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Maris F. Cutting

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PERSPECTIVE-TAKING ACCURACY

ON A CONCEPTUALLY COMPLEX PROBLEM

by

MARIS F. CUTTING

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ABSTRACT OF THE DISSERTATION

Perspective-Taking Accuracy
on a Conceptually Complex Problem

By MARIS F. CUTTING

Dissertation Director:

Clark A. Chinn

Perspective taking is the process of constructing an understanding of other persons' ways of conceptualizing and responding to situations. It involves the effortful employment of strategies that enable individuals to visualize, understand, anticipate, or predict the perceptions, thoughts, feelings, or actions of others. This is achieved when the observer attempts to create a mental model that corresponds to another's own mental model of situations. The present research was designed in the context of a model that views perspective taking as a process of constructing a representation that varies in difficulty according to (a) the degree of similarity between the perspective taker and the target person and (b) the degree of similarity between the perspective taker's own life situation and that of the person whose perspective is taken (target situation) (Cutting & Chinn, 2007).

The perspective-taking problem provided to participants (college students enrolled in an educational psychology course) is unlike most prior research on

perspective taking. It required them to predict how a conceptually novel target person (a villager living in Los Molinos, Peru) responded to a dissimilar situation (introduction of water purification practices). Multiple source documents on this topic provided opportunities for participants to seek out information and adjust their mental models accordingly. In addition, a variety of prompts and scaffolds to promote strategy use were examined for their influence on perspective-taking accuracy. Results from this study showed that brainstorming multiple predictions facilitated initial prediction accuracy and that new information in critical source documents enhanced final prediction accuracy. However, cognitive biases, such as rationalizing anomalous information and confirmation bias, interfered with correcting inaccurate predictions.

Acknowledgement/Dedication

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CHAPTER 1

Introduction

Perspective taking, the ability to understand and predict the thoughts, feelings, and behaviors of others, is an important component of social cognition. It impacts not only communication with others in academic, work, and social settings, but also success in understanding those with whom there is no direct contact. Therefore, it is important for communication within particular places and times as well as across them. Transnational and cross-cultural perspective taking help to bridge barriers in an increasingly complex and global world. Inter-generational and historical perspective taking make it possible to understand the past and how it continues to shape, for better or worse, the present and future.

Perspective taking is both pervasive and poorly understood. It affects many different domains of knowledge. Research on reading has shown that perspective taking is an important component in narrative processing, shaping what is remembered by the reader (Anderson and Pichert, 1978; Pichert and Anderson, 1977). This is accomplished as the reader constructs a mental representation (situation model) that corresponds to that of the protagonist in the story (Ziegler, et al., 2005; Zwaan, 1999). Noice and Noice (2002) found that actors use perspective taking to engage in *active experiencing*, a technique for getting inside the head of a character.

In the health sciences, perspective taking (Lobchuk and Vorauer, 2003), empathy (Lebeau, 1998; Loewenstein, 2005) and narrative competence, (Hurwitz, 2000; Charon, 2001a and 2001b), are viewed as important components of patient-centered medical practice and medical decision making, helping to improve diagnosis, care, and

medical outcomes. Neurobiologists such as Shamray-Tsoory et al. (2005) and Ruby and Decety (2003), among others, have investigated the neuroanatomical basis of perspective taking to gain a better understanding of the brain structures involved while individuals are engaged in perspective taking tasks.

In the domains of history (e.g., Davis, 2001; Wiley & Voss, 1996; and Wineburg, 1998) and international affairs (e.g., Kimmelmeier & Winter, 2000), researchers and practitioners have noted the important role played by perspective taking in understanding individuals and societies separated by time, geography, and culture. Understanding individuals within the context of their own society and/or epoch is critical for appreciating the importance of context in shaping individuals and societies.

Moreover, in education, successful teaching depends, to a large extent, on an instructor's ability to determine what students already know, what misconceptions may interfere with new learning, and what approaches and strategies may enhance learning. Therefore, cultural competence (e.g., Miranda, 2002) and the ability to scaffold student learning along the way (e.g., Hogan & Pressley 1997) are vitally important for successful outcomes. Perhaps, still more importantly, perspective taking has been linked with altruism (e.g., Batson, et al., 2003) and other prosocial behaviors.

With this wide array of disciplines that depend on successful perspective taking, it is not surprising that the investigation of perspective taking cuts across various branches of psychology (educational, social, industrial, developmental and cognitive, to name just a few) as well as interdisciplinary fields such as healthcare and neuroscience. Much of this literature suggests that the way individuals view themselves strongly influences how they regard others.

Initial Research on Perspective Taking

This dissertation study derives from initial research that tested several different perspective taking scenarios and prompts to identify tasks with the potential to highlight cognitions during perspective taking. In contrast to most perspective taking research, which employs tasks in which individuals attempt to take the perspective of people much like themselves in familiar situations, these scenarios involved dissimilar perspective taking targets (e.g., villagers living in a third world country and an elderly couple living in early 20th Century Poland) in relatively dissimilar situations (e.g., dire health consequences resulting from a polluted water source or a reunion with a long absent son). This research showed that participants had difficulty taking the perspective of dissimilar target persons in dissimilar situations.

The Present Study

Because this study addresses perspective-taking accuracy, I decided to base my perspective-taking tasks on real events with known results, in this instance a 1955 case study that reported the results of long-term efforts by healthcare workers to convince the inhabitants of Los Molinos to boil their unsafe drinking water. Two individuals discussed in the Los Molinos case study were represented in the tasks for the current research. Neither ended up boiling their drinking water. The tasks for the current research employed perspective taking target persons (two villagers from Los Molinos, Peru) in a situation (efforts by a healthcare worker to convince them to boil their contaminated drinking water) that is likely to be unfamiliar to and dissimilar from study participants and their own experiences.

Results from initial research (Cutting & Chinn, 2005) showed that perspective taking with dissimilar target persons and situations is more difficult than with similar target persons and situations. This is particularly true for target persons and target situations that are so different from the observer that they might have very different conceptual categories for viewing the world. In such instances, successful perspective taking may require new learning that changes existing ideas and beliefs, something very like conceptual change.

The purpose of the present research was to determine how individuals responded when engaged in a complex perspective-taking task. What strategies did they use? What cognitive tools at their disposal were helpful for understanding others? What obstacles impeded a successful overcome? In order to answer these and other questions, the present research employed a task that required a considerable amount of effort. Perspective taking targets that were similar to the observer or one-time performances without benefit of feedback or opportunities to monitor and correct the process could not begin to uncover the complexities of this process. For this reason, the present research employed a task that required study participants to take the perspective of an individual from another decade, location, and culture, someone who was very different from themselves and living in circumstances that were likely to be very different from any they had previously encountered.

In addition to developing tasks that involved perspective taking with dissimilar or conceptually novel targets in dissimilar situations, the tasks themselves provided opportunities for extended engagement in a perspective-taking problem. In order to create a task in which study participants had multiple opportunities to seek out additional

information, monitor their accuracy, and make adjustments to their understanding or predictions, I employed a perspective-taking task that utilized source documents.

The present research used source documents derived from an anthropological case study (Wellin, 1955) about the attempt of a healthcare worker to convince community members to change their practices and begin to boil their contaminated drinking water. There were many obstacles to this effort, including cultural traditions, poverty, and resource allocation. In this case study, Mrs. E (a poor housewife who wanted to improve her sanitary practices) and Mrs. F (a culturally conservative older woman) were visited regularly by Nelida, a healthcare worker. In fact, neither of them ended up boiling their drinking water. However, their reasons for not doing so were very different. To be completely accurate, participants had to arrive at the correct prediction and for the right reasons. Mrs. E did not boil her drinking water because she was too busy to undertake any new responsibilities. Mrs. F did not boil her drinking water because she had a very different conception of the cause of disease derived from her culture. She was unable to change the habits and beliefs of a lifetime.

After reading an initial scenario that introduced the problem and one of these two individuals, participants selected, read, compared, and evaluated various source documents and used them to construct a representation of the target individual (Mrs. E or Mrs. F) in order to predict if she ended up boiling her drinking water. The participant's task, therefore, was to create a model of the target person and target situation in order to make a prediction about what most likely resulted from Nelida's efforts. To help them accomplish this, half of the participants were provided with cognitive tools to help them brainstorm multiple predictions, to evaluate documents, and concurrently update their

current thinking about what was likely to happen. In addition to the potential for shedding light on the strategies employed by perspective takers to understand complex problems, this research attempted to investigate the use of multiple source documents in a new domain.

CHAPTER 2

Literature Review

Research on perspective taking is scattered across many different bodies of literature. This review synthesizes research from diverse disciplines including educational psychology (e.g., Gehlbach, 2004), cognitive development (e.g., Leslie & Roth, 1993), social psychology (e.g., Batson, 1991), narrative processing (e.g., Morrow, 2001; Zwaan, 1999), patient-centered medicine (e.g., Charon, 2001a), cross-cultural psychology (e.g., Peng et al., 2001), and intelligence analysis (Heuer, 1999). The purpose of this review is to show how research across these varied disciplines has informed the development of a theory of perspective taking that forms the basis for the current research.

The difficulty and complexity of a given act of perspective taking may vary from simple and relatively automatic, as when an employee, upon viewing his boss slam the door to his office, decides not to ask for a raise that day. It may also be effortful and complex, as when a peaceful nation attempts to understand the intentions of a neighboring despot. Similarity to or familiarity with the perspective-taking target person and target situation may play a key role in perspective taking accuracy. The focus of the present research is to examine perspective taking when the target person and target situation are both dissimilar from and unfamiliar to the perceiver. From this vantage point, perspective taking can be viewed, not as a product, but as a process of constructing an understanding of another person's way of conceptualizing and responding to situations (e.g., Davis, 1996) that involves the effortful employment of strategies that enable individuals to visualize, understand, anticipate, or predict the perceptions, thoughts, feelings, or actions of others (e.g., Ames, 2005). According to Cutting and Chinn (2007),

perspective taking is the process of constructing an understanding of other persons' ways of conceptualizing and responding to situations. It involves the effortful employment of strategies that enable individuals to understand or predict the perceptions, thoughts, feelings, or actions of others. This is achieved when the observer attempts to create a mental model that corresponds to another's own mental model of situations. In other words, perspective taking involves an attempt by an observer to reconstruct the representation that the target person has for a particular situation.

According to this model of perspective taking, the difficulty of constructing such a representation varies according to (a) the degree of similarity between the perspective taker and the target person and (b) the degree of similarity between the perspective taker's own life situation and that of the person whose perspective is taken (target situation). Perspective taking becomes more and more difficult with increasing dissimilarity between observer and target person, as well as with increasing dissimilarity with the target situation. This model of perspective taking also specifies four core processes that are used to develop these mental models (schema selection, schema elaboration, monitoring, and model adjustment) and a range of specific strategies that support these processes as well as obstacles to their employment.

Examples of Perspective Taking Across Two Dimensions of Similarity

First, perspective takers can vary in how similar they are to the target person (degree of target similarity). At one end of the continuum, the perspective taker can be *identical* to the target person, as when persons are asked to anticipate how they themselves will respond in a given situation; this is taking one's own perspective. The perspective taker can be *highly similar* to the target person, as when a university student

attempts to take the perspective of a new roommate who comes from a very similar background. Moving further along the continuum in the direction of decreasing similarity between the perspective taker and target person, the perspective taker may be increasingly dissimilar to the target individual, as when the university student attempts to take the perspective of a professor. At the far end of the continuum, the target individual is not only dissimilar to the perspective taker, but may be so different that they possess incommensurable worldviews, as when a U.S. university student tries to take the perspective of a Japanese baseball player. Incommensurable worldviews or conceptions involve concepts for understanding situations that are fundamentally different from each other. The difference is so extreme that the perspective taker may lack the very concepts needed to understand the target individual. To understand the work ethic of a Japanese baseball player it is helpful to understand the concept of Japanese samurai, a concept that may be lacking in perspective takers from very different cultures (Whiting, 1977).

The second aspect of similarity is that of the target situation to situations which the perspective taker has experienced (situation similarity). At one end of the continuum, the target situation is similar (a university student trying to imagine the situation at another university). Moving across this continuum, the perspective taker encounters increasingly dissimilar situations (as when a student from a peaceful suburb tries to imagine life in a war zone). As with target similarity, situation similarity may even involve differences that can be called incommensurable, in which key concepts needed to understand the target situation are lacking. For instance, to understand the significance of events such as the potlatch ceremony among Tinglit Indians, one must first understand the concept of a moiety, which is not precisely like any concept familiar to most U.S.

undergraduates. Cutting and Chinn (2007) refer to incommensurable situations as conceptually novel situations. Table 2-1 provides additional examples of target persons and target situations across these two dimensions of similarity (from Cutting & Chinn, 2007).

Table 2-1

Examples of Two Dimensions of Similarity (Perspective Taker = US College Student)

	<u>Similar situation:</u>	<u>Dissimilar situation:</u>	<u>Conceptually novel situation:</u>
	Students gets a bad grade	Parental divorce	Living in Japan
<u>Similar target</u>	Similar college student gets a bad grade	Similar college student's parents divorce	Similar college student moves to Japan
<u>Dissimilar target</u>	Dissimilar college student gets a bad grade	Dissimilar college student's parents divorce	Dissimilar college students moves to Japan
<u>Conceptually novel target</u>	Egyptian exchange student gets a bad grade	Egyptian exchange student's parents divorce	Egyptian exchange student moves to Japan

Culture may play an important role in both dimensions of similarity. Certainly, cultural differences are likely to be an important source of more extreme differences between perspective takers and target individuals. However, culture may affect the situation as well, and may do so relatively independently of the target individual's culture. For example, those involved in disaster relief in other countries need to be

familiar with customs such as religious observances and burial practices in the afflicted area. In attempting to understand the perspective of a US relief worker in Southeast Asia after a tsunami, it would be important for an outside observer to take into account the cultural constraints that exist within the target situation.

By combining the two dimensions of target and situation similarity, it is possible to achieve a better understanding of the many sources of difficulty in perspective taking. Perspective takers may be asked to take the perspective of similar people in similar situations (e.g., how a very similar college student will respond to a lower-than-expected grade) represented by the top left-hand cell in Table 2-1. As the target individual and/or the target situation become increasingly dissimilar, the task of the perspective taker becomes more difficult as well. In fact, the two dimensions of similarity have very broad ranges; understanding dissimilar people in dissimilar situations can require a process akin to conceptual change. For instance, when reading about an indigenous culture described by an anthropologist, readers may be unable to understand the people described without constructing new conceptual categories that are used by these people to understand their world. The most challenging scenario in Table 2-1 is represented by the bottom right-hand cell, exemplified by a typical U.S. undergraduate trying to predict the reaction of an Egyptian exchange student who studies in Japan. Here the perspective taker has incommensurable schemas for understanding both target person and target situation. Preliminary research (Cutting & Chinn, 2005) suggested that perspective taking becomes more and more difficult with increasing dissimilarity between observer and target person, as well as with increasing dissimilarity to the target person's situation, yet there is very

little research that employs perspective taking tasks that involve dissimilar or conceptually novel target persons or target situations.

Prior Research on Perspective Taking Classified by Two Dimensions of Similarity

Because Cutting and Chinn (2007) argued that perspective taking becomes more and more difficult with decreasing similarity between observer and target person, as well as with decreasing similarity with the target situation, they applied the two-dimensional taxonomy of similarity to prior research on perspective taking. Table 2-2 provides a classification of relevant psychological studies according to these two dimensions. Most psychological studies of perspective taking fall into just two cells. In these studies, participants were asked to take either their own perspectives (e.g., Buehler & McFarland, 2001) or the perspective of people who are quite similar to themselves (e.g., Davis et al., 1996). Moreover, the target persons were in situations that were similar to situations that the perspective taker had experienced. As globalization has highlighted the importance of being able to take perspectives of people in different cultures and situations, this narrow focus presents a serious limit to the applicability of current perspective taking research.

Research on self-accuracy generally has employed situations that require perspective takers to predict their own future state, choice, or behavior, none of which require observers to stretch beyond their own experiences (e.g., Gilbert et al., 1998, 2002). These studies appear in the upper left cell in Table 2-2. Moving down the table to research on perspective taking with similar targets, the vast majority of the studies reviewed for this dissertation employed fictional or real targets that were quite similar to the observer/participants, generally students of the same age and from similar backgrounds. Most of them required students to engage in perspective taking in situations

(e.g., interpreting an answering machine message or the feelings of a relationship partner) with they had likely experienced. A few studies involved situations (e.g. being faced with significant health problems) that they may not have experienced but with which they were likely familiar. Some manipulated target similarity, requiring the perspective taker (usually a college student) to take the perspective of a dissimilar target person (e.g., skinheads and elderly persons). As will be shown later, differences in race, age, geography, or culture across target persons and target situations may influence the selection of strategies employed for perspective taking as well as obstacles to their successful employment.

Table 2-2

Review of Perspective-Taking Literature by Two Dimensions of Similarity

		<u>Target Situation</u>			
		<u>Similar</u>	<u>Dissimilar</u>	<u>Novel</u>	
Target person	Self as target	<p>Buehler & McFarland (2001) Canadian university students; predict own reactions to situations; self</p> <p>Duval & Silvia (2002) US college students; attributions for success and failure; US college students</p> <p>Epley & Dunning (2000) US undergraduates; predictions in social scenarios; self and other undergraduates</p> <p>Gilbert et al. (1998) US college students; predictions about food preference; self</p> <p>Gilbert et al. (2002) US college students; predictions about food preference; self</p>	<p>Kruger & Gilovich (2004) US undergraduates; trait evaluation; self & other undergraduates</p> <p>Lam et al. (2005) Canadian undergraduates; prediction of future emotional states; self</p> <p>Vorauer & Ross (1999) Canadian undergraduates; response to interpersonal problem situations; self</p> <p>Wilson & LaFleur (1995) US undergraduates; prediction of future behavior; self</p>	No studies	No studies

(table continues)

Table 2-2 (continued)

Review of Perspective-Taking Literature by Two Dimensions of Similarity

		<u>Target Situation</u>			
		<u>Similar</u>	<u>Dissimilar</u>	<u>Novel</u>	
Target person	Similar	Batson et al. (2003) US college students; assignment to different tasks; US college student	Kruger (1999) US undergraduates; ability comparison; US undergraduates and self	No studies	No studies
		Bernstein et al. (1982) US female college students; Problem-solving scenario; US female college student	Lobchuk & Vorauer (2003) Family caregivers; patient care; cancer patients		
		Davis et al. (1996) US college students; discussing college; college student	Moore (2005) Members of university community; negotiation scenario; self and other members of university community		
		Drolet et al. (1998) US MBA students; negotiation; US MBA students	Oswald (1996) Adults attending college; decision to attend college; adult		
		Epley et al. (2004) US college students; interpret answering machine message; unspecified other person	Oswald (2002) Adults attending college; decision to attend college; adult		
		Hodges et al. (2002a) US college students; comparison of religious behaviors; US college students and self			
		Ickes et al. (1990) Acquainted US college students; videotape of their conversation; acquainted US college students			

(table continues)

Table 2-2 (continued)

Review of Perspective-Taking Literature by Two Dimensions of Similarity

		<u>Target Situation</u>			
		<u>Similar</u>	<u>Dissimilar</u>	<u>Novel</u>	
Target person	Similar	<p>Senecal, et al (2003) French Canadian couples; emotional scenarios; romantic partner</p> <p>Simpson, et al (1995) Romantic couples; evaluation of pictures of opposite sex; romantic partner</p>	<p>Stinson & Ickes (1992) US male college students; unstructured interactions; US male college students</p> <p>Van Boven, (2000) US college students; beliefs about affirmative action; US college</p>	<p>Batson, et al. (1997) US colleges students; woman in distress; young woman</p> <p>Davis et al. (2004) US college students; woman's health problems; woman</p> <p>Dixon & Moore (1990) Children; evaluation of behavior; mother</p> <p>RoBnagel (2004) German under-graduates; give directions; experimenter</p>	No studies

(table continues)

Table 2-2 (continued)

Review of Perspective-Taking Literature by Two Dimensions of Similarity

		<u>Target Situation</u>			
		<u>Similar</u>	<u>Dissimilar</u>	<u>Novel</u>	
Target person	Dissimilar	<p>Ames (2004a) US university students; various situations; graduate students/selected fields</p> <p>Ames (2004b) Columbia U. undergraduates; pop culture preferences; suburban high school, graduate, and Berkeley students</p> <p>McPherson Frantz & Janoff-Bulman (2000) US college students; conflict situation; parents or adolescents</p>	<p>Galinsky & Moskowitz (2000) US college students; none; skinheads & elderly persons</p> <p>Ruby & Decety (2003) Medical students; respond to health-related questions; self & lay person</p>	<p>RoBnagel, C. S. (2000)</p> <p>German undergraduates; instructions for toy assembly; young boy & undergraduate</p> <p>Wiley & Voss (1996) US undergraduates; reading and writing about history; 1800-1850 Ireland</p> <p>Wineburg (1998) Historians; reading documents; Abraham Lincoln</p>	No studies
	Novel	No studies	No studies	No studies	No studies

Core Processes Employed During Mental Model Building

In addition to employing dissimilar and conceptually novel target situations and target persons, the current research differs from earlier research on perspective taking in attempting to isolate core cognitive processes involved in perspective taking. Cutting and Chinn (2007) argued that this involves building a representation of the target person and target situation that is congruent with that held by the target person by using the hypothesized four core processes for mental model building: schema selection, schema elaboration, model adjustment, and monitoring. Each process is associated with a cluster of strategies that can be employed to carry out the process. The four core processes and their attendant strategies are outlined in Table 2-3.

Schema selection strategies are employed for choosing an appropriate initial schema for understanding a target person or target situation. Schema elaboration enables the perspective taker to flesh out schemas by generating causal explanations. Model adjustment permits the perspective taker to alter the mental model under construction so that it provides a better match to the perspective-taking problem. Monitoring strategies are employed in conjunction with schema selection, elaboration, and adjustment strategies. Some specific strategies in these categories listed in Table 2-3 and discussed in this literature review have been well researched in the psychological literature, while others are speculative and require substantiation through the sort of research undertaken for this dissertation.

Table 2-3

Cognitive Strategies Employed during Model Building

Selection strategies	Elaboration strategies	Monitoring strategies	Adjustment strategies
Select single relevant schema or case	Generate causal	Suppress ill-fitting situation &/or target	Individual model adjustments
<ul style="list-style-type: none"> • Retrieve the self schema (projection) • Retrieve memories of similar situations • Use stereotypes • Search for analogies • Generate general abstract schemas, e.g., general cultural schemas or general purpose difference schemas • Suppress ill-fitting target person or target situation schemas 	explanations <ul style="list-style-type: none"> • Unpack schemas 	schemas <ul style="list-style-type: none"> • Suppress self perspective • Recognize you have no appropriate schemas • Reduce confidence and maintain low belief when strong belief unwarranted • Refrain from inserting familiar schema components when making adjustments 	<ul style="list-style-type: none"> • Extrapolate from a less extreme instance/person • Relativize traits • Make correlated adjustments to schemas Schema Melding <ul style="list-style-type: none"> • Meld person schemas or situation schemas • Modify stereotypes by merging or averaging more than one schema • Meld person schema with situation schema
Select multiple relevant schemas or cases		Compare alternative models	General-Purpose-Model Modification Strategies
<ul style="list-style-type: none"> • Select alternative schemas • Select alternative related schemas that may be melded together 		Be alert to anomalies Consider differences between self/own situation & others/their situations	<ul style="list-style-type: none"> • Incorporate additional target information • Generalize from specifics • Use general difference schemas to generate ideas for new model elements
Seek out instruction		Gather external information to test model: Make and check predictions	<ul style="list-style-type: none"> • Abduce explanations for discrepancies

Research on Core Processes Employed During Mental Model Building

This literature review examines relevant prior research on perspective taking as it informs each of the four core processes proposed by Cutting & Chinn (2007).

Additionally, the psychological literature is rich in studies on cognitive biases and other factors that impede social cognition, in general, and perspective taking in particular.

Some of these obstacles to perspective taking specifically impact one of the four core processes. However, there are also crosscutting obstacles such as motivation and

cognitive load that are non-specific in their effects. In the following section, prior research on schema selection, elaboration, monitoring, and adjustment strategies are

discussed in turn. This is followed by a discussion of obstacles to perspective taking.

Finally, this literature review concludes with an examination of three bodies of research that inform the current perspective-taking task: research on cross cultural understanding, conceptual change, and the use of multiple source documents to enhance learning.

Research on Schema Selection Strategies

When people take perspectives, they often seek relevant schemas of target persons and situations to assist their perspective taking efforts. The choice of a particular set of schemas to assist with perspective taking depends on the perspective taker's individual life experiences, background knowledge, the proposed two dimensions of similarity, and, importantly, the context in which perspective taking takes place. In many cases, schema selection strategies are employed in conjunction with monitoring, elaboration, and adjustment strategies. Although the four core processes are discussed separately for purposes of analysis, this in no way implies that they take place in isolation or in a particular sequence.

Individuals may select a single pre-existing schema or case for the target person and target situation, and much of the literature reviewed suggest that this is the most common approach. In this study, participants often reported that they had based their initial predictions on the schema they had for themselves, what they would do if they were educated about the necessity of boiling contaminated water. A few participants in the Mrs. F task (older, culturally conservative woman) mentioned an elderly relative who formed that basis of their initial thinking about the task. If later these schemas or cases are found to be inadequate or incomplete, the perspective taker may find it appropriate to elaborate or adjust them in order to provide a better fit.

Cutting and Chinn (2007) specify a series of schema selection strategies, many of which have been researched by others, as well as additional plausible schema selection strategies, that have yet to be studied. All of these strategies are listed in Table 2-3, column 1, and Tables A-1 through A-4 indicate their possible utility across the two dimensions of similarity. (For example, selection of the self schema may be a useful strategy for similar targets but is likely to be inappropriate for dissimilar or conceptually novel targets.)

Retrieve the self schema. The simplest schema selection option is simply to retrieve the schema for the self. Often called *projection* in social psychology literature (e.g., Hodges, Johnsen, & Scott, 2002; Van Boven & Loewenstein, 2005), this schema selection strategy is relatively easy to employ, requiring the least amount of effort (Krueger et al., 2005). The observer need only use the existing schema about the self rather than build a new one. This strategy is employed when perspective takers believe (perhaps mistakenly) that there is a very high degree of similarity between themselves

and the target person (Ames 2004a, 2004b, 2005). Self schemas are more likely to be chosen inappropriately when there is diminished cognitive capacity available for processing or scant motivation to engage in the mental effort required for building a schema (Davis, 1996; Epley, Keysar, Van Boven, & Gilovich, 2004; Gehlbach, 2004).

Retrieving the self schema might seem to be a useful strategy for perspective taking with identical and similar targets. However, even for quite similar target individuals, this strategy will not necessarily result in understanding the perspective of the target individual as this strategy depends, to a great extent, on the perspective taker's own self-understanding (Wilson & Dunn, 2004). Gilovich et al. (2005) noted that the tendency for automatic positive expectations about the self combined with selective self-testing of these expectations often lead to biased self-perceptions.

Ames' (2004b, 2005) similarity contingency model of projection and stereotyping posits that, in ambiguous situations where there is little behavioral evidence available, perspective takers employ either the self schema or stereotyping, selecting one over the other based on their perceived similarity to the target. Many researchers (e.g., Davis et al., 1996; Davis et al., 2004; Galinsky & Moskowitz, 2000) found that perspective-taking instructions, such as the prompt to "put yourself in another person's shoes," led to increased overlap between the observer's self-described traits and those they ascribed to a similar target. This was particularly true for positive traits (Davis, et al., 1996). Thus, when encouraged to take the perspective of another individual, observers were more likely to list adjectives to describe the target person that they had earlier listed to describe themselves. This may lead perspective takers to note only those traits they share with the target person and fail to perceive important differences.

In contrast, instructions to categorize targets for membership into different groups often lead to reduced overlap between the observer's self-described traits and those they ascribed to a target (Clement, 2002). This finding has often been interpreted as demonstrating that stereotyping has a deleterious effect on perspective taking. Representational overlap often is considered to be a precursor of accurate perspective taking (e.g., Galinsky & Ku, 2004). However, this is not necessarily the case. Representational overlap may invite false positive identification with target persons who, in fact, are quite different from the perceiver.

Strull & Gaelick (1983), employing Tversky's (1977) feature matching model, found that the direction of the comparison is critical when the self schema is employed: when individuals compared themselves to others, less similarity was perceived, but when they compared the other person to themselves, greater similarity was noted. Humphrey (1986) argued that the use of self representations as a source for social reference and prediction has evolutionary advantages, particularly in situations requiring pre-emptive and rapid action. This facilitative effect was corroborated by Karniol & Shomroni (1999), who found that perspective taking with dissimilar targets required greater mental effort than perspective taking with similar targets. However, despite the advantages of using the self schema for perspective taking, the retrieval of the self schema is likely to be increasingly problematic for different and, especially, conceptually novel targets. Yet, little research on perspective taking has employed such targets.

Use stereotypes. Stereotypes are formed in order to explain aspects of social groups and to explain relationships between groups. They are one alternative to the retrieval of the self schema. From the limited number of studies that address perspective

taking involving dissimilar individuals (see Table 2-2), it appears that perspective takers often use the self schema inappropriately. When there are important differences between the perspective taker and the target individual, the perspective taker may actually be more accurate by selecting a stereotype than by assuming that the self schema is applicable (e.g., Macrae, 2000 and Jussim et al., 2005). In the absence of detailed background knowledge about the individual or situation, perspective takers are likely to employ stereotypes about groups to aid in model development (Ames 2004a, 2004b, 2005; Kunda & Thagard, 1996). These stereotypes are undifferentiated with regard to individual traits or the distribution of traits within particular groups and represent a group “average” (e.g., Madon et al., 1998). So long as stereotypes represent averaged information and not biased information, they may in fact prove to be beneficial. Cutting and Chinn (2007) suggested that, in order to be useful for perspective taking, stereotypes should be supplemented by elaboration, adjustment, and monitoring strategies. The process of elaborating, monitoring, and adjusting stereotypes helps to avoid some of the biases that the selection of stereotypes can promote. Of course, once they are individually differentiated, these schemas are no longer stereotypes.

Select alternative schemas. This top/down strategy is employed to select several different parallel schemas, from which, in conjunction with monitoring strategies, a single representation is chosen. This strategy is useful to avoid committing too early to a particular schema. Heuer’s (1999) textbook on the *Psychology of Intelligence Analysis* described the pitfalls of committing too early to a specific schema for foreign rulers and governments, where such representations are both useful, even unavoidable, but also a potential trap. Because intelligence analysts must use masses of data at a very early stage

of analysis, the employment of a single schema to organize the data may have devastating effects. An advantage of maintaining multiple schemas is that it keeps open several different possibilities until sufficient data is available to choose among them. This schema selection strategy becomes increasingly important for different and, especially, conceptually novel target persons and target situations. For the present research, half of the study participants were randomly assigned to the Model Revision (MR) condition, which required them to generate three alternative predictions for the perspective-taking problem.

Seek out instruction. Finally, perspective takers may realize that existing schemas are inadequate and opt to construct a schema from scratch by seeking out instruction. Elfenbein and Ambady (2003) demonstrated that there might be a learning component even with the seemingly automatic processes involved in reading facial expressions. They found that increased cultural exposure (learning) facilitated accuracy in recognizing facial emotion in individuals from different cultures. Instruction even improves perspective taking with close friends. Stinson and Ickes (1992) noted that improved perspective taking between friends over strangers resulted primarily from their more detailed knowledge of one another. Their improved accuracy in predicting each other's thoughts and feelings in imagined situations resulted less from motivational factors and similarity to one another than from their more detailed schemas for each another. Ahn et al. (1992) demonstrated that, when provided with sufficient background knowledge, it is possible for individuals to construct a schema from a single example. This suggests, for example, that reading about or observing a single potlatch ceremony among Tlingit Indians may be sufficient for constructing a schema for the concept of a moiety. Seeking out instruction

implies that perspective takers acknowledge that they have no appropriate schemas on which to base a mental model. They must therefore go to other sources that, in combination with monitoring, elaboration, and adjustment strategies, form the basis for a new schema.

Participant observation with the assistance of an informant is employed by anthropologists and sociologists as they attempt to understand another culture or sub-culture. Participant observation was initially employed as an ethnographic research tool to study non-Western societies and is based on cultivating personal relationships with local informants to learn more about their culture (e.g., Angrosino, 2002; Bernard, 2002). In order to accomplish this, anthropologists typically lived within a cultural group for an extended period of time. In addition, this method has been applied to the study of groups and sub-cultures such as inmates in mental hospitals (e.g., Goffman, 1961).

Reading books and foreign newspapers and watching movies, to name a few options, also provide the means to construct a differentiated schema for target persons and target situations. Without new information to correct misunderstandings, perspective taking is likely to be highly inaccurate. Although seeking out instruction can be productive with similar targets and situations, it is particularly important with dissimilar and conceptually novel targets and situations. However, as this strategy is both effortful and time consuming, it is more likely to be reserved for perspective taking at the dissimilar and, especially, the conceptually novel extremes of each dimension of similarity (or perhaps when the consequences of error may lead to unacceptable outcomes). For the present research, participants were required to seek out instruction regarding a conceptually novel target person (a villager from Los Molinos, Peru) in a

dissimilar situation (the attempt by a healthcare worker to convince her to boil her contaminated drinking water) by selecting source documents to read.

Research on Schema Elaboration Strategies

Schema elaboration strategies enable perspective takers to enhance schemas by making full use of information available in memory. They differ from model adjustment strategies in that the general components of the schemas themselves remain unchanged. However, new information is employed to add significant details and causal explanations to construct a coherent narrative. This enables perspective takers to interpret relationships and appreciate the significance of what may have appeared to be random bits of information. Thus, in perspective taking, schema elaboration involves generating more elaborated mental models that facilitate predictions and explanations. (Table A-2 indicates the utility of elaboration strategies across the two dimensions of similarity.)

For the present study, participants make an initial prediction and then read related documents. If they initially predicted that Mrs. E or Mrs. F did not boil her drinking water, they would find information in the documents to enhance this prediction. Thus, when ready to make a final prediction, it was likely to remain the same but, very often, with more detailed explanations with causal connections that integrated the various schema elements. The original schema is elaborated, but not changed in any substantive way. The process of connecting schema elements in the problem situation with corroborating information in the documents would result in the development of a causal model to explain why Mrs. E or Mrs. F did not boil her drinking water.

Research on narrative processing illustrates the key role played by elaboration in making sense of text through the construction of situation models. *Situation models* are

schemas that are selected (using background knowledge) and then elaborated and adjusted as readers continue to learn about the world they have entered. *Situation models* are equivalent to *mental models* (see Cutting & Chinn, 2007): readers build situation models, and perspective takers construct mental models. However, the two terms differ in one important respect. Cutting and Chinn distinguish between perspective taking targets and situations, whereas situation models in narrative research incorporate the two. Therefore, the authors employed the term *mental model* in order to avoid confusion.

Situation models include agents, space, time, events, and causal relations, and they must be constantly elaborated and adjusted to integrate new incoming information (van Oostendorp, 2001). Readers slow down their reading rate for sentences that involve a break in its coherence (Morrow, 2001). Having constructed a situation model, readers more quickly process words that describe objects that are close at hand to the protagonist compared to those that are located in another room (Glenberg, Meyer, & Lindem, 1987) and take longer to read sentences that introduce a time shift (Zwaan, 1999). They are more mindful of the goals that the protagonist has yet to accomplish than those that were accomplished (Trabasso & Suh, 1993). All in all, readers appear to inhabit the world of the story and view the physical and mental landscape from a perspective other than their own. What is more, so long as they are fluent readers, they do so without training or instruction.

Halldorson and Singer (2002) found that the causal explanations provided by readers are integrated with the resulting text representation. Pichert and Anderson (1977) and Anderson and Pichert (1978) demonstrated that the assignment of a particular perspective for reading constrained the construction of a particular causal model. The

authors manipulated readers' points of view by assigning a particular perspective prior to reading a passage. Pichert and Anderson (1977) used two different passages, one describing a house and another describing an island. They asked readers to take the perspective of either a potential homebuyer or burglar for the first passage or the perspective of a florist or a person who had been shipwrecked on the island for the second reading passage. Individuals assigned to each perspective tended to learn and later recall those story elements that were strongly associated with their particular perspective. For example, readers who took the perspective of a burglar were more likely to remember the location of the television set, while those assigned the perspective of the homebuyer were more likely to remember the leaky roof. In terms of Cutting and Chinn's (2007) perspective taking model, as readers took the burglar's perspective, they elaborated what they read to note that certain items were valuable and thus likely to be of interest to a burglar.

Mishra & Brewer (2003) showed that theories might serve a similar function to that of assigning a particular perspective; theories also focus the attention of the reader. It appears that both theories and narratives forge causal connections among schema elements. In this way, elaboration may help the observer to make sense of the perspective-taking problem. However, it is not necessary to explicitly induce a perspective or provide a theory in order to entice readers to adopt another's point of view. Whether fiction or non-fiction, narratives seem to pull fluent readers into their story, causing them to make a deictic shift (Zwaan, 1999) from their own personal perspective to that of the protagonist or narrator. The reader accomplishes this by building a situation

model (VanDijk & Kintsch, 1983) of the physical and psychological landscape of the story.

Elaboration is also an important component in constructing situation models for non-fiction narratives. Narrative is often used as a tool for argument both by historians (Voss, Wiley, & Sendak, 1999) and prosecuting and defense attorneys (Pennington & Hastie, 1993). Defense attorneys and prosecutors elaborate evidence to form a narrative to support their own positions. In their research on jury deliberations, Pennington and Hastie found that the disruption of causal connections in prosecutors' closing arguments resulted in participants rendering fewer guilty ratings. In fact, disruption of causal connections led to far fewer guilty verdicts than manipulations that impacted the quantity and quality of the evidence. Noice & Noice (2002) provided another example of the use of causal explanations to enhance perspective taking in their research on the mental processes employed by professional actors as they attempt to get inside a character. Noice (1991) had found previously that professional actors generated three times more explanatory elaborations than novice actors.

Elaboration strategies are important tools for similar, dissimilar, and conceptually novel targets and situations because they provide a tool for making sense of information. For the present research, participants in the Model Revision (MR) condition were required to elaborate mental models as they read relevant documents. They were also required to show how new information from relevant source documents accorded with their current mental model of the perspective-taking problem.

Research on Monitoring Strategies

Monitoring strategies represent the third cluster of strategies. They can be employed in conjunction with schema selection, elaboration, and adjustment strategies. They enable perspective takers to step back from a particular schema, as it is being selected or elaborated, in order to evaluate its utility for understanding the perspective-taking problem. They also help perspective takers evaluate mental models that are under construction. Monitoring strategies are useful for similar, dissimilar, and conceptually novel targets persons and situations, but become increasingly important as the potential for perspective taking errors increases with dissimilar and, especially, conceptually novel situations and targets. Cutting and Chinn (2007) identified five sets of monitoring strategies that appear to be appropriate for monitoring accuracy in perspective taking. (See Table 2-3, column 3 and Table A-3.) The design of the current study, in which participants read documents that confirmed an initial No prediction and disconfirmed an initial Yes prediction regarding the outcome of the healthcare worker's efforts, encouraged the employment of the monitoring strategy "be alert to anomalies."

This strategy permits perspective takers to note any anomalies or inconsistencies that arise during perspective taking. Being alert to anomalies prompts perspective takers to focus on those aspects of a representation that do not work well. Kunda & Thagard (1996) compared the social perceiver's task to that of making sense of text. Like readers who build situation models, social perceivers decode and integrate incoming information about a target within a pre-existing knowledge base. In social perception, prior knowledge includes constructs about stereotypes, traits, and behaviors. Kunda and Thagard's parallel-constraint-satisfaction theory of impression formation holds that social

stereotypes and individuating information jointly influence and constrain impressions formed about others. Stereotypes and the traits with which they are associated may constrain what is observed and color the meaning of observed behavior. This takes place automatically, except when certain factors trigger controlled processes: (a) tasks that require explanations or predictions; (b) information that is difficult to interpret because it is surprising, has conflicting implications, or strongly violates group stereotypes; or (c) tasks that require increased accountability or the need to reach particular conclusions. The first two factors involve anomalies. They trigger controlled processes, more deliberative perspective taking, and increased strategy use. For the present research, participants were required to gather information to test their mental model(s). MR participants were also provided with a document evaluation tool to facilitate the detection of anomalies. However, those who did not use this tool (No Model Revision—NMR participants) still had ample opportunity to discover that information in critical documents contradicted an initial Yes prediction

Research on Model Adjustment Strategies

Adjustment strategies provide the means for altering schemas and mental models so that they provide a better match to the perspective-taking problem. They are used in tandem with monitoring strategies, as perspective takers must continually evaluate changing schemas and models until they decide that they provide an adequate match to the target person and target situation. In fact, with conceptually novel target persons or target situations, model adjustment may require conceptual change. Therefore, in comparison to some schema selection and elaboration strategies, adjustment strategies

require substantial deliberate effort. The ability to sustain this effort is affected by motivation and the availability of cognitive resources.

Cutting and Chinn (2007) discussed three general classes of adjustment strategies. The first class of strategies makes adjustments to a single schema. The second one involves combining information from two or more schemas to create a new composite mental model. The third class of strategies comprises general-purpose model revision strategies that can be used at any stage of the model construction process.

Individual model adjustments. Cutting and Chinn (2007) considered several strategies for adjusting individual schemas. (See Table 2-3, column 4 and Table A-4 for a complete list of proposed adjustment strategies.) Individual model adjustment strategies will typically be invoked when the perspective taker notices a discrepancy between the selected schema and the target individual or situation. For the present study, participants in the NMR condition made a single prediction, read documents, and made a final prediction. However, although their perspective taking was based on single schema (for example, “Mrs. E will boil her drinking water in order to keep her family safe.”), which is typically derived from employing the self schema (“that is what I would do.”), additional information from the documents could potentially result in model adjustment, i.e., a final prediction that Mrs. E will not boil her drinking water. Several documents describe the busy lives of poor housewives who must gather water from distant water sources, care for the livestock, take care of a large family, deliver food to family members working in the fields, and so forth. If a participant notes that Mrs. E’s situation is very different from her own, this may result in model adjustment.

Adjustments with multiple schemas. This group of adjustment strategies is based on adjustments that involve combining two or more schemas to generate a novel mental model of a situation. In the present research, participants who brainstormed three separate predictions could potentially merge two of them to form a more complete mental model. For example, a participant in the Mrs. F task might make two separate predictions for why the elderly, culturally conservative Mrs. F would not boil her drinking water. One of these predictions might be based on the reason that she was too old to change. A separate prediction might have noted that she cooked for the community and altering her practices would affect her cooking. The final prediction could potentially merge these two schemas and then elaborate them with new causal connections.

Research on combining information from multiple categories indicates that this does not occur automatically; rather, individual's attention must be drawn to the features that are critical to the combination (Murphy & Ross, 1999). Cutting and Chinn (2007) proposed that melding schemas during perspective taking is similarly challenging; the amount of effort and cognitive skill required to merge schemas depends, to a great extent, on three factors: number of schemas to be merged, their complexity, and the extent to which the resulting mental model requires interactions among schema elements (Rogoff, 2003). All of these factors combine to make perspective taking more difficult when targets and situations are dissimilar or conceptually novel.

General-purpose model-modification strategies. General-purpose model-modification strategies can be applied to any mental model under construction, whether it is based on one or multiple schemas or on no schemas at all. Cutting and Chinn (2007) have proposed that perspective takers faced with dissimilar or conceptually novel target

persons or situations will need to generate radically new mental models, whereas perspective takers faced with similar ones can use these strategies to generate minor adjustments to mental models.

An obvious reason for making adjustments to models is additional information (incorporate additional target information) about the problem situation. The more one knows about the lives, values, customs, and beliefs of the target persons, the more accurate perspective taking will be. Sometimes this means attending to all given information carefully, to be sure that every possible item of information has been carefully considered and coordinated with the model of the target person and situation. This will require deliberate model construction and inferencing to put many pieces of information together (cf. Collins, Brown, & Larkin, 1980; Norris & Phillips, 1987). Such inferencing goes beyond what is normally performed during reading comprehension (e.g., McKoon & Ratcliff, 1992). Ahn, Brewer, and Mooney (1992) similarly found that undergraduates did not construct an explanatory model that incorporated all available information without highly explicit prompting to consider all the needed information.

On many occasions, however, there will be a need to gather additional information about target persons and situations. Discrepancies between expectations generated from initially constructed mental models and new information can lead to a realization that the model is inadequate and that still more information is needed. DaCosta and Chinn (2007) found that many problem solvers do not seek adequate information when solving complex social problems; it is anticipated that many perspective takers will be similarly reluctant to expend the effort to seek out the needed information.

When there are discrepancies between the predictions yielded by a mental model and actual outcomes, perspective takers can improve their models by attempting to abduce an explanation that can account for the anomaly (abduce explanations for discrepancies). Abduction is the process of inferring the best explanation that can account for a body of data (Harman, 1965; Peirce, 1957). Little is known about the psychological process of abduction. Although there is a growing philosophical literature on this topic, psychologists have focused much more on induction and deduction than on abduction. The present model of perspective taking postulates that understanding abduction is central to understanding how people construct mental models that facilitate accurate perspective taking. However, abduction can present a two-edged sword and cut both ways. In the present study, some participants who encounter anomalous information in the documents may adjust their predictions from Yes to No. To do this, they may abduce a completely new mental model to account for the anomalous information. However, there may be others, when faced with contrary evidence in documents, who maintain their initial Yes predictions by incorporating this information in their current model. That is, they may abduce an explanation that would account for these discrepancies rather than adjust their mental model to accord with the contrary evidence: For example, “Even though Mrs. E is too busy to boil her drinking water, as the scenario states, she is resourceful. She will multi-task and make the time to boil the water.”

In the present research, the impact of a number of the schema selection, elaboration, monitoring, and adjustment strategies discussed in this review were studied through deliberate manipulations of research design. Various prompts and tools were

designed to encourage participants to actively engage in the employment of many of these highlighted perspective-taking strategies.

Obstacles to Accurate Perspective Taking

There are a number of factors that affect perspective taking (see, for example, Gehlbach, 2004 and Davis, 1996) and several of the core processes discussed above. These include, but are not limited to, motivational factors such as accountability and target preferences, automatic/controlled processes and cognitive load, developmental stage in theory of mind, and cognitive biases.

Motivational Factors

Perspective taking accuracy is enhanced when perspective takers are made accountable for their judgments (e.g. Ames, 2005; RoBnagel, 2000) and when perspective takers have a positive opinion of the target person (McPherson Frantz. & Janoff-Bulman, 2000; Ickes, et al., 1990; Steins & Wicklund, 1996). These factors may increase self-monitoring which, in turn, promotes more accurate schema selection, greater schema elaboration, and a more extensive model adjustment. Conversely, Senecal et al. (2003), Simpson et al. (1995), and Simpson, et al., (2003) found that couples are often motivated to be less accurate about a partner's reactions to social situations, predicting more appropriate and fewer less appropriate (relationship threatening) reactions than their partners actually experienced. Thus, increased motivation may increase the use of strategies but also may also result in cognitive biases to predict a favored outcome.

Automatic/Controlled Processes

In many instances, social cognition takes place at a level of automatic processing. For example, Oswald (1996) distinguished between cognitive perspective taking, a controlled process, and affective perspective taking (a.k.a. empathy), an automatic form of processing. Also, according to Hodges and Wegner (1997), there are two types of empathy, automatic empathy, which they described as effortless and comparable to emotional contagion, and controlled empathy, which “is as effortful as climbing up a mountainside” (pp. 319-320). Gilovich, Epley, and Hanko (2005) noted that self-enhancement occurs in automatic mode because an individual’s good intentions and hopes for success are more easily accessed. RoBnagel (2000, 2004) found that, when perspective takers were required to self-monitor their communications, controlled processes took over. The MR condition in the current study attempted to facilitate controlled processes with the use of cognitive tools that maximized deliberate evaluation of the documents.

Developmental Stage in Theory of Mind Development

There is a large body of research (e.g., Flavell, 1999, 2004; Wellman, et al., 2001) that suggests that young children are unable to engage in perspective taking because they possess an underdeveloped “theory of mind” and assume that all others think what they think, feel what they feel, and know what they know. The ability to take another’s perspective is dependent on recognizing that other perspectives exist and then suppressing the self perspective in order to think about what others may think, feel, and know (Samson, et al., 2005). Harwood and Farrar (2006) found significant and positive

correlations between theory of mind performance on false belief tasks and affective perspective taking in three-to five-year olds.

Cognitive Biases

The primacy of the self in social comparisons (see, for example, Hodges, Bruininks, & Ivy, 2002; Hodges, 2005; Krueger et al., 2005) results in egocentric biases that influence the representational processes of schema selection, elaboration, and adjustment. Moreover, whereas individuals have no difficulty recognizing cognitive bias in others, they are usually blind to their own (McPherson Frantz, 2006). The cognitive biases associated with the selection of the self schema have their greatest impact in the employment of schema selection strategies.

Obstacles to the Employment of Schema Selection Strategies.

Schema selection strategies may be compromised by using inaccurate schemas or the selection of inappropriate schemas, such as using the self schema in attempting to understand very different target persons or situations. However, even appropriate and accurate schemas may be compromised by the employment of heuristics such as anchoring and adjustment (e.g. Epley, Keysar, Van Boven, & Gilovich, 2004; Epley, Morewedge, & Keysar, 2004) that provide for the selection of the self schema as the initial schema chosen for perspective taking, and availability, a heuristic in which the likelihood of a prediction is based on how easily a schema or case comes to mind (e.g., Balcetis and Dunning, 2005; Epley & Gilovich, 2004). Although Funder (1987) and Jussim, et al. (2005) pointed out that that the use of these heuristics in social cognition often make sense, their employment with different or conceptually novel targets or situations may have disastrous consequences.

Cognitive biases associated with the self schema. It may be appropriate to select the self schema to understand the perspective of a similar person, but the self schema may be deficient for a variety of reasons, including inaccurate self-knowledge (e.g. Bartlett, 1932, 1958; Loftus, 1997; McAdams, 2001; Schacter et al., 1998) and a variety of cognitive biases that arise as individuals compare themselves to other. These cognitive biases may be caused by ephemeral drive states and emotions at the time the prediction is made (Buehler & McFarland, 2001; Gilbert et al., 1998; Gilbert et al., 2002; Van Boven & Loewenstein, 2003; Wilson & Gilbert, 2003). Additionally, self-enhancement biases result in individuals perceiving themselves in overly positive ways and appear to emerge as the result of the primacy of the self concept in social comparisons (Balcetis & Dunning, 2005; Gaertner & Sedikides, 2005). Because positive self-attributes are more readily accessible (Alicke & Govorun, 2005) and self -knowledge is richer and more diverse than knowledge of others (Kruger, Epley, Parker, & Ng, 2005; Moore, 2005), these factors lead to a tendency to believe oneself to be superior on self-relevant dimensions (Kruger, 1999; Sedikides & Strube, 1997; Wilson & Dunn, 2004). Kruger and Gilovich (2004) argued that self-enhancement might derive from assigning greater weight to one's own intentions and failing to take into account these unobservables in others. A *confirmation bias* ensures that individuals are more likely to remember those things that confirm positive self-knowledge than those that disconfirm it (Wilson & LaFleur, 1995). In fact, the resulting *self-enhancement effect* is often seen as evidence of an individual's distinctiveness (Balcetis & Dunning, 2005; Sedikides, 2003).

The *fundamental attribution error* (FAE) represents an often-cited example of self-enhancement bias, leading individuals to attribute positive results to their own

positive traits and rationalize negative results as deriving from situational factors. However, when judging the behavior of others, such attributions are reversed (Barresi, 2000). This cognitive bias may be due to accessibility to their own intentions and other unobservables rather than a dichotomy between personal and situational causes (Malle, 2005). Although individuals consider themselves to be unique (Hodges, 2005), they still regard others as more similar to themselves than they actually are. Paradoxically, this *false consensus effect* appears to operate in tandem with self-enhancement (Nickerson, 1999; Sedikides, 2002). Thus individuals are likely to perceive others as more similar to themselves than they really are when attempting to take their perspective. However, they consider themselves to be unique and special when comparing others to themselves.

The curse of knowledge is a cognitive bias that results from being biased by one's current knowledge state when trying to appreciate a more naive perspective (Birch, 2005; Keysar, 1994). This includes *hindsight bias*, the inability to recapture an earlier knowledge state, and an inability to utilize discarded modes of thought (Vygotsky, 1962). People can no longer think as they once thought and therefore lose a connection with their historic selves. This cognitive bias is more likely to occur with the Mrs. F task. Mrs. F did not boil her drinking water because she held to a very different conception of the cause of disease. It may prove difficult for US college students to remember and appreciate their own naive conceptions of disease prior to schooling.

In addition to falling prey to one or more of these cognitive biases, individuals also tend to employ unrepresentative or readily available self-knowledge (Tversky & Kahneman, 1986; Vorauer & Miller, 1997) integrated by cultural (Otten, 2005) and personal theories (McAdams, 2001). In fact, self-knowledge may provide little more than

a theory of the self rather than a trusty blueprint for predicting an individual's own behavior. This makes it very difficult for people to know themselves or predict how they, and therefore how others like them, might respond in particular situations.

Despite the tendency to overuse the self schema, it is very important that perspective takers remain aware of commonalities across persons and situations. It may turn out that the target person or target situation is, in fact, not all that different from the perspective taker and the perspective taker's own experiences. Similarly, there are often important commonalities across very different cultures, such as a desire to secure adequate food and security. It is important for perspective takers to keep such commonalities in mind and not to overemphasize differences. For example, Mrs. E in the present study was fairly modern in her views about the origin of disease. She, in fact, did want to boil her water. Those who noted this took advantage of the similarities that existed between themselves and Mrs. E. Although Mrs. E did not end up boiling her drinking water, she failed to do so only because her situation was very different and did not afford the time to boil water

Obstacles to the Employment of Schema Elaboration Strategies

Obstacles that specifically impact schema elaboration result primarily from increased cognitive load and cognitive complexity. The provision of additional time and feedback may help to sustain effort and reduce constraints imposed by memory. However, the development of a causal model (elaboration) may, in itself, interfere with another core process, model adjustment. Readers may fail to update situation models and hold on to older, discredited information (Anderson, et al., 1980; van Oostendorp, 2001),

particularly when the previous information was causally relevant (Wilkes & Leatherbarrow, 1988).

Obstacles to the Employment of Monitoring Strategies

It appears that conditions that help to reduce constraints on memory may facilitate perspective taking through the increased use of monitoring strategies. Reduced motivation (e.g., Steins, 2000) and constraints on memory capacity and increased cognitive load (Gilbert et al., 2002; RoBnagel, 2000, 2004) represent the greatest obstacles to the employment of monitoring strategies. These obstacles may be ameliorated by feedback (RoBnagel, 2004; but, see also, Kenny and DePaulo, 1993), accountability (RoBnagel, 2000, 2004, but, see also, Lerner & Tetlock, 1999), and liking for the perspective-taking target (e.g., Steins, 2000). However, research on couples has demonstrated that romantic partners are sometimes motivated to be inaccurate about what their partner is really thinking and feeling (e.g., Senecal et al., 2003; Simpson et al., 1995).

Obstacles to Accurate Model Adjustment

Adjustment strategies appear to be impacted by cross-cutting obstacles such as memory capacity and cognitive load. Anchoring and adjustment, discussed earlier as a schema selection strategy, requires serial adjustments (Epley, Keysar et al., 2004; Epley & Gilovich, 2001, 2006; Nickerson, 1999) that modify the initial model to reflect differences between the self and target person. These authors found that egocentric biases (failure to adequately adjust the representation) increased under time pressure. This suggests that memory capacity and cognitive load had a deleterious impact primarily during the adjustment step of this particular strategy. This is corroborated by RoBnagel

(2000 and 2004).

The perseverance of old theories (Anderson, et al., 1980), particularly when there are no new ones to replace them, makes it difficult for perspective takers to consider alternative models. Johnson and Seifert (1993, 1998) found that people have difficulty removing discredited information from models. Epley, Keysar et al. (2004) found that when perspective takers were inclined to accept, rather than reject, plausible values early in the adjustment process, the adjustment process was curtailed. Heuer (1999) noted the same problem in interpreting intelligence data. Thus, a variety of studies have found resistance to changing initial models once they are formed, even if the models had been formed only a short time before. In the present study, having made an initial prediction that Mrs. E or F would boil her drinking water, some participants may have recognized that some documents contradicted their initial prediction but still failed to adjust their mental models to accord with new information.

Research on Cultural Understanding

The present study was designed to study perspective taking at its most difficult, with tasks that involve different or conceptually novel target persons in different or conceptually novel situations. Rogoff (2003) provided an important explanation for the sources of difficulty in cross-cultural understanding. Key concepts from Rogoff's work that are particularly relevant to this dissertation study include the following:

- (1) Very often the perspective taker fails to understand that culture is not solely about other people. People bring their own cultural beliefs, practices, and understandings to the process and therefore must question their own cultural assumptions;
- (2) Cultural practices are interconnected and cannot be reduced to a few (or even

many) isolated differences. They are complex and mutually influence each other;

(3) It is important to separate value judgments from explanations. The value judgments that are held by the observer may, in fact, interfere with understanding the meaning of the behavior they observe. Behavior should be understood in the context of the meaning it holds for the perspective-taking target within her own community;

(4) “The process of carefully testing and open-mindedly revising one’s understanding in the light of new information is essential for learning about cultural ways” (Rogoff (2003), p. 30).

Indeed, the way in which different cultural groups construct explanations vary across cultures. Individuals from East Asian and Western cultures appear to differ in how they perceive the physical world and how they interpret events (Nisbett et al., 2001; Norenzayan & Nisbett, 2000). East Asians tend to be more holistic and attend to the entire causal field when determining causality. Morris and Peng (1994) found that Americans explained events (e.g., mass murders or the behavior of a target fish in a school of fish) in terms of individuals’ traits and dispositions. Chinese participants were more likely to see the behavior of mass murderers and fish in terms of situational factors as well as individual factors. Knowles and Ames (1999), as cited by Peng, Ames, & Knowles (2001), found epistemic differences between Americans and Chinese: Americans rate “what people say” as more important than “what they do not say” in determining what someone is thinking or feeling. Chinese participants showed the opposite preference. Americans have a “norm of authenticity.” They believe that a person’s internal attitudes and external actions should be consistent. In Asian countries, such direct behavior is often considered impolite.

Peng, Ames, and Knowles' (2001) review of the literature on the impact of culture on reasoning strategies provided evidence that East Asians and Westerners also differ in their inductive and deductive reasoning strategies. They found that Westerners tend to be more analytical and generally attend to a central object within a display. For this reason, they were also far more likely to ascribe the causation of behavior to the target's dispositions and ignore important situational factors. Because East Asians also rely on dispositions when situational causes are not apparent, it appears that the fundamental difference between the two groups stemmed from a stronger tendency on the part of East Asians to recognize "the causal power of situations" (Norenzayan & Nisbett, 2000, p. 133).

It appears that the ability to understand very different persons and situations may require a process of conceptual change. According to the two dimensions of similarity theorized by Cutting and Chinn (2007), perspective taking with conceptual change targets in conceptual change situations represent the most complex form of perspective taking.

Research on Conceptual Change

Conceptual change is a complex phenomenon that is influenced, not only by cognitive factors, but also epistemological beliefs and motivation (Mason, et al., 2008) as well as domain specific strategies. Although most research on conceptual change has studied change in scientific concepts, Leinhardt and Ravi (2008) noted a shift from naïve conceptions of history as a "singular, heroic, accurate causal account" to a nuanced and informed view of history "... as an interpretation of conditions and perspectives that surround a particular circumstance ... and back to a characterization of national identity through historical accounts" (p. 328). An important strategy in the study of history is to

pinpoint misconceptions, including the view that history is a narrative account of what happened in the past. Instead, “history” represents an interpretation of available information from the perspective of a particular historian. The study of history through multiple source documents highlights the importance of sourcing information in interpreting texts (Wineburg, 1991).

Research on conceptual change has shown that refutational texts (Mason, et al., 2008) and cognitive conflict (Vosniadou, 2007) tend to promote change. However, even in the presence of anomalous information that contradicts an individual's naive theory, real theory change may still not occur. Students may respond to anomalous information in a variety of ways (Chinn & Brewer, 1998, 2001). Instead of engaging in real theory change, learners may respond to contradictory evidence by ignoring it, rejecting it, questioning its validity, finding it irrelevant, holding it in abeyance and perhaps dealing with it later, reinterpreting it fit the current theory, or, perhaps, engaging in peripheral, but not substantive, theory change.

For the current study, where critical documents refuted a Yes prediction and strongly supported a No prediction for Mrs. E and another set of critical documents strongly supported a No prediction for Mrs. F, refutational texts represent a key design element. A change from a Yes prediction to a No prediction may involve conceptual change regarding participants' beliefs regarding the complex interplay of culture, economics, education, and resources in influencing human behavior. This is particularly true for the Mrs. F task, where Mrs. F held a theory of disease that was incommensurable with the germ theory of disease espoused by Nelida, the home healthcare worker.

Research on the Use of Multiple Source Documents

For this research, participants selected and read from among nine source documents with most of them about the culture, geography, resources, and economics of Los Molinos, Peru. These documents derived from a case study (Wellin, 1955). Although they did not provide an actual solution to the perspective taking problem, they did supply sufficient information to support an accurate initial (No) prediction or contradict an inaccurate initial (Yes) prediction. When coordinated with one another and compared with participants' current mental models, they provided opportunities for perspective takers to elaborate, monitor, and adjust their initial predictions.

Reading multiple source documents to study history has been shown to facilitate the use of reasoning strategies such as noticing contradictions and comparing and evaluating them (Wineburg, 1991). These strategies appear to promote the construction of a model of the problem situation that facilitates understanding of historical actors and the times in which they lived (Stahl et al., 2000; Wiley & Voss, 1999). VanSledright and Kelly (1998) suggested that students should be taught to view history as "...a set of representations of the past authored by persons who are telling stories employing different frameworks, making different assumptions, and relaying varying subtexts" (p. 261).

It appears that non-experts require assistance in employing the reasoning strategies typically used by trained historians to make sense of the various sources of data. These include sourcing, contextualization, and corroboration of evidence, which appear to be essential tools for expert practice (Wineburg, 1991). To facilitate students' ability to reason about multiple sources of evidence, Britt and Aglinskias (2002)

developed a cognitive tool that helped high school and college students to source and corroborate various documents. In their research, they also confirmed the finding by Wiley and Voss (1999) that writing arguments derived from various sources of information facilitates knowledge transformation.

However, the availability of multiple source documents may, by themselves, prompt increased use of evaluative strategies. Rouet et al. (1996), working with college students, found that the inclusion of multiple documents, especially primary source documents, resulted in greater use of the sourcing heuristic. Stromso et al. (2003), using think aloud protocols to determine the strategies employed by Norwegian law students as they read multiple source documents, found that students used memorization and organization strategies to process the information in the text they were currently reading. However, they made greater use of monitoring and, especially, elaboration as they focused their attention on texts they had read previously.

I believe that the use and evaluation of source documents applied to a complex perspective taking problem may reveal some of the cognitive processes employed by perspective takers. By reading source documents to learn more about a target person and situation, perspective takers are given opportunities to seek out new information, monitor its fit with their current mental model(s) of the problem, and make adjustments accordingly. In this way, the use of source documents provides a means for researchers to learn more about the cognitive processes employed during perspective taking. Additionally, their use for a complex perspective-taking task may shed light on how the strategies associated with the coordination of source documents apply to a new domain. Moreover, this study design may also shed light on confirmation bias, a cognitive bias

that results in the search for evidence that confirms existing beliefs, expectations, or hypotheses (Nickerson, 1998). A participant strongly influenced by an initial prediction may ignore, misinterpret, or rationalize evidence that conflicts with an initial prediction.

This literature review has discussed research that supports a theoretical model that serves as the background for the current research (see Cutting & Chinn, 2007). Taken together this research suggests that perspective taking is an effortful process of building a representation of the target individual and target situation in order to view the perspective taking problem from another's point of view. Research that taps into this process should incorporate a number of features:

- Tasks that require participants to create their own model of a dissimilar or conceptually novel target person and target situation in order to make a prediction about what is likely to occur. With a task that employs dissimilar or conceptually novel perspective-taking targets and situations, perspective takers are unlikely to possess schemas that are appropriate for perspective taking. Therefore, they must use a variety of processes, including schema selection, elaboration, monitoring, and adjustment, to help them build a mental model that fits the problem.
- Tasks that provide extended opportunities for perspective takers to engage in a perspective-taking problem and provide multiple opportunities to monitor their accuracy, seek out additional information, and make adjustments to their understanding or predictions. Reading source document affords perspective takers the means to determine when they have no appropriate schema and then to select information for building one. By elaborating, monitoring, and adjusting the new information provided by relevant

documents, perspective takers make use of a variety of strategies from the four core strategies.

- Tasks that provide cognitive tools to help participants to compare and contrast corroborating and contradictory information, monitor how well this information fits with their current model, and then induce written evaluations that force participants to update their model. In this way participants are prompted to engage in the elaboration, monitoring and adjustment strategies that are important when taking the perspective of different and conceptually novel targets and situations.

Overview of Study

In this study participants attempted to solve a perspective-taking problem that required them to make a prediction about how the perspective-taking target (a villager from Los Molinos, Peru) responded to a particular situation (attempts by a healthcare worker to convince her to begin boiling her contaminated drinking water). Participants, undergraduates and post-graduates from Rutgers University, read a prompt about the perspective-taking problem and then wrote a single initial prediction (or three predictions) about the likely outcome of the encounter with the healthcare worker. Next, they chose to read from among nine source documents as they considered their initial prediction(s). Seven of the nine source documents as well as the initial scenarios derived from selected passages in E. Wellin's (1955) case study, "Water Boiling in a Peruvian Town"¹ (see Appendix C for all source documents). At the end of the session, having read source documents, participants wrote a final prediction regarding whether or not the individual in the case study ended up boiling her family's drinking water.

¹ From P. D. Paul and W. B. Miller (Eds.), *Health, Culture, and Community*, New York: Russell Sage Foundation, 1955.

Perspective Taking Problem

The case study employed for the current research, “Water Boiling in a Peruvian Town,” describes how individuals from Los Molinos responded to the attempts by a healthcare worker named Nelida and a physician called Dr. U to convince them to boil their contaminated drinking water. The scenarios chosen for this dissertation represented two of several different individuals highlighted by Wellin.

Two tasks. Two individuals from this case study, Mrs. E, a younger woman who wanted to boil her water but did not have the time to do so, and Mrs. F, a culturally conservative older woman who could not be convinced of the need to do so, were represented in two separate tasks (scenarios). These tasks, based on the two dimensions of similarity, represent different or conceptually novel situations (villagers in Los Molinos, Peru faced with contaminated drinking water). Mrs. E is a dissimilar target person (very poor, younger woman with modern views about the causes of disease), and Mrs. F is a conceptually novel target person (very poor, older woman who believes in the local “hot and cold theory of disease”).

Instructions required all participants to employ the schema selection strategy "seek out instruction," as they decided which documents to read and the order in which to read them. Each document was sealed, with only a summary of information, represented by its title, available before it was opened. At the end of the session, all participants made a final prediction about the outcome of their perspective-taking problem.

Two instructional conditions. In order to determine the effects of strategy use on perspective taking accuracy, two groups, Model Revision (MR) and No Model Revision (NMR) participants received differing sets of instructions and cognitive tools that

manipulated (a) how they arrived at their initial prediction--brainstorming versus no brainstorming, (b) the number of active mental models they were required to maintain--one prediction or three predictions, and (c) whether or not they received document evaluation tools to help them monitor and adjust their initial prediction(s) as they read documents. Thus, the first group, the MR condition, read the scenario (about Mrs. E or Mrs. F), brainstormed ideas, and then made three separate initial predictions (Yes she will boil her drinking water or No she will not) and reasons for these predictions. The other group, the NMR condition, simply read the scenario and made a single initial prediction without brainstorming. The MR participants employed document evaluation and prediction revision tools while reading documents, while the NMR participants did not.

Brainstorming three possible outcomes in the MR condition was designed to encourage the use of additional schema selection strategies. Additionally, participants in the MR condition had to maintain three different mental models (predictions) as they read documents to reduce the possible “hardening of the categories” described by Heuer (1999) and thereby to promote increased monitoring and adjustment.

Unlike the NMR group, MR participants evaluated each document they read using a Document Evaluation Tool (see Appendix C). This tool was designed to encourage participants to evaluate whether the document supported, contradicted, or neither supported nor contradicted each of their three predictions. If the document was found to support or contradict any or all of their predictions, participants were required to note this information on their Initial Prediction and Prediction Revision Form. This cognitive tool provided the means to make elaborations or adjustments to the relevant prediction(s). The

participants in the NMR group simply read documents and then make a final prediction. They were provided with no cognitive tools to assist them in their efforts.

The MR and NMR groups were compared to determine any differences in prediction accuracy or strategy use that may have resulted from this manipulation. Because participants in the MR condition were required to evaluate each source document before going on to the next one, they were expected to read fewer source documents overall than those in the NMR condition.

Two document conditions. Half of the individuals in the MR group and half in the NMR group were randomly assigned to Full or Choice Document (FD or CD) instructions. Those with CD instructions were permitted to stop reading documents when they felt they had read enough evidence to make an accurate prediction; those with FD instructions were required to read as many documents as possible before they ran out of time. These document conditions were created to determine the impact of reading more documents on perspective taking accuracy.

This study represented a fully randomized 2 x 2 x 2 design, with two separate tasks (Mrs. E or Mrs. F), two instructional conditions (MR or NMR) and two document groups (FD and CD).

Research Questions

The purpose of this study was to determine what strategies were employed and what obstacles were encountered when participants undertook a complex perspective-taking task. Additionally, this study examined a set of cognitive tools and source documents to see if they supported the use of effective strategies to improve perspective taking accuracy. The specific research questions were:

1. Did the experimental manipulations affect perspective taking?
2. Did reading documents improve perspective taking?
3. How did accurate perspective takers differ from inaccurate perspective takers?
4. What individual differences distinguished accurate perspective takers from inaccurate perspective takers?

For research question 1, the MR and NMR groups were compared for initial and final prediction accuracy. Additionally, the CD group, which was not required to read a set number of documents before making a final prediction, was compared to the FD group, which was required to read documents until just before the end of the session. For research question 2, initial and final prediction accuracy were compared across conditions to determine if reading documents affected perspective-taking accuracy. Research question 3 focused on differences in strategy use among accurate and inaccurate perspective takers, and research question 4 examined individual differences among accurate and inaccurate perspective takers.

Research Design

This study had a fully randomized 2 x 2 x 2 design: MR participants brainstormed three possible solutions to the perspective-taking problem, actively maintained these three competing mental models while employing a document evaluation tool with which to monitor their predictions, and used an Initial Prediction and Prediction Revision Form to help them monitor and adjust these three mental models. NMR participants made a single initial prediction, read documents, and then made a final prediction. They were not prompted to brainstorm or make three separate predictions (i.e., received no prompts to facilitate schema selection strategies more appropriate for different or conceptually novel

targets), nor did they receive a document evaluation tool or prediction revision tool to help them monitor and adjust their initial single prediction. Half of the MR group was randomly assigned to FD instructions and half to CD instructions, half to the Mrs. E task and half to the Mrs. F task. Similarly, half of the NMR group was randomly assigned to FD instructions and half to CD instructions, half to the Mrs. E task and half to the Mrs. F task.

CHAPTER 3

Method

Participants

This study was conducted at the Graduate School of Education at Rutgers University (New Brunswick campus). The participants consisted of 141 students enrolled in the Educational Psychology course. They volunteered for the subject pool in order to earn research credits for their participation. Two participants in each study session signed up to take part in follow-up paired discussions regarding their respective predictions, receiving an additional research credit for their time.

Of the 141 participants in this study, 120 were undergraduates (65 sophomores, 44 juniors, and 11 seniors) and 21 were post-graduate or graduate students. Sixty-four of the participants had majors in the social science, 41 in the humanities, and 18 in math or science. The average age of all participants was 22, but their ages ranged from 18 to 53. One hundred and eight participants were female, and 33 were male. Mean GPA for the entire study population was 3.3 and ranged from 2.0 to 4.0.

Table 3-1

Information about Study Participants

	Total Sample	Breakdown
Number of Participants	141	108 Females; 33 Males
GPA	Mean GPA = 3.3	Range = 2.0 to 4.0
Academic Year	120 undergraduates	Sophomores 65 Juniors 44 Seniors 11
	21 post-graduate and graduate students	
Age	Mean Age = 22 years	Age Range = 18 to 53

Piloting

A pilot study was conducted to test two different perspective-taking tasks. One task was derived from a case study about Mayan bonesetters from Guatemala, and the other was based on a case study about the introduction of the practice of boiling contaminated water to Los Molinos, Peru. During the pilot study, an experimental condition was introduced. It required participants to use a complex tool to help them evaluate documents and to revise their predictions after reading every third document.

The bonesetter case study was eliminated due to the relatively impoverished data that was obtained from participants. I therefore decided to employ two tasks from the Los Molinos, Peru case study by adding a second scenario about another towns person.

Additionally, piloting revealed that the original experimental condition was too complex and afforded participants insufficient time to read more than a few documents. Therefore the experimental condition was modified for the current study.

Materials

The perspective-taking problem and source documents were excerpted for this study from a case study on medical anthropology (Wellin, 1955). The case study described the differing responses of various members of the community of Los Molinos to efforts to introduce sanitary water practices (boiling contaminated drinking water). With this case study serving as the foundation for the present study, I developed all other materials. These included two separate perspective-taking tasks based on two of the individuals discussed in the case study, seven source documents also excerpted from the case study, one source document excerpted from a 1998 New York Times article about the outbreak of cholera in Peru, and one source document from a website, together with various forms and cognitive tools. Copies of all the materials used for this study can be found in Appendix C.

Perspective Taking Problem (Scenario) and Initial Prediction and Prediction Revision

Study participants received one of two different scenarios. One scenario introduced Mrs. E, a poor housewife who, in the original case study, was open to boiling her drinking water but ultimately did not have the time to do so. The other scenario introduced Mrs. F, an older, culturally conservative woman who enjoyed the healthcare worker's visits but ultimately could not be convinced of the legitimacy of the practice of boiling water. After reading one of the two scenarios, participants made initial predictions about the likely outcome of efforts to introduce the practice of boiling water.

There were two different study conditions to which participants were randomly assigned. The Model Revision (MR) condition required participants to brainstorm factors that might influence Mrs. E or Mrs. F's decision and then to generate three possible outcomes, from which they chose a favored initial prediction. They recorded their initial predictions and reasons for each prediction on the Initial Prediction and Prediction Revision Form. This form provided space for later elaborations or adjustments as participants read and evaluated documents. The No Model Revision (NMR) condition had a simpler task. After reading one of the scenarios, participants were required to make a single initial prediction and then to explain the reasons for their single prediction.

Source Documents

There were nine source documents, each identified by a capital letter as well as a title that revealed its contents. With the exception of documents N (1998 New York Times article) and W, all documents were excerpted from the original Wellin case study. Three of these documents (H, C, and R) explained cultural factors that prevented Mrs. F--who was too culturally conservative to change her ways--from boiling her drinking water. These were the critical documents for the Mrs. F task. Documents S and O explained why Mrs. E--who was too busy-- did not boil her drinking water. They provided information about the factors that made poor housewives' lives so busy and demanding. They were critical documents for the Mrs. E task. Documents P and L came from introductory material in the case study that provided context information about the town of Los Molinos but were not associated with either woman's decision about boiling drinking water. Finally, documents N and W derived from two completely different sources, a 1998 New York Times article that described how cholera was introduced to Peru in 1991

and a current website on Peru's water resources. As this article post-dated the 1955 case study and was not specific to Los Molinos, it was not particularly relevant to either Mrs. E's or Mrs. F's decision. Table 3-2 below shows which documents were most relevant for Mrs. E's decision, Mrs. F's decision, or neither. As Mrs. E and F had different critical reasons for deciding not to boil their drinking water, their critical reasons did not overlap.

Table 3-2

Documents Relevant to Mrs. E, Mrs. F, or Neither

Document	Mrs. E	Mrs. F
H Hot/Cold Distinctions in Los Molinos Culture	0	X
C The Role of Local Civic and Healthcare Leaders in Influencing Water Boiling in Los Molinos	0	X
R Race, Class and Cultural Distinctions in Los Molinos	0	X
S The Water Supply in Los Molinos	X	0
O How Residents of Los Molinos Obtain Drinking Water and Wood for Fuel	X	0
N New York Times (1998) In Peru's Shantytowns, Cholera Comes by the Bucket	0	0
P Water Resources in Peru	0	0
W Access to Clean and Affordable Drinking Water in Peru	0	0
L The Geography and Demographics of the Town of Los Molinos	0	0

Participants read (NMR condition) or read and evaluated (MR condition) documents, depending on the condition to which they have been randomly assigned. They read them in any order they chose. A second factor, document condition, consisted of Choice Document (CD) or Full Document (FD) instructions. CD instructions permitted participants to stop reading documents when they were ready to make a final prediction, and FD instructions required participants to read all documents that they had time to complete.

Document Summary Form and Document Evaluation Tool

Participants in the NMR condition were required to list the documents they read and the order in which they read them on the Document Summary Form. Those assigned to the MR condition, like those in the NMR condition, listed each document they read, but they also were required to indicate the extent to which each document supported or contradicted each of their current three predictions regarding the outcome of their scenario (Mrs. E or Mrs. F). They did this by evaluating the degree to which each document supported or contradicted EACH of their predictions using the following ratings:

- (++) Strongly supports prediction
- (+) Supports prediction
- (0) Neither supports nor does not support prediction
- (-) Contradicts prediction
- (--) Strongly contradicts prediction

Furthermore, MR participants were prompted to elaborate (+ or ++ rating) or adjust (- or - - rating) their current predictions by incorporating any relevant information from the document they had just read. They recorded this information on the Initial Prediction and Prediction Revision Form described above and noted what information in the document led them to make the elaboration or adjustment to one or more of their predictions.

Final Prediction Form

All participants used the same Final Prediction Form to make a detailed final prediction about whether or not Mrs. E or Mrs. F ended up boiling her family's drinking water. Participants were also prompted to explain the reasons for their final prediction, to describe how their final prediction differed from their initial prediction, and to discuss

what factors or documents influenced any changes. Moreover, at the end of this form, participants were asked to rate a series of sixteen statements using a five-point rating scale. These statements were designed to determine levels of motivation, including interest in the task and effort expended, task complexity, and approach to evidence evaluation.

Procedure

Each session lasted 90 minutes. Participants were randomly assigned to one of eight conditions (fully randomized combinations of condition (MR or NMR), task (Mrs. E or Mrs. F) and document instructions (FD or CD). Next they were asked to read and sign a consent form. After first answering questions about age, years of college, GPA, and SAT scores, participants were introduced to the perspective-taking problem and provided with instructions for either the MR or NMR condition. As the former was more complex than the latter, instructions for the MR condition took at least ten minutes. NMR instructions took less than five minutes. Therefore, it was necessary to hold separate MR and NMR sessions. After receiving instructions, participants were informed that, if they finished early, they would be given another perspective taking problem to occupy them until the end of the session. These latter instructions were designed to maximize effort on the target task. Those who had begun with the Mrs. E task were provided with the Mrs. F task and vice versa. Data from the second task was not analyzed for this study.

Next, participants read and responded to a prompt for an initial prediction about the likely outcome to the perspective-taking problem. After reading directions on how to proceed, depending on condition to which they have been assigned, participants chose their first document.

Model Revision and No Model Revision Conditions

Participants in the NMR condition simply read a document and recorded the order in which they read it on their Document Summary Form. They continued to read documents and fill in the Document Summary Form until they had read all documents or until ten minutes before the end of the 90-minute session (FD instructions) or decided they have read enough documents to make a final prediction (CD instructions). At that time they made their final prediction using the Final Prediction Form. They also rated their degree of confidence in their prediction, their interest in the task, motivation to arrive at an accurate prediction, difficulty they experienced in attempting to complete the task, and approach to using documents.

Participants in the MR condition brainstormed factors that might influence a decision to boil water and then made three different predictions regarding the outcome. Next, they selected one of these predictions to serve as an initial prediction. As they selected and read documents, MR participants were required to determine how well each document supported, contradicted, or neither supported nor contradicted each of their three initial predictions, not just their initial selection. They used the Document Evaluation Tool for this purpose. The Document Evaluation Tool prompted them to monitor the match between the information in each document and their current mental model(s). These forms also prompted participants to make any needed adjustments to their mental models on the Initial Prediction and Prediction Revision Form.

All participants in the MR condition continued to read documents, using the Document Evaluation Tool and Initial Prediction and Prediction Revision Form, making any necessary elaborations or adjustments to one or more predictions after reading each

document. They continued with this process until they either (a) exhausted all the documents or (b) ran out of time (FD instructions) or decided that they had read enough documents to make an accurate prediction (CD instructions). At this point, they were required to make a final prediction using the Final Prediction Form. Like the participants in the NMR condition, they were asked to rate their degree of confidence in their prediction, interest in the task, motivation to arrive at an accurate prediction, difficulty they experienced in attempting to complete the task, and approach to using documents.

Data

Table 3-3 displays the types of data collected for this study. It specifies the sources of data (specific document, scenario, or form) and the kind of information that came from each source.

Table 3-3

Data Collected for the Study

Source of Data	Data
Questionnaire	<ul style="list-style-type: none"> Demographic data, including age, gender, GPA, SAT total, program, major, year in college
Initial Prediction(s)	<ul style="list-style-type: none"> Initial prediction accuracy
<ul style="list-style-type: none"> (NMR) End of scenario (MR) Initial Prediction and Prediction Revision Form 	<ul style="list-style-type: none"> Initial prediction reasons; Yes reasons; No reasons ; critical No reasons
Document Order Form (NMR)	<ul style="list-style-type: none"> Documents read; critical documents read; order in which documents were read
Document Evaluation Tool (MR)	<ul style="list-style-type: none"> Documents read; critical documents read; order in which documents were read; document evaluations (++, +, 0, -, - -) of support for predictions
Initial Prediction and Prediction Revision Form (MR)	<ul style="list-style-type: none"> Changes to predictions based on documents read
Final Prediction Form	<ul style="list-style-type: none"> Final prediction accuracy; final prediction reasons (Yes reasons; No reasons; critical No reasons) Prediction Decision Groups (Always Yes; Always No; Yes to No; No to Yes) Reasoning strategies
5-Point Rating scales	<ul style="list-style-type: none"> Approach to task, motivation, documents, confidence in final prediction

Data Analysis

This study used quantitative measures to compare for initial and final prediction accuracy across study conditions. Based on their initial and final predictions, participants could be placed in one of four prediction groups: (a) those who made inaccurate (Yes) initial and final predictions (Always-Yes group); (b) those who made inaccurate (Yes) initial predictions but accurate (No) final predictions (Yes-to-No group); (c) those who made accurate (No) initial predictions but inaccurate (Yes) final predictions (No-to-Yes group) and (d) those who made accurate (No) initial and final predictions (Always-No group). Experimental groups (MR/NMR; FD/CD) and decision groups were compared on a variety of measures: prediction accuracy, reasons for predictions, document ratings (MR condition only) and reasoning strategies.

Coding

Participants provided explanations for their initial predictions, citing specific information from the scenario that supported it. These explanations were coded for the reasons they gave to support their initial prediction. MR participants, who made three separate initial predictions, were required to designate a single favored prediction before reading documents. Only these designated initial predictions were coded for MR participants' initial reasons. Similarly, all participants were required to explain and justify their final predictions. Final predictions reasons were similarly coded for final reasons.

In addition, all participants were prompted to answer questions about how they arrived at their final predictions and what factors influenced their decisions. They also explained how their prediction changed over time. These extra-prediction statements

sometimes included metacognitive statements about their thought processes as they engaged in the task. Both extra-prediction statements and, when provided, metacognitive statements were coded for the reasoning strategies they revealed.

Using the constant comparative method, initial and final prediction reasons as well as reasoning strategies were coded into categories blind to condition. The reason codes took into account whether a particular reason supported a prediction of Yes (Yes reasons) or a prediction of No (No reasons). These Yes reason codes and No reason codes are displayed in Tables 3-4 and 3-5. Additionally, participants' extra-prediction statements and metacognitive statements were coded for reasoning strategies and are displayed in Table 3-6.

Table 3-4 and Table 3-5 display reasons for participants' initial and final predictions. These tables provide relevant information about these reasons, including the source material from which they were derived (scenario, documents, or both), a detailed description, their frequency of use in initial and final predictions, and, finally, examples provided by participants. By definition, all initial predictions derived from the scenarios. However, some of them, particularly No reasons, were often reinforced by information from the documents. Final predictions were based on the scenarios, documents, or both.

Table 3-4

Description of Yes Reason Codes

Code for Yes Reasons	Source	Description	Frequency	Example(s)
ID Important to Do	Scenario	Mrs. E or Mrs. F will boil her	Initial = 60	*The main reason that I feel Mrs. E will boil the water is because she wants to protect the health of her family. The documents that provided reasons for her to not boil the water gave reasons that were minor and temporary, such as not waking up earlier or not receiving information from the government. We know that Mrs. E already has personal experiences with death, so she probably wants to keep her family healthy. Death is a battle against the human race, and cultural differences do not matter.
	Mrs. E	drinking water because it is important		
	Mrs. F	to protect the health of her family or	Final = 43	
	Document N	the community.		
MC Made Changes	Scenario	Mrs. E will boil her drinking water	Initial = 39	*The text indicates that she implemented several household improvements following a conversation with Nelida and Dr. U.
	Mrs. E	because she has already proven she is open to change by building a privy and a pen for the animals.	Final = 9	

(table continues)

Table 3-4 (continued)

Description of Yes Reason Codes

Code for Yes Reasons	Source	Description	Frequency	Example(s)
R Resourceful	Scenario Mrs. E	Mrs. E is resourceful and self-sufficient; even though she is busy, she will find a way to boil her drinking water.	Initial = 26 Final = 13	<i>*Mrs. E is in complete control of the household and she is resourceful and self-sufficient. This suggests that she will be willing to do anything that would help the family. *I think while Mrs. E is doing her other chores she can still put a pot of water on the stove and boil it. Mrs. E can multi-task because in the case study it says that Mrs. E is resourceful and self-sufficient.</i>
CC Cooks for Community	Scenario Mrs. F	Mrs. F is renowned for her cooking and often cooks for her neighbors. She does not want to make them sick.	Initial = 19 Final = 6	<i>*...Because she is quite well known in the town and cooks for people, boiling water would be a good idea so that her food is healthy.</i>
NB Not Busy	Scenario Mrs. F	Although not explicit in the scenario, the description of Mrs. F suggests that she does have free time to boil.	Initial = 2 Final = 10	<i>*Since she (Mrs. F) and her daughter are usually home when Nelida visits, this indicates that they could easily enough be boiling water throughout the day.</i>

(table continues)

Table 3-4 (continued)

Description of Yes Reason Codes

Code for Yes Reasons	Source	Description	Frequency	Example(s)
LN Likes Nelida	Scenario Mrs. F	Although initially there were tensions between Nelida and Mrs. F, Mrs. F now enjoys Nelida's visits and will take her advice.	Initial = 32 Final = 17	<i>*As her relationship with Nelida improved, she (Mrs. F) came to the understanding that Nelida is looking out for her health. She trusts Nelida and Dr. U's opinion.</i>
E Educated	Scenario Mrs. E Mrs. F	Nelida and Dr. U have educated her about the diseases that are caused by polluted water.	Initial = 30 Final = 31	<i>*I have learned that Los Molinos, Peru is a place of poverty and stricted (sic) by diseases because of contaminated water. However, with the help of Nelida, a rural hygiene worker and Dr. U, hopefully the people, especially women, will understand that boiling water before use will kill any bacteria and other harmful elements in contaminated water. *Once Dr. U gives Mrs. E this critical information about how boiling water will protect her family, Mrs. E will most likely boil the water.</i>

(table continues)

Table 3-4 continued

Description of Yes Reason Codes

Code for Yes Reasons	Source	Description	Frequency	Example(s)
Y Young	Scenario Mrs. E	Mrs. E is young and will change her ways.	Initial = 2 Final = 2	<i>*Because Mrs. E is younger, it would also seem to make sense that she was less grounded in social customs than an older matriarch, although this is just speculation.</i>
FH Family Help	Scenario Mrs. F	The scenario describes Mrs. F's daughter as "usually at home." From this it was inferred that Mrs. F has help with her chores. Thus, she has time to boil her water.	Initial = 2 Final = 13	<i>*Even though the spring is far away from the household, Mrs. F has many children or grandchildren to help her carry the water and boil it. Although we don't know the age of the grandchildren, I still believe there are enough hands to help.</i>
NP Not Poor <u>Inaccurate: both women are poor</u>	None	Both Mrs. E and Mrs. F are described as poor. It is unclear why 5 people inferred "not poor." Because she is "not poor" she can buy supplies to save some time.	Initial = 5 Final = 5	<i>*Because the family was self-sufficient, I get the idea they are relatively well off compared to their neighbors. Mrs. E would then have the resources to purchase water and do other tasks such as boiling water.</i>

(table continues)

Table 3-4 (continued)

Description of Yes Reason Codes

Code for Yes Reasons	Source	Description	Frequency	Example(s)
CL Community Leaders <u>Usually a No Reason</u>	Document C	Civic leaders were indifferent whether housewives boil their water, so there is nothing to stand in their way if they decide to do so.	Initial = 0 Final = 3	<i>*The local leader--mayor, city council—don't care about what housewives do as long as they can drink the water.</i>
HC Beliefs about Hot and Cold Water <u>This is an important No reason for Mrs. F but not Mrs. E</u>	Document H	Some aspect of the theory of hot and cold does not apply to Mrs. E or Mrs. F, so she will boil water. This reason is often based on a misinterpretation of Document H.	Initial = 0 Final = 11	<i>*Mrs. F: I made changes to my initial prediction because I found out that cold water is considered bad anyway so there would be nothing wrong with boiling water. (Misinterpreted document H). *Considering the cultural beliefs about hot and cold foods, and the fact that cold food should be avoided by the elderly and young, I think Mrs. E will be more likely to “cook” her water so as not to give cold water to her parents and young daughter.</i>

(table continues)

Table 3-4 (continued)

Description of Yes Reason Codes

Code for Yes Reasons	Source	Description	Frequency	Example(s)
NDC	Scenario	Nelida is of a higher status than	Initial = 0	<i>*Nelida is cholo, who is a higher status than Mrs. F and her deep concern about the situation should help convince Mrs. F to make the effort and boil the water.</i>
Nelida from a Different Race or Class	Mrs. E	Mrs. E or F, so they will listen to		
	Mrs. F	her.	Final = 3	
	Document R			
P	Scenario	She is too poor to allow herself	Initial = 0	<i>*Mrs. E is poor, and cannot buy water from the vendors so Mrs. E realizes she has to boil water.</i>
Poor	Mrs. E	or family members to get sick	Final = 6	
<u>Usually a No reason</u>	Mrs. F	OR because she is poor, she		
	Documents S, O, R	cannot buy water and must boil.		<i>*Because she is poor, it is evident that the financial support from the growing children is vital for Mrs. F's family to survive, therefore to boil water to avoid risk of illness or possibly death due to water contamination</i>
WS	Scenario	She will boil her drinking water	Initial = 0	<i>*The favorite water resource is the irrigation ditch. It is only seasonal; the people are only left with the spring and the public well.</i>
Water Supply	Mrs. E	because the water supply is		
	Mrs. F	polluted and tastes bad. (Based	Final = 6	<i>People do not like the taste of the well water, but that is the last resource if the spring runs dry. Mrs. E has to boil the water because the water is polluted and tastes bad.</i>
	Documents S & O	on mis-interpretation of documents)		

Table 3-5

Description of No Reasons Codes

Code for No Reasons	Source	Description	Frequency	Example(s)
CL Community Leaders	Document C	She will not boil her water because community leaders and midwives are indifferent to or do not support the practice.	Initial = 0 Final = 41	<i>*The authority figures in government refuse to support Nelida's efforts. *If the people in power in this town don't care enough about clean water, why should the community?</i>
NFH No Family Help	Scenario Mrs. E Document R	There is no one at home to help out with the extra work involved in boiling water.	Initial = 1 Final = 11	<i>*Boiling water would become her additional chore on top of her others, since her daughter is too young to get it and men are not allowed to get it.</i>
NDC Nelida from a different race or class	Scenario Mrs. E Mrs. F Document R	Mrs. E is from a different social class than Nelida and Mrs. F is from a different race and class. This may interfere with Nelida's efforts educate them about the water.	Initial = 5 Final = 19	<i>*There are also the cultural differences between Nelida and Mrs. F that is not familiar to the other. It is hard to understand one's practices and know one's culture. *Since Nelida is a cholo, she is a different race than Mrs. F, so Mrs. F might not agree with Nelida's customs or the way she does things.</i>

(table continues)

Table 3-5 (continued)

Description of No Reasons Codes

Code for No Reasons	Source	Description	Frequency	Example(s)
P Poor	Scenario Mrs. E Mrs. F Documents S, O, & R	She is very poor and cannot afford to buy water and fuel, but must collect them herself.	Initial = 15 Final = 63	<i>*Being that her family is poor, it would be hard for her to even obtain a cost-sufficient (sic) system for boiling. *Since Mrs. F lives a life of poverty, she is dependent on what she has. Blacks are the lowest ranking in the town of Los Molinos. And due to their lack of money, poor families cannot afford to buy these necessities.</i>
CF Cost of Fuel	Document O	Poor residents of Los Molinos cannot afford to buy fuel for cooking and must gather it themselves.	Initial = 1 Final = 5	<i>*The family is poor and cannot bare the high costs of buying water or fuel; they must collect the supplies from the environment. (Also coded for WS)</i>
WS Water Supply	Documents S & O	It is difficult to obtain water most of the year and all of it is polluted. The time it takes to collect it means there is little time for boiling it.	Initial = 0 Final = 43	<i>*Obtaining water is a time consuming task, and Mrs. E already has a host of other responsibilities to take care of. *According to Document O, housewives take the long trek to the spring, an arduous, time-consuming chore, and do not have the time for boiling water. (Also coded B)</i>

(table continues)

Table 3-5 (continued)

Description of No Reasons Codes

Code for No Reasons	Source	Description	Frequency	Example(s)
B Busy	Scenario Mrs. E Documents S & O	She is too busy to take on the extra work of boiling water.	Initial = 17 Final = 95	<i>*I feel that Mrs. E is very busy taking care of her mother and daughter and like article O describes, may not have the time to boil water.</i>
OL Old	Scenario Mrs. F Document R	Mrs. F is 60 years old. She is too old to change her ways.	Initial = 7 Final = 17	<i>*Mrs. F is a conservative older woman. She is 60 years old and is probably used to doing things a certain way already, so she may not feel it is necessary to change her routine and start boiling her family's drinking water.</i>
CT Cultural Traditions	Scenario Mrs. F Documents H & R	She is culturally conservative and will follow local customs rather than boil their water.	Initial = 18 Final = 68	<i>*I would like to think she would (boil her water) after experiencing cholera outbreaks and being taught about the need for sanitation. However, I think the cultural aspects of peoples' lives are very hard to change. *She relies on tradition for information on how to go about her daily life, not outsiders as someone who is used to getting advice through newspaper or the web like Americans do.</i>

(table continues)

Table 3-5 (continued)

Description of No Reasons Codes

Code for No Reasons	Source	Description	Frequency	Example(s)
TW Taste of Water	Document H	She will not boil her water because the people of Los Molinos despise the taste of “cooked” water.	Initial = 0 Final = 22	<i>*These townspeople don’t even like the taste of water boiled, which could be another factor keeping Mrs. E from boiling. *The Los Molineros learn from an early age to hate the taste of boiled water and therefore boiling the water would alter Mrs. F’s famous food.</i>
HC Beliefs about Hot and Cold	Document H	She believes the local theory about hot and cold and will not accept Nelida’s instruction about the dangers of the local water supply.	Initial = 0 Final = 50	<i>*The commonly held views on the origins of disease in Los Molinos concerning “hot” and “cold” lead people to associate cooked (boiled) water with disease. If Nelida is constantly bringing up the possibility of someone catching a disease, Mrs. F might steer even further from boiling.</i>
GTD Germ Theory of Disease	Document H	She has no germ theory of disease and cannot understand why Nelida says the water causes disease.	Initial = 0 Final = 9	<i>*She is socially conservative and so probably won’t heed a major change in her lifestyle based on professed scientific findings. Her religion/cultural belief system hold that people do not get sick from bacteria but from “cold” elements and her belief system holds that drinking water should be cold.</i>

Codes for reasoning strategies were derived from written statements in the Final Prediction Form, which prompted participants to provide information about their thought processes while engaged in the task. Participants were prompted to state why they made their prediction, to provide details from documents that supported it, to explain how their prediction changed over time, and to describe what factors or information were most important for their final prediction. This information provided a means to determine the reasoning strategies employed by participants to arrive at their final prediction as well as cognitive biases and impediments that may have impeded its accuracy. This data was transcribed and coded blind to condition in order to determine differences in how participants thought about their task.

Because participants were not specifically prompted to write about their cognitions, reasoning strategies were inferred from the extra-prediction statements provided when responding to the prompts listed above. For example, if a participant noted that her prediction had not changed but that she had added more reasons to support it, this statement was coded as an elaboration. In some cases, participants reflected on their own reasoning processes to arrive at their final prediction, and these metacognitive statements provided further insights into their reasoning processes. The reasoning codes displayed below derive from both metacognitive and extra-prediction statements. Although metacognitive statements were relatively rare, they were provided across all study conditions and decision groups.

Table 3-6

Description of Codes for Reasoning Strategies and Cognitive Biases

Reasoning strategy	Source	Description	Frequency	Example(s)
(QP) Qualified Prediction	Final prediction	In final prediction, participants indicates they are a) less sure about prediction after reading evidence and/or b) states that Mrs. E or F will try to boil but may not be successful or consistent	13	<i>*Before I was stronger on the fact that Mrs. E would do it and now I am a bit less confident but still believe that Mrs. E will have the intention to boil the water from now on. *With Nelida’s influence, Mrs. E may boil water as she did install a privy and animal pens. This shows her willingness to try new things while living among her traditional community, which believes that boiling water does not good. If Mrs. E also believes that boiling water will not help her family in any way, she might not waste her time, as she is “resourceful.” For her time is the most important resource. *My prediction is that Mrs. F will eventually come to boil her water regularly, but she has not reached that stage just yet.</i>

(table continues)

Table 3-6 (continued)

Description of Codes for Reasoning Strategies and Cognitive Biases

Code	Source	Description	Frequency	Example(s)
(EL) Elaborated initial model	Comparison of initial and final predictions plus extra-prediction statements	Added new reasons to support initial prediction and/or made new causal connections among these initial reasons. Many did both. This code is added automatically if participant keeps the same prediction (Always Yes; Always No) but adds new reasons or makes new causal connections among the reasons.	71	<i>*My prediction has not changed, other than adding more evidence. The documents gave me information that would help my prediction.</i> <i>*My predictions grew and intertwined with one another—location, government, rank, and culture.</i>

(table continues)

Table 3-6 (continued)

Description of Codes for Reasoning Strategies and Cognitive Biases

Code	Source	Description	Frequency	Example(s)
(AN) Anomalous data from documents used to revise model	Comparison of initial and final predictions plus extra-prediction statements	<p>Changed prediction from Yes to No and cited specific documents or reasons that derived from documents to explain the change.</p> <p>In some cases, participants did not change their predictions, but qualified their predictions (QP) and cited anomalous information that made them qualify their prediction.</p>	67	<p><i>*At first I thought she would boil the water because she liked Nelida and Dr. U's talks. After reading several articles, I realized the importance of hot/cold foods and they don't like to boil things. I think the conservative Mrs. F will not boil the water. *At first I thought Mrs. E would boil because she appeared responsible. After reading the articles my opinion changed. The articles provided me with insight to Mrs. E's culture, which is traditional. Also, I originally thought poor people would most likely boil because they catch disease easier, but the articles showed poor people lack time to do this. *At first I believed that Mrs. E would start to boil her water all the time. Now I believe that Mrs. E would boil her water occasionally, when her water appears to be dirty or she has the time. The limited water supply and ways o obtain fuel and water caused my change of prediction.</i></p>

(table continues)

Table 3-6 (continued)

Description of Codes for Reasoning Strategies and Cognitive Biases

Code	Source	Description	Frequency	Example(s)
(WT) Wishful thinking	Extra-prediction statements	Statements that suggest the predictor had hoped for a positive outcome. A few noted that they had to fight against wishful thinking.	5	<i>*I am hopeful women will become educated about boiling water from Nelida and take a stand to prevent illness and death of their family members. *After reading about cholera, I would hope that Mrs. E would want to protect her family. * I think Mrs. F will still do the right thing. I'm an idealistic thinker and believe in change no matter the circumstances. *I don't think that Mrs. F did boil her water in some aspects, but part of me wants to believe she did because she was able to form a good relationship with Nelida.</i>
(RC) Rationalized contradictions	Extra-prediction statements	Noted anomalous information in the documents and then tried to explain them away OR discounted their relevance	28	<i>*I don't think it would be the idea of hard work that would stop her from boiling the water because, if she is self-sufficient and resourceful as the others say she is, and it is for the benefit of the family to boil water, I think she will do it. *I think while Mrs. E is doing her other chores, she can still put a pot of water on the stove and boil it. Mrs. E can multi-task because she is resourceful.</i>

(table continues)

Table 3-6 (continued)

Description of Codes for Reasoning Strategies and Cognitive Biases

Code	Source	Description	Frequency	Example(s)
(SS) Schema selection	Metacognitive statements	Some in MR condition discussed two or more of their initial predictions and consciously chose one of them. Others mentioned that they noted contradictory evidence and had to choose the stronger position.	12	<p><i>*Over time I realized that the evidence supported my third prediction, but for a wide variety of reasons.</i></p> <p><i>* I considered the economic problems that were mentioned in the documents, but I still believe that Mrs. F will adopt this new practice.</i></p>
(SM) Schema melding	Metacognitive statements	MR participants sometimes noted that they combined 2 or more of their earlier predictions. or combined their initial prediction with the new evidence.	3	<i>*I have combined my predictions 1 and 2.</i>

(table continues)

Table 3-6 (continued)

Description of Codes for Reasoning Strategies and Cognitive Biases

Code	Source	Description	Frequency	Example(s)
(P) Projection	Metacognitive statements	Used their own experiences and culture to predict Mrs. E or Mrs. F likely outcome.	4	<p><i>*I took from my own experience that someone who cares about their family would wish to provide them with safe and clean water.</i></p> <p><i>*Keeping in mind that this is not an American town forces me to change my mind about Mrs. E. Instead of looking into her heritage, I looked into mine for my (first) prediction.</i></p>
(CU) Cultural universals - might combine this with projection	Metacognitive statements	Statements about the existence of cultural universals that help to predict human behavior.	5	<p><i>*People in groups tend to act alike with very few people willing to go against the cultural grain. *Health is a strong universal experience, and I believe that any culture would want to stay healthy regardless of cultural differences. Death is a battle against the human race, and cultural differences do not matter.</i></p>
(E) Emotional response to NYT article	Metacognitive statements	Statements about cholera (documents N & W) as a “deadly disease” OR any mention of dire outcomes.	13	<p><i>*The New York Times article re-affirmed my original prediction because it gave clear facts about the severity of the situation.</i></p> <p><i>*Since cholera is so rampant there, she might break traditions in order to keep her family healthy.</i></p>

(table continues)

Table 3-6 (continued)

Description of Codes for Reasoning Strategies and Cognitive Biases

Code	Source	Description	Frequency	Example(s)
(CB) Confirmation bias	Metacognitive statements	Indicated that they looked for evidence to support their initial prediction OR noted that documents only confirmed initial incorrect prediction. Since documents did in fact confirm a No prediction, confirmation bias is only coded for final Yes predictors who made such claims.	8	<i>*It (my prediction) strengthened. The documents only gave more reason for me to believe that Mrs. F boiled her water. (Had made initial Yes prediction)</i>

Quantitative Analyses

Chi-Square test. Chi-Square was employed to test for significant differences in initial and final prediction accuracy across different experimental conditions (MR/NMR; FD/CD; Mrs. E task/Mrs. F task) and their interactions.

MANOVA. Multiple variable analysis of variance was employed to test for significant differences across different conditions (MR/NMR; FD/CD; Mrs. E task/Mrs. F task) and their interactions. Variables tested included reasons and critical reasons for predictions, reasoning strategies, and document evaluations.

T-tests. T-tests were used to test for differences among the four decision groups (Always-Yes, Always-No, Yes-to-No, and No-to-Yes predictors). Variables included reasons for predictions, reasoning strategies and document evaluations

Pearson Correlations. Pearson correlations tested for correlations of demographic variables (age, SAT total score, and GPA) and perspective-taking accuracy.

Validity and Reliability

All data was coded blind to condition. To ensure reliability on coded reasons for initial and final predictions, two raters coded 25% of the data. Inter-rater agreement was 87%. Moreover, two raters coded 23% of the reasoning codes. Inter-rater agreement was once again 87%. All differences were discussed and reconciled.

CHAPTER 4

Results and Discussion

There were four primary research questions: (a) Did the experimental manipulations affect perspective taking? If so, how? (b) Did reading documents, irrespective of experimental condition, improve perspective taking? (c) What were the critical differences between accurate and inaccurate perspective takers? (d) What individual differences distinguished accurate from inaccurate perspective takers? I first report the results of a manipulation check and then present findings on the four research questions. These findings reveal how manipulations, strategies, and individual differences converge as a whole to influence perspective taking accuracy.

Preliminary Question: Manipulation Check

The manipulations had the expected effects. Participants in the Model Revision condition followed their instructions. As instructed, they brainstormed and made three initial predictions on the *Initial Prediction and Prediction Revision Form*, evaluated documents using the *Document Evaluation Tool*, and, after reading each document they viewed as relevant, updated their mental model(s) on the *Initial Prediction and Prediction Revision Form*. Additionally, participants with Full Document instructions read significantly more documents than those with Choice Document instructions (8.72 vs. 7.55, $F(1,138) = 20.033$, $p = .000$).

Research Question 1

Did the Experimental Manipulations Affect Perspective Taking?

Experimental manipulations for this study consisted of the Model Revision (MR) vs. No Model Revision (NMR) conditions and Full Document (FD) vs. Choice Document

(CD) instructional conditions. In research question 1, initial and final prediction results for the MR/NMR conditions are compared separately and then the FD/CD final prediction results are compared.

Finding #1: Model Revision Condition Promoted Greater Initial Prediction Accuracy

The Model Revision condition had some additional features, including initial brainstorming of factors that might influence the decision to boil water and the provision to make three separate and very different initial predictions before selecting one of them. These MR instructions were designed to affect initial prediction accuracy. I had predicted that initial brainstorming and multiple predictions in the MR condition would facilitate initial prediction accuracy. Only 32 of the 141 participants (22.7%) made accurate initial predictions. Although more of them were in the MR condition (21 [29.2%] of MR participants vs. 11 [15.9%] of NMR participants), the difference was not significant ($\chi^2(1) = 3.512, p = 0.061$).

Finding #2: Model Revision Condition Had No Effect on Final Prediction Accuracy

I had predicted that the combination of all activities in the MR condition (brainstorming, making three initial predictions prior to reading documents, and the use of document evaluation and prediction revision tools while reading documents) would facilitate final prediction accuracy. There was no statistically significant difference in final prediction accuracy between the two conditions (66.2% in MR vs. 55.1% in NMR, $\chi^2(1) = 1.816, p = .178$). MR participants were no more likely to change an incorrect prediction to a correct prediction than their NMR counterparts.

Finding #3: Model Revision Condition Promoted More Critical Reasons for Accurate Final Predictions

Participants in both conditions were required to give reasons for their initial and final predictions. There were specific critical reasons for the Mrs. E task (e.g. too busy, poor, no family help) and critical reasons for the Mrs. F task (e.g., culturally conservative, too old to change). Accurate final predictors in the MR condition gave more critical No reasons than those in the NMR condition ($M = 2.64$ (1.241) vs. 2.13 (1.166); $F_1 = 4.304$, $p = .006$). When MR participants made accurate final predictions, they were significantly more likely than NMR accurate final predictors to provide better justifications for their predictions.

Finding #4: Full Document Instructions Had No Effect on Final Prediction Accuracy

I originally hypothesized that the instruction to read as many documents as possible would improve perspective taking accuracy. This hypothesis was based on the prediction that FD instructions would result in participants reading more documents, and therefore more critical documents than those with CD instructions. CD instructions permitted participants to stop reading documents when they felt ready to make a prediction. However, FD instructions had no effect on perspective-taking accuracy (63.1% accurate in FD condition vs. 58.0% accurate in CD condition, $\chi^2(1) = 0.334$, $p = 0.563$).

Summary of Effects of Conditions

Document instructions. FD instructions were no more likely to promote accurate final predictions than CD instructions. A possible explanation for this is that CD participants did read 7.55 documents, only about one fewer than the 8.72 documents read

in the FD condition. It may be the case that, as long as a minimum number of documents are read, reading more documents is not a significant factor for perspective-taking accuracy. I will address this issue in more detail in Research Question 3.

MR vs. NMR conditions. Although the results were in the expected direction, there was no significant difference in initial or final prediction accuracy between conditions. However, accurate final predictors in the MR condition provided more critical No reasons than those in the NMR condition. Thus, although the MR condition did not result in a significantly greater number of more accurate final predictions, those who made accurate predictions tended to provide better justifications for them.

Although it is possible that the various cognitive tools (Initial Prediction and Prediction Revision Form and Document Evaluation Tool) were merely ineffective in promoting prediction change in those who made initial Yes predictions, there is reason to believe that the complex set of MR instructions may have interfered with the process of prediction change. MR participants had a far more demanding task than NMR participants. They were required to follow a complex series of directions including (a) making three predictions instead one; (b) evaluating documents in light of each of these three predictions; and (c) making elaborations or adjustments to these predictions to reflect what they learned from the documents. Unlike the NMR participants, only two MR participants finished early (before the end of the 90 minute time frame). In contrast, NMR participants tended to complete the task early and therefore were provided with an additional task in order to complete their time commitment for earning research credits. Moreover, MR participants had lengthier instructions, which took longer to convey than instructions provided to NMR participants. Therefore, it is still an open question

regarding the efficacy of the MR manipulation. Future studies should address this issue through the modification of the study design to reduce intrinsic cognitive load and/or provide frequent measures of cognitive load throughout the task.

Research Question 2

Did Reading Documents Improve Perspective Taking?

This research question examines the influence of reading source documents on perspective taking accuracy. Were final predictions, which were made after reading documents, more likely to be accurate than initial predictions?

Finding: Reading Documents Resulted in Increased Perspective-Taking Accuracy

Participants in this study overwhelmingly made an initial prediction of a positive outcome for both Mrs. E (who was too busy) or Mrs. F (who had an incompatible theory of disease) (see Table 4-1). Overall, 77.3% of participants optimistically predicted that Mrs. E or Mrs. F would decide to boil her drinking water. After reading some or all of these documents, each participant made a final prediction. Whereas 22.7% of the 141 participants made accurate initial predictions, after reading documents, 60.7 % of the participants made accurate final predictions.

Table 4-1

Initial Predictions by Task

	Mrs. E	Mrs. F	Total
Initial prediction = No	13/71 (18.3%)	19/70 (27.1%)	32/141 (22.7%)
Final prediction = No	45/70* (64.3%)	40/70 (57.1%)	85/140 (60.7%)

Note: *Difference in Total Mrs. E participants due to missing final prediction from one participant

Participants' final predictions were more accurate than their initial predictions ($Z = 6.971, p = .000$ --Wilcoxon's Signed Ranks Test). Nearly all participants either

maintained their initial prediction (Always-Yes [n = 52] and Always No [n = 28]) or changed their predictions from Yes to No (n = 57). Only three participants changed their prediction from No to Yes.

None of the documents made any direct reference to Mrs. E or Mrs. F, but three documents contained information that suggested that people in Mrs. E's circumstances would be too busy to boil their drinking water. Another three documents suggested that people in Mrs. F's circumstances would be too culturally conservative to change their lifestyle. Thus, an important finding in this study was that new, indirect, and relatively subtle information did in fact improve perspective taking accuracy.

Hypotheses

To investigate why and how documents facilitated perspective taking accuracy, two hypotheses were entertained to discover what factors made a difference. The critical question was why some participants became more accurate as a result of reading the documents, whereas others did not. I therefore contrasted participants who maintained incorrect predictions (Always-Yes predictors) with participants who changed them from incorrect to correct predictions (Yes-to-No predictors).

Hypothesis #1: Those who made accurate final predictions read more documents than those who made inaccurate final predictions. Participants varied in the total number of documents they read. To address this hypothesis, I examined whether those who read more documents, regardless of document instructions (FD or CD), tended to make more accurate final predictions. Table 4-2 compares the number of documents read by Always-Yes and Yes-to-No participants. Those who changed their predictions from Yes to No did not read more documents than those who maintained a Yes prediction. In fact, there was

a negative, but not statistically significant, correlation between final prediction accuracy and number of documents read ($r(138) = -.160, p = .058$).

Table 4-2

Mean Number of Documents Read in FD and CD Conditions by Decision Group

	Always Yes	Yes to No
# Documents read (FD)	8.96 documents (.204)	8.58 documents (1.361)
# Documents read (CD)	8.00 documents (1.700)	7.42 documents (2.062)
# Documents read (FD + CD)	8.44 documents (1.335)	8.05 documents (1.797)

Note. FD = Full document condition; CD = Choice document condition

One explanation for the lack of effect from reading more documents is that there is a trade-off in number of documents read and time spent on each document. Perhaps it is more productive to spend more time with slightly fewer documents than to read as many documents as possible. This possibility will be entertained further in the discussion of Research Question 3.

Hypothesis #2: Those who corrected their inaccurate initial predictions read more critical documents than those who continued to make inaccurate final predictions. If reading documents per se did not improve perspective-taking accuracy, perhaps Yes-to-No predictors differed from Always-Yes predictors in that they read more of the critical documents for their task. Reading critical documents provides the essential information needed for a correct prediction.

Table 4-3 below shows the documents that were critical for the culturally conservative Mrs. F (H, C, and R) and the documents that were critical for the very busy Mrs. E (S, W, and O)

Table 4-3

Documents and Critical Documents Selected by Decision Group

Critical Document	Mrs. E		Mrs. E		Mrs. F		Mrs. F	
	Always Yes		Yes to No		Always Yes		Yes to No	
	(n = 25)		(n = 33)		(n = 27)		(n = 24)	
	#	% n	#	% n	#	% n	#	% n
H Hot/cold	21	84	31	94	24	89	21	88
C Community leaders	24	96	31	94	26	96	23	96
R Race/class	22	88	32	97	25	93	21	88
S Los Molinos water	25	100	30	91	26	96	19	79
O Obtaining water/Los Molinos	25	100	33	100	27	100	22	92
W Access to water/Peru	25	100	30	91	26	96	19	79
N NYTimes	24	96	32	97	27	100	20	83
P Water resources/Peru	23	92	28	85	26	96	19	79
L Geography	21	84	28	85	23	85	20	83

There were no significant differences in the number of critical documents read.

Mrs. E Always-Yes predictors read 100% of their critical documents (S and O), while

those who changed to an accurate final prediction (Yes-to-No predictors) read slightly fewer critical documents but always at least 90%. Mrs. F Always-Yes predictors were also numerically more likely to read critical documents than “Yes-to-No predictors.

The results from hypotheses 1 and 2 showed that there were no obvious differences between Yes-to-No and Always-Yes perspective takers in what they read. In fact, inaccurate perspective takers tended to read both more documents and more critical documents than those who changed their predictions. If the difference between accurate and inaccurate final predictors did not stem from the number or relevance of the documents they read, it must have derived from the quality of thinking in which they engaged while reading them. In Research Question 3, I examine differences between accurate and inaccurate perspective takers.

Research Question 3

How did accurate perspective takers differ from inaccurate perspective takers?

Many participants were successful in this perspective-taking task. In addressing Research Question 2, I found that accurate and inaccurate perspective takers did not differ in the number of documents read or the number of critical documents read. If accurate and inaccurate perspective takers did not differ in the documents they read, they may have differed in the quality of thinking about the documents they read. Research Question 3 explores in more detail how accurate and inaccurate perspective takers differed from one other.

To determine how accurate perspective takers differed from inaccurate perspective takers, I compared three groups: (a) Always-Yes predictors (n = 52)--those who maintained an initial inaccurate (Yes) prediction; (b) Always-No predictors (n = 28)-

-those who maintained an initial accurate (No) prediction; and (c) Yes-to-No predictors (n = 57)--those who changed from an initial inaccurate (Yes) prediction to a final accurate (No) prediction. A fourth group, those who changed an accurate initial prediction to an inaccurate final prediction after reading documents, consisted of only three individuals. Therefore, they were not included in this analysis.

To determine why some participants were more accurate whereas others were not, it is necessary to address two sub-questions:

- Why were some participants accurate from the start and resisted making changes? (Always-No predictors, n=28)
- Why did some participants correct their inaccurate initial predictions? (Yes-to-No predictors, n=57)

Written data collected for this study provided three different types of information: (a) reasons for initial and final predictions; (b) document evaluations on how well documents supported these predictions (MR condition only); and (c) the reasoning strategies derived from explanations for predictions. All three types of data were analyzed to determine differences among the three decision groups: Always-Yes, Always-No, and Yes-to-No predictors.

Subquestion #1: Why Did Always-No Participants Make Accurate Predictions from the Start and Not Change their Minds Later?

I examined two hypotheses that might account for why Always-No participants, in contrast to Yes-to-No and Always-Yes participants, made accurate predictions from the start.

Hypothesis #1. Always-No participants were more likely to identify critical information (in the scenarios) and interpret it correctly. Initial predictions and reasons were necessarily based on the information contained in the two scenarios. Additionally, participants may have been influenced by individual factors such as background knowledge, emotional responses to the scenarios, or cognitive biases. Initial reasons are displayed in Table 4-4. As different reasons were appropriate to a particular task (Mrs. E--who was too busy--or Mrs. F--who was culturally conservative), the results for Mrs. E and Mrs. F are reported separately within the table.

Not surprisingly, those who made an initial Yes prediction (first 4 columns in Table 4-4) supplied mostly Yes reasons. For example, 60% of the Mrs. E Always-Yes participants wrote that Mrs. E had already “made changes” (MC) suggested by Nelida and 70% of the Yes-to-No predictors did the same. Moreover, 56% of the Mrs. F Always-Yes participants wrote that the scenario stated that Mrs. F “likes Nelida” (LN) and 54% of the Yes-to-No predictors did the same. No single Yes reason stands out as uniquely important for either the Mrs. E or Mrs. F task.

Table 4-4

Number of Initial Prediction Reasons by Task and Decision Group

	Mrs. E	Mrs. F	Mrs. E	Mrs. F	Mrs. E	Mrs. F
	Always	Always	Yes to No	Yes to No	Always	Always
	Yes	Yes	(n = 33)	(n = 24)	No	No
	(n = 25)	(n = 27)			(n = 12)	(n = 16)
Yes Reasons						
ID Important to do (both)	13 (52%)	13 (48%)	19 (58%)	15 (62%)	0	0
MC* Made changes (E)	15 (60%)	0	23 (70%)	0	1 (8%)	0
R Resourceful (E)	12 (48%)	0	14 (42%)	0	0	0
CC Cooks for community (F).	0	7 (26%)	0	11 (46%)	0	1 (6%)
NB Not busy (F)	0	2 (7%)	0	0	0	0
LN Likes Nelida (F)	1 (4%)	15 (56%)	1 (3%)	13 (54%)	0	1 (6%)
E Educated by Nelida (both)	2 (8%)	14 (52%)	2 (6%)	11 (46%)	0	0
Y Young (E)	0	0	1 (3%)	0	1 (8%)	0
FH Family help (F)	2 (8%)	0	0	0	0	0
No Reasons						
NFH No family help (E)	0	0	0	0	0	1 (6%)
NDC (both)	0	0	0	0	0	4 (25%)
P Poor (both)	1 (4%)	2 (7%)	1 (3%)	2 (8%)	2 (17%)	6 (38%)
CF Cost of fuel (E)	0	0	0	0	0	1 (6%)
B Too busy (E)	1 (4%)	0	2 (6%)	1 (4%)	9 (75%)	4 (25%)
OL Too old (F)	0	0	0	0	0	6 (38%)
CT Cultural traditions (F)	0	2 (7%)	0	2 (8%)	4 (33%)	10 (62%)
O Other Reasons	7 (28%)	4 (15%)	6 (18%)	1 (4%)	0	0
Total	54	59	69	56	17	33
Average # Reasons	2.16	2.18	2.09	2.33	1.42	2.06

When we compare all the initial Yes predictors (columns 1-4) to the Always-No predictors (columns 5 and 6), it is clear that the latter viewed the scenarios very differently at the time of their initial prediction. Not surprisingly, the Always-No prediction group cited primarily No reasons. However, they also appeared to prefer one specific reason. For Mrs. E, the primary Always-No reason (75%) for not boiling her drinking water was that she was “too busy” (B). In fact, this was the critical reason suggested about Mrs. E in the original case study. For Mrs. F, 62% of the participants predicted that she would adhere to "cultural traditions" (CT), and this, in fact, was the primary reason suggested in the original case study regarding Mrs. F.

At this point in the study, the participants had read no documents; whatever differences existed between the initial Yes and No predictors is likely to have arisen from individual differences in how they perceived the original scenario or from differences in preliminary instructions for their condition (MR or NMR). Overall, however, participants who made accurate initial predictions provided significantly more total No reasons ($t(139) = 7.256, p = .000$) and, more importantly, critical No reasons ($t(139) = 6.918, p = .000$) to justify their predictions. They were right and usually for the right reasons. Therefore, Hypothesis 1 is strongly supported by these results: Always-No participants were more likely to identify critical information in the scenarios and to interpret it correctly.

Hypothesis #2. Always-No participants interpreted information in the documents correctly. In addition to correctly identifying critical information in the scenarios for their initial prediction, Always-No predictors correctly interpreted information in the documents. When they made their final predictions, they provided many more No reasons

($M = 4.25$, $S.D. = 1.295$) than Yes reasons ($M = 0.39$, $S.D. = 1.066$) and almost always identified the critical reason for Mrs. E or Mrs. F's failure to boil her drinking water.

Always-No participants with the Mrs. E task explained that Mrs. E was "too busy" to boil her drinking water 100% of the time. Those with the Mrs. F task chose "cultural traditions" 88% of the time when they explained in their final prediction why Mrs. F would not boil her drinking water.

Sub-question #2. What Differentiated Those Who Corrected their Initial Inaccurate Predictions (Yes-to-No Predictors) from Those Who Did Not (Always-Yes Predictors)?

Hypothesis #1. Those who corrected inaccurate predictions read more documents and more critical documents, which guided them to correct their predictions. This prediction is not supported by the data. In fact, Table 4-5 shows that, although the difference between the two groups is not significant, Yes-to-No predictors read slightly fewer documents, and slightly fewer critical documents, than Always-Yes predictors.

Table 4-5

Comparison of Total and Critical Documents Read by Decision Group

	Always-Yes Predictors (n=52)	Yes-to-No Predictors (n=57)
Mean total documents read (9 documents)	8.44 documents (1.335)	8.05 documents (1.797)
Mean Mrs. E critical documents (2 critical documents)	2.00 documents (0.00)	1.91 documents (0.144)
Mean Mrs. F critical document (3 critical documents)	2.78 documents (.260)	2.71 documents (.293)

Hypothesis #2. Those who corrected inaccurate initial predictions (Yes-to-No predictors) provided solely No for their final predictions, whereas those who did not correct their predictions provided solely Yes reasons Yes reasons for their final predictions. We might expect that those who changed predictions would encounter No reasons in the documents that caused them to change their predictions, whereas those who did not change would continue to focus on the Yes reasons they gave in their initial predictions. Part of this hypothesis was supported, but part was not.

The majority of Yes-to-No predictors gave solely No reasons when they made their final predictors (48 individuals provided solely No reasons vs. 9 individuals who gave a combination of Yes and No reasons). However, most Always-Yes predictors

provided both Yes and No reasons when they made their final Yes predictions (7 individuals gave solely Yes reasons vs. 45 gave both Yes and No reasons for their final Yes predictions (see Table 4-6).

Table 4-6

Number of Participants with Yes and No Final Prediction Reasons by Decision Group

	Always Yes	Yes-to-No	Always No
Only Yes or only No reasons	7	48	23
Both Yes and No reasons	45	9	5

However, Always-Yes predictors did give more Yes reasons than No reasons, with three Yes reasons for every two No reasons (see Table 4-7)

Table 4-7

Final Prediction Yes and No Reasons (Total, Mean, and Standard Deviation)

	Always Yes n = 52	Yes to No n = 57	Always No n = 28
Yes reasons	148 M = 3.04 (1.328)	10 M = 0.18 (.428)	6 M = 0.39 (1.066)
No reasons	96 M = 1.96 (1.328)	223 M = 3.91 (1.340)	121 M = 4.25 (1.295)

Although Yes-to-No predictors clearly provided far more No reasons than Yes reasons, Always-Yes predictors provided, on average, nearly two reasons why Mrs. E or Mrs. F might not have boiled her drinking water even though they ultimately predicted that she would have done so. This finding contradicts the latter half of Hypothesis #2. Always-

Yes predictors gave mostly Yes reasons, but not to the exclusion of No reasons; they gave both kinds of reasons. Nonetheless, these results clearly support the first part of the hypothesis: Yes-to-No participants provided far more No reasons than Yes reasons.

Hypothesis #3. Those who corrected inaccurate initial predictions (Yes-to-No predictors) provided more critical No Reasons than those who failed to do so (Always-Yes predictors). This hypothesis was confirmed. Yes-to-No predictors, in comparison to Always-Yes predictors, gave more critical No reasons ($M = 2.26$, $SD = 1.330$) vs. ($M = 1.04$, $SD = .907$) when they made their final predictions. This result was significant ($t(107) = 5.564$, $p = .000$).

Not only did Yes-to-No predictors note critical reasons for their predictions, but also 94% of Yes-to-No Mrs. E participants offered "too busy" as an important reason for rejecting their initial prediction, and 71% of the Yes-to-No Mrs. F participants offered "cultural traditions" (CT) as a reason to reject their initial prediction. These reasons were supported for Mrs. E and Mrs. F respectively in the original case study.

Most predictions that cited No reasons contained a mixture of critical No reasons and marginal or irrelevant No reasons. A No reason was marginal if it supported a No prediction but did not represent a critical No reason for the task. For example, Mrs. F did not boil her drinking water because she did not believe in the germ theory of disease. If a participant also noted that it would take a lot of time to boil water, this was considered a marginal reason for Mrs. F. However, it was a critical reason for the Mrs. E task. Some participants also cited irrelevant reasons (e. g., Mrs. F would not boil her water because foreigners had brought cholera to Peru--1998 NYT article). As participants in both conditions provided both critical and marginal/irrelevant reasons for their final

predictions, Table 4-8 displays the number of critical vs. marginal/irrelevant No reasons by decision group. Within each group, the difference between critical reasons and marginal/irrelevant reasons was also calculated and displayed in the columns labeled “Critical minus marginal/ irrelevant reasons.”

Table 4-8

Distribution of Critical and Marginal/Irrelevant Final Prediction No Reasons

	Always Yes Critical No Reasons	Always Yes Marginal/ Irrelevant No Reasons	Always Yes Critical minus Marginal/ Irrelevant Reasons	Yes to No Critical No Reasons	Yes to No Marginal/ Irrelevant No Reasons	Yes to No Critical minus Marginal/ Irrelevant Reasons
Total #	52	44	+8	131	102	=29
Mean # (S.D.)	1.04 (.907)	0.92 (.860)	+0.12	2.26 (1.330)	1.65 (1.026)	+0.61

Table 4-8 shows that Always-Yes predictors, in comparison to Yes-to-No predictors, provided an almost equal number of critical and marginal/irrelevant reasons. Therefore there was little difference between the number of good quality and poorer quality No reasons for their predictions (Mean difference = + 0.12 reasons). This means that they were just as likely to provide reasons appropriate to Mrs. E when working on the Mrs. F task and vice versa. In contrast, Yes-to-No predictors gave +0.61 more critical reasons than marginal/irrelevant reasons. However, the mean difference scores (0.12 vs.

0.61) between the two decision groups did not quite reach statistical significance. Both decision groups, whether or not they made accurate final predictions, tended to give some lower quality reasons that did not factor in the original case study.

Specific No reasons offered by the two decision groups are shown in Table 4-9. It displays the raw total and percentage of Mrs. E and Mrs. F participants who provided each No reason. Critical reasons (*) for Mrs. E and F are noted beside each code.

According to Table 4-9, only 52% of the Always-Yes predictors with the Mrs. E task identified the primary critical reason ("too busy"). In comparison, 94% of the Yes-to-No predictors noted this critical reason. Only 30% of the Always-Yes predictors selected "cultural traditions" or "theory of hot and cold" for Mrs. F; indeed 41% of them selected "too busy" for Mrs. F, which was not a factor in her decision. In contrast, 71% of the Yes-to-No predictors wrote that "cultural traditions" was an important reason for Mrs. F's failure to boil her drinking water. Most participants, but especially the Always-Yes predictors, selected some critical Mrs. F reasons for Mrs. E and critical Mrs. E reasons for Mrs. F. Participants in both decision groups had more difficulty identifying critical reasons for the Mrs. F task than for the Mrs. E task.

Table 4-9

Specific Final Prediction No Reasons by Task and Decision Group

	Mrs. E		Mrs. F		
	Always Yes		Always Yes		
	(n = 25)		(n = 27)		
			Mrs. E		
			Yes to No		
			(n = 33)		
			Mrs. F		
			Yes to No		
			(n = 24)		
No Reasons					
(CL) * (Mrs. F) Community leaders	4	(16%)	3 (11%)	14 (42%)	7 (29%)
(NFH) * (Mrs. E) No family help	2	(8%)	0	5 (15%)	2 (8%)
(NDC)* (Mrs. F) Nelida different culture	0		5 (18%)	1 (3%)	6 (25%)
(P)* Poor (Mrs. E)	3	(12%)	8 (30%)	17 (52%)	13 (54%)
(CF)* (Mrs. E) Cost of fuel	0		1 (4%)	2 (6%)	0
(WS)* (Mrs. E) Water supply	5	(20%)	5 (18%)	13 (39%)	9 (38%)
(B)* (Mrs. E) Too busy	13	(52%)	11 (41%)	31 (94%)	15 (62%)
(OL)* (Mrs. F) Too old	0		0	0	10 (42%)
(CT)* (Mrs. F) Cultural traditions	6	(24%)	8 (30%)	17 (52%)	17 (71%)
(TW)* (Mrs. F) Taste of water	1	(4%)	4 (15%)	6 (18%)	5 (21%)
(HC)* (Mrs. F) Holt/cold theory of disease	7	(28%)	8 (30%)	12 (36%)	13 (54%)
(GTD)* (Mrs. F) No germ theory of disease	0		1 (4%)	1 (3%)	5 (21%)

(table continues)

Table 4-9 (continued)

Specific Final Prediction No Reasons by Task and Decision Group

NO Reasons that were usually				
YES Reasons				
(CC) (Mrs. F)	0	0	0	1 (4%)
Cooks for community				
(R) (Mrs. E)	0	0	2 (6%)	0
She's resourceful				
(O) Other Reasons	0	1 (4%)	5 (15%)	4 (17%)
Total	41	55	126	107
Average	1.64	2.04	3.82	4.46

Note: * Indicates critical reason

Hypothesis #4. Those who failed to correct inaccurate initial predictions (Always-Yes predictors) increased the number of Yes reasons for their final predictions, while those who corrected their initial predictions (Yes-to-No predictors) decreased the number Yes reasons in their final predictions. Thus, although Hypothesis #3 had shown that Always-Yes predictors often provided No reasons, even critical No reasons, hypothesis #4 predicts that they were more likely to have an increase in Yes reasons in their final predictions. This hypothesis was confirmed. Table 4-10 shows that total initial Yes reasons increased from 86 to 101 for the Always-Yes group after reading documents. Yes-to-No predictors' total Yes reasons decreased from 109 to 12 after reading documents. The difference between groups for total final Yes reasons was significant ($t(107) = 15.430$, $p = .000$).

Of greater interest, however, is the change in specific Yes reasons provided by the Always-Yes group after they read documents. Table 4-10 displays the most common initial and final prediction Yes reasons provided by Always-Yes and Yes-to-No participants.

Table 4-10 shows that reading documents produced an increase in Yes reasons among Always-Yes participants. However, there was a decline in three specific types of Yes reasons ("cooks for the community," "likes Nelida," and "made changes"), no change in another reason ("resourceful"), and an increase in three reasons ("important to do"--from 25 to 37, "educated"--from 13 to 17, and "theory of hot and cold" --from 0 to 11). Both "important to do" and "educated" relate to document N, and to a lesser extent document W, that described the horrors of cholera, a water-borne disease that was introduced to Peru in the 1990s. Unlike Always-Yes predictors, Yes-to-No predictors appear to have been less affected by these documents (based on document ratings) and therefore the associated Yes reasons declined from 34 to 4 and from 13 to 2, respectively, for Yes-to-No predictors.

Table 4-10

Number and Percentage of Initial and Final Prediction Yes Reasons by Decision Group and Task

“Yes Reasons	Mrs. E Task		Mrs. E Task		Mrs. F Task		Mrs. F Task		Total Always Yes		Total Yes to No	
	Always Yes (n = 25)		Yes to No (n =33)		Always Yes (n = 27)		Yes to No (n = 24)		(n = 52)		(n = 57)	
	Prediction		Prediction		Prediction		Prediction		Prediction		Prediction	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
ID	12 (48%)	16 (64%)	19 (58%)	3 (9%)	13 (48%)	21 (78%)	15 (62%)	1 (4%)	25 (48%)	37 (71%)	34 (60%)	4 (7%)
MC	15 (60%)	7 (28%)	23 (70%)	1 (3%)	0	0	0	0	15 (29%)	7 (13%)	23 (40%)	1 (2%)
E	3 (12%)	4 (16%)	2 (6%)	1 (3%)	10 (37%)	13 (48%)	11 (46%)	1 (4%)	13 (25%)	17 (33%)	13 (23%)	2 (4%)
R	11 (44%)	11 (44%)	14 (42%)	2 (6%)	0	0	0	0	11 (21%)	11 (21%)	14 (25%)	2 (4%)
HC	0	9 (36%)	0	0	0	2 (7%)	0	0	0	11 (21%)	0	0
LN	0	0	1 (3%)	0	13 (48%)	10 (37%)	13 (54%)	3 (12%)	13 (25%)	10 (19%)	14 (25%)	3 (5%)
CC	0	0	0	0	7 (26%)	3 (11%)	11 (46%)	0	7 (13%)	3 (6%)	11 (19%)	0
Total	41	49	59	7	45	52	50	5	86	96	109	12
Mean #	1.64	1.96	1.79	0.21	1.67	1.93	2.08	0.21	1.65	1.85	1.91	0.21

Note. ID = Important to do; MC = Made changes; E = Educated by Nelida; R = Mrs. E is resourceful; HC = Hot/cold theory of disease;

LN = Mrs. F likes Nelida; CC = Mrs. F cooks for the community.

"Theory of hot and cold" made its appearance as a Yes reason only after Always-Yes predictors read document H, a critical document for the Mrs. F task. Document H describes the local hot and cold theory of disease. Whereas the original case study offered this as the primary reason why Mrs. F did not boil her drinking water, 9 of the 11 Always-Yes predictors employed it as a Yes reason to justify their prediction for Mrs. E. They noted, quite accurately, that Mrs. E had already been convinced by Nelida to make changes to her family's hygiene practices and predicted that Mrs. E would be less likely to believe in the "theory of hot and cold." This was, in fact, the case. However, Mrs. E did not boil her drinking water because she was much too busy to do so. Always-Yes predictors who provided HC as a Yes reason ignored the real reason for Mrs. E's failure to boil her drinking water; they failed to give appropriate weight to Mrs. E's busy lifestyle. The remaining two participants who employed HC to justify a Yes prediction were from the Mrs. F task. They both misinterpreted the "theory of hot and cold" and saw it as a justification for boiling water. Always-Yes participants were the only decision group to employ HC as a Yes reason.

Therefore, two of the three Yes reasons that increased after Always-Yes participants read documents appear to have been based on emotional responses to Document N, while the third ("theory of hot and cold") appears to stem misconceptions about the meaning or applicability of Document H. Hypothesis 5 below addresses how Always-Yes and Yes-to-No participants evaluated critical documents.

Hypothesis #5. Those who corrected their incorrect initial predictions (Yes-to-No predictors) evaluated documents more accurately than those who did not. As noted in Research Question 2, most participants, across all conditions, read all critical documents,

in fact almost all documents. Therefore, the differences between correct and incorrect final predictions must have resulted, not from the selection of the correct documents to read, but rather from how participants thought about them. Participants in the MR condition were required to evaluate the extent to which each document supported or did not support their three predictions with the Document Evaluation Tool. A large positive (between +1 and +2) average document rating in Table 4-11 indicates that a given document was evaluated correctly by most people in the prediction group. The analyses reported in this section focus on MR participants' document evaluations.

The results below lend support for Hypothesis #5, but only with regard to three specific critical documents, one for the Mrs. E task and two for the Mrs. F task.

Table 4-11

Critical Documents Ratings by Task and Decision Group

Document	Mrs. E Critical Documents		Mrs. F Critical Documents		
	S	O	R	H	C
	Water Supply in Los Molinos	How Los Molinos Gets Water and Fuel	Race, Class, and Cultural Distinctions	Hot/Cold Distinctions in Los Molinos Culture	The Role of Local Civic Leaders and Healthcare Workers
Associated No reasons	*Busy *Poor *No family help *Water supply	*No family help *Busy *Poor *Water supply *Cost of fuel	*Nelida different race	*Cultural traditions *Hot and cold *Germ theory of disease *Taste of water	*Community leaders
Always Yes	M = -.09	M =.0.73	M = 1.00	M = .40	M = 0.82
Mean rating	S. D. = 1.04	S. D.=1.35	S. D.=0.82	S. D.=1.51	S. D.=1.25)
Yes-to-No	M = .54	M = 1.69	M = 1.00	M = 1.56 S.	M = 1.33
Mean rating	S. D.=0.66	S. D. =0.60	S. D.=0.82	D.=0.53	S. D. =0.87

Documents S and O were critical documents for the Mrs. E task, and Documents R, H, and C, were critical documents for the Mrs. F task. Table 4-11 shows that Mrs. E Always-Yes participants were less likely than their Yes-to-No counterparts to rate these documents as supporting a No prediction. However, Document O was rated more highly

as supporting a No prediction by both prediction groups. Nonetheless, the mean rating for Document O for the Yes-to-No prediction group was significantly larger than that of the Always-Yes prediction group (Mean = 1.69, S.D. = .602 vs. Mean = 0.73, S.D. = 1.35; $t(25) = 2.522$, $p = .018$). Document O describes in great detail how difficult and time-consuming it was for Los Molineros to collect water and fuel. It provided the primary explanation for why the real Mrs. E did not have the time to boil her drinking water.

Similarly, for the Mrs. F task, Yes-to-No predictors rated the critical documents more positively than Always-Yes counterparts, with the exception of Document R, for which the ratings were identical. However, once again, the difference in rating for the two decision groups was significant for only one document, Document H (mean = 1.56, S.D. = .53, for Yes-to-No; mean = 0.40, S.D. = 1.51, for Always-Yes; $t(17) = 2.180$, $p = .044$). Document H described the local theory of disease. In the original case study, this latter reason represented the greatest obstacle to Mrs. F's following Nelida's advice. Therefore, Hypothesis #5 was confirmed. Those who corrected their initial prediction not only evaluated documents correctly, they also assigned greater significance (via their highest rating) to the most important document (O or H) for their condition.

Additional support for Hypothesis #5 is provided in Table 4-12, which combines the number of participants who provided either a + and ++ rating for each critical document. It shows the percentage of each decision group who noted that a given critical document supported a No prediction.

Table 4-12

Critical Documents Ratings Supporting a No Prediction

	Mrs. E Critical Documents		Mrs. F Critical Documents		
	S	O	R	H	C
Always Yes	36%	64%	70%	56%	54%
Yes-to-No	46%	94%	62%	100%	78%

For Mrs. E participants, only document O was rated by more than 50% of participants as supporting or strongly supporting a No prediction. Sixty-four percent of Always-Yes and 94% of Yes-to-No Mrs. E participants indicated that this document supported a No prediction. For Mrs. F participants, all three critical documents were rated as supporting a No prediction by at least 54% of participants in both decision groups. However, Document H was cited by 100% of Yes-to-No predictors but only 56% of Always-Yes predictors as supporting a No prediction.

Once again, this data shows that ratings for document O (Mrs. E participants) and ratings for document H (Mrs. F participants) represented a key difference between the two decision groups. The differences in critical document rating by decision group, particularly ratings for Document O (Mrs. E task) and Document H (Mrs. F task) may have resulted from several possible factors: (a) Always-Yes participants may have misunderstood or misinterpreted it; (b) they may have understood the document but doubted its relevance; (c) they may have understood the document and weighted its relevance appropriately, but found other reasons (Yes reasons) more compelling when it was time to combine and evaluate all the evidence; or (d) they may have felt emotionally

distressed about the ill-effects of contaminated water, and this exacerbated factors (a) though (c) above.

As noted in hypothesis #4, 11 Always-Yes predictors employed the “theory of hot and cold” as a Yes reason. Mrs. F participants appeared to misinterpret document H and Mrs. E participants used it inappropriately to justify a Yes prediction for Mrs. E. Additionally, two Yes reasons increased in number from initial to final prediction for the Always-Yes group. These were “important to do” and “educated by Nelida,” suggesting an emotional response to Mrs. E or Mrs. F’s predicament. Based on comments that were made in final predictions, the increase in these more emotional reasons was related to document N and, to a lesser extent document W, which described the spread of cholera in Peru in the 1990s. Always-Yes predictors often referred to “cholera: or specifically document N to emphasize how important it was for Mrs. E or Mrs. F to boil her drinking water. Therefore, the document ratings for documents N and W were also examined in the table below.

Table 4-13

Document Ratings in Support of a Yes Prediction by Decision Group

	Always Yes		Yes to No		Always No	
	(n = 23)		(n = 27)		(n = 19)	
Document rating	Doc. N (n = 23)	Doc. W (n = 20)	Doc. N (n = 23)	Doc. W (n = 21)	Doc. N (n = 16)	Doc. W (n = 16)
(++) Strongly supports Yes	15 (65%)	4 (20%)	4 (15%)	1 (5%)	1 (6%)	1 (6%)
(+) Supports Yes	5 (22%)	6 (30%)	9 (33%)	3 (14%)	5 (31%)	0
(0) Neither supports nor does not support Yes	3 (13%)	9 (45%)	10 (30%)	15 (71%)	10 (62%)	13 (81%)

Table 4-13 shows that 15 (65%) Always-Yes predictors felt that Document N strongly supported their Yes prediction(s), and another 22% rated the documents as supportive of a Yes prediction. Only 4 (15%) of Yes-to-No predictors noted strong support and 5 (26%) support for a Yes prediction. (Interestingly, Always-No predictors were the least likely to be influenced by Document N.)

It should be kept in mind that all document evaluation data was based on MR participants only. Therefore, it is important not to over-interpret these differences in document ratings for all study participants. However document ratings for the critical documents and document N are suggestive and receive additional support from data on reasoning strategies presented below.

Hypothesis #6. Those who changed their incorrect initial predictions to correct predictions (Yes-to-No predictors) as well as those who maintained accurate predictions

(Always-No predictors) reasoned accurately about critical documents whereas those who failed to change their inaccurate predictions (Always-Yes predictors) did not. Table 4-14 displays reasoning strategies and cognitive biases. They were coded based on statements made by participants to explain how they arrived at their predictions. In explaining their predictions, participants provided reasons for their final prediction (discussed above). However, very often participants made statements that indicated how they thought about the task and strategies they used to arrive at their final prediction. At times, some of them also revealed cognitive biases they may have interfered with arriving at a correct prediction. These reasoning strategies and biases, displayed in Table 4-14, confirm Hypothesis #6.

Table 4-14

Reasoning Strategies and Cognitive Biases Across Decision Groups

Reasoning strategies and cognitive biases	Always Yes	Yes to No	Always No	Total and % of
	Total and % of	Total and % of	Total and % of	N
	(n = 52)	(n = 57)	(n = 28)	(N = 140)
Reasoning strategies				
EL (Elaboration)	45 (86.5%)	1 (1.8%)	25 (89.3%)	71 (50.7%)
AN (Used anomalous information)	7 (13.5%)	57 (100%)	3 (10.7%)	67 (47.9%)
QP (Qualified prediction)	11 (21.2%)	2 (3.5%)	0	13 (9.3%)
SS (Schema selection)	7 (13.5%)	5 (8.8%)	0	12 (8.6%)
SM (Schema melding)	0	1 (1.8%)	2 (7.1%)	3 (2.1%)
CU (Cultural universal)	3 (5.8%)	1 (1.8%)	2 (7.1%)	5 (3.6%)
PROJ (Projection)	2 (3.8%)	1 (1.8%)	1 (3.6%)	4 (2.9%)
Cognitive Biases				
E (Emotional response)	12 (23.1%)	1 (1.8%)	0	13 (9.3%)
CB (Confirmation bias)	8 (15.4%)	0	0	8 (5.7%)
RC (Rationalized contradictions)	28 (53.8%)	0	0	28 (20%)
WT (Wishful thinking)	3 (5.8%)	2 (3.5%)	0	5 (3.6%)
Total cognitive biases	51	3	0	54

Always-Yes participants, instead of using anomalous information (AN) from the documents to adjust their predictions, elaborated (EL) their initial predictions, although six of them did note anomalous information that they could not explain away. Always-Yes participants very often integrated anomalous information from documents into a narrative that supported maintaining a Yes prediction. Moreover, they were far more

likely than Yes-to-No participants to reveal cognitive biases, including rationalizing contradictory evidence (RC) they read in the documents ($\chi^2(1) = 38.5, p = .0000$). They were also more likely to qualify their predictions (QP) ($\chi^2(1) = 6.47, p = .0012$), to mention that they had been influenced in their decision-making by Document N (E) ($\chi^2(1) = 8.56, p = .003$), and to make statements that indicated they were looking for evidence to support their initial prediction (CB--confirmation bias) ($\chi^2(1) = 7.34, p = .007$). Almost all instances of cognitive bias that were identified through extra-prediction and metacognitive statements (51 of 54) were found in the Always-Yes prediction group.

Those who changed their incorrect predictions to correct ones (Yes-to-No group) always noted anomalous information (AN) that led them to change their predictions. The two individuals who made statements suggestive of cognitive biases only did so to point out that they made a No prediction despite their wishful thinking and the information in Document N.

Always-No participants, like the Always-Yes decision group, almost always elaborated their initial predictions by adding new reasons and making new causal connections. A few used anomalous information to adjust the reasons for their predictions. As noted in Hypothesis #5, this group was least likely to positively evaluate Document N, and none wrote statements that indicated cognitive biases.

All in all, these results confirm that those who made correct final predictions reasoned correctly about the documents they read, whereas Always-Yes predictors did not. Although the latter often noted contradictions to their final predictions, Always-Yes predictors responded to this anomalous information in several ways. Some (11), although they failed to change their predictions, were more likely to qualify them. Others were

more likely to rationalize contradictory evidence and to be influenced by Document N, which appeared to heighten their emotional response to a negative outcome. This, in turn, may have led to the increased incidence of wishful thinking and confirmation bias.

Those who changed their predictions from Yes to No not only noted anomalous information, but also used this information to change their predictions accordingly. Yes-to-No and Always-No predictors were less likely to express a desire for a positive outcome (WT), were less susceptible to the influence of Document N, used anomalous information (AN) to adjust their mental model rather than rationalize contradictory evidence, and appeared more confident about their predictions (only two Qualified Predictions).

Research Questions 4: What individual differences distinguished accurate perspective takers from inaccurate perspective takers?

Data collected about participants included age, gender, GPA, SAT total, and academic year. Interestingly, only one of these demographic variables was related to perspective-taking accuracy--age. Although there was a significant negative correlation between age and final prediction accuracy ($r = -.190, p = .024$) and age and decision group ($r = -.168, p = .047$), this result likely resulted from the skewed age distribution among participants. In addition, there was no positive correlation between success on the perspective taking task and academic achievement. In fact, there was a slight, but not significant, negative correlation ($-.128$) between GPA and final prediction accuracy and ($-.026$) between SAT total and decision group. Whatever led to differences in task performance does not appear to be related to academic achievement.

Integrated Summary and Discussion

When participants in this study made their initial predictions, few were correct. Only 31 (22%) of the 140 participants made accurate initial predictions, despite the fact that the scenarios contained information that could have supported a prediction in either direction. This imbalance suggests that many participants were inclined to predict a "happy ending" to the story. After reading documents that supported a No prediction, 57 (52%) of the initial Yes predictors changed their minds. This left 52 individuals (48% of the initial Yes group), who resisted correcting their mental models. In the section below, I assemble the results discussed above in order to characterize the documents, strategies and biases that influenced each of these prediction groups.

Characteristics of the Three Decision Groups

Always-No Decision Group

One might describe this group as hard-headed realists, who noted from the beginning that Mrs. E, despite all her good intentions, would not have the time to boil her drinking water.

Example 1 (Mrs. E initial prediction): "No--She is too tired from everything she has to do in the day and has no time."

Those assigned to the Mrs. F task were, from the outset, unconvinced that an elderly, culturally conservative 60-year-old woman would change her ways to please an outsider, no matter how much Mrs. F came to like Nelida.

Example 2 (Mrs. F initial prediction):

No – She (Mrs. F) is a culturally conservative woman and therefore might resist any kind of change in her lifestyle. She relies upon tradition for information about how to go about her daily life, not outsiders as someone who is used to getting advice through newspapers or the web like Americans do. Also, she is known to be a very good cook. If people respect her so much for her domestic prowess, she might be hesitant to take advice about how to prepare food, something she knows she is good at, from someone who isn't so established. Thirdly, even if she does get along well with Nelida, it does not mean that she will necessarily listen to her. She might enjoy her company and view her as a friend, but it is not that difficult to be friends while still holding opposing opinions on some matters. Mostly, Mrs. F is sixty years old, and most likely she is rather set in her ways by now.

Always-No predictors made accurate initial predictions that, for the most part, were supported by the same critical reasons that were determinative in the original case study. Seventy-five percent of Always-No Mrs. E group wrote that Mrs. E was “too busy” to boil her drinking water and 62% percent of the Always-No Mrs. F group wrote that Mrs. F was too culturally conservative to change her beliefs. Interestingly, the three individuals who changed their accurate predictions to inaccurate one (No-to-Yes group) had all failed to provide a single critical reason for their initial No prediction.

The reasons that the Always-No decision group provided in their final predictions indicated that they also interpreted the documents correctly. Those with the Mrs. E task identified "too busy" as a critical reason 100% of the time and for Mrs. F chose "cultural traditions" 88% of the time.

Example 1 (Mrs. E final prediction):

No--While Mrs. E showed the willingness to change ways, by building a lavatory for her family and a pen for the animals, she still has to spend a lot of her time and energy cooking for the family, taking care of them and helping on the field. Since the family is poor, she is most likely to have to travel far to retrieve water since her family cannot pay for it. Children may be sent for water, but her daughter is too young and young men (teenage

nephews) do not fetch water. Since kids cannot get it, Mrs. E must. Also, her family may refuse to drink the hot water without flavoring (which they probably have trouble affording and is a luxury) and may be superstitious about drinking hot water, since their culture links illness to hot, boiled water.

Example 2 (Mrs. F final prediction):

No--I still believe that Mrs. F will not boil the water. If anything, these articles have reinforced my opinion that she won't boil the water. For one thing, Nelida is the only one telling Mrs. F she should boil the water. Mrs. F's culture says otherwise, Mrs. F's habits say otherwise, and the authority figures in the government refuse to support Nelida's efforts. Also, Mrs. F is poor and therefore has less time and money to spend on obtaining cleaner water, either through boiling or buying respectively. If it is a continual chore simply to get the water to the house, boiling the water probably seems like an additional nuisance. In addition, the currently held views on the origins of diseases in Los Molinos concerning "hot" and "cold" lead people to associate "cooked" (boiled) water with disease. Thus, if Nelida is constantly bringing up the possibility of someone catching a disease, Mrs. F might steer further away from choosing to boil her water.

In both instances, Mrs. E participants included some Mrs. F critical reasons and vice versa. However, the critical reasons for their task tended to dominate what they wrote.

For the most part, this decision group (89.3%) merely elaborated the original No reasons cited at the time of their initial predictions; they rarely referred to any Yes factors that might have caused them to think otherwise. In describing how their final predictions changed, most noted something like the following:

Example 1 (Extra-prediction statement): "My prediction hasn't really changed but evolved. I knew the cultural differences would be an obstacle. The articles just proved my point."

Example 2 (Extra-prediction statement): “My prediction grew and the reasons intertwined with one another.”

Moreover, Always-No participants made no extra-prediction statements suggestive of cognitive biases and were the least likely to make emotional statements (E) after reading about cholera in Document N, the New York Times article that described a cholera epidemic in Peru that post-dated the case study by 43 years.

For this group of individuals, the task appeared to be easy and straightforward. The typical Always-No predictor read the scenario, provided the critical reason that was most salient in the original case study, and continued to be convinced that their initial prediction and reasons for that prediction were accurate. When they had the choice regarding the number of documents to read (CD instructions), they read the fewest number of documents ($M = 6.79$ documents, $SD = 2.155$) of any decision group. The absence of qualified predictions, countervailing Yes reasons, or cognitive biases suggests that this group experienced the task as straightforward with the correct prediction obvious from beginning to end.

Always-Yes Decision Group

When Always-Yes participants made their initial predictions, they of course specified reasons from the scenario that supported a Yes prediction. For those with the Mrs. E task, "important to do" (52%), "Made changes" (60%), and "Resourceful" (48%) were the most prevalent reasons for their initial Yes predictions. For those with the Mrs. F task, "important to do" (48%), "Likes Nelida" (56%), and "Educated by Nelida and Dr. U" (52%) were the most prevalent Yes reasons.

Example 1 (Mrs. E initial prediction):

Yes—She wants to keep her family healthy. By boiling water, she may be able to deter any diseases in the water. Her parents are aging, so she would probably try to keep them healthy and living longer. Mrs. E also lost a sister, so she was probably upset by this death and is well aware of how important health is in her family. I believe this is the strongest reason because death is permanent and a universal experience.

Example 2 (Mrs. F initial prediction):

There was nothing that insinuated they were worried about her and her family getting sick in the description. Also, the fact that Mrs. F likes Nelida and enjoys her visits means she is not sour towards her for pushing the water-boiling practice while she is conservative and set in her ways—I would think Nelida's visits would cause tension, not joy, if she was pushing something Mrs. F wasn't willing to do—especially since there were initial racial tensions. Mrs. F probably boils her water and understands and appreciates Nelida and Dr. U's advice and that is why she enjoys their talks and company.

After making their initial predictions, the Always-Yes decision group went on to read more documents than the other two decision groups (8.46 documents--8.96 with FD instructions and 8.00 with CD instructions). When they made their final predictions, they often cited "important to do" (64% for the Mrs. E task and 78% for the Mrs. F task) as a primary reason for their final predictions.

Despite making a final Yes prediction, this group cited many No reasons from documents that contradicted their Yes predictions. As a matter of fact, they provided, on average, two No reasons for every three Yes reasons. Fifty percent of these No reasons were critical No reasons ("too busy" for Mrs. E and "cultural traditions" for Mrs. F) that were supported in the original case study.

Example 1 (Mrs. E final prediction):

I predict that Mrs. E will boil her water. The main reason that I feel Mrs. E will boil the water is because she wants to protect the health of her family. The documents that provided reasons for her to not boil the water gave reasons that were minor and temporary, such as not waking up earlier or not receiving information from the government. Once Dr. U gives Mrs. E this critical information about how boiling water will protect her family, Mrs. E will most likely boil the water. We know that Mrs. E already has personal experiences with death such as the death of her sister and the fear of death of her aging parents, so she probably wants to keep her family healthy. Health is a strong universal experience, and I believe any culture would want to stay healthy regardless of cultural differences. Death is a battle against the human race, and cultural differences do not matter.

Example 2 (Mrs. F final prediction):

I continue to believe that Mrs. F boils her drinking water. I believe this because, although she is said to be conservative and conservative beliefs seem to be against boiling water for the sake of “removing the cold,” there are 8 children in the household, some are bound to be old enough to fetch water—alleviating that burden for the most part from Mrs. F. That would make the task less time consuming for her. Also, the fact that she must have witnessed the outbreak of cholera in the early 90—that may even be how she lost her daughter-in-law. Witnessing such a thing and possibly being personally affected by it would probably convince her, especially if she was educated about it and given some sort of proof from Nelida or Dr. U, whom she respects and enjoys.

Reasoning strategies and, for those in the MR condition, document ratings provided evidence regarding their seemingly contradictory stance. Document ratings suggested that this decision group rated the critical documents differently from those who made final No predictions. Although 64% of the Mrs. E Always-Yes participants did rate Document O as contradictory to their final prediction ($M = 0.73$, $S.D. = 1.35$), their ratings were of lesser magnitude and less consistent than those who made accurate predictions. Although Mrs. F Always-Yes predictors rated documents R (70%), H (56%), and C (54%) as contradictory to their final prediction, their mean ratings, particularly for Document H, were lower than those who made accurate final predictions. In contrast,

65% of the Always-Yes group (vs. 15% of Yes-to-No and 5% of Always-No groups) found Document N to support a Yes prediction.

A closer look at the reasoning strategies and cognitive biases of Always-Yes participants provides additional insights: 15.4% made statements that suggested confirmation bias and 53.8 % attempted to rationalize the contradictory evidence they had noted. This group also appeared least secure in their final predictions (21.2% qualified their predictions) and were also the most likely to mention emotional reasons (E) relating to the New York Times article when making their final predictions.

Example 1 (Extra-prediction statement): "After reading about the cholera, I would hope that Mrs. E would want to protect her family. Even if local government officials do not spread the information, her personal experiences should persuade her to boil water."

Example 2 (Extra-prediction statement):

Reading about the beliefs of "hot" and "cold" made me re-think my initial prediction at first, but the other documents' arguments outweighed it. I believe Mrs. F gave Nelida more trouble at first, though, than I did before. The "hot" and "cold" article was the most influential. Knowing Mrs. F was poor and conservative and getting insight into how much they really believed and disliked boiling water made me think twice. However, I just don't think it was enough.

In comparison to the Always-No decision group, Always-Yes participants appeared to approach the perspective-taking task from an idealistic/emotional stance. They most often predicted that Mrs. E or F would boil her drinking water because it as "important to do." They were susceptible to the description of a cholera outbreak that took place in 1998, which appeared to fuel the importance of boiling water (cognitive bias--E), and made statements suggesting that they were looking for evidence in the documents to support their initial predictions (confirmation bias). Finally, although

Always-Yes participants noted many reasons why they might be wrong, they very often rationalized (RC) these reasons by elaborating their initial predictions into an integrated story to justify why they discounted or paid little heed to the No reasons they had cited.

For this group of individuals, who generally favored emotional reasons for their Yes predictions (“important to do”, “likes Nelida,” etc.), the most difficult part of the task was to find a way to deal with contradictory evidence in the documents. When they had the choice regarding the number of documents they would read (CD instructions), they read the most documents ($M = 8.0$ documents, $SD = 1.700$) of any decision group. Additionally, they usually cited a large number of countervailing No reasons that contradicted their predictions. The large number of cognitive biases, especially confirmation bias, rationalization of contradictions, and emphasis on emotional reasons they found in the Document N, suggests that this group experienced the task as an attempt to maintain their initial Yes prediction in the face of contradictory evidence. They may have been motivated to make inaccurate predictions (Senecal, et al., 2003; Simpson, et al., 1995) or resisted changing an initial mental model (Anderson, et al., 1980; Heuer, 1999; Johnson & Seifert, 1993, 1998)

Yes-to-No Decision Group

Yes-to-No and Always-Yes participants began with very similar findings for their initial predictions. Mrs. E Yes-to-No reasons were mostly "important to do" (58%) and "made changes" (70%), whereas Mrs. F Yes-to-No reasons were predominantly "important to do" (62%) and "likes Nelida" (54%).

Example 1 (Mrs. E initial prediction): “I think Mrs. E would begin to boil her drinking water. She seems very concerned about her family’s well being, which you can

see by her daily routine. I feel if she was given information that by boiling water she could help protect her family from disease, she would choose to do so.”

Example 2 (Mrs. F initial prediction): "Yes--She cooks for families and does not want to be responsible for getting them sick."

Additionally, Yes-to-No and Always-Yes predictors read about the same number of documents and critical documents. However, their results began to diverge in their approach to reading the documents. The majority of the Yes-to-No group, unlike the Always-Yes decision group, provided only No reasons for their final predictions and significantly more critical No reasons. Moreover, the specific No reasons they cited, much like the Always-No group, were the dominant No reasons supported in the original case study. For the Mrs. E task, 94% of the Yes-to-No predictors cited "too busy." For the Mrs. F task, 71% of this group cited "cultural traditions." Their reliance of these critical reasons is supported by their document ratings: 94% of Mrs. E Yes-to-No found strong support in Document O and 100% of those with the Mrs. F task found strong support in Document H.

Example 1 (Mrs. E Final Prediction):

After reading all the passages, I would say that Mrs. E will probably not boil her water. Given the cultural stigma about boiling water and since she is poor, which makes getting water more difficult, it would probably take too much of her time. Getting water would become primarily her additional chore on top of her others since her daughter is too young to get it. Men are not allowed to get it, nor are her nephews, who are of courting age. Given this, getting water everyday would become too much of a burden.

Example 2 (Mrs. F Final Prediction):

My final prediction is that Mrs. F did not boil the water. First her family is poor and according to evidence "O" poor women do not have free time for boiling water." Also, Mrs. F is conservative and the village culturally

believes “cooked” water to be linked with illness (as shown in H). Furthermore the villagers hate the taste of boiled water unless it is masked with something (H). R shows that Mrs. F probably adheres to tradition, which further supports her not boiling water. Finally, seeing that in C the men of the village don’t care whether the water gets boiled or not, it stands to reason that water boiling is not enforced.

This decision group was intermediate between Always-Yes and Always-No predictors in their ratings of Document N (Table 4-13). They reasoned as accurately as the Always-No decision group. Only two members of the 57 individuals in the Yes-to-No group revealed any cognitive biases. Importantly, in both instances, they stated that they had been influenced by the New York Times article or wishful thinking, but had resisted the temptation to make a Yes prediction. This group was the most likely to mention the "theory of hot and cold" (54%) to justify their No predictions, even more so than the Always-No prediction group.

Example 1: "I would like to think that she would [boil her water] after experiencing cholera outbreaks and being taught more about the need for sanitation, however I think the culture aspects of peoples’ lives are very hard to change."

Example 2: "Most of the documents I read seemed to contradict my initial prediction." Example 3:

I originally thought that Mrs. E would definitely boil the water. It seemed to me the only reasonable thing to do if you don’t want your family falling ill, you must do everything in your power to avoid it. I originally did not understand the amount of work and responsibility that lies on her shoulders.

Those who corrected their initial predictions used, by definition, anomalous information in the documents to correct their initial predictions. Although their initial predictions (like those in the Always-Yes group) suggest they had an emotional response

to their scenario and wanted a positive outcome, the documents persuaded them that a Yes prediction was untenable. Perhaps they were less soft-hearted than other Yes predictors or less susceptible to the cognitive biases of their Always-Yes counterparts. This cannot be determined by the data collected for this study. However, Yes-to-No predictors did appear to grapple with Document H to a larger extent than their Always-No counterparts, and 100% of them used Document H to support or strongly support their No predictions.

CHAPTER 5

Conclusions

Summary of Findings

In this chapter I discuss the statistically significant findings for this study and how they inform the theoretical model of perspective taking that informed its design. Next, I discuss the relationship between the results of this study, particularly prediction change results, in light of research on the role of anomalous information in conceptual change. I also address the lack of individual difference findings for academic ability with perspective-taking accuracy on the present task. Finally, I discuss the limitations of the present study and the relevance of this research to educational practice.

Reading Documents Improved Final Prediction Accuracy.

More than 50% of those who made incorrect initial predictions corrected their predictions after reading documents, particularly one or more of the critical documents for their task. This statistically significant result held true across all experimental conditions. However, reading documents alone was not responsible for improved perspective taking. Both those who made accurate final predictions and those who did not read approximately the same number of documents and approximately the same number of critical documents. In fact, inaccurate predictors tended to read more documents than those who were accurate. Therefore, although the number of documents participants read was not a key factor in improving perspective-taking accuracy, the opportunity to seek out instruction by reading critical documents was an important factor for many study participants.

Accurate Perspective Takers Reasoned Correctly about Critical Documents

Cognitive biases played a key role in the interpretation of documents. Always-Yes predictors, who maintained their incorrect predictions after reading documents, very often maintained a set of contradictory reasons for their final predictions. These reasons often included emotional Yes reasons such as “important to do” and “educated by Nelida about diseases from contaminated water.” However, they also discussed reasons, and very often critical reasons, why Mrs. E or F might not boil her water. These Always-Yes participants were far more likely to make extra-prediction statements and metacognitive statements that indicated they had been influenced by confirmation bias, emotional responses to the case study, and extraneous information in a New York Times article about the spread of cholera in Peru. This article post-dated the original case study by 43 years. All in all, inaccurate predictors invested a good deal of time (and words) explaining why they disregarded key evidence in the documents.

Perspective-Taking Accuracy Was Not Associated with Measures of Academic Ability.

There was no significant statistical relationship between perspective-taking accuracy and two separate measures of academic ability—SAT total and Grade Point Average. In fact, there was a slight, but not statistically significant, negative correlation between perspective-taking accuracy and these two measures.

Theoretical Model

Cutting and Chinn (2007), viewed perspective taking as the effortful employment of strategies to enable individuals to understand or predict the perceptions, thoughts, feelings, or actions of others. This is achieved through the construction of a mental model that corresponds to that of the perspective-taking target. Perspective taking therefore represents an attempt by an observer to reconstruct the representation that the target

person has for a particular situation. The level of difficulty that is experienced in constructing this mental model, according to this theory, varies along two dimensions: (a) the degree of similarity between the perspective taker and the target person and (b) the degree of similarity between the perspective taker's own life situation and that of the person whose perspective is taken (target situation).

Schema Selection

This model also specifies four core processes that are used to facilitate the construction of accurate mental models (schema selection, schema elaboration, monitoring, and model adjustment) and a range of specific strategies that support these processes. The present research attempted to isolate some of the key strategies associated with these core cognitive processes. The manipulations for the Model Revision condition (MR) were designed to promote increased monitoring and frequent updates of three separate mental models while reading documents.

Schema selection strategies, employed to help participants select an appropriate initial schema for the target person and situation, were promoted in the MR condition by the instruction to brainstorm factors that might influence Mrs. E or Mrs. F's decision about boiling water. After they brainstormed, MR participants were required to make three very different predictions and select one of them to serve as their favored mental model. This instruction resulted in MR participants making more accurate initial predictions than NMR participants. Thus, of the 22% of participants who made accurate initial predictions, more of them were in the MR condition. This result had marginal statistical significance. Despite its relative effectiveness, this schema selection strategy

alone was not sufficient to generate perspective taking accuracy in the majority of MR participants.

Seeking out instruction. Cutting and Chinn (2007) hypothesized that, when a perspective taker has no appropriate schema for understanding the perspective taking target or situation, seeking out additional information is an appropriate strategy, particularly for very different or conceptually novel perspective taking targets and situations. This task was designed so that participants read documents that would provide additional information about the demographics, geography, economics, culture, and infrastructure of Los Molinos, Peru. The theoretical model that informed this research predicted that additional information, which was available to all participants despite experimental condition, would facilitate final prediction accuracy. This was indeed the case. More than half of the participants corrected their inaccurate initial predictions. As there was no significant difference between the MR and NMR conditions, it appears that reading new information, in and of itself, was responsible for improved perspective-taking accuracy.

Monitoring Strategies

The MR condition also prompted participants to engage in strategies that would support increased monitoring and thereby facilitate model revision and adjustment. Participants in the MR condition were required to use a document evaluation tool to determine the extent to which any given documents supported, contradicted, or neither supported nor contradicted each of their three initial predictions. However, there was no significant difference in final prediction accuracy between the MR and NMR conditions. Despite this lack of effect for this experimental condition, a comparison among the three

prediction groups (Always-No, Always-Yes, and Yes-to-No predictors) revealed distinct differences in the reasoning strategies and cognitive biases that were displayed in their extra-prediction and metacognitive statements. For example, Always-Yes predictors were very likely to note contradictions between their predictions and the evidence they had read. More than half of them rationalized the contradictions they noted by providing an explanation for discounting or explaining away anomalous information. In this way, they were able to integrate anomalous information into their mental model. It appears that monitoring strategies are important for accurate perspective taking, but that the manipulation (Document Evaluation Tool) employed for this study was insufficient to offset factors that interfere with accurate perspective taking.

Schema Elaboration and Model Adjustment

Elaboration. By definition, those who found reasons in the evidence to alter their predictions engaged in model adjustment. As it turned out, those who did not change their initial predictions did elaborate their mental models. They added new details from the contradictory evidence in documents but still elaborated their initial predictions with additional extraneous details. Always-No predictors rarely had reason to adjust their mental models as they almost always had provided relevant reasons for their accurate initial predictions. For them, reading documents provided additional details, which were elaborated in their final predictions.

Adjustment. In contrast, predictors who corrected their initial predictions (Yes-to-No decision group), by definition, engaged in model adjustment. Rather than rationalizing or ignoring document information that confirmed the accuracy of a No prediction, they used this new information to adjust their mental models. As predicted by

the original theory of perspective taking that informed this study, model adjustment resulted when participants noticed that evidence did not support their initial mental model. Importantly, when Yes-to-No participants explained their changed predictions, they focused almost exclusively on No reasons when explaining their final prediction. Very few Yes-to-No predictors mentioned the Yes reasons that had informed their initial predictions.

Although Cutting and Chinn (2007) described prediction change as a process of model adjustment, the theory did not anticipate the extent to which perspective takers would note anomalous information and still fail to adjust their mental models. However, Chinn and Brewer (1993) had predicted a range of outcomes when students encounter anomalous information, including discounting or re-interpreting the anomalous data to fit the individual's current mental model. Although Cutting and Chinn postulated that cognitive biases would impede perspective taking accuracy, the theory should be revised to incorporate the finding that anomalous information may be incorporated in mental models for the purpose of preserving inaccurate predictions.

Obstacles to Model Adjustment

Finally, the original theory hypothesized a set of factors and cognitive biases that could impede perspective taking accuracy. In fact, cognitive biases appear to have held sway with the Always-Yes prediction group, who often ignored or rationalized evidence in documents that contradicted their predictions. Results from the present study suggest that Always-Yes participants were motivated to maintain their initial predictions. They were far more likely to maintain emotional reasons (e.g., "important to do") for final

predictions, even while recognizing evidence from critical documents that contradicted their predictions.

Much research on perspective taking has emphasized the role of empathy in eliciting perspective-taking. Instructions to “put yourself in another person’s shoes” led to recognition of similarity to the perspective-taking target (e.g., Davis et al., 1996; Davis et al., 2004; Galinsky & Moskowitz, 2000). This was particularly true for positive traits (Davis, et al., 1996). This phenomenon appears to have occurred in the present study, particularly with Always-Yes participants, despite the fact that participants were not given specific instructions to do so. However, in the present study, it is possible that the most empathic or compassionate individuals, those who had emotional responses to the scenario and documents, were more likely to engage in valiant efforts to maintain their initial rosy predictions. Extra-prediction and metacognitive statements by Always-Yes predictors were far more likely to include statements that suggested confirmation bias, to cite emotional reasons for their Yes predictions (such as “important to do”), and to include elaborations that rationalized contradictions to justify a happy ending. These emotional responses were often influenced by a response to Document N, the account of a cholera epidemic described in a less-than-relevant New York Times article. Davis’ (1996) multi-dimensional theory of empathy, may explain this result. Davis held that empathy consists of four inter-related but separable components. His Interpersonal Reactivity Index (IRI) (Davis, 1983) consists of four components: (a) perspective-taking—the tendency to embrace another person’s point of view; (b) empathic concern – the tendency to feel sympathy for others; (c) personal distress—the tendency to have a physical response to another’s plight; and (d) fantasy—the use of the imagination to

experience the feelings and actions of others. The results of this study would suggest the empathic concern, perhaps accompanied by emotional distress, may have resulted in diminishing perspective-taking accuracy in highly empathic individuals. Thus, although empathic concern is often viewed as an important factor in promoting perspective taking (e.g. Davis, 1994), it is possible that too much empathy may be as detrimental to social cognition as too little.

Therefore, if anything, Cutting and Chinn's theory of perspective taking may have underestimated the role of cognitive biases in perspective taking. The document evaluation manipulation in the MR condition was not sufficient to counter their effects. These results suggest that the influence of cognitive biases might be still more pronounced when a given perspective-taking task is intertwined with self-interest or long held belief systems. Dire or rosy predictions about the outcomes of war or policy decisions come to mind.

With these results in mind, the present theory appears to explain a number of phenomena through the core processes of schema selection, monitoring, elaboration, and adjustment. However, the influences of cognitive biases are strong and appear to specifically impact model adjustment. Many participants in the present study worked very hard to maintain their initial predictions in the face of contrary evidence. Further research should address factors such as prior knowledge and prior beliefs that promote or hinder accurate perspective taking.

Conceptual change

Dunbar (2005) in his review of scientific reasoning and thinking, distinguished between two kinds of conceptual change. One consists of adding new knowledge to an

existing conceptual structure. In this form of conceptual change, there is no conflict between pre-existing concepts and new information. In the present study, this sort of change has been termed "elaboration" and is defined as the addition of new model components with, very often, new causal connections. Dunbar's second category of conceptual change refers to "radical conceptual change" (p. 715) where existing conceptual structures are re-organized in new ways. This type of conceptual change corresponds, in the present study, to the use of model adjustment and the reasoning strategy AN, using anomalous information in the documents to correct a prediction. With very few exceptions, Yes-to-No participants represented the only participants to undergo Dunbar's second type of conceptual change. Always-Yes participants failed to correct their mental models of a world in which (a) Mrs. E lacked the time to boil her water and (b) Mrs. F could not be convinced to change the habits of a lifetime. Always-No participants had no real need to change their mental models because the critical documents confirmed them. There were, however, a few individuals in the Always-No prediction group who corrected the reasons for their predictions. For the purpose of this study, this too constituted conceptual change.

The results from this study accord with Chinn and Brewer's (1998) classification of responses to anomalous data (real theory change, peripheral theory change, ignore it, reject it, question its validity, find it irrelevant, hold it in abeyance, or reinterpret it to fit the current theory). Fifty-seven participants, as noted above, did change their "theories" (mental models), and 28 participants had accurate mental models from the outset. The remainder, 52 Always-Yes participants, responded to anomalous information in the documents in several different ways. A few participants (13.5%) provided only Yes

reasons for their final predictions and therefore appeared to ignore the anomalous information. The remaining group provided both Yes and No reasons and therefore engaged in several of the other alternatives suggested by Chinn and Brewer. A few (21%) qualified their predictions, suggesting that they were not quite ready to change their prediction (held in abeyance). Many more participants (54%) reinterpreted anomalous information to fit their initial prediction (RC--rationalized contradictions). This latter group seems to have been motivated by Document N (E—emotional response to document N), and their predictions were also associated with confirmation bias (CB). However, the RC code (rationalized contradictions) employed for this study may have grouped together several of Chinn and Brewer's more nuanced categories including questioning the validity of the anomalous data, rejecting it, or finding it irrelevant. It was not possible to elaborate this code further with the present data.

No prediction regarding the two separate tasks (Mrs. E and Mrs. F) had been entertained for the present study. However, the theoretical basis of this research, the two dimensions of similarity regarding perspective taking targets and situations, would predict that the Mrs. F task is more conceptually complex than the Mrs. E task. Mrs. F was older and had cultural reasons for not boiling her drinking water. Mrs. E, although dissimilar in many ways from those who participated in this research, had fairly straightforward reasons for not boiling water—she simply did not have time, a reason broadly familiar to most Americans.

In fact, the Mrs. F task did appear to be more difficult for study participants. The Mrs. E critical documents were relatively straightforward and, therefore, many initial Yes predictors corrected their initial predictions with a 46% increase in prediction accuracy

from initial to final predictions. Those who began with an initial Yes prediction for Mrs. F were faced with the opposite situation. The most critical document for Mrs. F, Document H, was very difficult for many to understand as the “the theory of hot and cold” violated the Western notion of the germ theory of disease. Those with the Mrs. F task had only a 30% increase in prediction accuracy from initial to final prediction. Although there were no significant differences in perspective taking accuracy between tasks, the results were in the expected direction.

Individual Differences

Academic achievement, whether measured by grade point average or SAT total score, was not correlated with perspective-taking accuracy. In fact, there was a slight, but not significant, negative correlation. A number of researchers (e.g. Macpherson & Stanovich, 2007; Toplak & Stanovich, 2003) have also reported no relationship between myside bias and cognitive ability. Moreover, Klaczynski, et al, 1997, demonstrated that intelligence and objectivity are unrelated. In fact, much like the Always-Yes participants in this study, who put a lot of effort into rationalizing contradictions between evidence and predictions, the Klaczynski, et al. participants engaged in more sophisticated reasoning strategies and greater depth of processing to counter belief threatening information.

Limitations of the Study

The present study was devised to look at perspective taking from a particular theoretical perspective (Cutting & Chinn, 2007) and to address the dearth of research on

perspective taking with very different or conceptually novel target persons and situations. It was designed specifically to require the effortful employment of strategies that result in conceptual change. Therefore, this research does not address the forms of relatively automatic forms of social cognition. First efforts at social perspective taking derive from the emergence of a young child's theory of mind and, presumably, accuracy improves with new experiences and therefore increased familiarity with other minds. Perspective taking with target persons who are similar or familiar would likely entail the employment of relatively accessible schemas for the target person and target situation. The present study examines perspective taking when such schemas may not be available and mental model construction provides the best option of making accurate predictions.

The results of the present study are limited by several factors. Although there were 141 participants in the current research, most of them were women (77%) and almost all of them were planning to become teachers. Additionally, most participants were undergraduates ranging in age from 18 to 22. Therefore, these findings should be replicated with wider age range of participants, with more men, and with participants from a variety of disciplines and levels of educational attainment.

Moreover, the model revision manipulation was far more complex and time-consuming than the no model revision condition. For this reason, it was difficult to interpret the lack of effect for final prediction accuracy in the MR condition. Researchers have found that measures for beliefs about certainty of knowledge (e.g. Schommer, 1993), need for cognition (e.g. Kardash and Scholes, 1996), and a disposition for active open-minded thinking (e.g. Baron, et al., 1993) are associated to motivated reasoning (Klaczynski et al., 1997). Therefore, measures of cognitive load, need for cognition,

active open-minded thinking, and personal epistemology might have helped to disentangle why the manipulation failed to yield positive results. Differences in personal epistemology, active-open minded thinking, and need for cognition might have influenced participants' approaches to document selection as well as the cognitive strategies employed to interpret them. Additionally, sub-optimal levels of cognitive load have been shown to reduce monitoring and adjustment (Gilbert, et al., 2002; RoBnagel, 2000 and 2004), which the MR condition was designed to support.

Future research would also benefit from the inclusion of a wide range of tasks that are completed over several sessions. These tasks might include additional perspective-taking scenarios based on real-life events, such as the current task, as well as tasks that require pairs of participants to predict one another's thoughts or feelings, such as those utilized by Senecal et al., 2003 and Simpson et al., 1995. Moreover, the inclusion of post-task interviews with all participants may help to highlight reasoning strategies and cognitive biases that, in the current study, were not specifically targeted by prompts for extra-prediction written statements.

Relevance to Education

As noted at the beginning of this dissertation, perspective taking is pervasive and implicated in teachers' ability to understand how their students think, how they learn, and how their individual and cultural differences influence that learning. Accurate perspective taking is also important for students' ability to understand and learn from one another as well as their ability to learn about other cultures and epochs that are remote in space or time. This study has shown that preconceived notions may impede accurate perspective taking, but it has also shown that seeking out additional information may result in

elaborating existing understandings and, more importantly, change those that were not correct.

Brainstorming and making three separate predictions in the Model Revision condition proved to be a useful tool that enhanced the number of correct initial predictions. Brainstorming served an important function in opening up a variety of options for the interpretation of data (Heuer, 1999). This is important because, in all but three instances, individuals who made accurate initial predictions in this study continued to read and reason correctly about the task. Brainstorming the thoughts and feelings of complex characters in a novel or possible reactions of a populace to a critical historical event are likely to encourage students to consider alternative interpretations or explanations and thereby provide the foundation for new learning.

If this approach is combined with reading historical source documents, students can test their predictions. In doing so, they are more likely to engage in some of the strategies employed by historians to understand the past (Rouet, et al., 1996; Wineburg, 1991). Reading source documents to correct inaccurate predictions was found to be highly beneficial for improving perspective-taking accuracy. Reading documents led more than half of those who made inaccurate initial predictions to correct their mental models; critical documents also led those who were initially accurate to enhance (elaborate) their mental models. In the present study, participants merely read relevant documents. In a school setting, students have the opportunity to discuss and debate their ideas and learn from one another as well. This added element may support, not only more accurate and elaborated concepts about academic subjects, but also facilitate conceptual

change. Such discussions may reveal cognitive biases, useful reasoning strategies, and support growth in metacognition.

In the present study, Always-Yes participants engaged in reasoning strategies (e.g., confirmation bias and rationalizing contradictions) that suggested they were motivated to be inaccurate (e.g. Senecal et al., 2003; Simpson et al 1995). They provided reasons for their predictions, such as “Important to do,” that appeared to stem from concern for Mrs. E or Mrs. F and her family. Always-Yes participants often cited an extraneous document, the New York Times articles that described a cholera epidemic in Peru, as supporting their prediction. This suggests that they felt more empathy and compassion for their perspective taking target persons than other participants in this study. Despite the value that should be placed on empathy in social cognition, such concern may motivate cognitive biases, which, in turn, influence reasoning and understanding. Strongly held beliefs derived from culture, values, and conceptions about the nature of knowledge and learning, influence the ability to profit from and reason about evidence. For a large group of participants in the present study, this was certainly the case. In a classroom setting, it is important that everyone, including teachers, externalize their assumptions and find opportunities to test them. Seeking out information will not always yield accurate results, but, when coupled with open-ended discussions in the classroom, the pursuit of additional information, such as from the various source documents for this study, is more likely to enhance both learning and perspective taking.

It is particularly important that educators examine their own values and beliefs about knowledge and learning. Students represent a range of similar, dissimilar, and conceptually novel target persons within the school setting. Teachers’ own assumptions

may interfere with their ability to consider a range of factors that could potentially influence student learning. This may occur even when students come from socioeconomic and cultural groups that are similar to those of their teacher. Misunderstandings and misconceptions are still more likely when they do not. Then it becomes even more difficult to determine what factors may interfere with learning. Why does a given student, who calculates numbers with ease, have difficulty solving word problems on a math test? Is this the result of lack of attention, cognitive load, reading difficulty, or an inability to connect words such as “and” and “difference” with the operations of addition and subtraction respectively. Why does a student fail to participate in class discussions? Is this result of shyness, lack of interest, or discomfort with public performance? Does it stem from a cultural belief that it is impolite to contradict others? Perhaps the topic of the discussion is at variance with religious strictures or prior learning. Teachers who question their own assumptions, entertain multiple possibilities, and suspend judgment while they gather additional information are far more likely to diagnose reasons for what they observe. Having predicted a more accurate set of reasons for academic difficulty, teachers are far more likely to devise strategies to moderate their effects.

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APPENDIX A: THEORETICAL MODEL (Cutting & Chinn, 2007)

Table A-1

Schema Selection Strategies Across Two Dimensions of Similarity

Strategy	When useful						
	Self	Targets			Situations		
		Similar	Dissimilar	Novel	Similar	Dissimilar	Novel
Select single relevant schema or case							
Retrieve the self schema	+	0	-	-	+ (self as target) 0 (similar target)	-	-
Retrieve memories of similar situations					+	-	-
Use stereotypes		0	0	0			
Search for analogies					0	+	+
Generate general abstract schemas such as general cultural schemas or general purpose difference schemas	0	0	+	+	0	+	+
Suppress ill-fitting target person or target situation schemas	+	+	+	+	+	+	+
Select multiple relevant schemas or cases							
Select alternative schemas	0	+	++	++	+	++	++
Select alternative related schemas or cases for merging	0	+	++	++	+	++	++
Seek out instruction	0	+	++	++	+	++	++

^a Key: (0) - strategy likely to be neutral or no grounds for prediction;

(-) – strategy unlikely to be helpful;

(+) strategy enhances likelihood for success;

(++) success unlikely without using several ++ schema selection, elaboration, monitoring, and adjustment strategies.

^b Note: These designations as plausible, but conjectural, due to lack of research on perspective taking with dissimilar and conceptually novel situations and targets.

Table A-2

Schema Elaboration Strategies across Two Dimensions of Similarity

Strategy	When useful						
	Self	Targets			Situations		
		Similar	Dissimilar	Novel	Similar	Dissimilar	Novel
Generate Causal Explanation	+	+	+	0	+	+	0
Unpack Schemas	+	++	++	0	++	++	0

^a Key:

(0) - strategy likely to be neutral or have no grounds for prediction;

(-) – strategy unlikely to be helpful;

(+) strategy enhances likelihood for success;

(++) success unlikely without using several ++ schema selection, elaboration, monitoring, and adjustment strategies.

^b Note: These designations as plausible, but conjectural, due to lack of research on perspective taking with dissimilar and conceptually novel situations and targets.

Table A-3

Monitoring Strategies Across Two Dimensions of Similarity

When useful							
Strategy	Targets				Situations		
	Self	Similar	Dissimilar	Novel	Similar	Dissimilar	Novel
Suppress ill-fitting situation or target schemas							
Suppress self perspective	-	+	++	++	+	++	++
Recognize you have no appropriate schemas	-	0	+	++	0	+	++
Reduce confidence & maintain low belief when strong belief levels are unwarranted	+	+	++	++	+	++	++
Refrain from inserting familiar schema components when making adjustments	0	0	++	++	0	++	++
Compare alternative models	+	+	++	++	+	++	++
Be alert to anomalies	++	+	++	++	+	++	++
Consider differences between self and own situation and others and their situations	0	+	++	++	+	++	++
Gather external information to test model: Make & check predictions	+	+	++	++	+	++	++

(table continues)

Table A-3 (continued)

Monitoring Strategies Across Two Dimensions of Similarity^aKey:

(0) - strategy likely to be neutral or have no grounds for prediction;

(-) – strategy unlikely to be helpful;

(+) strategy enhances likelihood for success;

(++) success unlikely without using several ++ schema selection, elaboration, monitoring, and adjustment strategies.

^b Note: These designations are plausible, but conjectural, due to lack of research on perspective taking with dissimilar and conceptually novel situations and targets.

Table A-4

Model Adjustment Strategies Across Two Dimensions of Similarity

Strategy	When useful						
	Self	Targets			Situations		
		Similar	Dissimilar	Novel	Similar	Dissimilar	Novel
Individual model adjustments							
Extrapolate from a less extreme instance/person	0	0	+	0	0	+	0
Relativize traits	0	+	+	0			
Make correlated adjustments to schemas	+	+	+	0	+	+	0
Schema Melding							
Meld person schemas or situation schemas	+	+	+	+	+	+	+
Modify stereotypes by merging or averaging more than one schema	0	+	+	0	+	+	0
Meld person schema with situation schema	+	+	+	+	+	+	+
General purpose model modification strategies							
Incorporate additional target information	+	++	++	++	++	++	++
Generalize from specifics	+	+	+	0	+	+	0
Use general difference schemas to generate ideas for new model elements	0	0	++	++	0	++	++
Consider the causal field	+	++	++	++	++	++	++
Abduce explanations for discrepancies	+	+	++	++	+	++	++

^aKey: (0) - strategy likely to be neutral or have no grounds for prediction; (-) – strategy unlikely to be helpful; (+) strategy enhances likelihood for success; (++) success unlikely without using several ++ schema selection, elaboration, monitoring, and adjustment strategies.

^b Note: These designations as plausible, but conjectural, due to lack of research on perspective taking with dissimilar and conceptually novel situations and targets.

APPENDIX B: Experimental Design

Table B-1

Model Revision and No Model Revision Conditions for Perspective-Taking Study

<u>No Model Revision Condition</u>	<u>Model Revision Condition</u>
No brainstorming	Brainstorming
Make 1 prediction	Make 3 predictions
No document evaluation tool	Use document evaluation tool and revise predictions accordingly

Table B-2

Choice Document and Full Document Conditions for the Perspective-Taking Study

<u>Choice document Condition</u>	<u>Full document Condition</u>
Stop reading documents when ready to make a predictions	Read all documents that there is sufficient time to read.

Table B-3

Mrs. E Task and Mrs. F Tasks Categorized by the Two Dimensions of Similarity

	Mrs. E: 30-year-old poor and busy cholo housewife who is open to change	Mrs. F: 60-year-old poor black housewife who is culturally conservative
Target similarity	Dissimilar	Conceptually novel
Situation similarity	Conceptually novel	Conceptually novel

Table B-4

Sequence of Document Use for Model Revision and No Model Revision Conditions with Full and Choice Document Instructions

Model Revision	Model Revision Full	No Model Revision	No Model Revision Full
Choice Document	Document	Choice Document	Document
Read documents in any order	Read documents in any order	Read documents in any order	Read documents in any order
Fill in Document	Fill in Document	Fill in Document	Fill in Document
Evaluation Tool and, revise mental models accordingly	Evaluation Tool and revise mental models accordingly	Summary form	Summary form
Choose another document	Choose another document	Choose another document	Choose another document
Fill in Document	Fill in Document	Fill in Document	Fill in Document
Evaluation Tool and revise mental models accordingly	Evaluation Tool and revise mental models accordingly	Summary form	Summary form
Continue to read documents until ready to make a final prediction	Read all documents or as many as time allows	Continue to read documents until ready to make a final prediction	Read all documents or as many as time allows
Make final prediction	Make final prediction	Make final prediction	Make final prediction

APPENDIX C: Materials

C-1: Scenarios by Task and Condition: (A) MR Mrs. E, (B) MR Mrs. F (C) NMR Mrs. E (D) NMR Mrs. F

(A) Mrs. E MR Condition

Nelida is a rural hygiene worker whose full-time job is visiting households in the small mountain town of Los Molinos, Peru in order to help the people improve their hygiene. The water in Los Molinos is contaminated. There is no sanitary water system, nor is it economically feasible to install one. The residents, however, could hope to lower the incidence of typhoid and other water-borne diseases by regularly boiling water before consuming it.

When Nelida first took up residence in Los Molinos, only a few of the 200 households were boiling their drinking water. She knew that there were many cultural norms and practices that she was not familiar with and has been trying tactfully and by indirection to persuade others to adopt the practice of boiling drinking water. She has been aided in her work by Dr. U, a health department physician who visited the community to give public talks on topics of health and hygiene.

Nelida's objectives include efforts to get people to install and properly use privies, burn garbage daily, control house flies, and report suspected cases of communicable disease promptly. She also tries to get housewives to boil drinking water. When Nelida first arrived, she discovered that 15 of the 200 households were already boiling water daily and that every household boiled water on occasion, particularly when family members were sick. During the next two years, she paid several visits to every home but devoted especially intensive effort to 21 families. She visited every one of these selected families between 15 and 25 times. Of the 21 housewives, she has induced 11 to boil water regularly.

The E family is poor and cholo² with deep roots in Los Molinos and an impressive number of kinsmen. The titular heads of the household are the aged grandparents. Senile and ailing, the grandmother wields little authority in the household affairs and leaves their effective management to a daughter, Mrs. E, who is in her early thirties. Mrs. E has a young daughter and the title of "Senora" to show for her brief common-law union. However, neither Mrs. E nor her child suffers any stigma with the family or in the community at large. Instead, Mrs. E is known as resourceful and self-sufficient. Three other individuals complete the household of seven: Mrs. E's brother and two teen-age nephews, who are offspring of a dead sister.

Mrs. E's busy day begins at 5:00 a.m. She is responsible for preparing meals, collecting wood for the hearth and fodder for the livestock, taking meals to family members working in the fields, overseeing her very young daughter and aging parents, and various other household chores. Following upon conversations with Nelida and Dr.

² Cholos are of mixed Indian and Spanish descent, primarily Indian

U, Mrs. E implemented several household improvements, including building a homemade privy for the family and pens for barnyard animals.

Consider what you have learned about Los Molinos and Mrs. F and brainstorm a list of predictions about whether Nelida was successful in convincing Mrs. F to boil her family's drinking water. Be sure to write an explanation for each prediction showing how the available information supports the prediction. Be as detailed and specific as possible for each prediction. **Please note that you can make the same prediction more than once as long as you provide a different explanation for that prediction.**

In the space below, brainstorm a list of factors (e.g. economics, religion...) that might influence Mrs. F's decision to boil her family's drinking water.

Now read the instructions that follow this page. Remember the factors you noted above as you make your predictions.

(B) Mrs. F MR Condition

Nelida is a rural hygiene worker whose full-time job is visiting households in the small mountain town of Los Molinos, Peru in order to help the people improve their hygiene. The water in Los Molinos is contaminated. There is no sanitary water system, nor is it economically feasible to install one. The residents, however, could hope to lower the incidence of typhoid and other water-borne diseases by regularly boiling water before consuming it.

When Nelida first took up residence in Los Molinos, only a few of the 200 households were boiling their drinking water. She knew that there were many cultural norms and practices that she was not familiar with and has been trying tactfully and by indirection to persuade others to adopt the practice of boiling drinking water. She has been aided in her work by Dr. U, a health department physician who visited the community to give public talks on topics of health and hygiene.

Nelida's objectives include efforts to get people to install and properly use privies, burn garbage daily, control house flies, and report suspected cases of communicable disease promptly. She also tries to get housewives to boil drinking water. When Nelida first arrived, she discovered that 15 of the 200 households were already boiling water daily and that every household boiled water on occasion, particularly when family members were sick. During the next two years, she paid several visits to every home but devoted especially intensive effort to 21 families. She visited every one of these

selected families between 15 and 25 times. Of the 21 housewives, she has induced 11 to boil water regularly.

Sixty-year-old Mrs. F is culturally conservative and a member of the Los Molinos Black community. She is locally renowned as a superb cook, and other families solicit her services to prepare feasts. She is poor and lives with her family consisting of a daughter, her daughter's husband and their child, a widower son and his five children, and two other grandsons. The latter are the children of a daughter working away from Los Molinos. The son and son-in-law both work as plantation field hands and provide the primary support for the household.

Nelida pays regular visits to Mrs. F and her daughter. One or both are usually at home. Because Nelida is cholo (of mixed Spanish and Indian descent) and the F household is black, there were some initial tensions and suspicions between them, but Mrs. F likes Nelida now. Mrs. F attends Dr. U's talks and enjoys Nelida's visits to her home.

Consider what you have learned about Los Molinos and Mrs. F and brainstorm a list of predictions about whether Nelida was successful in convincing Mrs. F to boil her family's drinking water. Be sure to write an explanation for each prediction showing how the available information supports the prediction. Be as detailed and specific as possible for each prediction. **Please note that you can make the same prediction more than once as long as you provide a different explanation for that prediction.**

In the space below, brainstorm a list of factors (e.g. economics, religion...) that might influence Mrs. F's decision to boil her family's drinking water.

Now read the instructions that follow this page. Remember the factors you noted above as you make your predictions.

(C) Mrs. E NMR Condition

Nelida is a rural hygiene worker whose full-time job is visiting households in the small mountain town of Los Molinos, Peru in order to help the people improve their hygiene. The water in Los Molinos is contaminated. There is no sanitary water system, nor is it economically feasible to install one. The residents, however, could hope to lower the incidence of typhoid and other water-borne diseases by regularly boiling water before consuming it.

When Nelida first took up residence in Los Molinos, only a few of the 200 households were boiling their drinking water. She knew that there were many cultural

norms and practices that she was not familiar with and has been trying tactfully and by indirection to persuade others to adopt the practice of boiling drinking water. She has been aided in her work by Dr. U, a health department physician who visited the community to give public talks on topics of health and hygiene.

Nelida's objectives include efforts to get people to install and properly use privies, burn garbage daily, control house flies, and report suspected cases of communicable disease promptly. She also tries to get housewives to boil drinking water. When Nelida first arrived, she discovered that 15 of the 200 households were already boiling water daily and that every household boiled water on occasion, particularly when family members were sick. During the next two years, she paid several visits to every home but devoted especially intensive effort to 21 families. She visited every one of these selected families between 15 and 25 times. Of the 21 housewives, she has induced 11 to boil water regularly.

The E family is poor and cholo³ with deep roots in Los Molinos and an impressive number of kinsmen. The titular heads of the household are the aged grandparents. Senile and ailing, the grandmother wields little authority in the household affairs and leaves their effective management to a daughter, Mrs. E, who is in her early thirties. Mrs. E has a young daughter and the title of "Senora" to show for her brief common-law union. However, neither Mrs. E nor her child suffers any stigma with the family or in the community at large. Instead, Mrs. E is known as resourceful and self-sufficient. Three other individuals complete the household of seven: Mrs. E's brother and two teen-age nephews, who are offspring of a dead sister.

Mrs. E's busy day begins at 5:00 a.m. She is responsible for preparing meals, collecting wood for the hearth and fodder for the livestock, taking meals to family members working in the fields, overseeing her very young daughter and aging parents, and various other household chores. Following upon conversations with Nelida and Dr. U, Mrs. E implemented several household improvements, including building a homemade privy for the family and pens for barnyard animals.

Consider what you have learned about Los Molinos and Mrs. E and make an initial prediction about whether Mrs. E will boil her family's drinking water. Be sure to write an explanation for your prediction that shows how the available information led you to your prediction. Be as detailed and specific as possible.

Explanation and Prediction

I think Mrs. E **DID** **DID NOT** (CIRCLE ONE) begin to boil her drinking water because

³ Cholos are of mixed Indian and Spanish descent, primarily Indian

(D) Mrs. F NMR Condition

Nelida is a rural hygiene worker whose full-time job is visiting households in the small mountain town of Los Molinos, Peru in order to help the people improve their hygiene. The water in Los Molinos is contaminated. There is no sanitary water system, nor is it economically feasible to install one. The residents, however, could hope to lower the incidence of typhoid and other water-borne diseases by regularly boiling water before consuming it.

When Nelida first took up residence in Los Molinos, only a few of the 200 households were boiling their drinking water. She knew that there were many cultural norms and practices that she was not familiar with and has been trying tactfully and by indirection to persuade others to adopt the practice of boiling drinking water. She has been aided in her work by Dr. U, a health department physician who visited the community to give public talks on topics of health and hygiene.

Nelida's objectives include efforts to get people to install and properly use privies, burn garbage daily, control house flies, and report suspected cases of communicable disease promptly. She also tries to get housewives to boil drinking water. When Nelida first arrived, she discovered that 15 of the 200 households were already boiling water daily and that every household boiled water on occasion, particularly when family members were sick. During the next two years, she paid several visits to every home but devoted especially intensive effort to 21 families. She visited every one of these selected families between 15 and 25 times. Of the 21 housewives, she has induced 11 to boil water regularly.

Sixty-year-old Mrs. F is culturally conservative and a member of the Los Molinos Black community. She is locally renowned as a superb cook, and other families solicit her services to prepare feasts. She is poor and lives with her family consisting of a daughter, her daughter's husband and their child, a widower son and his five children, and two other grandsons. The latter are the children of a daughter working away from Los Molinos. The son and son-in-law both work as plantation field hands and provide the primary support for the household.

Nelida pays regular visits to Mrs. F and her daughter. One or both are usually at home. Because Nelida is cholo (of mixed Spanish and Indian descent) and the F household is black, there were some initial tensions and suspicions between them, but Mrs. F likes Nelida now. Mrs. F attends Dr. U's talks and enjoys Nelida's visits to her home.

Consider what you have learned about Los Molinos and Mrs. F and make an initial prediction about whether Mrs. F will boil her family's drinking water. Be sure to write an explanation for your prediction that shows how the available information led you to your prediction. Be as detailed and specific as possible.

Explanation and Prediction

I think Mrs. F **DID** **DID NOT** (CIRCLE ONE) boil her family's drinking water
because

C-2: Source Documents for Perspective Taking Task

(C) The Role of Local Civic and Healthcare Leaders in Influencing Water Boiling in Los Molinos

The town's local leaders, a mayor and town council, are unconcerned either as officials or as men with women's household routines. For example, the mayor does not interfere with what his wife does with the water so long as it is there for him to drink. Therefore, members of the local government have maintained a hands-off attitude toward Nelida's attempts to foster the boiling of drinking water.

Additionally, the local midwives, who are untrained in Western medicine, have reason to preserve the status quo and maintaining local customs. Although they cooperate with the hygiene center on maternity issues, lay midwives tend not to support innovations such as boiling domestic drinking water as this practice conflicts with their theories regarding the origin of disease.

(H) Hot/Cold Distinctions in Los Molinos Culture

The basic principle of the system is that many things in nature are inherently hot, cold, or something intermediate, quite apart from actual temperature. Things that can be so distinguished include food, liquids, medicine, body states, illnesses, and even inanimate materials. In essence, hot-cold distinctions serve as a series of avoidances and prescriptions, important to such areas of belief and behavior as pregnancy and child rearing, food habits, and work habits. They apply especially to the entire health-illness system, including prevention, diagnosis, home medical care, convalescence. They also provide culturally plausible explanations for chronic illness and even death.

The hot or cold nature of most food does not change regardless of temperature variation, cooking, or other processing. Water is one of the few exceptions. "Raw" water is cold; "cooked" water is hot. Cooked water in Los Molinos has become linked with illness. Through processes of association, Los Molineros learn from earliest childhood to loathe boiled water. Most residents can tolerate boiled water only if they add a flavoring – sugar, tea, lemon juice, cinnamon, onion, lemon peel, barley, corn, or herb.

Once an individual is considered sick, whatever the specific diagnosis, he or his family invoke the avoidances and prescriptions of the system. Extremes of "hot" and "cold" are denied him; it would be unthinkable, for example, to let him eat pork, which is "very cold" or to drink brandy, which is "very hot" in particular. "Cold" is virtually an evil entity; it can be absorbed through "airs" or the ingestion of food, can take up lodgings within the body, and can wreak great harm even long after it has entered. The avoidance of "cold" is a must for the very young, the very old, the pregnant, the delicate, and the sick.

At no point does the notion of bacteriological contamination of water enter the scheme. By tradition, boiling is aimed at eliminating not bacteria but the innate "cold" quality of unboiled water.

(L) The Geography and Demographics of the Town of Los Molinos

Los Molinos is one of several hundred rural communities in the valley of Ica, a coastal region about 200 miles south of Peru's capital city of Lima and connected with it by the Pan American Highway. The valley is one of 40-odd oases which interrupt the rainless, sun-baked desert of the Peruvian coast. To the west is the Pacific and to the east tower the Andes. A river which flows only during the four- to five-month rainy season in the Andean highlands is the valley's prime source of water and its life's blood. Nature in the region is a study in contrast between rich agricultural oasis and encompassing desert, between aridity in July and fertility in January. Culture, too, shows sharp contrasts. Agriculture ranges from primitive subsistence farming to large-scale commercial cultivation. In communities like Los Molinos, one finds rude cane and adobe huts, traditional saint cults, native curers and lay midwives, and a complete absence of sanitary water or sewage systems. In the city of Ica, only 15 miles away, there are architect-designed dwellings, the Rotary Club, physicians and hospitals, and a relatively efficient water and sewage system.

Los Molinos has a population of approximately 1000. Most people in Los Molinos are peasants. Some own individual family plots, but the majority work as field hands for local plantations. The physical core of the town consists of two long rows of houses. About midway is the town's main square, a large cleared rectangle bordered by the Catholic Church, the Civil Guard post, municipal quarters, the public well, and the dwellings of the more prominent families. Most houses are uniformly drab adobe and mud-plastered cane structures – dirt-floored, windowless, one-storied affairs.

(N) New York Times December 8, 1998: In Peru's Shantytowns, Cholera Comes by the Bucket by WENDY MARSTON

UP in the Pampas de San Juan de Miraflores, a shantytown sprawled over the arid mountainsides south of this city, Natalia Chococna Flores, who is 4, tells a public health official that she has diarrhea. Natalia, with her three siblings, two dogs and a goat in tow, leads the nurse to the place where she went to the bathroom -- directly in front of the family's water tank. The nurse collects the girl's feces in a container, asks about the health of the rest of the family and moves on to the shack next door.

The nurse's weekly visit is part of Peru's strategy of tracking cholera, the bacterial infection that was a global terror for much of the last two centuries. The disease has made a resurgence in South America and through much of the developing world. But cholera is also symptomatic of a larger problem: as population in the developing world surges, poor water quality and limited availability become more pressing. Peru's epidemic, though now mostly under control, foreshadows other health threats.

"Already, we have over a billion people with no access to clean water, and about 1.7 billion with no access to sanitation services," Mr. Serageldin said in a telephone interview while on business in France. "Before the population stabilizes, there will be

three billion more people on the planet, and almost all of them will be in cities in developing countries."

Cholera, which is transmitted through tainted water and uncooked food and causes acute diarrhea, severe dehydration and, occasionally, death, finds its niche in areas with rapid population growth, poor infrastructure and lack of government resources. The disease came to Peru in January 1991, most likely in a Chinese ship that dumped its sewage into the bay. Within three weeks, cholera spread up and down the coast. Three months later, about 1 percent of Peru's population had the disease. The disease has since spread south to Chile and north to Mexico. The World Health Organization has recently reported outbreaks in Guatemala, Nicaragua and Honduras as a result of the disruption to water supplies wreaked by Hurricane Mitch.

Peru was an ideal target for cholera, vulnerable because of its coastal location and its poor water system. (The same cholera bacteria have been found in the Chesapeake Bay, for instance, but the water infrastructure in the United States makes an outbreak virtually unthinkable.) In 1991, there was little chlorination in Peru; even today the water system frequently shuts down and existing pipes don't reach all areas. Water pressure often drops, allowing pipes to take in sewage from lines nearby.

Wendy Marston is a health and science writer who lives in New York.

(O) How Residents of Los Molinos Obtain Drinking Water and Wood for Fuel

The fuel and water problem is most severe for the poor, who cannot afford to buy these commodities and must collect them from the environment. Middle class families can supplement the search for wood with wood purchased from wood sellers and buy water from water sellers when the local ditch is dry during the dry season. Many poor housewives take the long trek to the spring, an arduous, time-consuming chore; middle income housewives, on the other hand, can buy spring water from water sellers and are in a better position to devote the gained time to just such household chores as water boiling. Because they are poor, many women must do double duty as housewives and as field hands. These women must leave their houses early and do not have free time for boiling water. In part, the community considers women middle level precisely because they need not perform the double role of housewife and field hand but can dedicate their full time and energy to the household.

(P) Water Resources in Peru

On average, surface water in Peru is abundant. Nevertheless, they are unequally distributed in space and time. Especially the coastal area, where the country's major cities are located, is very dry. Furthermore, the deterioration of water quality is critical in some regions. It is due fundamentally to the contamination by productive activities from industry, above all the mineral-metallurgic, and to municipal wastewater and agrochemicals that affect the sources of water supply and put the population's health at risk.

(S) The Water Supply in Los Molinos

Water runs in pipes in Los Molinos. It is borne directly from stream and well to large earthenware containers in the household by means of cans, pails, gourds, and casks. Children are the most frequent water carriers. It is considered inappropriate for males and females of courting age and married men to carry water, and they seldom do. There are three sources of water: a seasonal irrigation ditch, a spring, and a public well. All are sedimented in various degrees, subject to pollution at all times, and show contamination whenever tested. Of the three, the irrigation ditch is most favored. It is close, running parallel to the main road about 50 yards distant; children can be sent to fetch its water; it has the virtue of being running water rather than stagnant; and it inspires complex devotion for its annual rejuvenation of the Los Molinos soil. People like its taste. It is only seasonal, however, running from about December to April and is part of ramified irrigation system feeding off the River Ica.

The spring lies a mile or more from the center of town; it is a year-round source and is used by many families when the ditch is dry. Several local men who are professional water sellers fill their casks and load their burros at the spring and peddle the water to the housewives. During the dry-ditch season, most families deal with the water sellers; only women and children of the poorest families make the formidable trip to the spring on foot. The public well, although a year-round source, is used regularly only by the families living nearby. Most Los Molineros dislike the taste of its water.

(R) Race, Class and Cultural Distinctions in Los Molinos

Los Molinos is predominantly *cholo*, a term which has racial, cultural, and social meanings and corresponds to the term *mestiza* used in other parts of Latin America. Cholos are racially mixed, basically Indian with some Spanish admixture. They follow a way of life which is not Indian, Spanish, nor modern western, but a vigorous mixture of the three. Socially, they rank low in Peru's social geography, just a cut above Blacks and Highlanders. More than two-thirds of the community is cholo, and the remaining one-third is split between highlanders and those of descended from African slaves. Highlanders are similar in racial makeup to cholos, but are looked down on by coastal cholos; their native tongue (Quechua) and highland clothing are derided. The town's Blacks are descendants of slaves introduced centuries ago by slave-trading Spaniards. Cholos, Negroes, and highlanders all speak Spanish, although recently arrived highlanders do so with a noticeable accent.

Economic distinctions are also recognized within the town. About ten families are prosperous. The rest are about equally divided between moderately well-off and poor. These distinctions are all relative; from an outsider's point of view they might be considered three grades of poverty. Economic and ethnic distinctions enjoy only gross correspondence with each other. Cholos are found along the whole economic range.

Adherence to the traditional way of life in Los Molinos is common across all ethnic groups. However, cultural practice can vary with age, social class, and several other factors.

(W) Access to Clean and Affordable Water in Peru

Of the 27 million people in Peru, approximately 6.4 million people don't have access to water services and 11.3 million don't have access to sanitation services. More than 40 percent of the population lives below the national poverty level. For many of the families without piped water, buying water from private vendors can cost a huge proportion of their meager household income, causing families to resort to untreated water from wells, rivers, and streams. Lack of access to clean and affordable water contributes to the rapid spread of water-borne diseases. In the early 1990s, after World Bank and Inter-American Development Bank water sector 'reforms' began, a massive cholera epidemic originated in Peru causing more than 3,000 deaths and spreading across Latin America.

C-3 Document Tools

(A) Document Evaluation Tool (MR Condition)

Instructions:

- Decide which document you would like to read first and record its letter in the space provided for the Document letter.
- Briefly record each of your predictions in the lines provided under Prediction #1, #2, etc.
- Read the document and mark on it any information that supports or contradicts your various predictions.
- Consider each of your predictions separately and decide if the document supports, contradicts or neither supports nor contradicts each of the predictions.
- Use the scale below to show how well each prediction is supported or contradicted by the document.
 - ++ **Document strongly supports prediction**
 - + **Document supports prediction**
 - 0 **Document neither supports nor contradicts prediction**
 - **Document contradicts prediction**
 - **Document strongly contradicts prediction**
- Continue this process for each document you read. If you add a new prediction, consider all the documents in light of this new prediction as well.

<u>Prediction</u>	<u>Prediction #1</u>	<u>Prediction #2</u>	<u>Prediction #3</u>	<u>New</u>
<i>Briefly label each prediction here</i> ⇒				
1st Document: Letter ____	_____	_____	_____	_____
2nd Document: Letter ____	_____	_____	_____	_____
3rd Document: Letter ____	_____	_____	_____	_____
4th Document: Letter ____	_____	_____	_____	_____
5th Document: Letter ____	_____	_____	_____	_____
6th Document: Letter ____	_____	_____	_____	_____
7th Document: Letter ____	_____	_____	_____	_____
8th Document: Letter ____	_____	_____	_____	_____
9th Document : Letter ____	_____	_____	_____	_____

(B) Document Order Form (NMR Condition)ORDER IN WHICH DOCUMENTS WERE READ

First Document Read Letter: _____

Second Document Read Letter: _____

Third Document Read Letter: _____

Fourth Document Read Letter: _____

Fifth Document Read Letter: _____

Sixth Document Read Letter: _____

Seventh Document Read Letter: _____

Eighth Document Read Letter: _____

Ninth Document Read Letter: _____

C-4: Initial Prediction and Prediction Revision Form (MR Condition only)

**INSTRUCTIONS FOR INITIAL PREDICTION AND
PREDICTION REVISION FORM**Making initial predictions:

- Using a black pen, brainstorm three different predictions in the spaces provided. **TRY TO MAKE AT LEAST ONE OF YOUR PREDICTIONS VERY DIFFERENT FROM THE OTHERS. Provide reasons for each prediction in the adjacent *Reasons* column.**
- After writing down your three separate predictions, **CIRCLE THE # OF THE PREDICTION (#1, #2, or #3) that you think is most likely to be correct.**

Revising predictions:

- After reading the first document you may find information that leads you to change or discard one or more of your initial predictions. Make changes to the affected prediction(s) using RED ink. Using that same RED ink color, provide reasons for each change(s) in the reason column. As you read more documents, return to this form to make any needed changes to one or more of your predictions. Keep changing your ink color each time you make a revision.

Making completely new predictions:

- Additionally, as you read documents, you may come up with a totally new prediction. In the space provided on this form for a *New Prediction*, write your new prediction and provide reasons for it. (USE BLACK INK INITIALLY, BUT MAKE ANY ALTERATIONS WITH DIFFERENT INK COLORS.)

INITIAL PREDICTION
AND

Explanation and Prediction 1

I think Mrs. ____ **DID** **DID NOT** (CIRCLE ONE) boil her family's drinking
water because Reason(s) for revision

Explanation and Prediction 2

I think Mrs. ____ **DID** **DID NOT** (CIRCLE ONE) boil her family's drinking
water because Reason(s) for revision

PREDICTION REVISION FORM (Right side of form)

C-4: Instructions for (A) MR Condition with Full Document Instructions; (B) MR Condition with Choice Document Instructions; (C) NMR Condition with Full Document Instructions; and (D) NMR Condition with Choice Document Instructions

(A) MR Condition with Full Document Instructions

Initial Predictions and Prediction Revisions (Green Form)

After reading about the perspective taking problem, use the *Initial Prediction and Revision Form* to record your ideas. Using the black pen, brainstorm three different predictions in the spaces provided. **Then, circle the Prediction # for the one that you think is best.** Keep this form handy as you read documents.

Follow the instructions on the *Initial Prediction and Prediction Revision Form* to revise these initial predictions once you begin to read documents.

Choosing Documents

You have 9 documents, each containing information that may be helpful in making your final prediction. They are organized in no particular order. Their titles give some indication about what information they provide. You may read them in any order you choose. However, once you open a document, you are committed to reading it and considering its evidence. **As you read documents, mark directly on the page evidence that confirms or contradicts your various predictions.**

Document Evaluation Tool (Blue Form)

Once you have chosen your first document to read, follow the instructions on the Document Evaluation Tool to record how the document impacts your various predictions.

Final Prediction Form (Yellow Form)

After you have read all the documents OR when given a signal that you need to finish up, fill out the Final Prediction Form. Your prediction on this form represents your best prediction and explanation for the outcome to the problem. Make sure you use the Document Evaluation Tool and Prediction Revision Forms fully to help you make the best possible prediction.

If you finish early, please hand in your packet and request another task.

(B) Model Revision Condition with Choice Document Instructions

Initial Predictions and Prediction Revisions (Green Form)

After reading about the perspective taking problem, use the *Initial Prediction and Revision Form* to record your ideas. Using the black pen, brainstorm three different predictions in the spaces provided. **Then, circle the Prediction # for the one that you think is best.** Keep this form handy as you read documents.

Follow the instructions on the *Initial Prediction and Prediction Revision Form* to revise these initial predictions once you begin to read documents.

Choosing Documents

You have 9 documents, each containing information that may be helpful in making your final prediction. They are organized in no particular order. Their titles give some indication about what information they provide. You may read any or all of them and in any order you choose. However, once you open a document, you are committed to reading it and considering its evidence. **As you read documents, mark directly on the page evidence that confirms or contradicts your various predictions.**

Document Evaluation Tool (Blue Form)

Once you have chosen your first document to read, follow the instructions on the Document Evaluation Tool to record how the document impacts your various predictions.

Final Prediction Form (Yellow Form)

After you have read all the documents you choose to read OR when given a signal that you need to finish up, fill out the Final Prediction Form. Your prediction on this form represents your best prediction and explanation for the outcome to the problem. Make sure you use the Document Evaluation Tool and Prediction Revision Forms fully to help you make the best possible prediction.

If you finish early, please hand in your packet and request another task.

(C) NMR Condition with Full Document Instructions

Selection and Use of Documents

You have 9 documents, each containing information that may be helpful in making your final prediction. They are organized in no particular order. You may read these documents in any order you choose. However, once you open a document, you are committed to reading it and considering its evidence. Your goal is to read as many of these documents as you can within the time allotted.

Keeping track of the order in which you read documents

Attached to the documents is a form to keep track of the order in which you read them. Please record on this form the LETTER of document you read first. As you continue to select documents, list their letter as well. You may choose documents in any order you like. Their titles give some indication about what information they provide.

Final Prediction Form

Once you have read all nine documents OR when you are given a signal that only fifteen minutes before the end of this session (whether or not you have read all the documents), complete the Final Prediction Form. Your prediction on this form represents your best prediction and explanation for the outcome to the perspective taking problem.

If you finish early, please hand in your packet and request another task.

(D) NMR Condition with Choice Document Instructions

Selection and Use of Documents

You have 9 documents, each containing information that may be helpful in making your final prediction. They are organized in no particular order. You may choose to read any or all of them and in any order you choose. However, once you open a document, you are committed to reading it and considering its evidence. Stop reading documents when you are ready to make a final prediction.

Keeping track of the order in which you read documents

Attached to the documents is a form to keep track of the order in which you read them. Please record on this form the LETTER of document you read first. As you continue to select documents, list their letter as well. You may choose documents in any order you like. Their titles give some indication about what information they provide.

Final Prediction Form

Once you have read all the documents you care to read OR fifteen minutes before the end of this session (whether or not you have read all the documents you wanted to read), complete the Final Prediction Form. Your prediction on this form represents your best prediction and explanation for the outcome to the perspective taking problem.

If you finish early, please hand in your packet and request another task.

C-5: Final Prediction Form (All Conditions and Tasks)

It is time to state your final prediction regarding whether or not Mrs. ____ will boil her family's drinking water. Make sure that you explain your prediction and incorporate details from the documents that helped to you make it. If you need additional space for your final prediction, use the space on the back of this page.

How has your prediction changed over time?

What factors or information caused you to make changes to your initial prediction?

Please answer the following questions about your experience working on this task. Indicate your answer by circling a number 1 (not true at all) through 5 (very true). You can use any number on the scale.

1. I enjoyed working on this task.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

2. I found the topic very interesting

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

3. It was important to me to arrive at the right answer.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

4. When developing my prediction, I made sure to include the most important information.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

5. I tried to make sure that my prediction fit the evidence.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

6. I made sure that I considered information that did not fit my prediction.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

7. I tried to improve my prediction by thinking about how to include new information.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

8. I paid as much attention to information that contradicted my prediction as information that supported it.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

9. While working on this task, I was certain that I could arrive at the correct answer.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

10. I enjoyed working on this problem because it had no obvious answer.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

11. I continued to work on the problem even after I arrived at a plausible prediction.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

12. I felt it was important to read and think about as many documents as possible in order to make an accurate prediction.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

13. I thoroughly considered all the evidence before making a final prediction.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

14. It was important to me that I understand how the people in this case study thought and felt.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

15. The instructions were clear and easy to follow.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

16. I am confident that my prediction is accurate.

1	2	3	4	5
NOT AT ALL TRUE		SOMEWHAT TRUE		VERY TRUE

What made this task easy/difficult?

Curriculum Vitae

Maris F. Cutting
132 Snowden Lane
Princeton, NJ 08540
Phone: 609-924-3837
E-Mail: cuttinmf@umdnj.edu

Education

- Ph.D., Educational Psychology, Rutgers University, 2009
Dissertation: Perspective-Taking Accuracy on a Conceptually Complex Problem
- M.A., Rider University, Teaching Reading and Language Arts, 1989
- M.A., Cognitive Psychology, Swarthmore College, 1978
- A.B., Psychology, Boston University, 1969

Experience

- Instructor, 2004 - 2009
UMDNJ: Robert Wood Johnson Medical School
Department of Psychiatry, Cognitive Skills Program
- Adjunct Instructor, 2009
Rutgers University
Graduate School of Education, Psychology of Learning
- Instructor and Assistant Director, 1999-2004
Rider University,
Adjunct Faculty (1999-2004)
Assistant Director, Rider Learning Center & Tutoring Services (2003-2004)