefore, as the coding scheme becomes more developed and represents more of the data, the coding process becomes less challenging as the data more readily fit the descriptive categories of the coding scheme.

While this process is important to describing the data within one study, we note that theoretical saturation may not always occur within a single study. As described in the previous section, the mental models of strategic processing in internet reading have been challenged, questioned, revised, and refined by attending to underexamined aspects of reading (i.e., epistemic processing) and the underlying factors that influenced them (e.g., uncertainties of online information space and readers' responses to the contextual features). This window into previously unresearched phenomena is an important affordance of the verbal protocol analysis and has contributed to the subsequent development of research questions and data analysis. As such, through building on previous works, researchers may be able to seek to foreground the importance of replication and multiple contexts to understanding what a single study contributes, or not, to an overall understanding of strategic processing and the possibility of reaching data saturation within a single study, while recognizing that theoretical saturation requires subsequent research.

ARGUMENTATION AND EVIDENTIARY REASONING IN QUALITATIVE VERBAL PROTOCOL ANALYSIS

Verbal protocol analysis involves an argument process. It requires a logical reasoning concerned with the experiences of human subjects and the processes they engage in to navigate and make sense of the world (Bogdan & Biklen, 2007). Chi (1997) elaborated on this idea within the context of verbal report data regarding the potential of qualitative methods to capture participants' natural behaviors in authentic settings to gain a "richer and deeper understanding of a situation" (p. 280). Central to developing claims in qualitative research are the data analysis procedures used to identify evidence of a particular phenomenon. However, this process is not without challenges because "coding of verbal reports is an interpretive act" and "the richness of language and the constructive nature of understanding language" present both the promise and the challenge of making a legitimate claim substantiated by verbal reports (Pressley & Afflerbach, 1995, p. 122).

Because qualitative research is primarily inductive and grounded in data, rather than deductive or beholden to theory, there is particular importance placed upon the conceptual frameworks that ground the study and contribute to the inferences made from the data (Merriam, 1998). Thus, the coding of qualitative data typically includes a robust explanation of both previous research, related theory, and their contributions to the emerging data coding and analysis schemes. Further, as in quantitative research, the methods of analysis are discussed at due length; however, the involvement of the researcher as an analytical instrument (Patton, 1990) often engages additional discussion on the methodological decisions made (i.e., rationale that supports why a particular method, approach, and procedure is chosen, employed, or modified within the context of its use).

We present the path of argumentation undertaken in our verbal protocol analysis concerning epistemic processing for online reading (Cho et al., 2018). As outlined in Figure 23.4, the diagram (informed by Toulmin's (1958) argument model) unpacks the reasoning process into the following components:

- **Claim:** The assertions made about the focal aspect of investigation about epistemic processing in online reading.
- **Data:** The verbal report data collected from a suitably designed research task and the results from the qualitative verbal protocol analysis in relation to codes, categories, and themes of epistemic processing in online reading.
- **Warrant:** Theoretical framework that describes what epistemic processing means in online reading, why the studies of the topic matter, and how it can be investigated.
- **Backing:** Empirical studies that use verbal protocol analysis to examine epistemic processing in online reading and therefore elaborate the theoretical framework.
- **Qualifiers:** Conditions that limit the claim made from evidentiary reasoning.
- **Rebuttals:** Counterclaims, alternative explanations, or limitations that could be suggested in response to the claiming and reasoning.

We first sought to examine why epistemic processing matters in online environments through an overview of the theoretical literature in the areas of personal epistemology and internet reading, which serves as the *warrant* for our study. We drew on previous work that established theories for understanding how epistemic beliefs influence learning processes (Hofer & Pintrich, 1997), the relationship between epistemic beliefs and cognitive processing (Hofer, 2004), and established what we meant by epistemic processing and addressed relevant concerns regarding measurement issues related to personal epistemology (Cho, 2014; DeBacker, Crowson, Beesley, Thoma, & Hestevold, 2008; Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012; Greene, Azevedo, & Torney-Purta, 2008). Our exploration of theoretical warrant extended to a discussion of the perspectives informing our understanding of epistemic processing in online reading, which included recognizing the intertextual nature of the internet (Landow, 1992), complexities of identifying sources of information (Lankes, 2008; Metzger & Flanagan, 2013), and the sophisticated and critical mindset needed to seek and gain knowledge from reading online (Greene et al., 2014; Lankshear, Peters, & Knobel, 2000; Ulyshen, Koehler, & Gao, 2015).

We then drew on additional research to expand these theoretical understandings to other studies which sought to utilize verbal reporting methods to investigate the role of epistemic beliefs in online reading, as *backing* for the warrant established in theoretical overview. We discussed the contributions and limitations of the selected empirical studies related to the particular dimensions of epistemic beliefs (Hofer, 2004), how individual differences of readers could interact with epistemic beliefs when reading online (Mason, Boldrin, & Ariasi, 2010a), the relationship among sophisticated epistemic beliefs, searching processes, and understanding (Mason, Boldrin, & Ariasi, 2010b), the influence of a particular topic on the enactment of epistemic beliefs (Ferguson, Bråten, & Strømsø, 2012), the role of self-regulation and epistemic processing in learning from online sources (Greene et al., 2014), and the processing related to

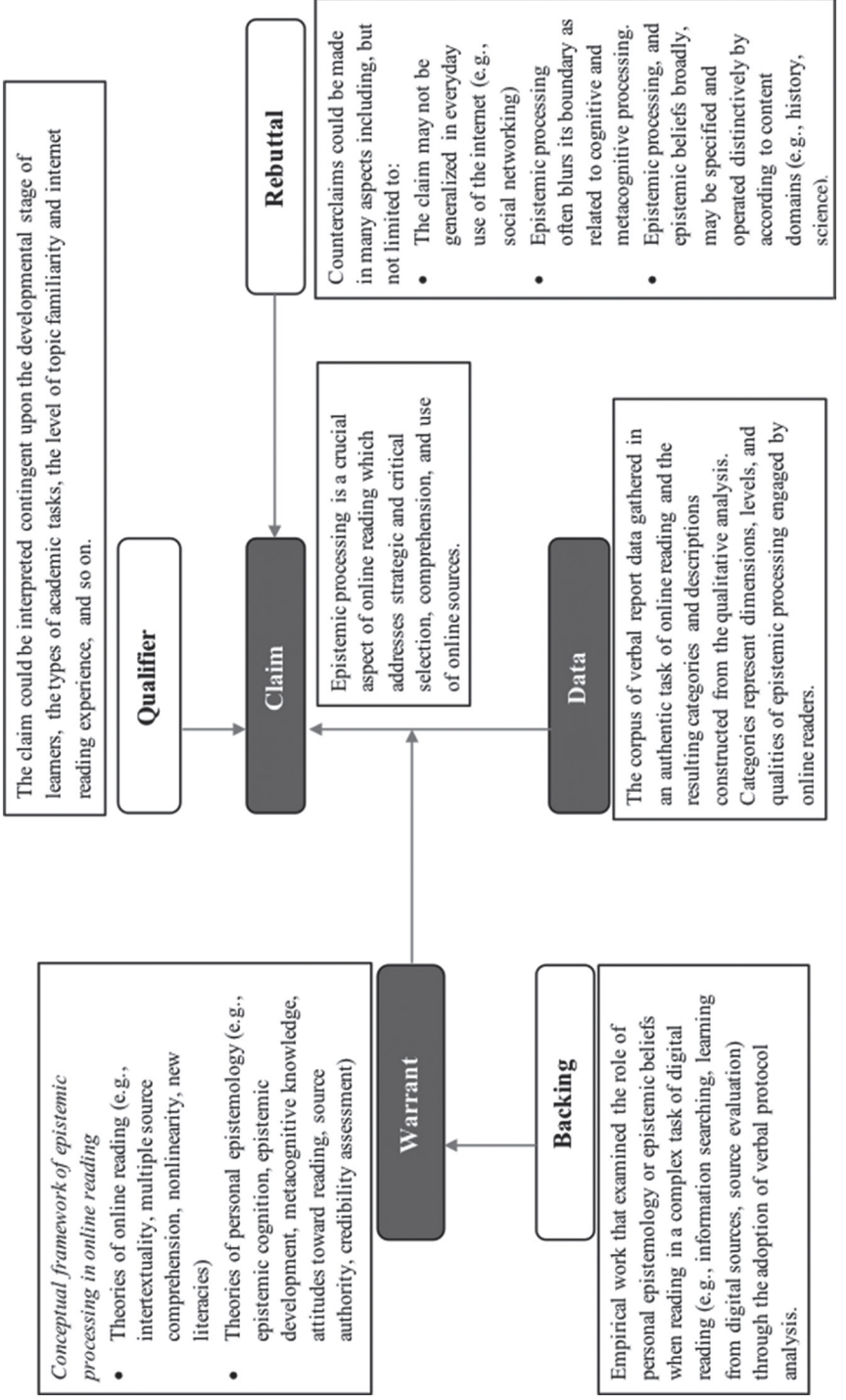


Figure 23.4 A Simple Representation of Argument Reasoning Engaged in Verbal Protocol Analysis of Epistemic Processing in Online Reading

views that readers may hold about the nature of knowledge (Barzilai & Zohar, 2012). Having presented the previous warrant and backing, we argued that in order to build on the existing understanding of epistemic beliefs and online reading, it is also important to understand the epistemic processes readers employ in an unconstrained digital space and which particular processes are undertaken by more and less successful readers. In one way, we hope to build a theoretical net which is capable of capturing and then explaining the phenomena reported in participants' verbalizations.

We used readers' concurrent verbal protocols as *data* that is particularly well-suited for capturing the moment-to-moment processes of readers as they navigate a multi-source text environment. We first identify the context of data collection and detail the types of data and methods used to collect it. Then, we describe how the data was prepared for analysis, which included transcripts of participants' verbal reports along with the screen capture of their actions. The transcripts were then open coded using semantic segmentation of data (Chi, 1997), which allowed for particular thoughts or actions to be contextualized within a larger chain of processing. This initial coding focused on a small sample of data to identify all possible instances of epistemic processing. Subsequent coding involved comparison of the researcher-generated codes to develop superordinate code categories which were then integrated into a coherent coding scheme. The remaining data was analyzed in a process of axial coding with the initial coding scheme to refine and improve it throughout the data analysis process. Because a primary purpose of our study was to investigate the epistemic processes that emerged from the data, the explanation of the categories and related dimensions and actions were the first major *claim*. In addition to descriptions of epistemic judgment, monitoring, and regulation, verbal report data was presented to exemplify each element of the three larger categories (Cho et al., 2018, pp. 209–210).

Our findings were then discussed relative to the nomological network provided by prior theory and research. This also allowed us to *qualify* the context in which our claims were grounded and recognized that our study did not capture students who were not likely to be proficient at thinking aloud, nor the knowledge that is gained when seeking to understand as part of a collaborative effort. However, the study did yield evidence about how the individual epistemic processes of students experienced more and less success during their reading task. Yet, there are other potential limitations of (or counterclaims against) our study that must be addressed in any discussion of our findings. These include the critical questioning task that may not reflect the ways in which students learn from online sources in more personal spaces, the nature of the task design to be situated within a school context, and the non-verbalized beliefs that learners may hold. Further, research on domain expertise indicates that lack of domain knowledge and understanding of disciplinary practices (Maggioni, Fox, & Alexander, 2010; Warren, 2011) may also shape the process of online reading.

In summary, argumentative reasoning is an essential part of the verbal protocol analysis that seeks to achieve a methodological rigor and theoretical contribution to generating new knowledge and insights. Such evidentiary process requires connecting the research work to a robust conceptual framework built upon previous studies of key constructs to be examined, and to a thoughtful consideration of counter claims and alternative explanations. Through the process, researchers may be able to seek to not only establish a clear ground for the claims that emerge from the data but also to clarify the importance of our findings through acknowledging additional and alternative perspectives.

REMAINING ISSUES IN THE QUALITATIVE ANALYSIS OF VERBAL REPORT DATA

As reviewed in this chapter, and in relation to our own research, qualitative analysis of verbal report data has many challenges. These challenges, to name a few, include identifying and accounting for the contextual influences of tasks on verbal reporting, and acknowledging the sometimes ambiguous boundaries within which verbal report data can describe a particular type of strategic processing of interest, but beyond which the inference of strategy or process is not warranted. Finally, the complex argumentative work on a claim made for strategic processing ought to be substantiated by evidence of verbal data and theoretical reasoning to bond the claim and evidence, which should result in a robust understanding of the particular phenomenon being studied. However, we counter that these issues can be addressed with detailed accounts of the variables and their influences involved in research task. We note that qualitative analysis, as opposed to quantitative work, embraces the *complications and interweaving* nature of strategic processing across a series of critical moments. Sophistication about such nuances and complexities and revelation of possible factors that might have affected the process by active use of *contextual knowledge and situated reasoning* is one of the powerful virtues that a rigorous and sophisticated qualitative analysis can achieve.

We support that verbal protocol analysis is *a system of methods* that is useful for the scientific investigation of what strategic processing is and how it works. The purpose of verbal protocol studies of reading is to know what the reader is doing and thinking while performing a cognitive task, which can be achieved through situated inferences that are made from the real-time language data collected through carefully designed procedures for verbal reporting. Such analysis can challenge and help us to detail the nature and process of decision making and thinking engagement in the comprehension of readers with different tasks (e.g., Hartman, 1995; Wolfe & Goldman, 2005), texts (e.g., Eva-Wood, 2004; Gottlieb & Wineburg, 2012), and environments (e.g., Azevedo, Guthrie, & Seibert, 2004; Coiro & Dobler, 2007). This stance is undergirded by accumulated methodological work suggesting verbal reports as a helpful source of information (e.g., Fox et al., 2011) by which we can look into not only readers' conscious, goal-directed, and strategic acts of reading (e.g., Pressley & Afflerbach, 1995; Suh & Trabasso, 1993) but also the mental representations built through such processing (e.g., Chi, 1997; Tenbrink, 2015).

We note that reliable inferences made from verbal data have significant contributions to exploring, building, and refining theoretical models of and perspectives on reading in complex tasks and contexts (Cho & Afflerbach, 2018; Pressley & Afflerbach, 1995). What must be reiterated here is that what could be inferred from a participant's verbal data depends on our acuity with theoretical confidence in response to the subtleties, nuances, and complexities of what verbal utterances mean and represent; all of such inferences are contingent on the task, the context, and the participant. For example, a conclusion drawn from what verbal data tell us about reading can be therefore bolstered in association with, and is often disrupted by, a method of *triangulation* (Denzin, 1970) that interrelates other complementary data sources such as behavioral, biometric, and outcome data that are sensitive to detect the influences

of how reading works in that complex coordination of relevant variables on the substance of the verbal data (Bråten, Magliano, & Salmerón, in press; Magliano & Graesser, 1991).

At the same time, we also note that central to the credibility of a qualitative study is *transparency* in data collection and analysis. A robust explanation of the procedures and factors involved in verbal protocol analysis increases the trustworthiness of findings (Lincoln & Guba, 2000). Reporting contextual information about both the participants and the researcher, and the procedures they have been through, is critical to a publishing of qualitative work in general, and verbal data analysis especially. Both verbal protocol experts (Afflerbach, 2000; Chi, 1997) and qualitative methodologists (Cresswell, 2014; Denzin & Lincoln, 2005) address the importance of *disclosure* in qualitative work. Qualitative data produces a rich understanding of particular phenomena, which is closely tied to both the participants and the context in which the data is produced. Thus, it is critical to disclose that information which directly relates to verbal data analysis when reporting the results of a study.

More important is disclosure related to *researcher positionality*, which is shaped by theoretical approaches that inform the design and purpose of the study and securing data sources that best demonstrate the focal aspects of the study (Denzin, 1986; Miles, Huberman, & Saldana, 2014). The theoretical approaches to qualitative verbal data analysis serve to disclose the orientations and perspectives used by the researchers to both design their study and inform their data analysis. Establishing a clear position within the existing literature is an important contribution to the credibility of reports of qualitative verbal data analysis. Therefore, theoretical positioning and orientation of the researcher must be completely disclosed, due to the potential influence that these elements have not only on the process of data collection and analysis but also on the consequent claiming and reasoning about strategic processing in reading.

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