

Abstract

Anyone who has clarified a thought or prompted a response during a conversation by drawing a picture has exploited the potential of image making as an interactive tool for conveying information. Images are increasingly ubiquitous in daily communication, in large part due to advances in visually enabled information and communication technologies (ICT), such as information visualization applications, image retrieval systems and visually enabled collaborative work tools. Human abilities to use images to communicate are however far more sophisticated and nuanced than these technologies currently support. In order to learn more about the practice of image making as a specialized form of information and communication behavior, this study examined face-to-face conversations involving the creation of ad hoc visualizations (i.e., “napkin drawings”). A model of image-enabled discourse is introduced, which positions image making as a specialized form of communicative practice. Multimodal analysis of video-recorded conversations focused on identifying image-enabled communicative activities in terms of interactional sociolinguistic concepts of conversational involvement and coordination, specifically framing, footing and stance. The study shows that when drawing occurs in the context of an ongoing dialogue, the activity of visual representation performs key communicative tasks. Visualization is a form of social interaction that contributes to the maintenance of conversational involvement in ways that are not often evident in the image artifact. For example, drawing enables us to coordinate with each other, to introduce alternative perspectives into a conversation and even to temporarily suspend the primary thread of a discussion in order to explore a tangential thought. The study compares attributes of the image artifact with those of the activity of image making, described as a series of contrasting affordances. Visual information in complex systems is generally represented and managed based on the affordances of the artifact, neglecting to account for all that is communicated through the situated action of creating. These findings have heuristic and best-practice implications for a range of areas related to the design and evaluation of virtual collaboration environments, visual information extraction and retrieval systems, and data visualization tools.

**Image-Enabled Discourse:
Investigating the creation of visual information as communicative practice**

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Chapter 1 Problem Statement

Anyone who has reached for pen and paper during a conversation to clarify a thought or prompt a response has exploited the potential of image making to enhance communication. We might tend to think of words as being the primary way we engage with each other, but a number of other tactics are available to us when we try to communicate. We can gesture, grunt or make a face. We also have the ability to communicate by making pictures. Because images and visual information enable exchange of meaning across a range of contexts, they are playing an increasingly important role in how we work and communicate with each other, in both face-to-face and virtual environments.

As ubiquitous as images are becoming within our daily communications, there are significant theoretical and methodological gaps in research that addresses the role that visual information plays in the exchange of meaning. The consequences of these gaps can be seen when someone becomes frustrated while trying to use the virtual white board feature of a distributed collaboration tool or puzzled by the logic that produced less than helpful results for an image search. Contrast this to any number of situations when a few quickly drawn marks on a notepad (or physical white board, for that matter) smoothed the way to a successful exchange. When faced with particularly difficult communication challenges, we show great facility in deploying image-based strategies. The disparity between the ease with which this occurs in face-to-face conversations

and the awkwardness of many virtual or digital applications would seem to indicate that when it comes to taking advantage of the full range of communicative power enabled by images and visual information, our own innate human abilities are far more sophisticated and nuanced than the technology-enabled tools we currently use.

Take, for example, the instance of a graduate student who is meeting with two academic advisors to discuss his thesis. He is struggling to convey his level of mastery of the topic at hand, but he is also trying to negotiate differences of opinion that the two faculty members have expressed regarding the details of a theoretical argument at the center of the discussion. The student draws a picture that represents the abstract theoretical concept at the core of his thesis, proving that he understands the components of the theory (to both himself and his advisors). He uses the drawing to reinforce his words and to provide further evidence of his mastery. But the drawing also fulfills another function in the conversation. The persistent quality of the drawing also enables it to be used to establish a mutually experienced point in time and space for the three people involved in the conversation. This permits them to discuss points of difference and possible alternative interpretations, without losing context with each other, allowing them to identify and reconcile discrepancies related to the abstract concepts being represented.

In this way, the creation of the drawing not only enhances communication by allowing the student to verify and show what he knows, but it also allows all of the people involved in the conversation to synchronize with each other and negotiate a mutual understanding. This simple example highlights one of the central propositions of the research presented here: that the deployment of

images within a conversation can serve a number of communicative roles or functions within the bounds of that exchange. Despite its familiarity to many of us, this phenomenon has not yet been the focus of concentrated study and therefore is not being used to inform the development of image-enabled information and communication technologies (ICT). The research presented here provides a theoretical framework and methodological approach for the study of the creation of visual information as a communicative activity.

In order to see the practical value of a deeper understanding of image-enabled exchanges, the conversation between the graduate student and his advisors can be used to examine apparent shortcomings in two image-related ICTs: software applications that enable distributed communication and image retrieval systems that enable us to locate specific pieces of visual information within an archive.

First, by extending the example into the domain of distributed communication, we can imagine this same interaction, conducted using a virtual white board like those typically included with many software applications designed to support distributed work. As part of the white board functionality, these interfaces generally include a white rectangle representing a blank canvas visible to all participants. Vector-based drawing and text tools provide the ability to create basic shapes and add words or phrases to the canvas. It would seem that all the necessary components to duplicate the face-to-face experience described above are available.

Although the experience of using computer-supported drawing tools in distributed work applications is improving, it is not yet as fluid as the face-to-face drawing experience. Many collaborative tools are designed to give most

participants only limited access to display and content creation tools. Drawing on the digital white board, then, does not share the same egalitarian and equal access quality exhibited by mark making in face-to-face conversations. Standard shapes are quickly and easily added to the digital white board, but more fluid, free-hand drawings often appear crude and awkward compared to those drawn with pencil or ink. This substantially limits the type of images that can be created and used to communicate through these interfaces. Visually enabled distributed communication systems allow people to use a range of tools for connecting with each other, such as video, audio and the white board, however, the user interfaces of these tools are generally compartmentalized, complicating the process of switching between modes or simultaneously using more than one mode of communication. In contrast, such studies as the work of Suchman (1988), Østerlund (2008), Walny et al. (2011) and others show the range of material practices associated with whiteboard use. Digital versions of these tools do not always support the full range of communicative practices embodied by their analog counterparts.

One could easily argue that these challenges could be overcome with better technology: “smarter” access and control management, a more sensitive drawing stylus, or more robust 3D visualization of the shared workspace. A better understanding of the nuances involved in face-to-face communication, however, could inform and improve the development of these enhancements. If the ultimate goal of such distributed communication tools is to achieve the same fluency and fluidity as face-to-face interactions, a thorough understanding of that baseline experience is essential (Hollan & Stornetta, 1992). The research presented here seeks to provide just that: a richer and more detailed

understanding of the face-to-face “gold standard” by which such applications are measured.

The value of more rich and robust understanding of image-enabled communication can also be demonstrated by looking at another class of visually oriented ICTs. Consider the visual artifact left after the interaction between graduate student and advisors, the drawing that represents the abstract theoretical concept. Current search engines will help us locate specific visual artifacts within an image collection by predominantly relying on the automatic detection of specific visual features and/or, in some cases, on tags assigned by human annotators.

Both of these approaches to indexing images rely heavily on the visual content of the image to reflect the specific meaning conveyed by the image. As we will see throughout the following discussions of communication activities, meaning exchanged between individuals during an interaction is also dependent on contextual factors. This means that search engines that rely solely on the visual content of an image in order to model the meaning of the artifact work with only partial representations of the significance conveyed by that artifact. Because identifying meaning is dependent on understanding contextual cues and influences (a premise that is discussed at length later in this dissertation), information about the situation in which an image is created and deployed needs to be included when describing the meaning associated with a given artifact.

Having the ability to incorporate contextual factors into the document model would improve the accuracy of the representation of the image within the system, making it easier for the search engine to produce helpful results. The challenge lies in establishing which contextual information is most relevant,

capturing that information and incorporating it into the image indexing system. Again, the implicit baseline measure here is the human interpretation of images, and without a more complete understanding of the multiple ways that images are used within a communicative context, it is extremely challenging to identify the most effective contextual parameters to use for improving the performance of image retrieval systems.

1.1 Research focus

The study presented here addresses the issues introduced above by focusing on the creation of a particular type of image, so-called “napkin drawings.” These images consist of marks made on an available surface during the flow of a conversation. They are sometimes kept, sometimes abandoned, and notoriously cryptic for those not involved in the discussion. Marks on a napkin or sketches created on a whiteboard are information artifacts that embody a particular type of communicative practice that plays a specific role in the exchange of meaning between individuals. This study reveals the complex ways the creation of these visualizations contribute to conversational involvement. Gumperz describes this aspect of communication as our ability to attract and sustain others’ attention (1982, p. 4). Spontaneously created visualizations can anchor, bridge, and facilitate the flow of information at crucial moments in a conversation. Rarely seen as aesthetic objects of great admiration for their own sake, these images answer to a different set of requirements than other constructed images (such as art). Often corresponding to moments of heightened clarity, insight or coordination, the creation of such visualizations can be viewed within a broad communicative context, alongside linguistic and other non-textual modes of

expression. *Image-enabled discourse* is the term introduced here to refer to this phenomenon in a broad sense. *Ad hoc visualizations*, meaning drawings created for a particular purpose within a specific context without consideration for any possible wider application (i.e. a napkin drawing), are highlighted as one type of image-enabled practice.

Image-enabled discourse views the human proclivity to create and deploy visual information during conversations, *in situ*, as a phenomenon worthy of focused study. Through this study, the creation of images during small group interactions is positioned as a specific type of information-driven communicative behavior, separate from doodling or artistic practice. Rich descriptions of visually enabled social interactions can greatly inform and influence the design of systems that enhance multimodal communication. The goal of this study is to expand the ways that images and image-creation are understood and supported by these tools.

Specifically, this research addresses the following three research questions:

- RQ1: What communicative **activities** are taking place when people draw during face-to-face conversations?
- RQ2: What role do these activities play in managing **conversational involvement** and **coordination**?
- RQ3: Which **affordances** of drawing are most salient for image-enabled discourse strategies?

What is it about ad hoc visualizations that make them such effective conveyors of meaning in some situations? Why do people start drawing while they are talking? Why make a mark rather than utter a word? It may be hard to think of this as anything but a natural, automatic and intuitive response, and

many people will refer to the adage “a picture is worth a thousand words.” The question remains, however, *which* thousand words are being replaced and *why*? Is the image really *replacing* words or is it offering an alternative or supplement to other modes of communication? Why, when given the choice between words, which have dictionary definitions and specific rules of grammar, do we sometimes turn to the seemingly ambiguous realm of images in order to be more precise? And are there situations where visualizations actually hurt or hamper communication?

To begin to answer these questions, this dissertation presents a discourse-oriented study of ad hoc visualizations as image-enabled communicative practice. The study described here focuses on the creation of visual information within the context of face-to-face conversations as a communication process. This interactive phenomenon is inherently dynamic and multi-directional; each participant may have unique and evolving goals throughout the course of the exchange, and therefore, the creation of ad hoc visualizations may serve different purposes as the conversation progresses. A methodology was designed to allow for situated study of image creation and use throughout a series of interactions.

In the remainder of this chapter, the benefits of a contextual investigation of image-enabled discourse will be examined. Chapter 2 provides a review of scholarly work related to the study of visual information. This discussion reveals that although there is a significant amount of research devoted to the study of images across a range of disciplines, a contextually driven approach to understanding the creation and use of visual information in social interaction has been missing. Chapter 3 begins to bridge this gap with preliminary empirical data and with a theoretical framework derived from the field of discourse

studies. Chapter 4 is devoted to a description of the research design and methods used in the dissertation study. Analysis and findings are presented in Chapters 5, 6, and 7. This document concludes with a discussion of limitations, implications and future work in Chapter 8.

Before continuing, it is necessary to clarify that there are three studies described in this document. Because of the lack of research directly related to the phenomenon of interest, an exploratory, theory-building study was conducted using a qualitative and inductive methodology. This is referred to as the **preliminary study**. Findings from this study are described in Chapter 3 in order to illustrate and argue for the extension of linguistic theory into the domain of image-based communication. The goal of the preliminary study was to provide empirical support for the theoretical basis of the proposed investigation, in lieu of previous research. The methodology for the **main study** is described in Chapter 4. This investigation followed an entirely different research design than the preliminary study, addressing some limitations of the earlier study. The main study included a **pilot study** that closely followed the protocols designed for the main study and served as a proof of concept.

1.2 The domain of images

From rudimentary drawings of stick figures hung on a refrigerator to Paleolithic incised marks on a cave wall to abstract paintings hanging in the museum, we use the term “art” to refer to any image that is made by human hand with an apparent intention of expression. Just as constructed sound is often referred to as music, consciously constructed images are often called art, whether their creators aspire to such a label or not. The more ambiguous the visual expression, the

more likely we are to grant latitude and mystery to the meaning of the image. Many people, when faced with a particularly minimal canvas hanging on the wall in the local institute of contemporary art, will throw up their hands and claim ignorance of the expertise necessary to appreciate the artwork.

Historically, the vast majority of scholarship devoted to the study of images comes from the field of art. Until relatively recently, if one were to study images, the criteria brought to that analysis would be built from concepts commonly associated with the humanities, for example aesthetics or emotional symbolism. In this realm, the image is often seen as an expression (or perhaps, an impression), gaining power from ambiguity and inviting multiple interpretations. Discussions of works of art often revolve around the representation of abstract concepts such as beauty, power, cultural values or social conflicts. Art images are often created to intentionally provoke complex reactions related to belief systems and these are the frameworks that frequently guide interpretive analyses.

The term art is simultaneously an inclusive term for any visual artifact constructed by human hands, and at the same time a term used to explain the utter incomprehensibility of a modern intellectual product. This one simple word is frequently used to refer to radically different types of images. In common usage, this is not a problem, and can even be seen as a sign of respect for expressive and creative endeavors (i.e., “He really is an artist when he’s working on those old cars.”). In many ways we show a preference for vision over other senses, equating this mode of communication with intuition, deep knowledge, insightful observation, cleverness, or persuasion. Why we associate visuality with this power to transcend, or to operate at a higher level of abstraction, or to

cut to the chase is a complex question.

In fact, artists are not the only people who make and use images. Many different kinds of images are produced and deployed in broad ranging and diverse circumstances. Scientists use visualization software to represent highly complex data sets, revealing previously undetected relationships and patterns. Physicians use spectroscopy to reveal aspects of the human body that are otherwise hidden from view. Business people can rapidly disseminate complex financial information with high degrees of accuracy and speed using visualization tools that have become as standard as the office photocopier. Info graphics regularly appear in the pages of popular magazines, newspapers, and websites. Each of these contexts has different criteria for evaluation and interpretation (Kress & van Leeuwen, 1996).

Beginning in the mid-twentieth century, research into the psychology of art and image interpretation gained momentum, in large part due to the work of Rudolph Arnheim and his contemporaries. Arnheim (1969) brought his training in art history together with psychological observation of human behavior to expand the ways we think about the perception of images in culture and communication. In his groundbreaking work, he revealed the strong relationship between cognition and visual representation in terms of art interpretation and appreciation. Arnheim's work on perception, cognition and visual form provided new ways to think about the processes we use to make sense of what we see.

More recently art historian and visual studies scholar James Elkins argues for the inclusive study of both art and non-art images, opening that discipline to a new range of images not previously studied. Like Arnheim, Elkins argues that our current frameworks for talking about visualizations are not robust enough to

adequately address the range of contexts in which images occur. In his book entitled *The Domain of Images*, Elkins (1999) describes our current approaches as mired in art-centric perspectives and calls for an expanded study of non-art visual artifacts. In making his argument, Elkins describes a typology of graphic forms that spans from alphabets to pure pictures, making distinctions based on context of use, the prevalence of formalized syntax (even a landscape painting can be “read” to a certain degree) and the possibility that a purely visual representation is possible, but very difficult to achieve.

Many images are created with the intention of conveying or representing a view of the world. In this sense a representational landscape painting is similar to an informative bar chart. Both are depicting a state of being at a given moment in time. The criteria used to evaluate and interpret these images, however, are distinct. According to principles of genre and cultural context (Bateman, 2008), each of these images are expected to convey very different types of meaning. One could even argue that the painting does not convey information as much as it conveys an experience. Here lies the real difference between art and non-art images. Images produced in the context and for the purpose of art invite multiple interpretations as well as a collage of intellectual, emotional and cognitive responses, while non-art images are generally intended to convey specific (although sometimes non-verbal) interpretations. They are created to clarify, inform, and elucidate. This is what is meant by informative images, and this is why an investigation of image-enabled discourse needs to be able to address these types of images using a framework distinct from the potentially prescriptive lens used to evaluate art images.

1.3 Visualization as a process

In the last hundred years or so, the availability of advanced tools for both the creation and the distribution of images has grown exponentially (e.g., invention and mass production of affordable still and video cameras; ubiquity of photocopiers; sensitive scanners and high resolution color printers; powerful software applications that allow even novice users to create professional quality digital images; not to mention the World Wide Web). Technology has certainly advanced our ability to create increasingly sophisticated information visualizations, but the practice of using images to convey specific informational meaning is not a new phenomenon.

Fig. 1.1. Representation of horses on wall in the Ekain cave, Basque country



Download from: http://commons.wikimedia.org/wiki/File:Ekainberriko_zaldiak_%28Pottoka%29.jpg

In order to better understand the importance and impact of developing frameworks for the study of informative images and their creation within dialogic contexts, a brief digression will take us back 30,000 years. Cave art is the oldest preserved evidence of the creation of visual information by humans (Fig.

1.1). The title “art” is in many ways ill suited to this class of images. We have no way of knowing if any of the associations that term carries in our modern frame of reference would have been meaningful in terms of Paleolithic life.

Nevertheless, these images created by early humans are typically referred to as “art” and have most frequently been deciphered using the same subjective frameworks as those used for the interpretation of more contemporary artistic images. Paleolithic paintings and engravings, preserved on cave walls throughout the world, have traditionally been studied as evidence of ritual and spiritual practice, with the images most often being viewed as talismans. Speculating about the meaning of these captivating depictions, researchers have constructed at times elaborate narratives of ritual and magic to explain the existence of these images.

Because of the power of these images to spark the imagination, it has been exceedingly difficult to keep interpretation free from assumptions about what our early ancestors thought and felt about the practice of image making. We feel a connection when we look at these representations, especially those where the hand of the ancient maker is clearly visible. We imagine what it must have been like for early human to make a mark on the hard, stone surface. At a certain level, this connection is real: the human impulse to leave a mark is old and deep.

In order to better understand these images, researchers have recently sought to supplement speculation and imagination with forensic investigation. Scholars such as paleobiologist R. Dale Guthrie (2005), use cave drawings to learn more about what daily life was like for early humans, what relationships early people had with the animals they hunted and depicted on cave walls, and what social factors influenced the location and subject matter of these early

visual artifacts. While the general public is familiar with the most well-preserved and elaborate cave imagery, Guthrie has studied the more mundane images that are far more plentiful than those commonly featured in coffee-table books. He has found that the majority of the images appear to have connections to far more humble aspects of daily life and, in fact, many were made by children. The argument that some of these images did in fact perform ritual religious roles for early humans is certainly compelling, however, according to scholars like Guthrie, the creation of images could also have been a much more regular and normal activity in the lives of Paleolithic humans: “The shadow of this entrenched magico-religious paradigm and its frequent uncritical use often cloud open and frank discussion of alternative approaches and ideas about ancient art” (p. 11).

For these scholars, reconstructing the moment when the images were originally conceived and created is painstaking and frustratingly full of guesswork. It is seen as vital for a comprehensive and accurate understanding of Paleolithic cave imagery, however, and even more generally, of early human society. Viewed from this perspective, we can see how the image artifact carries only part of the story of its creation and meaning, and how having similar contextual information could be important for understanding the role of contemporary images.

In the field of painting and drawing, the term “mark making” is used to isolate and highlight the practice of using an instrument to leave a trace on a surface. Sometimes employed by art historians and critics when discussing the gestural qualities of a piece of art, this term is most frequently used by artists to refer to the way that a mark (or series of marks) indicates the human hand of the

maker. During painting and drawing courses, particular attention is often devoted to enabling students to develop a range of mark-making skills. From this perspective, marks left on a surface convey particularly potent information about the moment of expression and the act of creation.

Kellogg (1970), Freeman and Cox (1985), and Van Sommers (1984), among others, make the argument that the emergence of a mark making practice is fundamental to the cognitive development of children. By studying the scribbles and drawings of hundreds of children over a period of several years, Kellogg identified typical and sequential stages of mark making that are observable in all children. Based on these observations, she concluded that the development of a mark making practice plays a systematic role in a child's growing awareness of themselves and the world around them. More recently, Hopperstad (2008) studied the relationship between learning, play and drawing in primary school education. She states, "The way in which children produce drawings is a valuable starting point for supporting their visual literacy. Drawing is a semiotic or meaning-making activity in which children use visual resources to share information, knowledge and ideas" (p. 77). These cognitive studies focus on the child as creator, seeking to articulate the relationship between his or her inner world and the child's external representations. The role of visual representation within social contexts and as part of a broader socialization process is briefly mentioned at times, but not dwelled on in these studies in any sustained way.

There is much to be gained from having the ability to differentiate between images, not just by form or format, but also by the roles visualization plays in social interactions. Interpretation of content can require a high degree of contextuality, a product of the time and circumstances of the creator as well as

the viewer. For example, a minimalist painting and a drawing on the cave wall were created under very different circumstances, and although we cannot be absolutely certain, it is safe to say that the motivations spurring the creation of the images cannot be assumed to be identical.

In his discussion of information visualization, Ware highlights the cognitive roots of the process of visualization in relation to system building, pointing out that visualization can refer to the *process* of generating meaning using a visual mode of communication, as well as a technology-based *product*. This is also relevant for the study of image-enabled communication: the term *ad hoc visualization* encompasses *both* the process of spontaneously creating an image as well as the image itself. The study described here looks at image creation in the context of conversations as a process, one that generally results in an artifact, but that also includes the motivation or need for the image, the deployment of the image in a specific context and the reception of the image within an overarching communicative structure. As Ware points out, visualizations have gone “from being an internal construct of the mind” to being “an external artifact supporting decision making” (2000, p. 2). At one point, visualization was seen as a cognitive activity, a process. More recently the word has come to mean a computer-based activity involving the graphical and digitized representation of data.

When we predominantly focus on just one aspect of visualization, such as the content of that image (either through automated analysis or more qualitative interpretation), we generate static analyses of graphical content in which the image is seen as a *fait accompli* rather than an embodied mode of communication. Embodiment in this sense refers to the act of giving material form to a thought or an idea. The mode of expression that we choose when we express ourselves

conveys meaning. This concept will be discussed further, however, at this point, the important thing to note is that the act of visualization is itself an embodied communicative process.

1.4 Image making as information behavior

For many years, information scientists have studied information behavior in parallel to the development of computer-driven tools for information access. The human ability to create and share complex information visualizations far exceeds our current understanding of how these images function in collaborative, interactive situations. This is problematic, limiting the usability of current tools and the development of new, more effective ones.

In the field of information science, there is a pervasive assumption that information is *text* (Buckland, 1991). (This is discussed further in Chapter 2 where we will see that Buckland's observation still holds true some twenty years later.) Research frameworks for the analysis of textual information and verbal communication are well developed, while our means for performing the same investigations of visual information and the use of visualizations to communicate are comparatively weak. Working with multimodal information including images is still seen as a challenging task for many systems. This can in part be attributed to the fact that our methodologies for the interpretation of multimodal communication are relatively new, in comparison to the frameworks developed for working with textual data.

While the study of language and text is well established, the various nascent areas of image-centered research are only beginning to coalesce around integrated and accepted concepts regarding the role images play in

communicative practices and culture. Other areas of social science research such as visual anthropology and visual sociology are developing methods for analyzing visual data (i.e., content analysis performed on video or photographic data), but information scientists have not yet established similarly systematic methods for studying multimodal artifacts and the role they play in information processes. There is a tendency for the content of all images to be interpreted as though they are art objects, rather than viewing some images as evidence of information behaviors. For example, dimensions of aesthetic criteria used in image retrieval experiments are often derived from value-laden schema developed in the area of art and design (i.e. red means passion, blue means serenity). These constructs are often taken as credible and absorbed into a social science methodology without validation, even though they originally may have been developed for entirely different purposes.

In terms of investigating image-enabled discourse and specifically the creation of ad hoc visualizations, there is also the problem of how to study the creation of information. Here we do not have a clear precedent, given that the creation of information has rarely been a topic of focused investigation, in spite of the fact that it is included as a primary stage of the information lifecycle, followed by production, distribution, dissemination and use (Rubin, 2004, p. 3). In spite of the paucity of work in this area, information creation is certainly of increasing relevance to any field interested in developing the next generation of information technology. According to Rubin, "In the past, participants in the cycle had a distinct, linear relationship. By contrast, in the Web environment, authorship and the functions of authorship have changed" (p. 4). By learning more about the process of using images to communicate, including recognizing

the unique communicative aspects of visual information as well as developing preliminary frameworks for the study of information creation, we can improve existing tools and perhaps invent new ones that enhance, amplify and optimize our natural abilities.

1.5 Conclusion

Representation of multimodal information, and visual information in particular, is still considered a difficult problem that we are far from fully understanding. The processing of textual information was also once considered beyond the reach of our capabilities. But now we see from projects like IBM's Watson, the computer that competed on the Jeopardy television game show and won against human opponents, that difficult problems can be tackled with concentrated effort and innovative methodologies. Addressing the challenges of working with multimodal information will require extensive effort across a number of domains, from the humanities, social sciences, cognitive science and computer science. This study presented here contributes to this multidisciplinary effort by providing a preliminary baseline of image-enabled human behaviors.

On a certain level, people exhibit great expertise at deploying images, whether manually constructed or automatically generated, just when we need them. Bringing this facility with visualization into more conscious and deliberate focus will allow us to better exploit this seemingly innate human communication practice when building visually enabled tools and systems. Until recently, the principles that guide the interpretation of images have stemmed from research in the arts. Technology, however, is enabling a wide spectrum of images to be deployed in a vast range of contexts. Just as Elkins (1999) argues, our

frameworks for understanding the potential represented by the entire domain of images will require more robust approaches to the study of visual communication and informative images. Insight provided by a functional understanding of the role of images within communication has great potential to enhance traditional information models by incorporating notions of context and functionality into the design and deployment of visual information. Using insight generated from social behavior studies like the one presented in this dissertation, image-enabled ICT could be developed to more successfully extend our face-to-face visualization strategies into distributed and virtual environments. Inspired by the example provided by the evolution of the text-based systems, this study makes the implicit argument that close analysis of human behavior is an important initial step towards developing more sophisticated and functional protocols for working with multimodal information in complex systems.

The absence of a conceptual framework for studying image making as a contextual, communicative activity is not the result of a lack of interest in images on the part of those building the tools and systems discussed above. In the next chapter, a more detailed look at the ways that images are generally studied further explicates the problem introduced here, and provides justification for developing an alternative approach for investigating the creation of visual information.

Chapter 2 Gap Analysis

Image-enabled discourse focuses on the *context of the creation* of the image and de-emphasizes analysis of the *image as an artifact*. Underlying this position is the assumption that important and under-evaluated elements of perceived meanings can be identified through the analysis of the social circumstances in which images are created and interpreted. In the vast majority of visual studies scholarship, however, the image artifact is the primary focus of analysis. Therefore, the review of literature presented here highlights examples of research that, while still focused on the artifact, acknowledge the value of defining and describing contextual and functional aspects of images. In this sense this literature review is a gap analysis that supports the need for a more interactive, contextual study of image-making practices.

Images are often created with the intention of conveying or representing a view of the world. In this sense a representational landscape painting is similar to an informative bar chart. Both depict a state of being at a given moment in time; in fact, the criteria used to evaluate and interpret these images are distinct. There are many different kinds of images produced and deployed in broad ranging and diverse circumstances. This chapter provides a survey of many of the ways that images are examined in communicative, information-driven contexts, discussing the research methodologies commonly associated with different types of image-based phenomena. This gap analysis will convey a sense

of the range and, at times, diffuseness, of this research.

The review of literature begins with discussions of image typologies, visual grammar, and visual culture and semiotics, with a nod to the influence of linguistic theory on these approaches to the study of images. Next, approaches to the study of visual perception and cognition are discussed. This is followed by a brief overview of literature related to visual literacy and the use of images in education. The gap analysis then turns to work specifically related to visually enabled information and communication technologies (ICT). This more technology-driven area of image-based research is not typically included with other branches of visual studies, and this survey highlights differences between studying images as elements of information systems compared to the humanities-influenced approaches. The research is presented in terms of two approaches: systems-based studies that focus on building and evaluating tools that recognize, generate or represent visual information; and task-based studies that investigate the ways in which users interact with visual information and image-enabled interfaces. The chapter concludes with an explanation of the ways that a discourse-centered perspective bridges the gaps described throughout this chapter.

2.1 Types of images

A rudimentary dichotomy was introduced in Chapter 1, distinguishing artistic images from informative images. More elaborate schemes for the classification of visual representations exist, typically focusing on formal characteristics in order to make distinctions between similar types of images (i.e., maps, charts, and diagrams; or photographs, drawings, and paintings). Some classification

systems, however, take a more contextual approach. Three of these image typologies will be discussed in this section. Arnheim's classic approach takes into consideration the contextual function of an image in conjunction with its form or format. Next, Elkins' continuum of seven classes of image types is described, encompassing a taxonomic spectrum from words through pictures. And last, Ware's discussion of sensory versus arbitrary visual representations reflects a more cognitive perspective on the classification of images.

2.1.1 *Arnheim and the function of images*

During the mid-twentieth century, art historian Rudolf Arnheim published an influential series of books about the nature of visual perception and its relation to art interpretation. Incorporating elements of psychology and an emerging understanding of visual cognition, his work still influences discussions about how it is that we make sense of what we see. While Arnheim is most often specifically referring to art, his principles of visual thinking are highly transferable. In his 1969 classic entitled *Visual Thinking*, Arnheim presents a basic scheme to describe the range of functions performed by images: picture, symbol, sign (Table 2.1). A representational painting (such as a portrait or a landscape) will most often be classified as a *picture*. Under certain circumstances, however, it might also serve as a *symbol* of intellect or refinement, such as when it is included in a theatrical set, for example. In contrast, it could also be deployed as a *sign* if it appeared on a building facade with an arrow indicating the entrance to a museum. Important to understanding Arnheim's scheme is the fact that the effort of abstraction from image to concept, particularly in the case of symbols, is undertaken by the viewer and is not latent within the image itself. In order to

understand the role of the image, it is necessary to have certain contextual information. According to Arnheim, the function is not carried by the image itself, but is determined by the context of use. He clarifies that these classes are not mutually exclusive in that, “A particular image may be used for each of these functions and will often serve more than one at the same time” (p. 136). In this way, a triangle may at times function as a picture of a mountain, a symbol of hierarchy, or a sign of danger. This is our first example of an approach to image studies that acknowledges the limitations of relying solely on the content of an image in order to classify its meaning.

Table 2.1. Adapted from Arnheim (1969)

Function	Description	Example
Picture	An image that portrays a thing at a higher level of abstraction by rendering some (but not all) relevant qualities (shape, color, etc.).	A painted portrait depicting an individual.
Symbol	An image that portrays an idea or a concept at a lower level of abstractness by giving its intangible qualities a shape or form.	A physical cross (referring to the crucifixion) gives form to the more abstract notion of Christian faith.
Sign	An image that arbitrarily stands for something without reflecting its characteristics visually.	A red and white inverted triangle traffic sign that, in the U.S., means “Yield.”

2.1.2 *Elkins’ continuum of image types*

The typology of images devised by art historian and visual studies scholar James Elkins also reflects an awareness of the ways in which context influences the construction and use of images.

Table 2.2. Adapted from Elkins (1999, p. 89)

Type	Description	Examples
Allography	The name for all variant shapes of a letter, including calligraphic forms and paleographic styles. This is the purest form of <i>words</i> .	Paleography, signatures and autographs, layout, typography, graffiti, and calligraphy
Semasiography	The study of written characters that function in part by resembling what they denote	Hittite, Bamum, Assyrian, Phoenician, Egyptian, Chinese, and Mayan characters, and the pictographic elements in mathematical and musical notations
Pseudowriting	Scripts that are not “full”—that is they cannot express the entirety of a language. When there is only a limited set of signs (a small “signary”), writing tends to become more clearly pictorial.	Defective scripts, as in Renaissance pseudohieroglyphs, rebuses, predynastic Egyptian and Chinese, Peruvian mnemonic scripts, Olmec, Aztec, Mixtec, Teotihuacan, and Inuit; it also includes hobo signs, treasure signs, brands and potter’s marks.
Subgraphemes	At the pictorial limit of writing, images that not only lack a full signary but are also distributed over a surface with no comprehensible formatting. Once the order in which the signs should be read is no longer clear, the image begins to look more decisively like a picture.	Modern graffiti, aboriginal paintings
Hypographemes	When it becomes impossible to distinguish between the signs. This form is closest to the ideal of a purely visual <i>image</i> and concludes the sequence from almost-pure writing to almost-pure picture.	Fine-art paintings and drawings, Taoist “talismans,” and some rock art
Emblems	The nearly universal practice of associating a short text and a few symbols with an image. This category moves in the direction of pure notation.	Advertisements, book illustrations (with their captions), and paintings in museums (with their labels). Examples that more heavily rely on additional notation are paper money, coins, stocks, and tickets.
Schemata	Strongly notational images that have all the elements of emblems and are also based on geometric forms such as reference lines – curves, scales, grids, nets, or other geometric configurations that order the image. This is the closest form to pure <i>notation</i> .	Maps, engineering drawings, graphs, charts and tables, diagrams, flow charts, genealogical trees, Boolean circles, and geometric configurations

Elkins reflects on the inherent problems associated with grouping and classifying images: “Given the vastness of the field, it would be imprudent to choose any one criterion or system; instead it seems reasonable to install just enough order to enable the interesting questions to find voice, and to remain open to alternative ways of ordering the material whenever possible” (1999, p. 82).

With this qualification in mind, Elkins walks through strengths and weaknesses associated with various classification schemes of increasing complexity. He rejects a taxonomy that includes only a single class of images, while elegant and inclusive, because of the impossibility of finding a single term that works equally well for all visual representations. The terms *image*, *visual artifact*, *text*, *gramma* (Greek for picture, written letter, or piece of writing) and *graphein* (Greek verb meaning “to write, draw or scratch”) are all examined and rejected because none fully capture the multidimensional quality of visual representation (Elkins, 1999, p. 83). Elkins goes on to discuss a dichotomous classification contrasting *word* with *image* as distinct classes of representations. He immediately challenges this simple pairing, however, by pointing out hybrid manifestations, such as maps, which he deconstructs using Goodman’s detailed definition of *notations* (Goodman, 1968). Elkins pursues this line of reasoning, moving next to a three-way demarcation of image types: *word*, *image* and *notation*. Ultimately, Elkins rests here, arguing that if one looks at word, image and notation as anchor points on a continuum, all images can be placed somewhere along the spectrum. He refines this spectrum into seven distinct kinds of images, as shown in Table 2.2.

2.1.3 Ware's dichotomy of image types

Colin Ware (2000) has also created a scheme for the classification of images, presented in his book on perception and computer-enabled visualization. He contrasts *sensory images* with *arbitrary images* (p. 10) (Table 2.3). According to Ware, this dichotomy, informed by cognitive and neural science, supports the theory of sensory languages. This theory holds that the human visual system evolved as an instrument to perceive the physical world, adapting to the presence of both types of images as it developed.

Table 2.3. Adapted from Ware (2000)

Type	Description	Example
Sensory	Symbols and other elements of visual images that rely on the perceptual processing of the brain rather than learned conventions or norms in order to hold meaning for a viewer	An image of a dog or a flower
Arbitrary	Sign systems that require knowledge of the code to interpret	A stop sign or traffic light

Sensory images are inherently interpretable by all humans, regardless of cultural context, for example, an image of the sun, or a flower, or a dog. When children are learning to speak, they have an uncanny ability to recognize that a drawing of a beagle and a photograph of a German shepherd are both “dog,” in spite of the fact that each representation is embodied in a very different way. Ware would say that the similarity is based on sensory mechanisms that are universal to humans.

Arbitrary refers to aspects of representation with no perceptual basis, and

which therefore must be learned. For example, a red circle with a diagonal line through it used to signify some sort of prohibition is an *arbitrary* rather than a *sensory* image. Ware provides the example of the word “dog” (as opposed to the concept of *dog*), which bares no resemblance to any visual representation of a dog. Nevertheless, the word D-O-G has come to present the concept of *dog* in the English language. This association is arbitrary, with no perceptual basis. It is merely the collection of letters (or string of sounds) that we have learned to associate with a certain type of animal. Ultimately the connection between sign and signifier is arbitrary and becomes a matter of convention (De Saussure, 1959). Ware would say that symbols, as arbitrary images, rely on cultural conventions and are dependent on knowledge of the references for interpretation. As Ware points out, this is rarely, if ever, a clear-cut distinction, as many instances of visual representation include both sensory components and arbitrary convention.

2.2. Visual grammar

Scholars such as Goodman (1968), Bertin (1983), and Kress & van Leeuwen (1996), have attempted to codify the syntax of visual imagery. These scholars have sought, in one way or another, to look at visual artifacts as systematic expressions of meaning, capable of being de-coded, similarly to the ways that verbal language can be disambiguated using structural rules of syntax and grammar. Research in the area of visual grammar shows that when structural rules for visual images are sought, by necessity the domain of applicability for those rules is often constrained to a specific domain or type of image.

These approaches tend to focus on formal elements (such as points, lines,

charts, graphs and tables) of standardized visual genres, interpreting images based on relatively proscribed relationships between structure and meaning. There is a falling away of predictive structure, however, as images become more “picture-like” (Elkins, 1999) illustrated by the difference between a chart or graph (less picture-like) and an impressionist landscape painting (more picture-like). This is a limitation of visual grammar schemas.

One of the most prevalent practical applications of visual grammars can be found in cases where a system automatically generates or interprets visual representations. For example, many image retrieval engines automatically parse the content of an image in order to index the artifact for later access (e.g., Datta, Joshi, Li, & Wang, 2008; Enser, 2000). Automated image-generating systems, such as information visualization applications or highly sophisticated digital imaging systems like those used to produce computer-generated (CG) effects in film, rely heavily on narrowly defined parameters to generate visual representations. These systems are discussed more in Section 2.6.1 *System-based approaches*, however within the context of this discussion of visual grammar, it is important to note that in these applications, the *meaning* is not the thing being automatically generated or interpreted. A system can be programmed to conjure up a representation of light and form based on algorithmic rules, upon which a *human* can imbue meaning. An *artifact* is what is actually generated by the application. In other words, a computer can make a goofy looking dog, as long as it is told what goofy looks like. But why does goofy look goofy? And how do we know what visual goofiness is? Does it mean something if a character sounds goofy as opposed to looking goofy? Why did the programmer choose the parameters? How does that affect the information received by the user of the graphic? People

make a host of decisions that support the automated process.

As discussed later in this chapter, images are also analyzed for structural content features in the process of building image retrieval systems, such as Google Images. There are two basic approaches to developing image retrieval systems: text-based retrieval in which images are tagged with descriptive labels that are in turn used for document modeling, and content-based retrieval which relies on the automated detection of visual features which are then compared and contrasted in order to classify images. Content-based systems that automatically detect and categorize visual features at the pixel level have received the most attention over the last decade. This has resulted in a relatively unified approach to the development and optimization of these systems, though many remain far from being ready to implement in the real world (Datta, et al., 2008). In both types of system-based retrieval studies, access to an image artifact remains the central point of interest, rather than a broader, more contextual understanding of the range of behaviors associated with the creation or use of visual information (Wilson, 2000), and the research primarily focuses on evaluation of the effectiveness of the system in terms of traditional criteria such as precision and recall.

Regardless of the sophistication of the system and the application, using visual grammar to understand images offers only a partial view into the process of visualization as experienced by people. In order to expand our understanding of visuality beyond image-as-artifact into the realm of image-creation as embodied mode of communication, a more sophisticated contextual approach is needed that recognizes that the form and format of an expression can be as communicative as the content that is represented.

2.3 Visual culture and semiotics

The fields of visual cultural, visual anthropology and visual sociology have evolved to provide more culturally aware contextual frameworks for the analysis of images. Kostelnick and Hassett explain, “To understand how visual language works, we need to define the social behavior among designers and readers that shapes, stabilizes, and transforms it and that normalizes it as conventional codes” (2003, p. 3). Contemporary studies in visual culture (e.g., Mirzoeff, 1999; Sturken & Cartwright, 2001) generally rely quite heavily on theories of sign and signifier in order to understand the intersection of various social systems as evidenced through visual artifacts. Similarly, image-oriented areas of cultural critique in the arts and humanities have been heavily influenced by scholarly work in semiotics (Dikovitskaya, 2005; Kress & van Leeuwen, 1996; Rose, 2007). For example, variations in interpretations of a single sign are often seen as indicators of cultural or social conflict. The influence of a semiotic perspective has coincided with post-modern challenges to conventional notions of beauty, ownership and authorship. Because of the very strong historical and philosophical influence of semiology, the terms visual studies, visual culture and visual semiotics have been used interchangeably (Elkins, 2003).

It follows that visual semiotics (i.e., visual studies, visual culture) is the study of how images influence social and cultural interactions within specific communities (Rose, 2007). In this field, the term *text* has come to mean any manifestation of cultural expression, not just those that take form in verbal language. A photograph is seen as a text as readily as a novel, and all textual artifacts are examined to determine their role in supporting or subverting social

discourse within a given context. Analysis of visual rhetoric often focuses on dynamics of persuasion and influence (Hill & Helmers, 2004).

Purely linguistic applications of semiotic principles tend to yield highly structured schematic representations of the chain of meaning making associated with a given instance of language use (Chandler, 2002). Generally speaking, when semiotic principles have been applied to visual representations the results have taken a more varied character than traditional language-centric analyses (Dikovitskaya, 2005; Rose, 2007; van Leeuwen & Jewitt, 2001). Semiotic approaches to the analysis of images range from similarly highly specified schema to more impressionistic descriptions. Attention is often given to a collection of signs within a given image as indication of social or cultural identity, rather than to structural analysis of one particular sign. For example, a semiotic analysis of the imagery included in a magazine advertisement might look at the interaction between the logo of the manufacturer, the product brand and the photo used to promote the sale of the item as evidence of a particular dominant gender paradigm in a specific culture. In both visual grammar and visual semiotics, the image artifact as it exists within a specific context is the unit of analysis, with the application of linguistically driven principles or schemes being *post hoc* to the production or creation of the image, akin to a historical analysis of texts.

2.4 Visual perception

Research in the area of visual perception is conducted by cognitive scientists and neurologists who study human functions and by computer scientists who focus on artificial intelligence and machine learning. In both cases researchers attempt

to break down the core aspects of visual stimuli in order to better understand the process of perception. These base units of stimuli result in neurological response in humans and trigger algorithms within computer systems. The field of visual perception is expansive and rapidly growing. While the questions driving these investigations focus primarily on the physiological and cognitive mechanisms of visual perception, it is interesting to take note of a few examples in order to get a sense of the ways that the conversion of visual stimuli to visual information is operationalized in these studies. For example, Roy (2005) developed a schema for use in artificial intelligence applications that grounded language interpretation using features of the physical environment automatically detected by a sensing robot. Holšánová's work on discourse, cognition and vision (2008) is among the cognitive, perception-based research most closely aligned in spirit with the view of visualization advocated through this dissertation. This research explores the relationship between language, vision and cognition in spoken discourse, using eye movement and other measures of cognitive activity to identifying specific loci of attention.

In his work related to the mechanics of human image perception, cognitive scientist Donald Hoffman provides a stochastically-based description of the process humans use to interpret visual parts (Hoffman, 1998; Hoffman & Singh, 1997). According to this research, when we disambiguate visual stimuli, we perform unconscious statistical analyses of the likelihood of certain scenarios based on previous experience. This work builds on earlier research performed by Hoffman and colleagues looking at the cognitive processes humans use to recognize shapes in order to better understand how it might be possible to emulate this with computers (Hoffman & Richards, 1984).

There are other studies that look at visual perception in terms of cognitive load and mental processing (Paas, Renkl, & Sweller, 2004; Sweller, 1988). Sweller identified a distinct relationship between access to domain-specific schemas (i.e., mental images) and real-time problem solving. The acquisition of new mental schemas at the same time as problem-solving activity is taking place was seen to significantly increase cognitive load because the two tasks do not use overlapping resources. For example, learning how an engine works (i.e., developing a mental model) at the same time that you are trying to fix one is challenging because the two tasks require different cognitive resources. Though focused on mental representation rather than visible images, this work is of potential interest here because an investigation of image-enabled discourse may result in support for the notion that drawing is a way to aid the sharing of schema during the course of coordinated problem solving, allowing for a more efficient switch between schema acquisition and other cognitive work.

In related research, the drawings of children have been used as indicators of cognitive development (e.g., Jolley, 2010; Milbraith & Trautner, 2008; van Sommers, 1984) and as diagnostic tools when evaluating possible neuropsychological problems such as autism (Freedman, 1994; Oster & Gould, 1987; Selfe & Clowes, 1977). For example, a small girl named Nadia (Selfe, 1985) drew extremely advanced images of a horse at a very young age, including occlusion and foreshortening, much earlier than a child generally acquires such skills. Initially seen as a savant, the child was diagnosed with a dissociative mental disorder that caused her to remain abnormally detached from her surroundings. Through the use of drawing and other non-standard tests, it was determined that Nadia “was attending to the visual/perceptual characteristics of objects but not

to the objects as representatives of classes, i.e., their functional properties” (p. 141). Hence, she was able to draw, literally, exactly what she saw, without other world knowledge or emotional attachments interfering.

2.5 Visual literacy and the use of images in education

Education researchers have applied cognitive psychological models to study the effectiveness of mental models and visual representations within learning environments. Much of the research related to use of images in the classroom focuses on learning styles and level of expertise, refraining from delving more deeply into the nature of the images themselves, or the role visual information plays in individual exchanges of meaning at a more basic behavioral or social level. In 2003, a collaborative report was published evaluating the educational impact of visualization (Naps et al., 2003). The researchers who compiled the report found that two aspects of the use of visualization in the classroom were important: 1) the enhancement of learning with visualizations, and 2) the ways in which instructors deploy those visualizations in their lessons. They found that while the use of visualizations in learning could be extremely effective, integration of visualizations into classroom instruction falls short of its potential because educators did not always use them effectively.

Other studies support this finding. Analogical models used in science education often take the form of visual representation. Harrison and Treagust (2000) conducted a study to evaluate the accuracy of student interpretations of these visual representations, highlighting the importance of multiple types of visual literacy in the learning process. They found that students exposed to a limited number of visual representations of abstract concepts tended to mistake

the representation for physical reality, and were unable to adequately extend the visual analogy provided by the image, instead falling back on a literal interpretation. For example, the structure of an atom can be depicted in a number of ways, but most will not accurately represent the differences in scale and distance between the nucleus and electrons, as this would require extraordinary displays. When students are shown a single version of a visual representation of the atom, they are less likely to gain an accurate understanding of the structure. When exposed to multiple representations, however, each depicting a subset of attributes more or less accurately, the students gain the ability to synthesize the visualizations into a more accurate understanding. Therefore, students who were shown multiple visual representations of abstract or complex concepts tended to have a better grasp of the relationship between the models and the natural world.

Prior knowledge and cognitive load were the focus of Cook's (2006) study of visual representations in science education. According to Cook, while visual representations are essential in the science classroom, they are not always presented in a way that helps students to learn, and so her work involves presenting instructional design guidelines for optimizing the use of visual representations in this context. Gustafson, MacDonald and Gentilini (2007) studied drawing and talking practices among third grade students who were working with university industrial design students to design a piece of furniture. This research generated insight into how drawing and talking protocols might be used to teach design technology in elementary classrooms.

Henderson's study of engineering sketches and drawings as boundary objects highlights the role that visual literacy plays in the social practices

embedded in the design process (1991). Although not set in the classroom, Henderson's work revealed the ways in which the drawn object is implicated in collaborative processes of conscription and group participation. Similarly, Roth and McGinn (1998) looked at the rhetorical role that inscriptions (i.e., graphical representations as opposed to mental images) play in social practices in an effort to build an expanded theoretical framework for representation practices in classroom learning environments. The focus of this work was on the public or shared aspect of inscriptions, enabling the drawn object to serve as a boundary object in classroom interactions.

The visual literacy work of Edward Tufte (1983, 1990, 1997) is very well known for its clear and concise descriptions of the mechanics of visual representation. He provides best practice standards for the creation of effective information graphics, with a focus on heuristics of visual logic and aesthetics. He does not delve into the behavioral aspects of the creation and use of visual information, but does seek to elucidate the various processes at work when we examine and interpret visual information such as graphs, maps and three-dimensional models.

Along the same lines, Miniard, et al., (1991) approached this topic from the field of media studies and advertising, investigating the persuasive effects of different types of pictures including affect-laden imagery versus product-relevant information (i.e. a field of flowers versus a photograph of a bottle of air freshener). The findings of this study showed that persuasion is a complex event which is more dependent on the perceived involvement of the viewer than the content of the image. Van Gelder (2003) builds on a commonly held assumption regarding the ease of use of visual information when he discusses the potential

for argument mapping to enhance deliberation and persuasion. In doing so, he claims that computer-supported visualization tools can improve general reasoning skills. Harris (2006) conducted a study in which information literacy standards of evaluation were applied to image-based content, resulting in a set of three heuristics for what the researcher called “visual information literacy.”

Other studies have also sought to better understand image-based knowledge acquisition within specific domains. Not always identified as visual literacy research, these studies nevertheless reveal the ways in which images are deployed to accomplish specific tasks. Weedman’s (2002) study of one social scientist’s use of images in her research practices resulted in the identification of three functions fulfilled by images: 1) as a tool for thinking, 2) carrier of information, and 3) memory system. McCay-Peet and Toms (2009) conducted a similar, though larger, investigation in which the use of visual information by 30 journalists and historians was examined. Using a work task model, they interviewed participants about their use of images for information and/or for illustration. They found that the stage of the work task greatly influenced whether the image was used as an information source or as an illustration.

The specific use of images in scientific practice has also been studied. The subjects of ethnographic studies such as these are often groups of scientists working on specific types of problems and the generalizability of findings is, as a rule, less important to researchers than shedding light on a particular scientific process or professional social dynamic. In this way, the images themselves appear to be of secondary interest to those studying scientific work. For example, Suchman’s research (1988, 1995) looking at representing practice in scientific work included analysis of whiteboard activities related to collaborative

engagement. Knorr-Cetina & Amann (1988; 1990) investigated the image as evidence and nexus of work practices in a natural science laboratory. Ochs, Gonzalez and Jacoby (1996) examined interactions between scientists, focusing on grammar, graphic representation and gesture to reveal the ways in which references to the self (subjective) and the other (objective) across these modes are involved in efforts to achieve consensus.

2.6 Visually enabled information and communication technologies

With the rapid development of interactive tools and technology, the ability to create images and share them with others has increased exponentially, radically expanding what Elkins refers to as the domain of images (1999). The result is an image-centered phenomenon that deeply integrates visibility, technology and information. Many of the visual artifacts created by these increasingly sophisticated ICT are primarily intended to convey specific information, such as data visualizations, information graphics, and documentary photos and video. While scholars in the humanities have developed socially and culturally driven interpretative frameworks for the analysis of visual artifacts, the study of images within information science, systems engineering and computer science fields are typically more applied.

Recent research has focused on: the representation, indexing and query matching of visual artifacts in retrieval research (as with image retrieval); and system design, building, and evaluation in information visualization, human computer interaction (HCI) research and computer supported collaborative work (CSCW). In general, these approaches to the study of visual information have not taken a discourse-oriented approach. Discussions do, however, circle around a

need to devote more attention to contextual or interactive aspects of visual information use, as will be shown through the following examples. The overview here will highlight studies that show openness to alternate, more contextually aware perspectives on the informative nature of images.

Studies focused on the informative aspects of images are often limited by two issues: 1) prioritization of building systems over constructing more comprehensive conceptual models of practices associated with visualization, and 2) primary focus on the image artifact to the exclusion of learning more about the behaviors surrounding the creation and use of those artifacts within communication. While information science provides some frameworks for the study of visual information, this work has yet to congeal into a unified set of methods or theories for investigating the process of visualization, including creating, accessing and using images within communicative interactions.

2.6.1 System-based approaches

System-based studies address issues related to visual information, with research focused on the design, development, evaluation and improvement of automated tools for creating, storing and accessing visual information. The goals of these studies range from finding new methods of information representation through modeling and algorithms, to evaluating existing systems, developing new systems and conducting user testing in order to improve current methods or tools. Work in this area is primarily undertaken by computer scientists, engineers, and cognitive scientists interested in artificial intelligence. Two broad categories of systems-based research related to visual information are discussed below: information visualization and image retrieval.

Information visualization researchers build systems for creating visual representations of information that ease the interpretation of complex and large data sets. This work is closely related to visual analytics and other types of large scale data processing techniques. Because of a distinct focus on technical development, comparatively few information visualization studies have concentrated on the ways people create and use technology-enabled visualizations within specific contexts in order to achieve communication goals. A few exceptions are noted here.

In their recent article about scientific data visualization, Fox and Hendler point out that “new technologies for data generation are decreasing in price at an incredible rate (in terms of cost per data generated), whereas visualization costs are falling much more slowly” (2011, p. 705). The result is that the visualization “becomes an end product of scientific analysis, rather than an exploration tool allowing scientists to form better hypotheses in the continually more data-intensive scientific process” (p. 705). As Fox and Hendler report, the “creation of visualizations for complex data remains more of an art form than easily conducted practice” (p. 705), referring to the precious quality that can be associated with these visual products. The importance of recognizing visualization as a process rather than merely an end product was raised during a recent panel discussion at the 2011 IEEE VisWeek Conference in Providence, Rhode Island. Organized by Robert M. Kirby and Claudio T. Silva, the session was entitled *Verification in Visualization: Building a Common Culture*. Panelists expressed concern for the integrity of data analytics presented in visual form, citing examples where an attractive image masked faulty logic or algorithms. Kirby and Silva claim that “comparatively little time is spent on verifying and

validating the correctness of our efforts when we think we've reached our goal(s)" (2011, p. 1) and propose that more focused attention on how these visualizations are used could help to remedy the situation. User studies do exist in the realm of information visualization, as will be shown next, however it is clear from this recent public forum including experts in the field that the efforts made to date are not enough.

Preliminary efforts to evaluate the effectiveness of information visualization techniques focused on comparisons of readability between types of graphical representations (Dickson, DeSanctis, & McBride, 1986). An exception is found in an early attempt at constructing a taxonomy of visual representation (Lohse, Biolsi, Walker, & Rueter, 1994). In an effort to learn more about the types of visualizations that appear in the world and how we group them, the researchers conducted an empirical study of 60 different images, resulting in the identification of eleven categories of visual representations. As noted above, such schemes are often highly prescriptive, matching a specific set of images, and this example is no different. The scheme falls short of helping us "understand how different types of visualizations communicate knowledge" (Lohse, et al., 1994, p. 48) as claimed by the authors, but it is an important example of an attempt to empirically study the role visual information plays in communication.

Chen and Yu (2000) performed a meta-analysis of empirical information visualization research, focusing on three aspects of the studies: users, tasks and tools. They found that, at the time of the study, the field was still quite heterogeneous and comparisons across studies were difficult. They were able to identify, however, a need for better integration of cognitive testing with the evaluation of the effectiveness of visualizations features. They also found that

“The development of task-feature taxonomies relies on a better understanding of how users make use of given visualization features” (2000, p. 864). Similarly, Hundhausen, Douglas and Stasko (2002) conducted a meta-analysis across 24 experimental studies of algorithm visualization effectiveness in relation to four learning theories, supporting the idea that cognition and learning need to be addressed hand-in-hand with image-specific factors in order to accurately measure the effectiveness of information visualization systems.

North and Shneiderman’s (2000) interface for coordinated visualizations allows users to “snap” together multiple coordinated tools to represent a given set of data using a variety of forms and formats. Their system acknowledges that the effectiveness of an information visualization is often dependent on having the ability to compare and contrast across a range of representations. A system for creating visualization of spreadsheets was developed with a similar concern for user needs associated with representations of large data sets (Jankun-Kelly & Ma, 2001). The goal of the researchers was to enable faster examination and evaluation of large data sets by users, as well as by reviewers and collaborators who may need to understand and extend the concepts represented by the visualization. D. M. Russell’s discussion of information needs in relation to information visualization systems stands out as another example of a more user-centered approach to the study of information visualization (Russell, 2003). While the focus of this work is still on the creation of a visualization system, the research grounds a discussion of design decisions in an understanding of human sense-making activities. These cases are examples of user needs motivating the system building, however, neither focus on behaviors as the primary phenomenon of interest for the research.

Ellis and Dix (2006) conducted an analysis of user studies of visualization systems in order to better understand why user-based evaluations of these systems were “so difficult.” Recognizing the persistent limitations of user studies in this area, they recommended a more explorative approach to evaluating these systems. Shneiderman and Plaisant’s (2006) in-depth, long-term cases studies could be seen as an example of this type of approach. Heer, Viegas and Wattenberg (2009) developed a tool for asynchronous collaborative information visualization, envisioning visualizations not just as analytic tools, but as social spaces. Their user study of the system, therefore, included social data analysis. Huang, Eades and Hong (2008) have also attempted to apply more robust user studies to reconsider traditional approaches to evaluation of information visualization systems that were previously predominantly based on time error. In fact, the BELIV workshops (BEyond time error: novel evaLuation methods for Information Visualization) held since 2006 in conjunction with the annual ACM International Conference on Human Factors in Computing are expected to be a source for more work in this area in coming years.

There are additional approaches to evaluating human interaction with visualization systems. Purchase, Cohen and James (1997) performed an experimental study using human participants in order to validate the design of graph drawing algorithms that had been created in order to produce “aesthetically pleasing” information graphics. Dastani (2002) developed a perceptually motivated formal framework for the evaluation of data visualization systems. The argument for this framework, based on how people physically see visualizations, is that while there are subjective and cultural aspects of interpretation involved in evaluating the effectiveness of a visual

representation, they are highly dependent on the initial perception of visual elements. Without perceiving the image, no other interpretation can occur, and additional interpretation is actually secondary to the primary event of perception.

Also working in this area, Ghoniem Fekete and Castagliola (2005) have compared the readability of node-based versus matrix-based graphs constructed with increasing complexity, resulting in a set of heuristic guidelines for maximum readability. Using similar methods of quantifying the process of evaluating the interplay between visual elements, researchers have attempted to automate the process of generating visual displays of information based on predetermined presentation goals (Zhou & Feiner, 1998). This work overlaps with other perception-based approaches to visual information such as computer vision (see 2.4 *Visual perception*). The technical aspects of information representation are also discussed in the field of cartography and geographic information systems (GIS). Notable is MacEachren's work relating his own user-based research on cartographic representation (MacEachren & Kraak, 1997) to Jacques Bertin's cognitive-semiotic approach to graphic theory (MacEachren, 2001).

While research in the area of evaluation of information visualization systems shows a decided shift in the direction of more contextually aware approaches to the study of information visualization techniques, the field is likely to remain focused on system building and automation, leaving for others the more concentrated study of human communication and behaviors related to visual information.

Similar, though perhaps not to the same extent, is the field of image

retrieval. As mentioned earlier in this chapter, there are two basic approaches to developing image retrieval systems: text-based retrieval in which images are tagged with descriptive labels that are in turn used for document modeling, and content-based retrieval which relies on the automated detection of visual features which are then compared and contrasted in order to classify images. The facial-recognition work of Hayes and Milne (2011) is an interesting recent application of content-based techniques. A series of portraits drawn from photographs were analyzed using quantitative methods in order to compare the source image and drafted representations. The researchers were interested not only in differences between the two types of representations, but in the possibility of automatically detecting the identity of the artists who created the portraits. In both types of retrieval studies (text-based and content-based), accessing an image artifact remains the central point of interest, rather than a broader, more contextual understanding of the range of behaviors associated with the creation or use of visual information (Wilson, 2000), and this research primarily focuses on evaluation of the effectiveness of the system in terms of traditional criteria such as precision and recall.

Notable exceptions can be seen in two specialized aspects of image retrieval research: user-based perspectives on developing image retrieval systems, and techniques and applications for multimodal information extraction. In some ways both of these areas demarcate current boundaries of this field of study, and also open possibilities for integrating a discourse-oriented perspective on the use of visual information into document models and evaluation protocols in the future.

Jorgensen's investigation of user-provided image attributes suggests that

people associate pictorial content with a wide range of concepts, not just those visually represented in a given image (Jorgensen, 1998). Her conclusion was that if access to image-based content was to improve, all facets of interest must be incorporated into retrieval systems. Similarly, Greisdorf and O'Connor recognized that in grouping images based on descriptive criteria there is often a "constant overlap as well as a lack of consistent membership among and between images" which is a challenge to retrieval system development (2002b, p. 383). Their research revealed that "what viewers see depends as much on who they are as it does on what they see" (p. 383) and investigated a range of user determined organization schemes to make the case for allowing users of retrieval systems to define how images contained in a database would be tagged. In another study they found that people tended to provide descriptions of objects and content-based elements that were not actually present in the image (Greisdorf & O'Connor, 2002a).

Content-based retrieval systems use differences in visual features such as color, shape and shading in order to identify subject matter in images. Many researchers have adopted the perspective that content-based systems are superior to other approaches inherited from text retrieval. They recognize that automated interpretation of visual features, however, must be supplemented with knowledge-assisted retrieval (Yoshitaka, 1999) and/or high-level templates to address the so-called "semantic gap" between low-level feature extraction and human semantic associations (Liu, Zhang, Lu, & Ma, 2007; Smeulders, Worring, Santini, Gupta, & Jain, 2000). Maillot, Thonnat and Boucher (2003) propose an ontology-based knowledge acquisition system in order to address this gap by providing access to information regarding the domain of use. Other researchers,

such as Vogel and Schiele (2007), have investigated the possibility of using semantic information when building a representation of an image for use in retrieval systems. By assigning local image regions to semantic classes, a more robust representation of content is constructed. Like the classification schemes described earlier, Vogel and Schiele's representations are dependent on a defined domain of image types (nature scenes, in this case). In an effort to free image retrieval systems from such domain-specific applications, others are taking a more brute force approach, relying instead on various statistically-driven analyses of digitized image content. Within this area, many content-based image retrieval systems rely on similarity scores derived from automated feature recognition, while Cord, Gosselin and Philipp-Foliguet (2007) argue for a two-step stochastic approach involving exploration and classification, defining categories based on a diverse set of examples. Overall, aside from the statistical approaches, most techniques for addressing the semantic gap involve inserting human contextual insight at some point in the access and retrieval process (Liu, et al., 2007).

Traditional user studies have been highlighted as a subset of image retrieval research (Goodrum, 2000). The output of these studies is somewhat prescriptive in terms of understanding a broader range of information behaviors associated with the use of images because they are often designed to evaluate human performance on pre-defined search tasks in relation to specific interface features or system functionality. An example of this is a study of the National Library of Medicine's Visible Human digital image library that focused on a visually enhanced search interface (North, Shneiderman, & Plaisant, 1996). Not only were users accessing a digital image repository, but also the interface they used to

navigate the database was designed to employ novel visually based functionality to search for information.

User-based perspectives on image retrieval like the studies mentioned here acknowledge the influence of context on the role of images as information sources. Similarly, research that is focused on the extraction and representation of multimodal information recognizes the interdependency between co-occurring modes of communication, such as information graphics included as part of a news story. This research is primarily focused on extracting information from multimodal artifacts such as newspapers, magazines and video. It involves not only automating the process of identifying salient and unique information conveyed by text, images, and gesture (in the case of video) but also systematically representing the relationships between these types of information for later access (Wu, Chang, Chang, & Smith, 2004). The modeling of these relationships is called multimodal fusion.

Multimodal fusion research generally seeks to integrate system-building approaches that have been developed for content-based image retrieval with advanced text recognitions systems such as natural language processing (NLP). The goal of these systems is to produce a rich representation of the information contained in a document, regardless of the modalities in which the information appears. Carberry and colleagues have recognized that even when graphic accompaniments to text are intended to provide support or illustrate concepts being discussed, as in the case of many information graphics, there is often more and different information in the images. They have argued for the importance of taking information graphics into account when summarizing a multimodal document for later indexing and retrieval (Carberry, Elzer, & Demir, 2006) and

have developed a system for automatically recognizing the high level message conveyed by an information graphic, which can be used as a summary of that image within multimodal document models (Burns, Carberry, & Elzer, 2008). Tracking recent advances in applying multimodal extraction techniques to video analysis, Gatica-Perez (2009) provides a comprehensive review of literature focused on the automatic analysis of small group conversations using nonverbal communication. For example, focusing on a business application for multimodal information extraction, Niekrasz and Purver (2005) developed an ontology-based model for automated meeting understanding. Their model encompasses “components of natural language, multimodal communication, multi-party dialogue structure, meeting structure, and the physical and temporal aspects of human communication” and is intended to be applied to video and audio recordings of business meetings.

2.6.2 *Task-based approaches*

The studies just described typically result in the design and implementation of a novel system as a primary output of the research. Visual information research that takes a task-based approach is often similar to systems-based research but takes a more intentional accounting of the human work that is motivating the use of the system. This type of visually oriented research generally focuses on the support and evaluation of specific tasks through the use of computer tools, usually involving a graphic interface of some sort, and frequently involving collaborative and/or virtual interactions. This research often involves the design, construction or improvement of a system, but analysis of user tasks and coordination activities is arguably the primary motivation of the study (Carroll,

Rosson, Convertino, & Ganoë, 2006). Most often falling under human computer interaction (HCI) and computer-supported collaborative work (CSCW) research, these studies often include the design and development of multimodal interfaces (Oviatt & Cohen, 2000).

The strongest unifier across task-based visualization studies in these fields is a concern for how computer tools can help people work more effectively and efficiently. Therefore, there is a decided focus on measuring task performance in relation to human-facing system elements (such as interface or interaction design). Many of the situations designed for these studies involve problem-solving interactions between participants. While this type of situation is compatible with a discourse-oriented perspective, few studies dwell on the specific communicative aspects of exchanges, instead focusing on how interactions contribute to or detract from the completion of a task. Generally, optimal (or simply effective) completion of work, especially collaborative or coordinated tasks, is the primary guiding objective of these investigations. Analysis of the role of visual information is contextualized, but is necessarily limited to those aspects of interactions deemed most salient to task completion.

In task-based user studies, visual information can include elements of a graphical user interface, video data or stimuli, physical gestures. Some studies focus on one or two specific elements of a visualization or interface in order to test the effectiveness of different types of representations. For example, a recent information visualization study (Hullman, Adar, & Shah, 2011) examined the surprisingly positive effects of purposely making an information graphic challenging to interpret. Researchers discovered that a limited and controlled increase in cognitive effort provoked by so-called “bad” design choices can

increase viewer involvement with an image, and therefore improve understanding and retention of information delivered in a visual format.

Investigating gesture as a means of interaction, Wahlster (1991) conducted experimental studies looking at the similarities and differences between natural pointing in face-to-face communication and simulated pointing using a system designed by the researcher with the goal of developing ways to use focusing techniques to improve interface design. Quek et al. (2002) conducted an HCI study that focused on the co-occurrence of gesture and speech to isolate cross-modal expressions of semantic intent. Their detailed case study of a 32-second video depicting a woman describing her living space involved two analytic passes through the video, one based on direct analysis of video/audio through automatic detection and recognition of gestures and verbal expression, and the other based on expert psycholinguistic transcription. Together these microanalyses were used to create a framework for designing a system that would be capable of processing multimodal input for the automatic extraction of discourse cues.

In order to build a more responsive user interface, Busso et al. (2004) developed a multimodal model for emotion recognition based on facial expressions and acoustic information. In another case, Morency, Christoudias and Darrell (2006) focused on eye gestures during interactions with an animated embodied agent (robot or avatar), in order to teach a machine how to interpret lulls or silences in conversation. This activity-focused work helps inform system-builders of the ways in which such embodied agents can make use of non-verbal signals like eye movement to communicate. For example, Morency et al. determined that humans tend to avert their eyes during times of increased

cognitive load, providing a means for an agent or robot to recognize that a silent human could be thinking if he or she is also looking away.

In addition to focusing on specific visual features of collaborative interfaces (i.e., graphic elements, gestures, etc.) CSCW and HCI research has also focused on cognitive aspects of representation in relation to collaborative interactions. A decade ago, researchers Petre and Blackwell (1999) investigated the role that mental imagery plays in enhancing the software design process. They investigated the individual, internal process of mental visualization, seeking to find evidence that computer programming has a closer relationship with visual language than verbal language. In terms of interface design, Smith and Fiore's (2001) investigation of visual elements used in threaded discussions found that such components could reinforce socially beneficial behavior in groups, indicating that the influence of imagery has the potential to extend into larger social domains than the immediate boundaries of the interface. Eppler has done extensive work researching the use of software-based collaborative visual communication tools for knowledge transfer (Eppler, 2004; Eppler & Burkhard, 2005). While closely related to information visualization on one hand and exchange of information through image-enabled discourse on the other, knowledge visualization focuses primarily on techniques for making individual knowledge accessible to another person or to an organization in collaborative business situations.

For decades, the whiteboard has served as a site for research concerned with the role of graphical representation in collaboration. Several of these studies are highlighted here. In one of the earliest and arguably best known investigations of whiteboard activities, Suchman (1988, 1995) references the

whiteboard extensively in her work looking at the visibility of work practice and the scientific inquiry. More recently, Østerlund (2008) looked at whiteboards as a type of information system in his study examining the documentation practices deployed by doctors to manage patient information.

In the early 1990s, a collaborative drawing interface called *VideoDraw* was created by Tang and Minneman (1991). This tool enabled users to share a “virtual sketchbook” and was based on observations of the ways in which individuals used graphic representations as collaborative tools in face-to-face exchanges. Ishii and Kobayashi’s work on the ClearBoard system (1993) is also an example of relatively early HCI research that builds on a recognition of the importance of whiteboards for effective communication in collaborative situations. Ishii and Kobayashi used cameras, video screens and electronic drawing tools to recreate the experience of face-to-face conversations in front of a whiteboard or chalkboard in order to digitally replicate the types of practices they associated with these analog tools. In order to design an application to support idea finding, Prante, Magerkurth and Streitz (2002) asked participants to work on creative problems using mapping and whiteboard tools. The results of their observations were turned into a list of requirements for a suite of collaborative work applications. Ju, Lee and Klemmer (2007) designed an interactive whiteboard to support distributed ad hoc meetings. Their system included using position sensors to provide information about user proximity in order to identify speakers/ authors, to automatically make room on the writing surface and to enable clustering or grouping of ink strokes. Tang, Lanir, Greenberg and Fels (2009) studied the ways in which users employ whiteboards to transition between related sets of tasks in order to design better large display applications.

Therefore, their analysis focused on interactive primitives and those affordances of the whiteboard that enabled users to successfully transition between tasks.

In a study designed to inform the design of information visualization systems, Walny et al. (2011) catalogued a series of drawings collected from white boards in a research institution in an effort to isolate both regularized and novel visual elements of “natural” visualizations. Interestingly, one of their conclusions was that greater understanding of patterns of visualization evident in these drawings is dependent on gaining more contextual information about the situations under which they are created. For the majority of whiteboard studies (with the exclusion of ethnographic approaches such as Suchman and Østerlund), focus is on task completion and requirements gathering aimed at system design and implementation. This obscures the discursive function of the activity of drawing in favor of seeing the drawn image as a discrete and independent object.

Research related to the design and development of visually enabled collaborative interfaces, such as the creation of multimodal tabletop displays designed to accommodate multiple users, often focuses on the use of shared visual space during small group interactions. Bly (1988) studied two-person design sessions in order to learn more about the ways that shared visual work space is used in collaborative interactions. This research compared face-to-face interactions with conversations between collocated individuals mediated by audio/video channels and telephone-only. Findings showed that similar drawing activities occurred in each communication environment, raising the question of whether the activity of drawing may be just as important to the design process as the drawing itself. While this work focused on documenting

and mapping the design process, it supports the notion that the action of drawing plays a distinct role in collaborative practices.

Researchers at Carnegie Mellon's Human Computer Interaction Institute have conducted a number of studies focused on the influence of shared visual space on collaborative task completion. In a study comparing collocated dyads with other dyads communicating via audio/video channels, researchers found that while collocated teams performed better than those that communicated via audio channel, similar efficiencies were not achieved by adding video to the audio (Fussell, Kraut, & Siegel, 2000). These findings indicate that there are potentially other communicative activities occurring in the face-to-face interactions that are not adequately translated in the video/audio feeds. Another study (Kraut, Gergle, & Fussell, 2002) explicitly identified the positive relationship between a shared visual space and collaborative task completion. Further experimental studies contributed to greater understanding of the role of visual information in maintaining task awareness and in achieving mutual understanding in collaborative work (Kraut, Fussell, & Siegel, 2003). A later study (Gergle, Kraut, & Fussell, 2004) empirically showed how action is used in lieu of explicit verbal communication within these shared visual workspaces.

"Finger talk" is the name given by researchers for the practice of using a series of fingertip interactions through a touchscreen interface in the process of collaborative decision-making (Rogers, Hazlewood, Blevis, & Lim, 2004). A tabletop was designed to accommodate this practice, informed by observations made regarding the ways in which a touch screen was able to mediate interactions in small groups. While much of the work devoted to multimodal interfaces assumes that input methods such as gesture and touch are superior,

recently Hornecker et al (Hornecker, Marshall, Dalton, & Rogers, 2008) conducted a study to determine if this was actually the case. Their study compared multi-mice input with multi-touch interfaces and found that while the touch interfaces enabled a higher level of awareness, more importantly these types of interfaces also allowed users to negotiate interference more quickly. Evaluation studies like this are important for ensuring that translation of unmediated communication modes (like gesture and touch) to digital environments (such as the multi-touch screen) retain the most important affordances of the original form of expression.

2.7 Summary

In order to gain increased insight into the range of behaviors associated with the creation of visual information and to address the research questions posed, it is necessary to 1) not treat visual information as textual information by default, but find ways to investigate the truly visual nature of this form of communication; and 2) look at the more observable aspects of behaviors and communicative practices associated with visual information, such as creation, rather than solely focusing on interpretation of the artifact. An investigation of image-enabled discourse will shed light on situations where exchange of information is enhanced or enabled by the selection of visual modes of communication during a conversation. Discourse, in this sense, refers primarily to dialogic communication. Image-enabled discourse encompasses both the creation and use of images in dialogue. Studying the creation of visual information within the context of image-enabled discourse is one way to extend our understanding of the role images play in communication and information behaviors.

Building a more comprehensive understanding of the role visualization plays in communication means not just looking at the image artifact in a monologic sense. Visualization needs to be viewed in the context of conversation, as an utterance (or embodiment) within an interactive episode. This perspective requires the study of image-enabled communication as an interactive *practice* involving two or more people (which requires contextual data in order to identify the overarching strategy), *in addition to* the study of tokens or products (individual image artifacts). Understanding image-enabled discourse requires study of the motivation for deployment of images in dialogic communicative strategies, as well as how the reception of these images affects the communicative outcome. In this sense, image-enabled discourse is a complement to the study of image-artifacts, and contributes to a more complete understanding of the phenomenon of interest: the exchange of meaning through the process of creating and using visual images. This process-oriented approach is missing from current theoretical and practical research, and explains at least some of the shortcomings of information visualization tools, image retrieval systems, and computer-supported collaborative work applications.

By invoking a discourse-oriented perspective for the study of image-enabled communication, a correspondence is drawn between linguistic theories and visual communication practices. The basis for this comparison is built on the co-occurrence of linguistic and paralinguistic modes of communication (such as gesture, body language and visualizations) during conversation. Because multiple modes of expression are used in concert, it stands to reason that at least some part of the principles explaining one (such as spoken language) may be applicable to another (such as gesture or mark making). Evolving approaches to

the investigation of language as an interactive and socially constructed phenomenon can be extended to support the notion that drawing is a functional meaning-making activity serving a specific role within multimodal communication. This is the realm of image-enabled discourse.

Linguistics and sociolinguistics provide substantial frameworks for explaining and discussing multiple aspects of communication. More specifically, discourse analysis can provide relevant and relatively well-developed theories regarding the motivations, practice and implication of strategic language use in social contexts. Also relevant is recent research that focuses on interactions between different modes of communication, examining how non-linguistic communicative practices influence interpretation and structure of meaning. In addition to analyzing the text-based (spoken or written) content of an exchange, multimodal discourse researchers also look at paralinguistic communication (such as gestures) from a communicative perspective. A wide range of perspectives about the nature of conversation can be found in the discourse literature, and the contrast between more rule-based and more socially-oriented perspectives leads to questions of which, if any, of the rules and frameworks used to describe linguistic phenomena can be applied to image-enabled discourse. This question will be explored in the Chapter 3.

Chapter 3 Theoretical framework

A graduate student is having a conversation with his advisor. The topic of this conversation is the design of the student's research study. Based on previous conversations, they share a similar level of familiarity with the topic, but the student has yet to commit to a specific method or plan for conducting the study. He begins the conversation by showing his advisor a drawing he made to represent what has been agreed on so far. The image shows a timeline with key steps in the research process highlighted. As the student receives feedback, he makes alterations to the original image, attempting to reflect back what he has heard. In this way, he is able to record his advisor's suggestions, while also understanding how suggested changes could affect the project in the big picture. Recalling the conversation at a later time, the student explained that drawing "just makes it easier for me to record the sequence [and relation] of the concepts...more clearly than writing words. For me, the drawing is about giving an overall picture... it's not about giving you details" (KI)¹.

Contrast this with a conversation between a husband and wife about the placement of holiday decorations on the front of their house. She attempts to explain where she wants the strings of lights hung. After attempting to explain verbally, and then with gestures, she is still not convinced that her husband understands what she wants or the importance to her of installing the lights in

¹ Participant quotes catalogued using combinations of numeric and letter codes.

the precise way that she has described. By creating a drawing, she feels that she is better able to convey the importance of the problem and to create a lasting point of reference. In her words, “I think it helped him because it made him realize how specific I wanted things to be” (KP). In the first example, the use of images during the conversation is motivated by a need to represent broad, overarching concepts. In the second example, it is motivated by a desire to represent highly specific, unambiguous information.

These examples of image-enabled discourse were collected during a theory-building exercise conducted during the initial stages of this research. They illustrate the importance of taking a contextual approach to the study of image creation. In both of the short vignettes, the differences expressed by the image creators relate more to the *role* the image played in the conversation than anything related to the visual *content* of the images. This is an important point of differentiation that would likely be lost in most of the research approaches described in the previous chapter, where the image artifact was shown to be the focal point for many visualization studies.

Producing a model of image-enabled discourse that complements artifact-centered approaches to the study of visual information is the main theoretical contribution of this study. In this chapter, empirical data and discourse theory are brought together to build a conceptual foundation for this representation of image-enabled discourse. First, an argument is made for extending the linguistics-based notion of discourse into the realm of visual communications referencing Kress and van Leeuwen’s writings on social semiotics and modalities of communication (1996, 2001) and Norris’ work related to multimodal interaction (Norris, 2004, 2011; Norris & Jones, 2005).

Following this general discussion, a preliminary empirical study is described. This theory-building exercise centered on eliciting narratives of conversations involving the creation of ad hoc visualizations and was conducted separately from the main study that is the primary focus of this dissertation. The preliminary study verified that patterns of image-making practices can be observed and classified in a systematic, discourse-oriented manner.

Next, key concepts from discourse studies are used to elucidate these preliminary findings by theoretically grounding the act of mark making within the broader notions of what Gumperz (1982) describes as discourse strategies and conversational involvement. A model of image-enabled discourse is introduced that borrows its basic structure from Hank's three-part conceptualization of communicative practice (1996), a unified perspective on language use that integrates dimensions of linguistic form, cultural ideology and social activity. The chapter concludes by defining core concepts related to identifying and describing these discourse structures in conversational data. The notions of common ground (Clark, 1996), framing (Goffman, 1974; Tannen, 1993), footing (Goffman, 1979) and stance (Jaffe, 2009b) are introduced as a means to further define and operationalize the idea of communicative activities.

3.1 Discourse and social interaction

By invoking a discourse-oriented perspective for the study of image-enabled communication, a correspondence is drawn between linguistic theories and visualization practices. Discourse studies (including the analysis of discourse structure and management, conversation analysis and approaches to the analysis of social interaction, such as interactional sociolinguistics) provide relevant and

well-developed theories regarding the motivations, practice and implications of strategic communication in social contexts. In this section, relevant research from discourse studies will be highlighted and an argument will be presented for basing a theory of image-enabled communication on linguistic theories related to social interaction.

The term discourse analysis is used across several fields of study to refer to similar, but not identical, concepts (Johnstone, 2000, p. 103). In practice, the precise meaning of the term discourse is dependent on context of use. It can mean:

- The meaning associated with language use above the sentence level
- A specific perspective or specialized vocabulary, as in the term “medical discourse” used to refer to patterns of communication between doctors
- Interpretivist concepts of power dynamics between social groups, as in “an underlying misogynistic discourse”
- A conversation or dialogue

Likewise, discourse analysis is a general term for the examination of language structure and use. Discourse analysis takes many forms depending on the research questions being addressed (Johnstone, 2000, p. 103). The primary focus of this investigation is on the creation of drawings within the context of face-to-face exchanges, therefore the term discourse is used to refer to conversation or dialogue and analysis will focus on sections or segments of social interactions where drawing occurs.

Given this focus, the approaches to discourse studies most relevant for the study of image-enabled communication are the perspectives commonly adopted

by those working in the area of interactional sociolinguistics. These researchers combine theories of communication and interaction with functional analyses of linguistic exchanges to reveal the relationships between social interactions and language use (Schieffelin & Ochs, 1986; Wardhaugh, 2006). They are concerned with the relationships between social context, constructed meaning and the structure of verbal interactions.

For example, one of the most influential sociolinguists and founder of the interactional sociolinguistic approach, John Gumperz, developed a general theory of discourse strategies to account for the specific types of knowledge, beyond just rules of grammar, that need to be shared to maintain conversational involvement (1982). He wrote, “Mere talk to produce sentences, no matter how well formed or elegant the outcome, does not itself constitute communication” (p. 1). According to Gumperz, we use prior experience about social norms, situational awareness, and contextualization cues in order to make judgments about the meaning intended by our conversational partners. We rely on “indirect inferences which build on background assumptions about context, interactive goals and interpersonal relations to derive frames” (p. 2), or points of reference, in terms of which we can interpret what is going on. Contextualization cues are the surface features of a message (such as pitch and prosody) that can signal how an utterance should be interpreted. These signals are “habitually used and perceived but rarely consciously noted and almost never talked about directly” (p. 131). It is this contextual understanding of what a given interaction is about and what is expected of us that guides our interpretation of communicative exchanges and allows us to stay engaged in conversation, and to discern contextualized meanings from the literal words spoken.

Linguistic and paralinguistic modes of communication (such as gesture, body language and visualizations) co-occur during conversation. Because multiple modes of expression are used in concert, it stands to reason that at least some aspects of the principles explaining one (such as spoken language) may be applicable to another (such as gesture or mark making). Applying a broadly interactional sociolinguistic perspective to the realm of visual communication will be the focus of the remainder of this chapter.

3.2 Modality and communication

Multimodal discourse analysis is the study of the intersection and interdependence of various modalities of communication within a given context. In addition to analyzing the text-based (spoken or written) content of an exchange, multimodal discourse researchers also look at paralinguistic communication (such as gestures and the use of space and material objects) from a communicative perspective. Researchers in this area seek to identify the influence of mode and context on meaning, focusing on co-occurrence and interaction between multiple semiotic systems (Royce & Bowcher, 2007). According to social semiotic theories related to modality, the form or format of an expression can have a specific role in the communicative power of a sign (Kress & van Leeuwen, 1996, 2001). Scholars have also noted the strong connection between technology and multimodal communication, citing the increasingly complex virtual communication environments in which we operate (Levine & Scollon, 2004).

At the heart of virtually all work in the area of multimodal discourse is the principle that all communication is inherently multimodal (Kress & van

Leeuwen, 1996, 2001). Levine and Scollon summarize this point in their introduction to their anthology devoted to multimodal discourse and technology:

...language use, whether this is in the form of spoken language or text, is always and inevitably constructed across multiple modes of communication, including speech and gesture not just in spoken language but through such 'contextual' phenomena as the use of the physical spaces in which we carry out our discursive actions or the design, papers, and typography of the documents within which our texts are presented (2004, p. 2).

Multimodal approaches to the study of discourse view communication as an interactive and socially constructed phenomenon that includes but goes beyond language use. Because of this, they can be extended to support the notion that drawing is a functional meaning-making activity serving a specific role within multimodal communication. This is the realm of image-enabled discourse.

Generally speaking, "mode" refers to the distinct semiotic system deployed for expressing meaning using specific conventions (Bateman, 2008; Kress & van Leeuwen, 2001). Using the vocabulary of social semiotics, Kress and van Leeuwen describe modality cues used in the creation of meaning as "motivated signs" (Kress & van Leeuwen, 1996, p. 154), which emerge in practice as conventions and norms. According to Kress and van Leeuwen "...any semiotic system, even smell, can be conceived of as a loose collection of individual signs, a kind of lexicon, or a stratified system of rules that allow a limited number of elements to generate an infinite number of messages" (in Levine & Scollon, 2004, p. 17). The precise nature of those modal rules or conventions of use can be more or less specific (Kress & van Leeuwen, 2001, p. 3). For example, Djonov and van Leeuwen (2011) recently investigated texture as a semiotic resource in

Microsoft's PowerPoint software settings that enable users to apply texture attributes to the background of slides, such as "parchment," "white marble," "pink tissue paper," etc.

When thinking about these differences, what characteristics of a given expression correspond to it being recognized as an alternate mode of communication? Are film and video different modes of communication or simply different media? Creating an adequate general definition for the term mode (in contrast to media, format, or even language) can be challenging. The previously offered description of mode as a semiotic system is drawn from Kress and van Leeuwen's approach to modality. They base this definition on the linguistic concept of modal verbs ("might," "could," "should," etc.), referring to the ability of these words to establish an existential stance similar to the orientation provided by a specific modality of expression (Levine & Scollon, 2004, p. 2). This can be a relatively opaque gloss of the term for those not deeply entrenched in semiotic or linguistic study.

In fact, in their many discussions of multimodality and social semiotics, Kress and van Leeuwen do not dwell on this point of origin, but instead clarify the concept of modality by comparing and contrasting their definition of a semiotic system to other more commonly used terms for similar phenomena. For example, although *mode* and *media* are often conflated in common speech (i.e., *multimedia* is often used interchangeably with *multimodal*), they are not synonymous. Media (or medium) is the vehicle of expression, including the conventions or affordances of that vehicle, but not necessarily the rules of grammar or syntax associated with communicating the content of an expression (the semiotic system or mode). For example, digital video and film are two very

different media: one is digital while the other is analog. Both digital video and film use the same modes of communication, however: moving images, spoken dialogue, and in some cases music.

3.2.1 *Modal affordances*

In establishing relevant boundaries between modes of communication, Gibson's (1979) much-cited notion of affordances can apply. Every mode has unique affordances that contribute to the ways it can be used to express meaning. Gibson states, "Affordances of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (1979, p. 127, italics in original). Donald Norman (1988) is given much of the credit for disseminating Gibson's term through his foundational work in the area of interface design. Norman further defines affordance as "actionable properties between the world and an actor" (1999, p. 39). He highlights the importance for designers to recognize "perceived affordances," contrasting this concept to mere conventions, warning not to conflate the two (pp. 39-40). Affordances are naturally embedded in a material or environment while conventions are the by-product of conditioning or institutionalized behaviors.

This use of the term affordance can be linked to the notion of modality through the concept of materiality. Norris highlights this in her discussion of multimodal interactional analysis, stating, "Different communicative modes possess different materiality" (2004, p. 3). She describes spoken language as having audible materiality and being neither visible nor enduring, while gesture is visible, but also quite fleeting. Print is visible and enduring, as is layout (such as the placement of furniture in a room or objects on a table top).

Affordances are inherent to the make up of an environment or a material, not something assigned by cultural practice. When applied to this discussion of modality, the term affordance refers to those aspects of a particular semiotic system that enable it to provide the conditions needed to convey specific types of meaning or to employ certain communicative strategies. For example, drawing is by nature persistent, tangible and visible. These are affordances of this mode of communication. It follows that there are expressions that may only be able to be created, perceived and/or interpreted in a drawn format. This idea challenges the adage that “a picture is worth a thousand words.” The existence of visual affordances could mean that, at times, there may be no number of words that can replace a visual representation, because there are expressions (or information) that are inherently visual. Therefore the mode of expression is deeply implicated in the communicative interaction.

3.2.2 *Multimodal social interaction*

Recent research in the field of discourse analysis examines how non-linguistic communicative practices influence interpretation and structure of meaning by focusing on interactions between different modes of communication. For example, Norris has built on Scollon’s (1998, 2001) work related to mediated discourse to apply multimodal analysis to social interactions (Norris, 2004, 2011; Norris & Jones, 2005). Her approach to the study of multimodal interactions is also heavily influenced by Kress and van Leeuwen’s social semiotic framework, sharing roots in the functional linguistic tradition. She focuses on “what individuals express and react to in specific situations, in which the ongoing interaction is always co-constructed” (2004, p. 4). She looks not just at verbal

expressions, but also at other types of expression such as head position, body position and layout of objects or spaces in order to reveal the ways in which this co-construction is built. According to Norris, analyses of interactions are based on the concepts of awareness and attention. She is clear in stating that “Awareness/ attention comes in degrees, and a person may be phenomenally aware of something without paying much attention to it” (p. 9).

Another key concept offered by Norris that can help to identify the distinctive communicative qualities of ad hoc visualizations (and begin to help us understand how this mode interacts with other types of expressions) is the distinction between embodied and disembodied modes of communication. Music, for example, can be embodied or disembodied. If a radio is playing in the background while a couple is sitting at the kitchen table having breakfast, music is seen as a disembodied mode of communication. If one of the participants in the conversation breaks into song, however, music becomes an embodied form of communication, and with that embodiment comes a different level and degree of attention and awareness. From Norris’ perspective, our choice to sing is meaningful, and this choice serves as information for our communication partners.

In his studies looking at the collaborative practices of architects (2005), Murphy examines the integrated nature of communication expressed through talk, gesture and material objects. In doing so, he positions the activity of imagining as a social, rather than or in addition to, a cognitive event. According to Murphy, through the collaborative work we do with language, our bodies, and the space around us, we engage in collective creative acts. This perspective relies on the notion that we use multiple and simultaneous modes of

communication in order to accomplish complex communicative and creative tasks.

Drawing a connection with Gumperz's work on interactional sociolinguistics, modal choices can be seen as a type of contextualization cue. This perspective is very helpful in highlighting the potential for a mode of communication to exhibit different affordances when expressed in an embodied versus disembodied form. For example, pulling up an image of a pair of shoes on a website in order to show a friend what you are thinking about purchasing is inherently different than drawing a sketch of your ideal shoe. Whether this difference is meaningful or not is dependent on the overall conversation. Increased understanding of these differences is one of the primary objectives of this study. Norris provides stable footing for investigating the potential of such choices to influence the exchange of meaning. In this way, her work provides a valuable underpinning for this framework.

3.3 Narrative approach to theory building

In order to hone in on drawing as a communicative mode, a preliminary narrative-based study was conducted with the intention of providing initial empirical support for viewing mark making as a form of multimodal social interaction. This first investigation addressed the following question: Why do people draw during conversations?

A series of 11 face-to-face semi-structured interviews were conducted during which respondents were asked to describe a spontaneous conversation they participated in where a drawing had been created during the course of the interaction. A second confirmatory phase expanded this collection of narratives

by administering a similar protocol via online questionnaire to an additional 39 individuals.

Inductive analysis of data collected during these semi-structured interviews provided initial evidence that image making, as opposed to retrieving a pre-existing image, performs a significant communicative (not just artistic) function in face-to-face conversations. The next section includes a brief summary of these findings and highlights the role these narratives play in theory building. Based on this evidence, a theoretical framework derived from the work of Hanks (1996) is then introduced which explicitly positions drawing as a communicative practice. The chapter concludes with an explanation of key concepts from the framework that were operationalized in the main study.

3.3.1 Elicitation of narratives

Two research techniques commonly used in information science research were selected to guide the design of semi-structured interview questions: critical incident technique (CIT) (Flanagan, 1954) and sense-making methodology (Dervin, 1998, 1999).

Since the 1950's researchers in the social sciences have used CIT to generate rich, contextualized qualitative descriptions of organizational, process-oriented behavior. The basic components of CIT have not changed significantly since introduced by Flanagan in 1954. Incidents are "any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about performing the act" (Flanagan, 1954, p. 327). An incident is critical when "the purpose or intent of the act seems fairly clear to the observer and the consequences are sufficiently definite to leave little doubt concerning its effects"

(p. 327). An incident should be considered significant when the observer is confident that it contributes to a positive or negative outcome in the activity of interest. Frequently, researchers using this technique ask informants to recall specific relevant events that happened in the recent past. The core of the technique, as developed by Flanagan, still applies today:

- Only simple types of judgments are required
- Qualified observers can produce richly detailed descriptions
- Evaluation based on an agreed-upon statement of purpose of the activity can ensure valid and reliable data.

The power of CIT lies in its ability to provide complete coverage of a content domain, providing a detailed and comprehensive description of human activity (Woolsey, 1986). The elements to be reported include: conditions of the incident, activities related to the incident, people involved and place or setting (Twelker, 2007).

Dervin (1999) offers a sense-making methodology with similarly aligned principles, providing a strategy for systematically identifying patterns in conditions and consequences related to information seeking behaviors. Similar to CIT's attention to the conditions of an incident, Dervin's methodology highlights conditions and change across time during instances of sense-making. Like CIT, sense-making methodology seeks to situate respondents in a specific moment related to a phenomenon of interest.

Applying this approach to the design of an interview protocol led to a series of probes that prompts individuals to reconstruct a sequence of events and then share perceptions related to each step of the phenomenon of interest. This approach relies on the expertise of individuals about their own movements

through space and time. In the context of image making, people are viewed as highly sophisticated in their creation and deployment of images as communicative devices. The interview protocol seeks to focus these experts on a specific episode and gather detailed rich information about events, perceptions and conditions. The interview script is included as Appendix A.

For the purposes of these interviews, drawing was defined as a persistent and visible mark. For example, a hand gesture is not a drawing but a series of scratches in the dirt is a drawing. Drawings can contain alphanumeric characters but do not have a strict directional orientation in order to be meaningful. For example, a phone number written on a napkin is not a drawing because it needs to be "read" from left to right to make sense; a diagram showing numbered measurements for the construction of a box would be a drawing because it does not need to be "read" in a certain direction (such as from left to right for English).

3.3.2 *Emergent patterns*

Inductive content analysis, guided by the semi-structured nature of the questions, was conducted on both the face-to-face and online responses.

Narratives were analyzed with these variables in mind:

- Descriptions of collaboration or coordination
- Statements indicating degrees of familiarity with topic being discussed
- Hospitable or salient conditions that seemed to contribute to the effectiveness of the communicative practice
- Enabling affordances of drawing that helped to establish those conditions
- Overall interaction outcomes

Table 3.1. Initial scheme: image-enabled communication behaviors

When they draw, people are...	Requirements/Conditions	Enabling affordances
<i>Building consensus</i> – Representations of a concept are created and normalized.	• Establish common points of reference • Aggregate and synchronize input from multiple sources • Build isomorphic bridges between knowledge domains	Plastic
<i>Persuading</i> – One person seeks to re-focus the attention of another to more closely align with a specific ideal.	• Independently amplify or diminish parts of a representation • Perceive information as accurate, complete and without bias	Mutually Accessible
<i>Synchronizing</i> – A waypoint(s) is created that marks synchronized understanding, before moving forward.	• Establish common points of reference • Aggregate and synchronize input from multiple sources • Build isomorphic bridges between knowledge domains • Map similar but not necessarily identical concepts	Symbolic
<i>Verifying</i> – The form of a message is changed in order to verify understanding.	• Accurately translate a representation into another language or mode	Authoritative
<i>Visualizing</i> – Specific information is conveyed in a mode as close to its original expression as possible.	• Perceive information as accurate, complete and without bias • Allow information to retain its context	Visual

While the face-to-face interviews provided richer data, the online responses were detailed enough to corroborate and extend a preliminary scheme that described image-enabled communicative practices related to the use of ad hoc visualizations (Table 3.1). Although there are drawbacks to the online format,

such as not being able to ask follow-up or confirmatory questions, these were offset by the ability to collect a greater number of responses, beneficial at this early stage of the research.

Regularities and consistencies regarding the ways people characterized their image-enabled interactions emerged from the data. In the following sections, each of the behaviors listed in Table 3.1 will be described including examples from the narratives. These categories are not necessarily mutually exclusive (for example, building consensus may involve synchronizing behaviors), however, each instance of drawing described in the narratives was identified as having a primary (or predominate) intention based on the contextual information provided by the person telling the story.

3.3.2.1 Building consensus

According to the narratives, drawing can be used to create a collaborative representation of a concept that reflects a normalized, agreed upon understanding of that concept. This is referred to as *building consensus* (or attempting to build consensus). Defining characteristics of these consensus-building interactions are that: 1) something new is created during the course of the conversation and 2) there is an expectation that all participants contribute to and are in agreement about the details, at least by the end of the conversation. The primary focus of the discussion generally evolves along with the drawing and might not actually exist in a recognizable format at the beginning of the conversation. Consensus building, as used in this context, does not depend on one person being an “expert” but instead relies on contributions from both participants.

Consensus building is contingent on specific material affordances of drawing, specifically the persistent and visible nature of marks made on a surface. The materiality of the drawing provides a common focal point that allows individuals in a conversation to establish a mutually accessible and tangible point of reference. The ad hoc visualization also allows participants to aggregate and synchronize input from multiple sources through the creation of isomorphic bridges.

An example of a drawing used to arrive at consensus was found in a story about a work session for a collaborative design project. According to the narrative, a team of 3 or 4 people was studying the behavior and perceptions of museum patrons in order to design new services for visitors. The group was trying to synthesize abstract data gathered from a number of different sources with the goal of creating a unified concept. The drawing served as a collective vision of their evolving ideas, as well as a record of the discussion. In the words of the respondent who recounted this experience, "The drawing helped to [make it] concrete. This was real and we had actually done something" (JD). Eventually this drawing was used to convey their proposed solution to the rest of the class. In another narrative, a respondent who was involved in a conversation during which consensus building took place stated, "It helped us to agree on what we would like to see happen" (9312). And a third example reflects the collaborative nature of these interactions: "So, she drew it up there, then he stood up and sort of corrected her, and then I went up and further involved myself..." (SW).

3.3.2.2 Persuading

In situations where a person seeks to convince someone of something, drawing is used to help *persuade* the other person of the validity and strength of the drawer's position. The creation of a visual representation allows the speaker to independently amplify or diminish aspects of the concepts being communicated. For example, a respondent shared a story about a conversation she had where she tried to convince colleagues to display new merchandise on the sales floor in a particular way. She stated that drawing an image of what she wanted “enabled them to see what I was seeing in my mind...The conversation ended when they both knew what the display should look like” (9334). Notable is the use of the word “should,” implying that the person describing this interaction was not interested in building consensus, but rather had a particular idea in mind that was the “right” way to arrange the display. The drawing gave more force or authority to the idea than the speaker was able to convey with words alone. Curiously, the drawn information in these situations is often perceived as having a certain (unsubstantiated) authority. In fact, throughout these narratives, people consistently equated visual representations with a lack of bias and a high degree of accuracy and completeness. For example, in response to a question about the effect the drawing had on the progress of the conversation, one respondent noted that it “made the concept very clear. And it wasn't judgmental or accusatory” (9370).

3.3.2.3 Synchronizing

The narratives also revealed that, at times, drawing could be used to establish a waypoint during a communicative process. Although similar in some ways to

consensus building, *synchronizing* refers to using drawing to orient oneself and one's conversation partner to a shared point of reference. In these cases, participants in the conversation each have specific knowledge or expertise in a particular domain but they do not necessarily share a common vocabulary. They enter the conversation with different backgrounds or perspectives. The drawing helps people to map individual points of reference to a shared worldview, to discover analogies and isomorphisms, and to establish a common perspective.

When drawing was described in this way, it seemed that communicators were able to resolve disparate vocabularies using a commonly familiar visual system of mark making. Synchronizing through drawing relies on the seemingly universal understanding of symbols such as arrows, circles and boxes. It also exploits our ability to factor in information conveyed by the speed at which the mark is drawn and the weight of the line laid down on the page. The drawing allows the participants to relate unfamiliar concepts with known knowledge structures through the marks on the page, mapping basic relationships and concepts to more familiar domains of experience.

This strategy is generally used by individuals with different domain expertise and a need to find a common language in order to communicate specific information related to the topic of conversation. For example, one of the narratives described a meeting of emergency responders: "The group needed to understand what the GIS [geographic information system] specialist meant and [he] started to draw. He drew a driveway with three structures on it coming off a main artery road. He then numbered them increasing from the road. He drew another example increasing from the top of the drive to the road... You could see

the group come together and understand that every second in an emergency is critical” (9316).

According to the narratives, in cases of synchronization, the drawing can act as an isomorphic bridge, allowing the participants to relate their own experience to the new concept through the mediating drawing. Unlike persuasion, one person is not trying to convince the other of the “correct” answer or way of looking at a problem. Both participants in the conversation are trying to find common points of understanding. And, unlike consensus building, neither participant is expecting to change or alter their perspective. They are instead seeking to find functionally similar points of correspondence between their individual experiences or knowledge.

3.3.2.4 Verifying

The narratives also revealed that in some cases, drawing can serve as a kind of proving ground. The person creating the drawing consciously seeks to transform or transpose a verbally expressed concept into a visual representation in order to: 1) verify the accuracy of their understanding, 2) verify the accuracy of the other person's understanding, or 3) test an emergent concept for him/herself. This is reflected in statements such as “I created the drawing so I could communicate to her what I thought she was saying to me” (DJ).

In these cases, a concept is converted into a different mode of expression, often using an alternative semiotic system, for the sole purpose of verifying the content (or message). For example, one respondent recounted a story where he drew a diagram in order to demonstrate to himself and his advisor that he fully understood the intricacies of a specific theory, “I was translating her word(s) into

drawing so that I can show that I'm understanding her idea. So, it's like checking" (KI). Another person described her reason for drawing this way: "I was conveying to him the same information in multiple ways which helped him to think about it and remember it" (KP). This respondent also commented that doing this increased her confidence that she was being understood.

In order for drawing to be used this way, it must be capable of at least a rudimentary correspondence with other language or symbolic systems. Although the translation does not, and in fact, cannot be "verbatim," the participants in the conversation need to be reasonably confident that visual representation of the concept is "true enough." Interestingly, this might challenge Benveniste, who Chandler tells us argued that translating from one semiotic system to another will always result in changed or lost meaning, since a certain amount of information is conveyed by the mode of expression itself (Chandler, 2002, p. 3; Hanks, 1996, p. 51).

3.3.2.5 Visualizing

Perhaps the most obvious of the behaviors identified through analysis of the 50 narratives, *visualization* refers to the fact that sometimes it is just easier and faster to depict certain things, such as spatial or abstract relationships, using a visually-based mode of expression. Visualizing through drawing allows information to be communicated in a format as close to "native" as possible. It would seem that based on the narratives, in some cases, the practice of drawing allows for the least amount of translation to take place, resulting in a more accurate delivery of intended meaning. Examples of this type of interaction include the conversation where a wife was explaining to her husband how she wanted the holiday lights

hung on the house, and a conversation where one man was giving directions to another about how to build a steel structure, specifically describing the configuration of weight bearing joints. In the words of the person describing this second conversation: "It was faster and much more precise [to draw] and clearly left far less opportunity for misunderstanding regarding the specific bit of information we were trying to exchange" (CB). Giving directions was a very common example of this type of behavior: "He needed a detailed map of the hiking trails.... There were too many directions to convey in just words alone" (9377). Descriptions of drawing used to visualize also tended to include at least implicit mention of a belief in the inherently accurate and unbiased nature of visual information.

3.3.3 *Enabling affordances*

Analysis of these narratives pointed to the conclusion that ad hoc visualizations were effective in these contexts because the conversation participants were able to exploit specific characteristics, or affordances, of their drawings. While all drawings carry similar affordances, each type of ad hoc behavior exploits these characteristics to differing degrees. Strictly based on these accounts of conversations during which drawings were deployed, enabling affordances of ad hoc visualizations include:

1. *Plasticity*- the ability to highlight certain dimensions of a representation (e.g., focus on time while ignoring space) in order to emphasize or direct attention to specific aspects of a thought or concept

2. *Mutual Accessibility*- the tangible, persistent nature of the drawing, as opposed to mental (private) or spoken (ephemeral) representations
3. *Symbolic Nature*- the semiotic nature of visual communication, specifically the ability for a mark to represent a concept
4. *Authoritativeness*- the uncanny ability for a visual representation to be perceived as incontrovertible evidence
5. *Visuality*- the fact that while all drawings are visual, not all image-enabled strategies exploit this quality equally

The main study, introduced in Chapter 4, will seek to confirm and extend these preliminary findings by clarifying the relationship between behaviors and affordances based on direct observations of drawing during face-to-face conversations.

3.3.4 *Beyond the narratives*

These narratives suggest that there are, in fact, observable patterns of communicative behaviors associated with image making during conversation. This is a big step towards constructing a theoretically supported methodology for discourse-oriented research in this domain. While these findings were encouraging, this investigation was constrained by a lack of direct observation of drawing during conversation and a heavy reliance on the memory of participants. This limitation is addressed by the main study, which involves direct observation of face-to-face conversation involving drawing. This early work, however, highlighted potentially fruitful directions for a more full-fledged study of image-enabled discourse. It also provides the basis for more informed appropriation of relevant constructs from discourse studies. The remainder of

this chapter will be devoted to contextualizing these observations within an emergent theoretical framework based on specific sociolinguistic concepts and constructs.

3.4 Unified model of image-enabled discourse

The preliminary theory-building investigation described above provides some insight into the types of patterns and behaviors we might expect to identify in image-enabled conversations. There is still much that we do not know about the phenomenon of interest, for example the ways that drawing is incorporated into the flow of the overall conversation. For this reason, the framework developed here needs to support an investigation that can identify and incorporate lower level linguistic and paralinguistic markers (e.g., specific word choice, repetition, echoing speech/behavior patterns, etc.) while also being open to explanations based on the functioning of higher level discourse segments (e.g., conversational opening/closing, challenges, negotiations, etc.). The concepts that form the core of this framework are borrowed from branches of discourse analysis and sociolinguistics. They address two basic methodological requirements: 1) the ability to accommodate multiple levels of abstraction in the analysis of communication interactions, activities and goals, and 2) the ability to integrate this analysis across multiple modes of communication. The resulting theoretical framework provided the basis for the design of data elicitation and analysis protocols, described in Chapter 4.

3.4.1 *Communicative practice*

In discussing his notion of communicative practice, linguistic anthropologist William Hanks wrote: "... to speak any language is not only to instantiate its grammar but also to appropriately contextualize utterances...[because]...the very same utterance can mean different or even opposite things depending upon how participants frame it" (1996, p. 220). In other words, simply knowing what words mean is not enough to truly communicate. One also needs to have contextual awareness and understanding. And by extension, not all communication happens according to textbook rules of grammar and syntax.

Hanks' work focuses on the situated and contextual understanding that enables communication through language use. He describes the ways that people integrate knowledge of grammatical form and rules of usage *with* understanding of social roles and cultural norms. Hanks calls for an inclusive approach to the study of language that incorporates multiple levels and lenses of analysis that span the breadth of these influences. He has produced an integrated view of language use, emphasizing the importance of looking across these dimensions in order to truly understand communicative practices. His work is helpful in the context of developing a framework for investigating image making as an information-driven, communicative act because it acknowledges that the content of the expression (or artifact, in the case of images) is only one part of the meaning conveyed by an utterance. The act of saying something, in a specific context within a particular situation also carries meaning.

For example, I walk down the hallway at my place of work and run into my boss. We exchange pleasantries about the weather, the office football pool and

our families. Then we go our separate ways. The content of the words we exchange reflect only one dimension of the communicative phenomenon that is taking place. As it turns out, I have recently been promoted and this is the first time that my new boss has addressed me in such a familiar way. In this sense, the fact we are having this exchange reflects my new position, indicates positive acknowledgment by a superior, and perhaps even marks my entree into the higher echelons of the company. This interpretation of our interaction reflects the approach to understanding language use advocated by Hanks.

The idea of communicative practice, as presented by Hanks, is operationalized as a semi-structured, semiformal three-way intersection between three aspects of language use: linguistic form, cultural ideology, and social activity (p. 230). We can understand each other and exchange meaning through language because of the *combination* of these three dimensions of communication (Fig 3.1). These three elements represent the continuum between irreducible rules of language use and relational patterns in actual language use, coming together in practice at the moment of synthesis. Regularities and contrasts across these three dimensions define communicative practice.

Form acknowledges that language is in fact a system with predictable elements. It generally refers to structural regularities in language such as grammar and syntax. In the example above, the sentences exchanged in the hallway can be diagrammed according to parts of speech, verb tenses and clause formation, formally describing the structure of language used.

Ideology is the collection of norms, positions, expectations and consequences brought to the interpretation of the utterance. This refers to the cultural bases for the inferences we make as a result of our previous experiences and worldview. I

understand my interaction with my boss as a reflection of my new status in the company because of my previous experiences. I also know that even though certain words, phrases or questions I use may be grammatically correct, they might be inappropriate in this context. These sensitivities reflect some of the ways that cultural ideology is expressed through language use.

Fig. 3.1. Three dimensions of communicative practice based on Hanks (1996)



Color separation images download from: <http://commons.wikimedia.org>

Activity is the improvised and social interactive nature of communication. This refers to the intentions, habits and strategies that we use to communicate with others, as well as the awareness that by communicating we are partaking in an interactive pursuit in collaboration with others. In the example above, the weather is not just a conversation topic. Talking about the recent hot/cold/rainy/dry spell is a way for the two participants to engage with each other, to make contact and establish a social connection.

Hanks points out that while these three dimensions are overlapping, they are nonetheless analytically distinct and the challenge is to allow each to exist in its own right, without looking at the others as mere by-product. Figure 3.1 illustrates this idea by comparing Hanks' framework to a color separation, like that used in standard printing processes. Each of the three color plates are equally important in forming the final image, though each only shows a partial view of the image. Similarly, each of the three dimensions identified by Hanks contributes to the overall communicative practice, although when considered on its own, each represents only part of the phenomenon. Hanks supports the idea of communicative practice with a range of research from the field of discourse studies. He discusses form in terms of discourse structure. Ideology in language use is described through examples from critical discourse analysis. Communicative activities are explained in terms of the analysis of discourse strategies.

Because of its hybrid nature, analysis of communicative practice does not yield a set of hard and fast rules of language use. Instead, the approach developed by Hanks is grounded on the idea of "habit," by which he means "the routine, repeated ways of acting into which speakers are inculcated through education and daily experience" (p. 11). He continues: "By looking to habituation rather than rules to describe this, we gain flexibility but also the ability to integrate heterogeneous features of the practice." Hanks also uses the term "strategy" when referring to patterns of practice with the idea that under certain circumstances agents engage in action with the aim of achieving certain ends by taking specific steps along the way. Hanks goes on to point out that while "Communicative practice and the verbal categories that it engages do help

sediment routine ways of perceiving and acting” this does not mean that “people are incapable of non-routine thought but only that socially established habits of language both guide and facilitate the ways they typically think, perceive, and act” (p. 176).

In contrast to more purely formalist perspectives, which take the position that shared knowledge of grammar forms the backbone of language use, according to Hanks “in order for two or more people to communicate, at whatever level of effectiveness, it is neither sufficient nor necessary that they ‘share’ the same grammar” (p. 229). Instead, he suggests that in order to communicate, people must “co-participate in an interpretive community with commensurate values regarding what counts as expression and how to view it” (p. 229). He goes on to speculate that such “partial, orientational, and socially distributed” schemes for communication go beyond language and are more firmly based in human perception (p. 229). Therefore the notion of communicative practice includes but is not limited to grammar. And because what counts as expression is socially negotiated, non-verbal modes of communication are not necessarily subordinated to linguistic expression.

Although much of Hanks’ argument is built on classic linguistic theory such as the work of Saussure (1959) and Peirce (1955), his perspective is also heavily influenced by the philosophy of the phenomenologists, in particular Ingarden, Schutz and Merleau-Ponty (see Hanks, 1996). Production of utterances within specific contexts occurs not just in standardized and expected ways (producing categories of language types) but also in surprising and unpredictable ways. The creation of meaning through this situational combination of utterance and context is seen by Hanks to have parallels with much phenomenological

thinking. Relying on our experience of ourselves and our environment, we use input perceived and processed by our bodies in order to make sense of the world around us. Merleau-Ponty's connection between body and understanding, a basic tenet of his conception of phenomenology, is key to Hanks' notion of embodied expression (pp. 121-122).

By emphasizing the connection between perception and understanding through the idea of embodied expression, Hanks implicitly signals that phenomenological principles (and the theories derived from them) can help to bridge the gap between linguistic theory and other frameworks for non-verbal communication. When we interact with others, we perceive and process not just verbal input, but a whole range of non-verbal signals as well. This is why the study of multimodal interactions (including non-verbal modes like drawing) can be viewed within the framework of communicative practice.

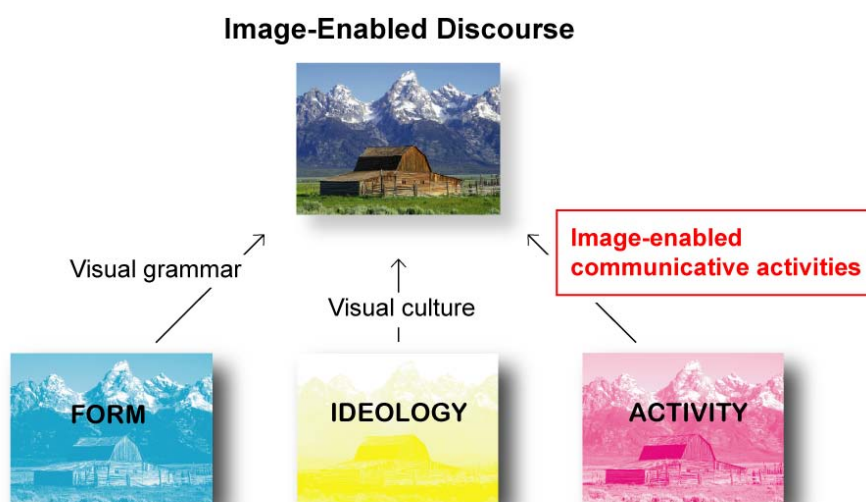
3.4.2 *Image-enabled discourse*

One of the problems highlighted by the gap analysis in Chapter 2 was that existing frameworks across visual studies research focus predominately on the image artifact. Initially, these frameworks, therefore, do not appear to be useful for contextualizing these image-enabled behaviors within a communicative framework. The notion of communicative practice can be used, however, to ground a unified model of image-enabled discourse by mapping the three dimensions of form, ideology and activity onto the practice of visualization (Fig. 3.2).

By associating the act of image making with other types of communicative practices, a structure is established for a holistic view of visual communication

that integrates formal features of visual content, cultural aspects of image interpretation, and most significantly for this research, communicative attributes of image-making activities. This framework contributes a unique infrastructure for contextual examination and representation of visual information.

Fig. 3.2. Unified model of image-enabled discourse based on communicative practice



The diagram presented in Figure 3.2 delineates the mapping of image-enabled discourse onto the framework of communicative practice. Form corresponds to the visual content of an image, as studied by those interested in visual grammar (e.g., Kress & van Leeuwen, 1996) and the automated detection of visual features of digital images (e.g., Datta, et al., 2008). The goal of much of the work in this area is the systematic and structural representation of visual information. Ideology relates to the roles that images play in cultural contexts, which is the focus of the predominantly semiotics-driven research in the area of visual culture. Culturally determined interpretation and use of images is also often the

subject of research in the humanities and more culturally-oriented social science research (e.g., Dikovitskaya, 2005).

The gap in existing visual studies research identified previously is now cast as a lack of attention devoted to the third dimension of communicative practice: image-enabled communicative activities. The study described in the following chapters contributes to this theoretical framework by providing empirical support and methodological guidance for the investigation of this aspect of image-enabled discourse.

The narratives presented earlier in this chapter support the idea that there are regularities across communicative behaviors that produce ad hoc visualizations. For example, the five behaviors associated with image-enabled discourse in the preliminary study fit appropriately into the notion of communication activities. What are people doing when they draw during conversation? According to the narratives provided, they are performing activities such as building consensus, persuading, synchronizing, verifying, and visualizing. This is the first step towards constructing a robust model of image-enabled discourse, building on the notion of communicative practice. The analysis described in the next chapters strengthens this theory building process by using *direct observation* of conversations involving drawing to further describe the ways in which image-making activities function within overall communication practices.

3.5 Operationalizing the notion of activity

In order to focus on the concept of communicative activity in the main study, it was necessary to design appropriate elicitation and analysis techniques for

examining the social dimension of image-enabled discourse. This required a clear understanding of what communicative activities are and how they appear in conversation. The goal of the next section is to further describe and define the concept of communicative activity in terms of the behaviors to be observed in the face-to-face conversations analyzed for the main study.

The notion of communicative activity is not unique to Hanks. When it comes to clarifying and operationalizing this concept in practice, a set of complementary theoretical constructs from the field of sociolinguistic supplement Hanks' work by describing particular approaches to discourse management that could be of potential relevance to image-enabled communication. Notions of common ground (Clark, 1996), framing (Goffman, 1974; Tannen, 1993), footing (Goffman, 1979) and stance (Jaffe, 2009b) are commonly used to describe types of discourse strategies used to influence social interaction and conversational involvement. The following discussion shows how these concepts contribute to the image-enabled discourse theoretical framework.

3.5.1 *Common ground and external representations*

Because the notion of communicative activity refers to the aspects of language use related to social interaction, both the speaker and the listener are seen as active participants in conversation. Clark refers to this interactive aspect of communication as *joint action* (1996, p. 3). A joint action involves two or more people working in coordination with each other (pp. 18-19).

Table 3.2 summarizes the general claims Clark makes about joint activities (pp. 37-38). This occurs when the activities performed by individuals are

coordinated in content and processes, allowing participants to reach both public and private goals. While these goals may be anticipated as a result of social norms or conventions, Clark points out that joint actions also create emergent products, unintended outcomes that nevertheless influence current and future actions. Achieving these goals (both expected and emergent) requires participants to play different roles that dictate the division of labor for a given activity. In the process of participating in a joint action, both conventional and non-conventional procedures will take place. How participants interpret, react to and embody these procedures contributes to the dynamic and interactive nature of joint activities.

Table 3.2. Attributes of joint activities

Participants	A joint activity is carried out by two or more participants.
Activity role	The participants in a joint activity assume public roles that help determine their division of labor.
Public goals	The participants in a joint activity try to establish and achieve joint public goals.
Private goals	The participants in a joint activity may try individually to achieve private goals.
Hierarchies	A joint activity ordinarily emerges as a hierarchy of joint actions or joint activities.
Procedures	The participants in a joint activity may exploit both conventional and nonconventional procedures.
Boundaries	A successful joint activity has an entry and exit jointly engineered by the participants.
Dynamics	Joint activity may be simultaneous or intermittent, and may expand, contract, or divide in their personnel.

With regards to operationalizing the concept of communicative activities, Clark's delineation of joint activities clarifies some of the main attributes of social engagement in conversation. The direct observation of interactions involving drawing will require a protocol that provides participants with an authentic experience of conversational involvement. Clark's attributes of joint activities provide a baseline for designing that experience.

Clark also states that the coordination needed to participate in joint actions is established through the presence of common ground, which enables people to focus their activities and actions towards their goals (both public and private). Clark sees common ground as being represented in three parts. *Initial* common ground refers to the prior knowledge, beliefs and assumptions that are taken for granted by participants in the joint activity. *Current state of the joint activity* is what participants understand to be true about the present state of the action being undertaken. And *public events so far* are part of the shared history of the participants, those events that lead up to the current state (p. 43).

While each of these representations of common ground could take a physical form, Clark pays particular attention to the external representation of the current state. He uses a game of chess as an example, where the board and the pieces are the external representation of the current state of the game. He identified five ways the current state of an activity can be reflected in physical form to reinforce or establish common ground (pp. 46-47):

1. *Physical model*– They can be viewed, touched and manipulated.
2. *Markers*– They contain markers that denote elements of the joint activity, ranging from cards in card games and positions in cues, to altars in churches and witness stands in courtrooms.

3. *Locational interpretation*– The markers can be interpreted in part by their spatial location with respect to other markers.
4. *Manipulability*– Some markers can be moved or altered, and the participants interpret these changes by the locations and forms that result.
5. *Simultaneous and parallel accessibility*– External representations are ordinarily accessible to all participants at the same time and in parallel.

The idea of external representation shows that the activity of establishing and maintaining common ground can have physical form. This idea is very interesting in terms of image-enabled discourse, where the persistent and physical nature of a visual representation seems well suited to performing this function. As discussed previously, materiality (including physicality) is closely associated with modal affordances. Clark's work provides an explicit connection between activity, affordance and modality.

3.5.2 *Framing*

Both Hanks and Clark refer to language use as a process, and each acknowledge that discourse structures shift and change throughout the course of an exchange. Variations and improvisations are the hallmark of spoken communication, and we are adept at shifting, switching, recovering and inventing in response to the dynamic nature of conversation. In all cases, joint activities are dependent on a shared point of reference. In sociolinguistics, framing refers to this process of identifying and applying an appropriate set of expectations to a given communicative episode (Tannen, 1993), in essence enabling that shared point of reference to be established.

The frame of reference that is brought to the interpretation of any communicative activity is comprised of a set of underlying expectations about what is happening in the conversation at any given moment. The use of frame analysis in sociological research was established by Goffman (1974), however Gregory Bateson initially introduced the concept of framing in his work on play (1972). He observed that when animals engaged in physical contact they are able to make the distinction between an aggressive attack and a playful bite. Humans possess a similar ability to discern benign roughhousing from hostile strike because we have the ability to frame play differently than other activities. Through the process of interpretive framing we are able to properly contextualize a playful shove as unthreatening behavior.

Tannen and Wallat position the term “frame” in relation to Bateson and Goffman, using it to refer to “participants’ sense of what is being done” (1993, p. 66). An interpretive frame refers to the “sense of what activity is being engaged in, [and] how speakers mean what they say” (p. 60). They explain, “People are continually confronted with the same interpretive task. In order to comprehend any utterance, a listener (and a speaker) must know within which frame it is intended: for example, is it joking? Is it fighting?” (p. 60). Shifts in, around, and through conversation structures result in challenges to the dominant frame of reference for the conversation.

Just as Clark and Hanks see communicative activities as dynamic processes and procedures, Tannen and Wallat also see framing as an interactive, dynamic dimension of communication. During the framing process, the underlying expectations that are used to interpret communicative activities are constantly being re-evaluated and refined. Tannen and Wallat highlight an explicit

connection between their use of the term “framing” and the notion of communicative activity, a central concept in the image-enabled discourse framework. Referencing the work of anthropologist Frake, they explain that the “key aspect of frames is what the people are *doing* when they speak,” drawing a connection between what Frake refers to as an *event* and what Gumperz calls an *activity* (p. 61). Framing, therefore, is one of the activities that people do with language. Rowe uses the term “hybrid activity space” to describe the state of multiple frames of references and communication goals existing within the same communication space (2005, p. 124).

Communication is dynamic and interactive, and “expectations about objects, people, settings, ways to interact, and anything else in the world are continually checked against experience and revised” (Tannen & Wallat, 1993, p. 61). The joint activities in which we participate when we communicate, therefore, all involve identifying and applying frames of reference. Gumperz talks about this continual negotiation in terms of conventions and contextualization cues (1982). These are the cues, such as pitch and volume, we use to set our underlying expectations about the interactions in which we engage. The signals we deploy allow us to index specific frames of references, “making certain contexts relevant at a given moment” (Rowe, 2005, p. 125).

Important for this study is the fact that these cues, strategically deployed within the shared communicative space of the interaction, are by definition public and observable. Focusing on the activity of framing (and related discourse management strategies associated with maintaining conversational involvement), as operationalized through both verbal and non-verbal contextualization cues, is one way to observe communicative activities as an

outsider. The next section focuses on a special type of framing behavior called footing, which has particular relevance for multimodal communicative activities.

3.5.3 *Footing and code-switching*

Footing is the term used to “describe how, at the same time that participants frame events, they negotiate the interpersonal relationships, or ‘alignments,’ that constitute those events” (Tannen & Wallat, 1993, p. 60). Goffman (1979), who initially introduced the term, makes an implicit connection between these alignments and other expectations brought to an interaction: “A change in footing implies a change in the alignment we take up to ourselves and the others present as expressed in the way we manage the production or reception of an utterance. A change in our footing is another way of talking about a change in our frame for events” (p. 5). He explains that a footing shift can signal a change in the *participation framework* of a conversation such as when the point of reference for an exchange is shifted from a particular speaker to something or someone else, for example when a new person enters a discussion. Shifts in footing can also indicate changes in *production formats*, such as when one person quotes (or speaks in the voice of) another.

The concept of footing can be used to discuss the ways in which we communicate who is an “official” participant in an interaction and identify the expected structure for an engagement. While typical statement-reply conversation structures presume that expected alignments related to a “speaker” and a “hearer” will be identifiable, Goffman points out that “the terms ‘speaker’ and ‘hearer’ imply that sound alone is at issue, when, in fact, it is obvious that sight is organizationally very significant too, sometimes even touch” (p. 6). For

example, we can use eye contact to draw someone into a conversation, or turn our bodies slightly to exclude someone from our sphere of communication. Breaches in the dyadic limits of talk, such as the presence of bystanders, for example, open the possibility for *dominant communication* to be interrupted or interfered with by *subordinate communication* (p. 9). Again, Goffman highlights the important role that paralinguistic communication plays in this process, stating that “this structurally important distinction between official recipients is often accomplished exclusively through visual cues” (p. 9).

Goffman further explains that “...it must be allowed that we can hold the same footing across several turns of our talk” (p. 25). In other words, one can maintain footing even when someone else is speaking, for example when the other person is merely affirming or providing encouragement to the speaker. In this sense footing is not tied solely to the use of specific linguistic markers, but relies on a higher level of awareness or attention between conversation participants in order to maintain involvement. Conversational asides are examples of these types of non-sequential footing structures, enabling participants to temporarily step “outside” the participation framework of the conversation, and then re-enter without having to re-establish context or frame of reference. Goffman refers to this as *sideplay* or *byplay* (p. 9).

Code-switching (Gumperz, 1982) is one way to embody a footing shift specifically marked by a change in the production format of the utterance (Goffman, 1979, p. 3). Gumperz defined conversational code switching as “the juxtaposition within the same speech exchange of passages of speech belonging to two different grammatical systems or subsystems” (1982, p. 59). For example, when two people share more than one language in common, they might alternate

between those languages (or codes) throughout the course of a conversation. The term can also be applied to switches between sublanguages or dialects such as breaking into jargon or slang with a peer (Myers-Scotton, 1993).

It is important to note that a code-switch is not simply a matter of substituting a word in one language for a similar word in another. According to Gumperz, in cases where participants in a conversation are bilingual, it is actually relatively unusual for these mid-conversation switches to occur because a person is unfamiliar with how to say something in the primary language of the exchange. In fact, as with other discourse strategies, the relationship between language usage and social context is complex (Gumperz, 1982, p. 61). Myers-Scotton points out “choices in specific interactions are best explained as cognitively-based calculations that depend on the actor’s estimation of what actions offer him/her the greatest utility” (Myers-Scotton & Bolonyai, 2001, p. 2). The choice to switch codes, therefore, could serve any one of a number of strategic purposes. (It is important to note that while the terms used here such as “strategy,” “purpose,” “intention,” and “utility,” may commonly convey a sense of conscious decision-making, from a functionalist point of view, these choices may be made with varying degrees of self-awareness.) Code-switching reflects a change of footing, either in the participation framework or the production format of the conversation.

While Clark’s notion of common ground describes the ways in which coordination is ideally established, code-switching is an example of the conventions of a conversation being intentionally manipulated for strategic purposes, while maintaining conversational involvement. Code switching reflects a “discourse unity” across utterances regardless of the language or

sublanguage used at any given moment (Myers-Scotton, 1993, p. 1). In this way, footing changes do not disrupt the frame of reference for a conversation, and in some ways are essential to maintain conversational involvement.

It is a small conceptual leap from code-switch to mode-switch, and in doing so, the multimodal discourse literature reviewed in the beginning of this chapter has renewed relevance for positioning a shift to drawing during a conversation as a special type of communicative activity. Gumperz's work shows that such shifts in production format are not disruptive by default, but can reflect strategic choices on the part of the conversation participants. In this way, drawing, as both a mode of expression and embodiment of participation, could theoretically be deployed to influence footing in a conversation. This provides further motivation for a close analysis of image making within face-to-face conversations, as its role in the overall conversation structure may be quite layered and nuanced, especially if drawing proves to be implicated in framing and footing management.

3.5.4 *Stance*

The last concept to be introduced in this chapter is stance. Stance refers to "taking up a position with respect to the form or the content of one's utterance" (Jaffe, 2009b, p. 3). Studies focusing on stance generally take into account a range of cultural and social factors that influence the manner in which an individual positions and represents oneself in the world. According to Jaffe, stance and stance-taking have been explored in depth across pragmatic, systemic functional, anthropological, sociolinguistic and critical discourse analytic traditions. Sociolinguists, in particular, tend to focus on the ways in which stance-taking of

various types is habitually associated with specific social roles, identities and relationships. For example, Bucholtz and Hall (2005) invoke the notions of stance and footing in their comprehensive discussion of the ways identity is produced through linguistic interaction.

Charles Goodwin provides an explicit connection between footing and stance. In his discussion of embodied participation frameworks, he explains that Goffman's notion of footing can be applied to the analysis of the way in which participants mutually position their bodies toward each other and the environment while engaging in conversation. He states that "one can begin to discuss these structures as, quite literally, types of stance" (2007, p. 61). While stance-taking can have a purely verbal form, physical position and action can be interpreted as an embodied expression of both alignment with relation to another and position with regards to one's own participation. In other words, stance can be a kind of "stepping in to the ring" or explicit action related to declaring participation or position in a dialogue. This can take a verbal form (i.e., "I disagree. I think that....") or it can take a physical, non-verbal form (i.e., stepping forward to reinforce stance and turning away as stance negation,).

In terms of drawing during face-to-face conversation, the action of picking up an implement for writing or drawing can be seen in terms of an intention to participate. The act of reaching for a pen and making a mark, in addition to resulting in the creation of a visual artifact, also has the potential to act as an embodied statement of stance. Whether or not drawing was deployed in this way in the conversations observed during this study will be discussed in Chapter 5, but for the moment the notion of stance is helpful because it reinforces the idea based on the sociolinguistic theories presented in this chapter that the activity of

drawing has the potential to serve multiple roles in the management of conversational involvement.

3.6 Conclusion

In this chapter, an argument was presented that described image-enabled discourse in terms of the three dimensions of communicative practice identified by Hanks: form, ideology, and activity, (Fig. 3.2). While formal elements and cultural ideology of images have been investigated to a degree, communicative activities involving the creation of images have not. Hanks' framework provides a basis for integrating this existing artifact-oriented research with an emerging focus on image-enabled discourse. It also casts the gap described in Chapter 2 as a lack of attention paid to image-enabled communicative activities. Addressing this gap will allow a unified model of visual communication similar in spirit to Hanks' linguistic framework to emerge. The study described in the next chapters addresses this gap, contributing the missing theoretical piece to the emerging model and a methodology for the examination of image-enabled communicative activities.

In the beginning of this chapter, two requirements for a practical and useful theoretical framework were offered: 1) the ability to accommodate multiple levels of abstraction in the analysis of communication interactions and activities and 2) the ability to integrate this analysis across multiple modes of communication. Findings from a preliminary theory-building exercise and concepts from the field of discourse studies were woven together to create a conceptual framework for image-enabled discourse that will inform the operationalization of key concepts in the study described in the next chapter.

Discussions in this chapter showed how this framework not only accommodates multi-level analysis of communication, but also supports cross-modal investigation of communicative practices.

The discussion in this chapter also revealed that direct observation of conversations involving drawing requires a protocol that provides participants with the opportunity for authentic experience of conversational involvement. Clark's attributes of joint activities provide a baseline for designing that experience. Additionally, the concepts of common ground, framing, footing and stance were introduced in order to inform the intent and implementation of the next stages of the research.

The next chapter will show how these theoretical concepts were operationalized in a study involving the direct observation of the creation of drawings during face-to-face conversations. This investigation contributes to our basic understanding of the role image making plays in communication by:

- Introducing a stream of discourse-oriented image research that supplements existing artifact-focused work and seeks to contribute to a multi-level understanding of image-enabled communication and visual information sharing;
- Providing empirical support for a unified model of image-enabled discourse;
- Generating an empirically derived set of image-enabled communicative activities, framing behaviors and affordances;
- Producing a standardized multimodal dataset documenting image-enabled communication practices;
- Adapting visual methods for the analysis of information sharing and

communication in multimodal environments.

As a result, the “activity” gap described above will be greatly narrowed and a more robust model of image-enabled discourse will be available for practical applications such as those discussed in Chapter 1 (e.g. document modeling for image retrieval, heuristic evaluation criteria for interface design and collaborative work tools, and the refinement and extension of existing computer-supported information visualization tools). The implications and benefits of having a framework for describing and investigating image-enabled discourse as communicative practice will be further discussed in Chapter 8.

Chapter 4 Methodology

The conceptual foundations for an empirical study of image-enabled discourse were laid in the previous three chapters. In Chapter 1, a problem statement outlined the ways in which the lack of focused attention in this area has limited the development of information and communication technologies and prevented a contextualized understanding of image creation as an informative and communicative activity. The gap analysis presented in Chapter 2 confirmed that the majority of visually oriented research is focused on the image artifact, rather than the process of creating images for the purpose of communicating. The literature review also showed how research in this area could contribute to a range of investigations across the field of image studies. This gap was partially addressed through the theoretical framework presented in Chapter 3. Narratives describing image-enabled conversations were collected and analyzed, attesting to the feasibility of identifying behavioral and communicative patterns associated with this mode of dialogue. The current chapter will describe the methodology designed to elicit, collection and analyze directly observed conversations that involve spontaneous drawing.

The concept of image-enabled discourse currently guiding this inquiry is based on the notion of communicative practice. A communicative practice is defined along three dimensions of language use: formal structure, cultural ideology and social activity. Image-based research that addresses the first two

aspects of language use, formal representations of visual content and culturally grounded approaches to visual ideology, does currently exist (see Chapter 2). As stated previously, this is not true for the study of image making in communicative contexts. By establishing a correspondence with Hanks' notion of communicative practice, image making is seen as a communication activity. The study described in detail in the next few chapters provides the missing link in the theoretical framework by highlighting image-enabled communicative activities as the focal point for analysis.

This was achieved by:

- Making systematic and rich observations of instances when drawings are created during conversations.
- Performing analysis of interactions to identify the role that drawing plays in the evolution and/or outcomes of conversations.
- Generalizing across multiple conversations to categorize individual instances of drawing in terms of types of communication activities performed.
- Confirming, revising, and reconstructing emergent themes and patterns by conducting confirmatory data analysis.

The methodology for this study used qualitative methods for data collection that yielded descriptive output and a content analytic scheme derived from a grounded, iterative approach to analysis. A protocol was designed to systematically capture image-enabled interactions in a naturalistic, observable environment. Participants were asked to engage in informal conversation with a partner, in a standardized setting. Normalized conversation prompts were used

to initiate and focus interactions. These conversation starters and the setting for the interactions were designed to provide favorable circumstances for the creation of drawings, while not being overly prescriptive. Video recordings of prompted conversations, as well as transcripts of both verbal and non-verbal interactions, provided empirical data based on direct observation. The intent of this design was not to create a controlled experiment, but instead to create situations where observations could be made in an unobtrusive and consistent manner while creating an authentic experience for participants. Procedural issues related to this qualitative, descriptive approach will now be discussed.

Table 4.1. Chronological phases of research methodology

PHASE	TASK	RESULT
Design of protocol	Procedure	Semi-structured script to facilitate interactions between pairs of participants
	Informed consent	IRB authorization and informed consent forms
	Setting	Standardized setup, including office supplies and snacks
	Video/audio recording setup	Two camera positioned capture both participants and surrounding area
	Conversation prompts	Set of 10 vetted prompts for use in protocol
Data elicitation and collection	Recruit participants	6 for the pilot, 10 for the main study
	Pilot	8 video recorded conversations
	Main study	15 video recorded conversations
Analysis	Initial coding	Verbatim transcripts Narrative transcripts Collection of emergent themes
	Focused coding	Transcripts annotated for • Image-enabled activities • Framing behaviors (Topic, Agreement, Boundaries, Stance and Vector)
	Analytic search	Sets of contrasting affordances

Table 4.1 offers a summary of the main phases of the study in chronological order. Each phase is described in detail in this chapter, beginning with a summary of the research questions that guided the main study. This is followed by details of the research design including participants, setting and data elicitation and collection procedures. A description of the approach to transcription and analytic methodology is offered, including a discussion of evaluation criteria and limitations of this study.

4.1 Research questions

This research is built on the notion that affordances provided by ad hoc visualization practices (i.e. drawing during conversation) create salient or hospitable conditions for specific conversation behaviors or structures. The intention of this study was to determine when and how the act of image making plays a role in communication. The design described in this section addresses the following questions:

- RQ1: What communicative **activities** are taking place when people draw during face-to-face conversations?
- RQ2: What role do these activities play in managing **conversational involvement** and **coordination**?
- RQ3: Which **affordances** of drawing are most salient for image-enabled discourse strategies?

The dynamic and spontaneous nature of the creation of ad hoc information visualizations makes it challenging to study the phenomenon in a systematic manner. A natural and ideal scenario would be to gather observations of drawing “in the wild.” In fact, almost all of us can think of a specific

conversation we have participated in or witnessed where drawing was used to great effect. As easy as it is to think of such an instance in the past, it is challenging, however, to predict when such moments will occur in the future, let alone to be there with video camera and notepad. Additionally, inconsistencies across natural environments and situations could easily confound attempts to systematically analyze across instances observed under different circumstances.

Image-enabled communication activities are deeply dependent on interactions between individuals. In order to focus on this phenomenon, the level of analysis for this study was the interaction between individuals. While there are certainly differences between individuals (i.e. some may consider themselves to be strong visual thinkers), this focus on the interaction means that the emphasis was on how communication unfolded *between* participants. Following principles of interaction established by sociolinguists and communication researchers (Burgoon et al., 2002; Clark, 1996; Gumperz, 1982; Hanks, 1996, 2000; Littlejohn, 1996; Philips & Jørgensen, 2002; Wardhaugh, 1985, 2006), it is clear that static assignment of “sender” and “receiver” roles at the beginning of a conversation is not an entirely accurate or useful description of the dynamics of face-to-face communication. This will be discussed in more depth later in this chapter, as it relates to the analysis of interactions. At this point it is important to bear in mind that it is more accurate, and generative, to think of the relationship between individuals in conversation as a flow of roles that shifts throughout the course of a conversation, rather than a volley with predetermined “sender” and “receiver.” Therefore, instances or episodes of interaction (or attempted interaction) provide the basic structure for data. Delineation of episodes will be discussed later in this chapter (see 4.3.2. *Transcription and initial analysis*).

4.2 Research design

To address the research questions, recordings were made of conversations involving the creation of ad hoc visualizations. The research was designed to provide ample opportunity for consistent observation and documentation of communication behaviors associated with the creation and use of visual information in the context of face-to-face conversations. Data elicitation, collection and analytic methods were designed to reveal information about three corresponding aspects of the conversations: What are people doing, communicatively speaking, when they are drawing? How do these activities relate to the overall conversation? Is drawing used differently than other modes of communication?

4.2.1 *Participants and setting*

This study looked at image-enabled communication as a widely accessible strategy practiced by a broad range of people. While groups such as engineers or designers are known to have rich visualization practices that are evident in their day-to-day work, these practices could be described as institutionalized in some ways, often being taught or modeled during professional training. While observation of highly sophisticated visualization practitioners may yield interesting heuristic results related to best practices, focusing on such a group runs the risk of becoming a study of extrinsic skills, rather than intrinsic capacity.

Likewise, while there may be people who are particularly effective at deploying visualizations (those described as having high visual literacy) or people who naturally tend to use imagery for problem solving (so-called visual thinkers), the goal of this research was to look at the *interactive* activity of

visualization, focusing on what happens when images are created during conversations. The artistry or cleverness of the images themselves was not the focus of attention. Because of this, the protocol for this study did not focus on a particular group or domain of “power users.” This domain-agnostic approach also contributes to greater generalizability for this research, resulting in an inclusive view of commonly deployed visualization practices.

With these generalized requirements in mind, participants were recruited from Syracuse University undergraduate and graduate courses within the School of Information Studies, Whitman School of Management and the College of Visual and Performing Arts. A modest incentive was offered for participation (a choice of either a \$5 gift card to Starbucks or a 1-in-10 chance to win a \$50 gift card to Amazon.com). Effort was devoted to assembling a representative sample that was not weighted to one gender, age or ethnicity. Participants were both native and non-native English speakers.

Participants were assigned to teams of two based on a stratified sampling approach to maximize the diversity of fields of study represented in each pair. It should be noted that the inclusion of students with art and design training had the potential to bias the interactions to some degree. Because of the argument already discussed regarding the mutually dependent nature of interactive communication, this was not expected to be highly problematic as long as diversity among conversation partners is maintained. Field of study and basic demographic information for each participant were noted and considered accordingly during analysis. In practice, no evidence of systematic bias as a result of the special training of some participants was observed in this dataset.

In order to preserve the naturalistic aspect of image-enabled behaviors, the fact that the study was focused on the creation of images was not shared with participants. During recruitment and initial briefing, participants in the study were told that they were part of a study that was looking at informal information sharing behaviors between peers.

Paired students were asked to come to a designated location in a university building on a specific day and time. The small meeting room used for conducting the protocol was set up with two chairs at a table in conversational proximity to each other. Two video cameras were discretely positioned, and a small wireless microphone sat in the middle of the table. Commonplace office supplies (such as white board, paper and pens) were provided, though no explicit prompts were given to use these items for drawing during tasks. Participants were casually invited to use “anything in the room” during the course of their conversations. The array and display of materials available were consistent across all groups. Additionally, in order to reinforce the informal nature of the interactions and create a welcoming environment, small snacks (such as cookies and sodas) were provided. Figure 4.1 illustrates the setup.

A total of 16 participants were involved (3 pairs for the pilot and 5 pairs for the main study). The initial strategy for determining the appropriate number of conversations to be recorded for analysis included a plan to conduct initial analysis of the interactions between the 5 pairs involved in the main study, then, if necessary, collect further data. After preliminary analysis, it was clear to those who reviewed the early findings (including committee members and peer reviewers) that the data collected to this point were very rich and capable of revealing substantial information about the types of interactions of interest. This

number of participants and prompts yielded a dataset that was manageable in terms of inductive, qualitative, multimodal video analysis, while also providing a degree of consistency across topics and variety across conversation participants.

Fig. 4.1. Setting for the study



4.2.2 Procedure

The protocol took about an hour to complete (including exit interview) and began with both participants completing an informed consent form,¹ after which they were given a brief introduction to the study (see Appendix B). As mentioned above, during recruitment and this initial briefing, participants were told that they were part of a study that was looking at informal information sharing practices between peers. This was necessary in order to preserve the

¹ The protocol has been designated exempt from regulations governing human subjects research by the Syracuse University Institutional Review Board (IRB#09-289). Because video recordings may possibly be used for reporting purposes, informed consent was obtained from all participants.

naturalistic aspect of communication behaviors and unselfconscious use of drawing.

Once participants completed the initial briefing, they were given a choice of five conversation prompts to start their interaction. Together they picked one to discuss. (The design of these prompts is described in detail in the next section.) The selection of one of the five prompts also served as its own kind of ice-breaker for individuals in each pair, providing an opportunity for them to get to know each other and establish rapport before jumping into the main portion of the conversation. Participants were not required to have any special training in order to discuss the assigned topics. Each pair was asked to work together to come up with an answer to their assigned question to the best of their ability. Even if they did not know the answer, the participants were asked to work with their conversation partner to create or invent an explanation. Their job was done when both participants were satisfied that they had adequately responded to the question posed. While a strict time limit was not set, most conversations on a specific topic lasted approximately 5-15 minutes.

Once the first question had been responded to, each pair received another set of 5 questions to choose from, following the same instructions as the first round. For the third and final round, a prompt was assigned to the pair. The variation on the third round was done in order to ensure coverage across as many question topics as possible, while also providing slightly different circumstances or comfort levels with the selected topic. Because the protocol is not experimental, this variation in the data was instigated strictly by a desire to gather a range of data, not to introduce any sort of control/treatment standard.

After the pair discussed the assigned questions (during which time a drawing may or may not have been created), both participants were debriefed together during a joint exit interview which included asking each of the participants to repeat back their responses to the three questions. For those conversations where drawing did not occur during the observed session, the exit interview was used to gather information about those instances where drawing could have been used but was not (e.g., instances where another pair may have used drawing). The script for the exit interview is included in Appendix B.

As expected, some, but not all, teams created drawings in the course of responding to the three prompts. Therefore, this protocol resulted in documentation of a range of practices and outcomes, allowing for comparisons across conversations where drawings occurred and those where it did not. Specific outcomes are reported in Chapter 5.

In summary, the protocol was administered to 8 pairs of participants (16 volunteers), with 3 pairs in a pilot, and 5 pairs in the main study. The dataset was logged based on conversation prompt, yielding 15 conversation clips from the main study (3 per pair), each of approximately 5-15 minutes in length.

4.2.2.1 Prompting naturalistic interactions

The theory-building exercise presented in Chapter 3 revealed a range of practices associated with image-enabled discourse strategies. The goal of the main study was to build on and validate these tentatively identified behaviors through direct observation. A key component of the methodology for the main study was the use of prompts to instigate conversations between participants without overtly directing the use of any specific modality or strategy. The prompts for this study

were designed to catalyze naturalistic interactions (discussed in detail in 4.2.2.2 *Design of conversation prompts*).

The prompts needed only to create opportunities for participants to engage in natural interactions. The function of the prompts was similar to conversation “ice-breakers” or “conversation starters.” This reflects a subtle but important point about the focus of this study. Measuring the success, effectiveness or speed of collaborative task completion was not relevant to answering the research questions. Making observations of the mechanics of the communication between individuals was. Therefore the conversation prompts were used simply to initiate and facilitate the flow of communication.

An example of how a similar approach to eliciting a specific, naturalistic behavior has been used in social science research can be seen in research conducted by Burgoon et al. (2002; 2001). This work focuses on deception practices and is grounded in interactive communication theories. The researchers were particularly interested in the dynamics of deception in dialogic communication. While the mechanics of deception in monologues (such as political speeches or broadcasts) had been investigated, Burgoon et al. were interested in how the dynamics of interaction affect the use and appearance of deception in conversation. Interestingly, they found that deception was more successful as interaction increased, indicating that when deceivers have the opportunity to answer questions or redirect their story in response to specific doubts expressed by their conversation partner, they were more successful in their duplicity.

In order to study this phenomenon, the researchers devised a protocol that presented participants with opportunities to engage in deceitful communication

with a partner. One group of subjects, who were referred to as the “sender” in the conversation, was trained to deceive, that is to say they were taught how to, at times, not “tell the truth, the whole truth and nothing but the truth” (Burgoon, et al., 2001, p. 513). They were then assigned to another participant (a “receiver”) who was not aware of their partner’s training, nor had they themselves been trained to deceive. A set of cards on which conversation topics had been printed was given to each sender. On certain cards there was a subtle notation in the upper corner, the “deception induction” indicator, which signaled the sender to use their skills of deception when discussing that topic. Additionally, half of the participants were asked to conduct a monologue, while the other half conducted a dialogue, allowing researchers to compare patterns of deception success across these two conditions.

Hancock et al. (2004) built on this basic protocol for their work in using automatic linguistic analysis for deception detection. While Burgoon et al. used their experimental protocol in order to examine the role of interaction and participation in deception practices, Hancock et al. were interested in prompting deception in conversations in order to build a corpus of transcripts for use in advanced computational linguistic experiments.

Although these studies looking at deception used experimental designs, their approach to prompted interactions provided inspiration and guidance for the design of this qualitative study focused on image-enabled conversations. The underlying challenge of designing the deception studies is similar to that faced in this dissertation study: the use of drawing in conversation, like deceptive behavior, is a common phenomenon, but difficult to predict. Like the deception studies, the study reported here used prompts to instigate conversations between

pairs of strangers. Unlike the experiments, this descriptive image-making study did not, however, involve training or directing participants to use drawing in any specific way during their conversations. Further, as expected, drawing did not occur during every interaction, providing valuable opportunities to compare and contrast conversations on the same topic, in the same setting that included drawing with those that did not.

4.2.2.2 Design of conversation prompts

The primary, and exclusive, role of the conversation prompt in this protocol was to enable direct observations of communication behaviors by instigating a naturalistic conversation. The prompts were designed to not explicitly prevent the creation of a drawing, but they also were intended to not explicitly dictate the use of drawing. In terms of the protocol, the ideal task would provide multiple opportunities for the use of any or all of the practices identified in the initial study, but at the same time would not close the door to the use of alternate image-enabled, and even non-image-enabled, communication practices.

The prompts used in this protocol were expressed in the form of a question, modeled on the common “ice-breaker” or conversation starter format. Each prompt was designed and pilot tested to make sure that 1) it provided adequate opportunity for drawing, without being overly prescriptive, 2) it was relatively easy to respond to, and 3) it naturally encouraged dialogue.

The first step to identifying potentially usable prompts was to ensure that the topic presented adequate opportunity to draw. This was achieved through a series of evaluations, starting with the data from the preliminary narrative-based

study. Since the situations described in these narratives all involved drawing, the stories provided a basis for creating an initial list of candidate prompts.

Fifty narratives describing conversations during which drawing occurred were gathered during the preliminary study. In addition to revealing early support for the tentatively identified image-enabled activities that were discussed in Chapter 3, other consistencies also emerged from these stories. The narratives involved a range of topics and types of exchanges including:

1. Providing instruction, such as one person guiding or teaching another
2. Describing abstract and/or ambiguous concepts
3. Recalling complex information
4. Combining individual work or thinking with consensus-building activities
5. An understanding of specific and sometimes extensive details that needed to be understood by all participants in the conversation
6. Focus on something to be designed and/or built (either physical or conceptual)
7. Identification and discussion of relationships and connections

Interestingly, the need for a visual artifact to exist after the conversation, either for reference or as a presentation vehicle for the ideas discussed during the conversation, was rarely specified as a motivation for the creation of the drawing during the interaction.

Based on these narratives, the following parameters were delineated to capture the range of topic characteristics evident in these narratives:

1. Level of abstraction (high to low)

2. Amount of expected familiarity with the concept (both participants having similar familiarity, or participants having disparate levels of familiarity)
3. Degree to which a topic or idea is transformed, refined, developed or changed during the course of a conversation (constructed to static)

Like the strategies presented in Chapter 3, these topic characteristics are not necessarily mutually exclusive. A set of thirty question prompts was generated to represent a range of these characteristics. The reasoning behind this approach was that if these open-ended prompts could reflect topic characteristics identified in real-life descriptions of the creation of drawings, there would be a basis for the belief that they could provide opportunity for creation of similar ad hoc visualizations within the context of this protocol. Several examples of these prompts are listed here (see Appendix C for the full list of 30 candidate prompts):

- Why is the sky blue?
- What is the most stable way to build a set of shelves?
- What determines weather patterns around the globe?
- How does the theory that dinosaurs descended from birds work?
- How does the defragmentation of a hard drive work?
- How do the various parts of the US government work together?
- Describe a place that you've visited in a dream.
- How does a car engine turn the wheels on a car?
- If you could live in any kind of house, what would it be like?
- How are cougars different from jaguars?

The next stage of developing the prompts involved evaluating whether these questions had the potential to systematically exclude or dictate the use of drawing. Judgments about anticipated likelihood that drawing could potentially happen in a conversation prompted by each of the questions were collected from several independent evaluators. The goal of this round of evaluation was to weed out those prompts that had an extremely high likelihood of drawing occurring and therefore were overly prescriptive (e.g., questions requiring a map) and those that had an extremely low likelihood of drawing occurring, seen as a waste of time and resources for the purposes of data elicitation (e.g., yes/no questions, questions requiring a list). Of particular interest were the prompts that scored somewhere in the middle: evaluators felt that drawing could conceivably happen, but was not a sure thing. This is where the highest likelihood of variability in communication behaviors was expected to be evident.

Judgments regarding the potential suitability of each of these 30 prompts for providing an opportunity to draw were gathered via an informal online survey (administered using the web-based application Checkbox 4.5), using a questionnaire comprised of Likert-type questions. Participants in this evaluation (N=26) were doctoral students in the School of Information Studies at Syracuse University. Participants were given these instructions: “For each of the following items, indicate the likelihood, in your opinion, that a drawing could be created during a conversation about the given topic.”

Five possible responses were provided (associated numeric score in parentheses):

- Drawing would not happen. (0)
- Drawing would probably not happen. (1)

- Drawing could happen. (2)
- Drawing would probably happen. (3)
- Drawing would certainly happen. (4)

The full results of this informal survey are shown in Appendix C, including mean and standard deviation, in descending order of averaged scores. High scores indicate that evaluators felt there was a greater likelihood that drawing would occur. Lower scores indicate that evaluators felt it would be improbable that drawing would occur during a conversation about the specified topic. These evaluations are reflective of cumulative judgments of twenty-six people.

In general, this evaluation revealed that the majority of the prompts could provide at least some opportunity for image-enabled strategies, while not explicitly requiring them. Prompts that received extremely high and extremely low scores were excluded. Overall, from the initial thirty questions, twenty prompts were judged to be good candidates for the study, as they “could” or “would probably” involve drawing (see Appendix C, average score between 1.92 and 3.05). The distribution of mean scores for these twenty sentences was fairly uniform, so in the interest of creating a representative set of prompts, every other question from the top twenty was moved to a final set to be used in the study, and the remaining ones served as alternates. In this way, a pool of ten prompts was selected to be used in the main study, with an alternate reserve of 10 prompts also being selected, should additional rounds of the protocol be needed. This allowed for a degree of variety in the content of the conversations, while also making it possible to assign the same prompt to multiple pairs, producing a

more diverse dataset for analysis. The resulting list of prompts used for the study is shown in Table 4.2.

Table 4.2. Set of ten conversation prompts to be used in the main study

Prompt	Mean score (N=26)	Standard Deviation
What is the most stable way to build a set of shelves?	3.04	0.720
How far is it from the earth to the sun, in relation to the whole solar system?	2.96	0.958
If you could live in any kind of house, what would it be like?	2.73	1.041
Why are the organs in the human body located where they are?	2.54	0.948
How does a car engine turn the wheels on a car?	2.50	1.030
How do clouds form?	2.31	0.884
Describe a place that you've visited in a dream.	2.27	1.041
How do the various parts of the US government work together?	2.19	0.801
How are cougars different from jaguars?	2.12	0.711
What determines weather patterns around the globe?	1.92	0.977

4.2.3 Data collection

Conversations and exit interviews were recorded using two high quality digital video cameras and audio recorded as a backup. The same setup was used for each session in order to aid analysis by minimizing potentially confounding issues such as variations in setting, quality of recording and camera angles. The cameras were positioned in unobtrusive locations, with one capturing facial expressions and gestures of both participants, as well as including an oblique view of the table surface. The camera angle was intentionally set to be wide enough to also capture activities focused on a white board located behind participants should they decide to make use of this resource. A remote controlled

panning feature on the cameras allowed the cameras to be re-oriented in these cases. The second camera was trained on the tabletop itself, capturing the process of drawing as well as any other movement or interaction with items on the table. Positioning and operation of the video camera were tested and refined during the pilot study (described below), ensuring that the recordings were as consistent as possible across sessions.

The approach to analysis (described in 4.3 *Grounded theory approach to analysis*) required that data be reviewed closely, repeatedly and iteratively. High quality video and audio recordings helped to ensure accuracy of transcriptions and discovery of patterns within the data by making repeated viewing and listening possible (W. J. Gibson & Brown, 2009). This approach yielded a tremendous amount of data. The comprehensive nature of the documentation allowed for flexibility in determining generative approaches for analysis. Specifically, video recording interactions allowed data to be analyzed at both micro and macro levels, enabling the specifics of a particular instance of image-enabled communication to be generalized to broader patterns of practices.

4.2.4 *Proof-of-concept pilot testing*

Prior to the main study, the protocol was tested in a pilot that included three pairs of volunteers. While the primary goal of some pilot studies is to provide data for preliminary analysis, in this case, the goal was to verify the protocol and perform a “proof-of-concept” for the approach in general. The goals of the pilot included:

- Rehearsal of informed consent and briefing of participants
- Refinement and clarification of instructions to participants

- Determination if an additional ice-breaker would be necessary to make participants comfortable enough with each other to engage in natural communication
- Evaluation of the initial set of 10 conversation prompts to confirm that:
 - There was adequate evidence of drawing in at least some of the conversations
 - The environment did not overtly prescribe any one type of conversation mode
 - The questions were relatively easy to understand and respond to
 - The topics fostered a dialogue between participants
- Evaluation and refinement of video and audio recording setup

The pilot was run with six volunteers, all graduate students in the School of Information Studies. Participants had a general familiarity with this research, but were not aware of the specific focus on drawing. According to responses during exit interviews, none of the participants felt that they were specifically encouraged to draw. Additionally, they were able to provide valuable feedback regarding the clarity of briefing and instructions; the extent to which the setting and interactions felt natural and comfortable; and their ability to respond to the questions in collaboration with their assigned partner.

According to pilot participants, the positioning of table, chairs and video camera was comfortable. All participants became easily engaged in exchanges and they felt that they were able to work with their assigned partner to generate a response. One participant drew attention to a potentially awkward aspect of the assigned activity. The first thing the volunteers were asked to do in

collaboration was to select a question to which they would respond together. This participant felt that this was potentially uncomfortable, as it required him to admit to a stranger that he did not know enough about a topic to discuss it at length. This was not altered for the main study because only one person noted this in the pilot. In fact, the negotiation of question selection served as an informal ice-breaker in many of the recorded conversations.

A few modifications were made, however, based on the feedback gathered during the pilot. The instructions were modified slightly to explicitly welcome participants to use any of the materials provided in order to collaborate with their partner while responding to the question. The pilot confirmed that each conversation took about 10 minutes, leaving time in a one-hour session for an additional exchange. A third question, assigned by the researcher, was added to the protocol. This additional prompt was selected in order to provide contrast to the questions selected by the participants themselves. As a result, the first pair completed two conversations and the second and third pair each completed 3 conversations, for a total of eight recorded exchanges during the pilot.

Additionally, the exit interview, which initially was based on the questions used in the preliminary study, was revised to be more concise and to exploit the fact that both participants in the conversation were present during the interview. With these minor adjustments, the protocol for the main study was very similar to the pilot.

4.3 Grounded theory approach to analysis

In this section, details regarding data preparation and analytic procedures are discussed. The techniques used for transcription of video data were derived from

discourse and conversation analysis (e.g., Have, 2007; Heath, Hindmarsh, & Luff, 2010; Hutchby & Wooffitt, 2008; Ochs, 1979). Analysis of data followed a qualitative, inductive methodology guided by principles of grounded theory (e.g., Charmaz, 1983, 2009; Strauss & Corbin, 1998). The level of analysis is the interaction (Norris, 2004) , and the unit of analysis is the discourse episode or segment (van Dijk, 1981). All of these procedural aspects of analysis are examined next.

Inductive approaches to qualitative analysis follow an additive process where the analytic schema emerges from the dataset itself as the analyst synthesizes, integrates and describes relationships between various concepts discovered within the data. Grounded theory, referred to as a “bottom-up” approach to theory building, is one of the most well-known approaches to inductive analysis (W. J. Gibson & Brown, 2009). Like many inductive approaches to analysis, grounded theory involves “the process of developing theory through analysis, rather than using analysis to test pre-formulated theories” (p. 26). When following a grounded theory approach to analysis, the focus is on allowing coding categories to emerge from the data.

Grounded theory methods result in very rich, essential descriptions and explanations by providing a structured means for weaving together the various observable influences that affect a specific process or event (Corbin & Strauss, 1990, p. 5). As the name implies, the goal is to ground the theory building exercise in empirical evidence (as opposed to statements of logic). Because it advocates responsiveness to the data and is open to iterative refinement of code structures based on direct observations, grounded theory approaches to

qualitative analysis are particularly appropriate in cases where established coding schemas are not available, such as this study of image-enabled discourse.

Grounded analysis involves many close, structured reviews of the evidence, and requires the researcher to follow a careful system for capturing evolving codes as they emerge from the data (Charmaz, 1983; Glaser & Strauss, 1967; Strauss & Corbin, 1998). Grounded theory methodology includes an iterative cycle where data elicitation, collection and analysis occur simultaneously. The researcher becomes sensitized to the nuances of the dataset by repeatedly viewing the material and refining the definitions of descriptive categories. Charmaz stresses that the discovery of these codes is the “fundamental means of developing the analysis” (1983, p. 112). Codes are constructed and added to the schema in direct response to what is observed in the data. This is in contrast to the main task in other types of content analysis, where the primary task of the analyst is to apply existing codes to the data.

As Strauss and Corbin point out (1998), grounded theory refers to a methodological and philosophical position regarding the inductive analysis of data. Since Glaser and Strauss introduced the methodology (1967) there have been some variations in the ways that researchers have executed the analytic techniques associated with grounded theory. This is in large part due to: differing opinions about the interpretation of the original guidelines; differences in researcher interests and objectives; and differences in the circumstances of data elicitation and/or format of data (Charmaz, 2009, p. 127; W. J. Gibson & Brown, 2009, p. 13).

The approach to analysis for this study was guided, influenced and informed by grounded theory methodology as outlined by Charmaz (1983). As a

“second generation” practitioner, she takes a pragmatic approach to the grounded theory process, recognizing the various constraints of conducting research in the real world (Charmaz, 2009). Charmaz’s perspective on grounded theory is flexible, pragmatic and was easily adapted to the circumstances of this study (p. 128). Four principles of grounded theory were adapted from her approach and applied to the analytic procedure described here (1983, pp. 110-111). These principles, and the actions taken to meet their requirements are listed below:

1. Analysis is iterative.

Charmaz provides guidelines for iterative analysis, emphasizing the importance of multiple passes through the data in order to discover emergent themes and concepts. To address this need for iterative discovery, multiple structured analytic passes were made through the videos, annotated transcripts and memos to track and record observations. In grounded theory, theoretical sampling refers to the need researchers might have during this iterative process to sample more data in order to clarify or elaborate an emerging analytic category (Charmaz, 1983, pp. 124-125; Corbin & Strauss, 1990, p. 8). This is not to be confused with participant or population sampling. In grounded theory research, theoretical sampling means continually returning to the data and looking at new cases until conceptual categories stabilize. From this analytic perspective, the basic units of analysis are these emergent “concepts” (Corbin & Strauss, 1990, p. 7), referring to the increasingly abstracted categories to which the data are reduced. As will be described in the next section, theoretical sampling for this study took the form of multiple initial passes through the data in order

to determine the appropriate features of the conversations to include in analytic transcriptions (see 4.3.2 *Transcription and initial analysis*).

2. Analysis is inductive.

As discussed in Chapter 3, the process of building a theory of image-enabled discourse began by inductively examining empirical data followed by a review of discourse literature to conceptually position these initial observations. This is consistent with traditional approaches to grounded theory (W. J. Gibson & Brown, 2009; Glaser & Strauss, 1967; Strauss & Corbin, 1998). The intention of the main study is to refine, augment and supplement that framework, informed by the sociolinguistic concepts related to conversational involvement introduced in that discussion. The main study is an extension of the theory-building exercise described in Chapter 3, not a test or proof of the emerging framework. Elicitation procedures were designed in order to provide rich data appropriate for inductive analysis.

3. Analysis is verified qualitatively, not through statistics.

Qualitative approaches to analysis have a range of criteria for ensuring that researchers maintain analytic integrity. More reductive techniques come with an expectation that researchers will follow standardized statistical methods for measuring inter-coder reliability. Because of the incremental, additive nature of grounded approaches to analysis, these same measures are not appropriate for validating the types of judgments made during this process (Corbin & Strauss, 1990). For the study reported here, evaluation criteria commonly applied to grounded theory research were followed

(Charmaz, 1983; Corbin & Strauss, 1990). These criteria are compatible with standard research practices in sociolinguistics (Johnstone, 2000), the primary reference discipline for this study. Issues regarding evaluation and verification are discussed throughout this chapter and will be summarized at the end of this discussion of research methods (see 4.4 *Evaluation of research methods*).

4. Analysis is a process.

Charmaz explains that “ground theorists aim to develop fresh theoretical interpretations of the data rather than explicitly aim for any final or complete interpretation of it” (1983, p. 111). This study has operationalized this principle through research questions that reflect three stages or steps in the process of better understanding the unique properties of image making at three different analytic levels. First, activities associated with drawing were identified. This required a mid-level analysis of interactions. Next, those activities were contextualized in terms of higher-level discourse management behaviors. And third, both activities and discourse management practices were examined in order to identify unique or salient affordances of image-enabled discourse. Identification of affordances required integrating low-level discourse features with higher level discourse strategies. In this way, both analysis and findings were cumulative and process-oriented.

The remainder of this chapter is devoted to describing in detail the grounded analytic procedures used in this study including the specific steps taken to prepare and analyze the video data. Following this step-by-step

explanation, issues related to verifying the emergent coding structure and evaluation of qualitative techniques will be discussed.

4.3.1 Systematic and iterative reviews of video data

In order to follow Charmaz's approach to grounded theory, it was necessary to establish a clear and logical process for making multiple passes through the data, with the goal of identifying patterns of communication practices involving drawing. Noise in the data is minimized by systematically categorizing and summarizing input, using codes to “pull together and categorize a series of otherwise discrete events, statements, and observations which they identify in the data” (Charmaz, 1983, p. 112).

Charmaz outlines two distinct phases in the analytic process: initial coding and focused coding. During the first structured pass through the data, the researcher looks for specific behaviors or interactions that can be defined and discovered in the data. Charmaz refers to this as “initial searching.” Another name for this process is “open coding” (Corbin & Strauss, 1990, p. 12). The data are analyzed line-by-line (in the case of textual data) and the researcher is encouraged to think about it from a number of different perspectives. Descriptive labels are applied to the data.

During focused coding, a limited set of descriptive codes that were identified during the initial phase is applied to a larger portion of the data corpus. This process, also referred to as “axial coding” (Corbin & Strauss, 1990, p. 13), is selective, because the researcher has used his or her judgment to choose categories of codes that are particularly interesting, relevant or persistent.

Charmaz states that the goal of focused coding is to “build and clarify a category by examining all the data it covers and variations from it” (1983, p. 117). Categories may shift, combine or break apart during this process. Properties from each category are delineated. It is at this point in the grounded approach that previous research is consulted in order to clarify or expand these code categories. The researcher may also gain insight from this literature regarding alternate ways to look at the data in order to learn more about specific phenomenon.

The third essential component of the grounded theory approach is the memos created by the researcher throughout the analytic process. As noted, by design, categories and perspectives can shift as a result of each pass through the data. Memos are used to capture the researcher’s thought process in progress. They are used to document analytic decisions and interpretations and to help the researcher reconstruct the decision-making process when it comes time to publish the research.

Video recordings are the principal data for this study. Video is highly conducive to grounded analysis because it allows the same data source to be reviewed from a number of different analytic positions (W. J. Gibson & Brown, 2009; Heath, et al., 2010, p. 62). Heath, Hindmarsh and Luff specifically point out that video can enable researchers to return to the data as a study develops in order to find variations or examples of certain phenomena (p. 62). In this way, the nature of video data supports one of the basic tenets of grounded theory philosophy: the iterative process of analysis and theoretical sampling. Liebenberger et al. (In press) have highlighted the ways that video and other visually oriented data can be used in conjunction with grounded theory.

Heath et al. (2010, pp. 62-66) recommend an analytic process for working with video that is strikingly similar to the one advocated by Charmaz:

1. A **preliminary review** of video allows the researcher to catalogue the data corpus, creating no more than a simple description and classification of what is observed. This phase can result in a list, table or chart that identifies the lead actors, topic, activity or process evident at specific times in the video.
2. The **substantive review** allows the researcher to identify specific fragments or episodes that will enable comparisons to be made and that will contribute to delineation of specific categories of interactions.
3. **Analytic search** of the data corpus will occur continually throughout the systematic review and description of the corpus. It involves gathering candidate instances of particular phenomenon, actions or processes of interest.

The *preliminary review* described by Heath et al. is analogous to Charmaz's *initial coding* phase (1983, p. 113), where researchers are looking for what they can define and discover in the data. *Substantive review* is similar in form and intention to *focused coding* (p. 116), involving selectively and conceptually organizing the data. Lastly, *analytic search* maps cleanly to the *memo writing* practice common to virtually all approaches to grounded theory, with both types of review focusing on documenting the analytic process and capturing exemplars to explain and illustrate categories and codes. The next section describes how these three phases were operationalized through the creation of detailed transcripts and iterative review of the video-based corpus.

4.3.2 *Transcription and initial analysis*

Although there are seemingly great benefits to working directly with recorded performance data (as opposed to field notes), linguistic anthropologist Ochs points out “the problems of selective observation are not eliminated with the use of recording equipment. They are simply delayed until the moment when the researcher sits down to transcribe the material from the audio- or video-tape” (1979, p. 44). Throughout these analytic processes, reliance on textual description and labeling is essential. Even with video data, text-based transcriptions play a vital role in the analytic process (W. J. Gibson & Brown, 2009, p. 173; Heath, et al., 2010, p. 67).

Ochs stresses that transcription is “a selective process reflecting theoretical goals and definitions” (1979, p. 44). The naming and delineation of both verbal and non-verbal actions during transcription involves a non-trivial amount of analysis and interpretation. For this reason, the initial transcription of video clips can be seen as a first analytic review of the data, allowing the researcher to make general observations about what will be most important to future analysis, as well as to begin to develop systematic naming conventions for categories of activity and actions.

For this study, the initial phase of analysis (“initial coding” to use Charmaz’s term, or “preliminary review” to use the term of Heath et al.) included making two sets of detailed transcriptions for each of the 15 conversation in the dataset: verbatim transcripts and narrative transcripts.

4.3.2.1 Verbatim transcripts

Verbatim transcripts documented spoken words as well as paralinguistic features. Following Have (2007), a slightly simplified version of the Jeffersonian notation commonly used for Conversation Analysis (CA) was followed to annotate these word-for-word transcripts (see Appendix D for complete list of Jeffersonian notations adapted for this study). Features captured in this first phase of transcription process included: spoken words, relative volume and emphasis, nonverbal utterance such as “uhm,” silences and overlapping speech. The verbatim transcripts were structured based on conversation turn, a typical format for CA (see, e.g., Have, 2007; Hutchby & Wooffitt, 2008). Timestamps were placed at the beginning of each spoken turn. A short analytic memo was included with each verbatim transcription, highlighting communicative behaviors or interactions of potential interest, clarifications of the annotation process, and questions for further investigation during later passes through the data. An example of the verbatim transcripts is provided in Appendix E.

4.3.2.2 Narrative transcripts

The second phase of transcription included the creation of a narrative record for each conversation, capturing the “story” of the conversation. As Norris points out, “Primacy of the mode of language—just like any other mode—may fluctuate at any given moment in any given interaction” (Norris, 2004, p. 17). Especially because the phenomenon of interest was a non-verbal communication behavior, it was important to balance the tendency in transcription to privilege the verbal over other modes of communication. Verbatim transcripts, by nature, can give undue weight to spoken communication, relegating non-verbal communication

behaviors to brief and possibly cryptic notations. It became clear that focusing on the verbal aspects of the interactions in the verbatim transcripts obscured many non-verbal or paralinguistic aspects of the interactions including those related to the creation and use of drawing.

The narrative transcription process directly addressed the two issues that surfaced during initial handling of the data. First, it allowed observations to be made directly from the multimodal data in a more integrated way, reducing potential bias privileging verbal components of interactions. Second, it allowed the researcher to make a higher-level pass through the data at this initial stage, bringing to the surface patterns and themes by providing a view of the data across multiple instances and episodes. Capturing the story of the interaction resulted in a more dimensional, situated picture of the conversation.

The narrative transcription was inspired by techniques used in video editing procedures where the producer looks at raw video footage and makes a time-stamped listing of interesting passages for use in the final edited film. Narrative transcription focused on creating prose descriptions of communicative events (as well as “non-events” such as long periods of silence) occurring during the conversation, looking across all modes of conversation.

The narrative transcripts were structured according to discrete units of analysis referred to as *episodes* (van Dijk, 1981) or *discourse segments* (Nakatani, Grosz, Ahn, & Hirschberg, 1995). These are passages of text that are “coherent sequences of sentences... linguistically marked for beginning and/or end, and further defined in terms of some kind of ‘thematic unity’...” (van Dijk, 1981, p. 177). A segment (or episode) is a “coherent chunk of phrases” combined in different ways based on the “purpose” of the speaker (Nakatani, et al., 1995, p.

1). This has been referred to as a “meso-level” approach to discourse analysis (van Dijk, 1981), as the segment or episode is more inclusive than the lower level grammatical unit of analysis, but at the same time requires a more granular perspective than would be needed to analyze the entire text as a whole. Segments were marked with timestamps that synchronized annotations in verbatim transcripts of the same conversation. An example of a narrative transcript is included as Appendix F.

4.3.2.3 Analytic memos

The analytic memos begun during the verbatim process were supplemented and, in some cases, corrected during the successive phases of transcription. A comprehensive list of analytic themes was kept at hand throughout the initial phase of examination, and modified as needed. Emergent patterns were compared against the research questions and informed analytic decisions in both the initial and focused phases of grounded theory coding. These initial analytic themes will be discussed in more detail in Chapter 5.

4.3.3 *Non-verbal behaviors*

The initial analytic process also involved supplementing the verbatim transcripts with systematic descriptions of non-verbal behaviors deemed salient and relevant to addressing the research questions. Based on patterns that emerged from both narrative descriptions of the conversations and from memos, a schema was crafted for capturing details of certain types of nonverbal communication behaviors. This schema was also guided by literature on the analysis of gesture and nonverbal behavior, which will be briefly outlined next.

Annotation and analysis of paralinguistic communicative behaviors can include a range of attributes and characteristics associated with the action and position of body parts during social interactions. Generally speaking “action” behaviors (such as hand gestures and head nodding) are supported by “position” behaviors (such as overall posture, trunk or frontal orientation, trunk lean and arm and leg positions) (Harrigan, 2005, p. 150). Harrigan describes three main categories of nonverbal descriptors that cover both action and position behaviors. (p. 137):

- *Proxemics* – referring to the perception and structuring of interpersonal and environment space
- *Kinesics* – referring to the actions and positions of the body, head, and limbs
- *Gaze* – which involves movements and directions of the eyes in visual interaction.

According to Harrigan, the majority of studies that involve the study of *proxemics* focus on the distance between interactants (p. 142). Behaviors associated with proxemics include interpersonal distance, lean, body orientation, and the relationship to a physical plane (Manusov & Patterson, 2006, p. 265). Choices about which spatial variables to include in transcription or coding (and how to describe or measure them) depends on the degree to which proxemics is considered the main focus of the study (Harrigan, 2005, pp. 143-145). Typically, for studies that focus *primarily* on proxemics, details regarding distance, frontal body orientation, touch and gaze are all captured. For those investigations where

proxemics are just one aspect of social interaction being investigated, only distance and, more rarely, orientation, is typically noted.

Kinesics addresses the vast range of body movements and positioning that the human body is anatomically capable of performing. Harrigan highlights three key features of body movement that aid coding (pp. 138-139). First, body parts can be viewed as systems. Humans have a limited number of movable body parts, and they often work in groups. Movements of the legs, arms and trunk are, for the most part, involved in body positioning. Upper arms, forearms, thighs and calves cannot be moved individually. With the exception of shrugging, shoulders, elbows and knees are typically moved in conjunction with an arm or leg. Noting the movement of group of body parts, rather than annotating the position of each individual element, simplifies coding. Harrigan further explains that just two body parts, the head and hands, are most consistently implicated in communication, and therefore they have received the most attention in nonverbal communication research.

Second, the range of anatomically possible movements is narrowed even more by social conventions and norms. Harrigan cites Ekman's work on "display rules" (1973) that guide our behaviors, limiting what we consider appropriate in any given social situation. Variations from these standards are certainly possible but they are considered "diagnostic with respect to mental or emotional stability or level of intellectual functioning" (Harrigan, 2005, p. 138). Once one considers the bodily movements and positioning that may acceptably occur during a social interaction, the task of coding becomes even more bounded.

Third, body movements and positioning rarely occur in isolation. Harrigan et al. point out that they are often displayed together, simultaneously or in

sequence (pp. 138-139), complementing one another. A suite of interrelated movements that flow together and support each other is easier to code than single, unrelated, isolated gestures.

Gaze, the third category of non-verbal behavior described by Harrigan, involves devoting attention to the movement of the eyes during social interactions. Eye contact is considered to be a vital component to intimacy and therefore is particularly important to some aspects of social interaction analysis (Manusov & Patterson, 2006, p. 267). Gaze can be an indication of response or feedback occurring between conversants; can be used to signal turn-taking intentions; or can reveal feelings or attitudes about the nature of the interaction at any given moment (Harrigan, 2005, p. 171). Gaze patterns can also reveal information regarding attention and interests. In recent years, the study of gaze has been conducted in close coordination with larger social constructs such as affiliation, intimacy, conversation, attention and dominance (p. 172).

In spite of these distinct categories, many researchers working in the area of nonverbal communication firmly believe in the integrated study of both verbal and nonverbal communication behaviors (Manusov & Patterson, 2006, p. 9). Notable are researchers such as Goodwin (2000, 2003) and Kendon (2004), who have conducted extensive research analyzing social interaction by examining the relationship between gesture and linguistic expression. Kendon refers to gesture as “the visible bodily action that has a role in [the utterance]” (p. 7). He also describes gesture as “any unit of activity that is treated by those co-present as a communicative ‘move,’ ‘turn’ or ‘contribution’” (p. 7).

In his work on the gesture-based communication practices of a man with aphasia, Goodwin states that gestures “do not stand alone, but instead count as

meaningful action by functioning as components of a distributed process” involving the aphasic man “making use of the language produced by others” (2000, p. 84). This speaks directly to the integrated nature of communication. Goodwin has also shown that gesture can play an important role in communication between fully functional individuals. For instance, his study of embodied participation frameworks looked at teaching-related interactions between a father and daughter working on a homework assignment (Goodwin, 2007). Goodwin showed that the physical positioning of participants influenced expression of conflict and attempts to manipulate the situation in ways that extended beyond their spoken interactions. Goodwin’s work helps to reinforce the analytic position taken in this study: that examining a single dimension or facet of communicative behavior will produce a limited view of what is taking place during social interaction, and observations need to be integrated across modalities (see also Norris, 2004).

Given all the nonverbal variables it would be possible to devote attention to when transcribing nonverbal behaviors, Harrigan et al. are clear in recommending that researchers carefully evaluate the questions guiding their investigation in order to determine the most appropriate suite of body actions and positioning to annotate (2005, p. 148). In applying an annotation scheme, the authors also warn against terminology bias, or the naming of specific behaviors using inferential rather than descriptive words. For example, they warn against describing a leg posture as “open” with a connotation of being receptive or accessible, rather it is more appropriate to describe the positioning of limbs as simply “uncrossed legs” (p. 141).

Following the conventions and recommendations briefly outlined above, notations covering the following areas were added to the verbatim transcripts:

- *Proxemics*: distance between interactants and orientation
- *Kinesics*: head and hand movements
- *Gaze*: direction

Table 4.3 Annotation scheme for non-verbal behaviors. Adapted from Ochs (1979, pp. 63-66)

Behavior	Dimensions	Indicators
Gestures	• Hand, shoulders, head • Degree of articulation (high to low) • Frequency/repetition (habitual to rare) • Mirroring, echoing • Touching • Tilt, nod/shake	• Anticipated or actual mode-shift • Degree of engagement and/or coordination between pair • Tone of interaction (i.e., impatient, involved, exciting, etc.) • Focus of attention for each participant
Overlap	• Overlapping speech • Simultaneous speech and gesture/movement	• Anticipated or actual mode-shift • Degree of engagement and/or coordination between pair • Tone of interaction (i.e., impatient, involved, exciting, etc.)
Gaze	• Position and orientation of head/face • Direction	• Level of comfort of participant • Focus of attention for each participant • Degree of engagement and/or coordination between pair • Tone of interaction (i.e., impatient, involved, exciting, etc.)
Drawing behaviors	• Picking up implement • Picking up or orienting paper • Drawing • Hovering implement over surface of paper • Putting down implement • Using implement to direct attention	• Anticipated or actual mode-shift • Degree of engagement and/or coordination between pair • Focus of attention for each participant
Body position	• Distance • Orientation • Trunk, arms/hands, head/face • Mirroring and echoing	• Focus of attention for each participant • Degree of engagement and/or coordination between pair • Level of comfort of participant • Tone of interaction (i.e., impatient, excited)

The rationale for deciding which nonverbal behaviors to include was grounded in the research questions and responded to relevant analytic themes

that were beginning to surface during these early phases of analysis (e.g., coordination, orientation and attention in relation to drawing). Again, these themes will be discussed more in Chapter 5, however a list of nonverbal behaviors documented during this last round of transcription is provided in Table 4.3.

This scheme evolved and was refined with each pass through the data and the relationship between drawing behaviors and various nonverbal behaviors with respect to social interaction and communication was identified. Because of the standardized configuration of table and chairs, many dimensions of proxemics were stable and consistent across all conversations. Also, descriptions of movement and gesture focused almost solely on upper body since participants were seated at a table (the few exceptions to this were noted in the transcripts). Action and position behaviors specifically related to drawing were also noted.

Attention was also devoted to documenting overlapping expressions (such as when two people speak at once or when someone draws at the same time as speaking) because 1) speech overlap does not require a modal shift but other types of overlap do; 2) this is another indication of coordination and engagement; and 3) it was an indicator of the general tone of the interaction (i.e., hurried, impatient, involved, etc.). Likewise, targeted, articulated hand gestures seemed to have some correspondence to instances of drawing and therefore special attention was devoted to documenting hand and arm gestures. The completion of this third round of transcription corresponded with the end of the initial coding phase (see Appendix G for example of transcript annotated with non-verbal behaviors).

4.3.4 *Focused coding and analytic search*

The result of the first phase of analysis was a set of annotated transcripts and analytic memos for each of the 15 conversations. The next stage of analysis involved focused examination of the data (Charmaz, 1983, p. 116). During this phase, a subset of themes that were identified during initial analysis was systematically applied to the data. Each category was defined, its characteristics delineated and the conditions under which it was observable were demonstrated. Charmaz highlights the importance of building and clarifying categories by examining specific instances in the data, during this phase, including those that appear to be exemplars as well as those that appear to be variations.

Initial coding yielded a number of possible directions for further analysis, many related to coordination and negotiation. Returning to the research questions was an important step in controlling the scope of the focused coding process. The first research question asks: What are people doing, communicatively speaking, when they are drawing? To address this question, the first phase of focused coding involved identifying categories that corresponded to communicative activities taking place when people create drawings during face-to-face conversations.

Targeted review of discourse segments involving drawing resulted in a working list of communicative activities associated with the act of mark making. A refined list was vetted through a series of data sessions during which three peer reviewers (two volunteers familiar with qualitative analysis plus the researcher) reviewed each episode of drawing and confirmed, revised or

corrected the activity category assigned. In cases where researchers held dissenting opinions, arguments were offered until consensus was reached. The process was repeated three times, until the number of adjustments to the categories, their definitions and their assignment to specific episodes was minimal and all three researchers were satisfied with the schema. Once these categories stabilized, the relative frequency of certain activities was compared and associations were identified between activities and conversation topics. As stated previously, the focus of the current discussion is on procedural aspects of the analysis. Detailed discussion of these communicative activities and the results of these analyses can be found in the next chapter (see 5.2.1 *Image-enabled communicative activities*).

The next phase of focused coding involved contextualizing these drawing-centric activities within a larger communicative structure in order to answer the second research question: How do these activities relate to the overall conversation? All fifteen conversations were reviewed to determine what conversational elements were common to all the interactions in the dataset. The standardized conversation prompt format for the interactions provided a basic starting point, with all sets of participants spending time getting acquainted, selecting a question for discussion, addressing the topic, and then coming to agreement about whether they had arrived at an adequate response.

Concepts related to conversational involvement discussed in Chapter 3 (such as framing, footing and stance) informed the development of a descriptive annotation schema. A pattern of five basic aspects of conversation appeared in every conversation in the dataset (these will be discussed in more detail in the next chapter):

1. Statement of the **topic**, or domain, of the exchange– This most commonly took the form of one of the participants reading the question aloud.
2. **Agreement** to engage by both participants– In most conversations this took an explicit form, with each person stating in some way, at some point, “Yes, I can engage with you on this topic.”
3. Delineation of the **boundaries** of the conversation– This involved the negotiation of what was needed or necessary in order to answer the question.
4. Establishing **stance**– This occurred when a person entered into active engagement in the conversation, either through statements like “I know...” or “I think.”
5. Introduction of a **vector**, or trajectory, for the conversation– For some conversations, the direction of the conversation was set in the very beginning, in others the trajectory was adjusted and altered throughout the discussion.

By identifying a structure common to all the conversations, connections and relationships were revealed between drawing activities and overall communication strategies. Comparisons could be made between conversations where drawing occurred and those where it did not.

The cumulative insight gathered through both initial and focused coding was used to address the last research question: What is it about drawing that is different from other modes of communication? Up until this point, analysis had shown the ways in which drawing is embedded in and integrated with more

general communicative behaviors. This phase of analysis looked across levels and instances to identify attributes and characteristics of drawing most salient to the ways it was being deployed in the conversations. These observations were compared and contrasted to the conversations where drawing did not occur.

Conducting what Heath et al. refer to as analytic search (Heath, et al., 2010, p. 66) and what Charmaz terms “integrating memos” (Charmaz, 1983, p. 123), all of the notes, memos, transcripts and clips accumulated to this point were reviewed in detail to reveal those aspects of the image-enabled interactions that appeared to be unique. During this final phase of analysis, a data session was conducted with a graduate level discourse analysis class. During this session, clips of drawing episodes were presented along side corresponding selections from conversations on the same topic during which drawing *did not* occur.

Following standard sociolinguistic and discourse analytic research methodologies (Johnstone, 2000), this data session was used to consider and discuss alternative interpretations of the social interactions taking place in the clips. A summary of the affordances of image-enabled communication activities compiled during this last phase of analysis is presented in Chapter 7.

Before moving on to a more in-depth discussion of the results and findings generated by this research methodology, a summary of evaluation issues related to the reliability and validity of these data elicitation and analysis techniques is provided in the next section.

4.4 Evaluation of research methods

The methodology for this study used a standardized protocol for elicitation of qualitative data documenting face-to-face conversations involving the creation of

drawings. The protocol included a standardized setting and informal script to guide interactions. The goal of the research design was to create situations where observations of interactions could be made in a reliable and consistent manner while allowing an authentic experience for participants. It was not designed to be a controlled experiment. Variables or themes of interest were not measured, but emerged through qualitative analysis and positioned in relation to a developing theoretical framework. Inductive analysis based on principles of grounded theory was informed by sociolinguistic research methods. The focus of analysis was the use of drawing as an interactive strategy for communication and information sharing, therefore the methodology does not involve analysis of the image artifact.

The next section discusses issues related to the evaluation of these research methods. The specific steps taken to address threats to validity are summarized, beginning with the research design and then focusing on analytic procedures. Specific challenges related to prompting naturalistic interactions within a lab-like setting are highlighted, along with a discussion of appropriate measures for evaluation of grounded theory analytic procedures.

4.4.1 Observation and documentation in a lab-like setting

The drawing-focused study reported here used a lab-like environment in order to provide a stable setting for interactions. By using consistent conversation topics and by capturing data using a stable audio and video setup, the protocol could be administered multiple times, while maintaining adequate reliability of data being collected. Specifically, the approach produced consistent documentation of similarly motivated conversations (prompted by the same

assigned topic) where drawing happened at times and did not happen at other times. This is a benefit of the methodology designed for this study. This approach to data elicitation was followed because, while observations “in the wild” have high internal validity, they can be time consuming and difficult to document with consistency. They also carry with them a distinctive situated tie to the environment, processes and domains in which they are witnessed.

Addressing these issues, a lab setting can provide ecological validity, producing observations that in some ways are more generalizable, while also minimizing expense and optimizing consistency of data collected across multiple instances. In addition, many aspects of the situated context are stabilized and standardized. For example, in their study of complex collaborative tasks, Humphries et al. (2004) discuss the prevalence of longitudinal field studies in most computer supported collaborative work (CSCW) research, pointing out that while ecological validity is often high with these studies, they are generally labor intensive and expensive in comparison to lab-based studies. Therefore, the researchers sought to validate a new laboratory model that would allow them to evaluate individual experiences with collaborative systems by maintaining an ecological experience for participants within the regulated setting of the lab. Humphries et al. showed that “controlled situations in the laboratory under the right conditions do effectively reflect the complex dynamics found in actual collaborative work contexts” (p. 2454).

Dwyer and Suthers (2005) used a similar lab-like setting for their study of written representation as a collaborative tool. The premise of their study was that the tools available in many online collaborative environments do not allow for the same degree of inventiveness and innovation that people in face-to-face

conversations bring to communication resources. To learn more about how people appropriate various materials, they designed a setup that would allow them to observe how people deployed paper-based tools for collaboration under conditions designed to emulate online conditions.

The setup for Dwyer and Suthers' study included a tabletop with hanging partition blocking the view except for the shared surface of the workspace. In effect, this limited the shared visual space of two participants to the tabletop and prevented them from seeing the face, gaze and to some degree body language of their partner. The table was covered with paper, and an array of materials were provided such as tape, rulers, scissors, string, paperclips, sticky labels and various writing instruments. Pairs of participants were asked to choose from a pool of "wicked" problems (real world problems of great complexity or scope, with no one correct answer) to discuss. In spite of a certain amount of variation between pairs, the researchers were able to use data collected from this study to isolate evidence of consistent communicative needs and identify methods for meeting those needs during the course of the collaborative task.

Internal validity of the interactions being observed in the current study was challenged by the presence of video recording equipment (see Gordon, Forthcoming), the artificial setting and the assignment of conversation prompts. These threats were mitigated by 1) encouraging an informal atmosphere in the research environment, 2) minimizing the intrusiveness of recording equipment by using small devices, and 3) pilot testing conversation prompts to ensure that they were interesting and thought-provoking enough to engage participants in a natural exchange. By taking these steps, awareness of the environment diminished as participants became involved in discussing the topic.

Generalizability from these interactions to other “real world” phenomena, also known as the external validity provided by the research design, was addressed through similar mechanisms. The more natural and unselfconscious the participants are, the stronger the claim can be made that these interactions do indeed represent the spontaneous, informal conversations in which we commonly and regularly engage. In addition, because the sample does not target one specific group, such as “visual thinkers,” engineers, or designers, bias caused by specialized or institutionalized skills is minimized. Determining the appropriate size of the sample based on richness of data and curating the topics to be discussed cultivated diversity while maintaining consistency in the data. Both of these actions also enhance the generalizability of the findings.

In this case, unmitigated threats to reliability could have resulted in a lack of consistency in the data collected across conversation sessions. The primary method to address this threat was to standardize the physical and situational context as much as possible so that the variations in communication strategies became the primary focus of analysis (rather than variability across settings or environments). Reduction of contextual noise was accomplished through a consistent and uniform environment for all sessions, use of a set of standardized prompts, and scripted briefing and debriefing of participants.

4.4.2 Analytic procedures

Two perspectives on qualitative analysis of data determined the measures taken to ensure validity and reliability of the analytic procedures followed in this study. First, as stated throughout this document, sociolinguistics and discourse studies are the primary reference disciplines for this research. Standard practices

in those disciplines are established. Second, grounded theory provided the procedural basis for conducting analysis. Embedded in this approach is a system for verifying and validating emergent findings. There are many philosophical and technical similarities between sociolinguistic approaches to data analysis and the grounded theory approach, including similar evaluation criteria. These commonalities served as a baseline for ensuring that analysis was conducted to a standard that would be considered appropriate and acceptable for this methodology.

Johnstone provides a brief summary of the many variations that qualitative analysis can take in sociolinguistic research (Johnstone, 2000). Showing much overlap with discussions of grounded theory, she summarizes commonalities in the evaluation of techniques for qualitative data elicitation and analysis in discourse-oriented research. Those criteria fall under four themes: systematicity and transparency; plausibility; replicability; and evidentiary warrant. Each is described below.

4.4.2.1 Systematicity and transparency

In developing a systematic approach to data analysis, it is necessary to minimize the risk of premature filters and self-fulfilling prophecies. Corbin and Strauss highlight change over time as one of the strongest characteristics of grounded theory, and one of the biggest challenges to evaluating research that follows this approach. They state, “Since phenomena are not conceived of as static but as continually changing in response to evolving conditions, an important component of the method is to build change, through process, into the method” (1990, p. 5). The grounded coding process, as outlined by Charmaz, inherently

involves a degree of simplification and reduction over time, and this consolidation is in fact a primary component of the approach. Corbin and Strauss explain that this systematic reduction of data into abstracted categories provides the generalizability required of all social science research: “The generalizability of a grounded theory is partly achieved through a process of abstraction...The more abstract the concepts, especially the core category, the wider the theory’s applicability” (1990, p. 15).

As highlighted throughout this chapter, in both the discussion of grounded theory methodology and throughout the description of analytic techniques applied to the data, an important aspect of the qualitative work done for this study involved making iterative and structured passes through the data. Notes and memos tracked the evolution of analytic themes and documented decisions made regarding which leads to follow. According to Johnstone, “systematicity in analysis means...making sure you have asked all the questions or examined all the possibilities on your list before deciding that the analysis is complete” (2000, p. 78). Doing so allows the researcher to have a high degree of authority for their claims. It also makes the “research process public so anyone could evaluate it” (p. 91). The methodological details included here document the systematicity with which the data elicitation and analysis were conducted for this study.

4.4.2.2 Plausibility

The goal of data sessions is to expose working analyses to alternate explanations and challenges. In the words of Johnstone, “Because there are no universally agreed on methods for proving things in our field (we can give ourselves credit for realizing that there cannot be), qualitative sociolinguistic researchers cannot

incontrovertibly prove that they are right (or wrong). But we can discover and say things that are plausible, relevant to practical problems, and important for our understanding of how language and society work” (p. 59). Data sessions are one way to establish the integrity, plausibility and soundness of interpretations.

Data sessions are small, informal gatherings where a researcher's data is presented to a small group of colleagues and preliminary findings/observations are presented for discussion. The researcher can explain his/her logic and rationale while the group raises questions, challenges assumptions, and offers alternate explanations. In highly collaborative sessions, “arguing to consensus” is used in order to test and refine working schemas. Once a researcher has developed an initial scheme, a certain portion of the corpus is presented to peer/colleague for coding using this scheme. Any regularities that are observed must be challenged, and instances where regularities are not apparent must be explained (Corbin & Strauss, 1990, p. 10). Any points of disagreement about how a specific episode or interaction is coded are discussed to the point of agreement. The entire corpus is then re-coded according to these revisions to the scheme.

For this study, in addition to regular meetings with committee members to review the progress of analysis, peer review took the form of data sessions occurring at three points: 1) during focused coding, involving collaborating with two colleagues familiar with qualitative analysis for three rounds of review, in order to identify and confirm categories of activities associated with drawing; 2) during analytic searching, with a graduate level class studying discourse analysis, as part of the process of identifying communicative attributes and affordances unique to drawing; and 3) during theory development, in the form of conference presentations to two groups of academic scholars familiar with

discourse research, 17th Annual Language, Interaction and Social Organization (LISO) Conference and the annual meeting of the International Visual Sociology Association (IVSA).

4.4.2.3 Replicability

Johnstone asks, “If someone else were to repeat your study, would he or she come to the same conclusion? Would it even be possible for your study to be replicated?” (p. 67). Given the realities of qualitative research, and the multiple, iterative processes of analysis associated with grounded theory development, replicability in this sense does not imply the same sort of repeatability expected of a lab experiment. Replicability in terms of sociolinguistics refers to the trail that is left by researchers that allow others to follow their chain of logic and decision making.

Johnstone points out that it is rare for sociolinguistics to conduct formal, confirmatory studies to evaluate the work of peers and colleagues, but the frameworks and methodologies of one researcher often greatly inform the work of others. Corbin and Strauss corroborate this, saying that in the social realm it is difficult to create study designs in “which one can recreate all of the original conditions and control all extraneous variables impinging upon the phenomenon under investigations” (Corbin & Strauss, 1990, p. 15).

In this sense, results are tested by applying ideas from one study to another domain or situation. In order for a methodology to be available in this way, the researcher must clearly state assumptions, bias, and other details of decision-making. According to Corbin and Strauss, those evaluating the research must ask: “Given the theoretical perspective of the original researcher and following

the same general rules for data collection and analysis, plus similar conditions, [could] another investigator be able to arrive at the same general scheme?" (p. 15). A systematic, transparent discussion of methods is key to establishing replicability in this way. This was the baseline used for reporting the procedural details in the current chapter. Sufficient details are provided to allow another researcher to duplicate the protocol. Although individual responses would vary if the protocol were run again (either by the original researcher or by someone else), the design of the study has been standardized and documented in such a way as to yield consistent results.

4.4.2.4 Evidentiary warrant

Results from sociolinguistic or discourse analytic research studies often highlight specific examples of the phenomenon of interest and describe those passages or episodes in detail. Often a detailed transcription of that segment of the dialogue is included. Johnstone (2000) borrows the term evidentiary warrant from Erickson (1986) to describe the role these examples play in maintaining the integrity of the research. Erickson suggests that "reviewing the data corpus repeatedly to test the validity of the assertions that were generated, seeking disconfirming evidence as well as confirming evidence" (p. 146) creates evidentiary warrant. The goal of these examples is to illustrate the claims of the researcher and show that each analytic category is clearly distinct and differentiated, and clearly reflects the discrete characteristics being attributed to the category. This is also an important aspect to preparing the research for publication. Evidentiary warrant for this study is provided in the next chapter

with examples throughout the discussion of findings providing rich description of the data that lead to specific conclusions.

4.5 Summary

This discussion of methodology operationalized key concepts from the theoretical framework described in the previous chapter. Details regarding the design and implementation of the study were provided along with justification and explanation of the qualitative perspectives that guided both data elicitation and analysis. The chapter concluded with a summary of evaluation criteria derived from the reference discipline of sociolinguistics and the methodological foundations of grounded theory. Chapter 4 has carefully remained focused on the procedural aspects of the study, leaving specifics of the observations gathered along the way to the discussions of findings and implications that will be the focus of the next chapters.

Chapter 5 Image-enabled communicative activities

The principal goal of this study is to reveal how a contextualized understanding of the circumstances surrounding the creation of image artifacts can inform our methods for engaging with visual information across a range of applications. The methodology described in the previous chapter was designed to reveal 1) how the spontaneous act of drawing a picture contributes to the exchange of information between individuals; 2) the ways in which multimodal communication practices, such as drawing, are deployed within overall communication structures; and 3) the affordances of drawing that enable it to be used in these ways. The description of research methods provided in Chapter 4 concentrated on the procedural details of the techniques used to elicit, collect and analyze data. The primary goal of the next three chapters is to report the outcomes of the elicitation protocol and to describe the themes that emerged as the analytic procedures were implemented.

The observations presented here paint a picture of the many aspects of visually enabled communication that are currently overlooked, taken for granted or only partially interpreted by the prevailing focus on the image artifact. These findings establish an empirically based point of departure for both extending current research and introducing new directions for investigating the role that visualization plays in small group coordination and collaboration.

The study involved 10 participants, paired into five groups, with each group responding to three conversation prompts. This resulted in fifteen video recorded conversations. Drawing spontaneously occurred in seven of these fifteen conversations, providing a rich dataset for qualitative, inductive discourse analysis guided by grounded theory practices. This chapter begins with a description of the dataset that resulted by running the protocol, including a summary of the conversations during which drawing occurred. Some general statements and observations are provided regarding the nature of the conversations. This is followed by a detailed discussion of emergent themes and core analytic concepts, divided into three sections corresponding to the three research questions. Findings will be presented as follows:

- Chapter 5– What communicative **activities** are taking place when people draw during face-to-face conversations?
- Chapter 6– What role do these activities play in managing **conversational involvement** and **coordination**?
- Chapter 7– Which **affordances** of drawing are most salient for image-enabled discourse strategies?

5.1 Overview of outcomes

Each of the five pairs of participants involved in this study responded to three conversation prompts during the course of their elicitation session. Of the fifteen conversations recorded, drawing occurred in seven. Each of the five pairs had a least one conversation where a drawing was created. In four of these seven conversations, both participants made visible, persistent marks during the course of responding to the prompt. Table 5.1 shows details of the questions addressed

by each pair and indicates whether drawing occurred during the ensuing conversations (including notations indicating whether one or both participant drew). The prompts listed in this table are in order of the expected likelihood that drawing would occur in the course of responding to the questions (according to the informal survey discussed in section 4.2.2.2 *Design of conversation prompts*).

Table 5.1. Outcomes

◆ = drawing by 1 ❖ = drawing by both □ = no drawing - = prompt not selected	Participant pairs				
	1	2	3	4	5
What is the most stable way to build a set of shelves?	❖	-	□	-	-
How far is it from the earth to the sun, in relation to the whole solar system?	-	❖	◆	-	◆
If you could live in any kind of house, what would it be like?	□	-	-	◆	❖
Why are the organs in the human body located where they are?	□	-	-	❖	-
How do clouds form?	-	□	-	□	-
Describe a place that you've visited in a dream.	-	□	-	-	-
How are cougars different from jaguars?	-	-	□	-	-
What determines weather patterns around the globe?	-	-	-	-	□

The total number of instances (or episodes) of drawing in each conversation is reported in Table 5.2. Episodes were defined in Chapter 4 as passages of text that are coherent and reflect thematic unity based on the purpose of the speaker (Nakatani, et al., 1995, p. 1; van Dijk, 1981, p. 177). As discussed previously, communicative episodes can be nested and overlapping. The term instance is

used to refer to passages within the conversations where drawing occurs in order to differentiate between these discrete moments in the conversation and other units of discourse evident in the exchanges.

Table 5.2. Total number of drawing episodes or instances per conversation

Pair /Conversation ID	Topic	Number of drawing episodes
1_3	Bookshelves	6
2_3	Solar system	6
3_1	Solar system	2
4_2	Dream house	2
4_3	Human organs	5
5_1	Solar system	2
5_2	Dream house	3
		Total: 26

The first notable observation about these results is that the expectations set by the vetting survey proved to be relatively accurate. Drawing occurred more frequently during conversations addressing prompts at the top of the list (those with higher expectations of the occurrence of drawing) in Table 5.1. This chart fails to show the variability, however, that existed across the conversations, especially in terms of the different ways that drawing was deployed in the course of responding to the very same question. As an example, drawing occurred during all three of the conversations that focused on the third question listed above, “How far is it from the earth to the sun, in relation to the whole solar system?” While there are interesting similarities across the three conversations,

mark making was deployed at different times and in different contexts within each conversation. The following excerpts demonstrate the qualitative differences in these three conversations.

5.1.1 *Adam and Gloria*

When Adam and Gloria¹ selected this topic, they began by sharing with each other what they knew (and did not know) about the elements of the solar system and the relative distance between planets. As they each tried to recall measurements, Gloria wondered if “Maybe we can do that in math” while spreading her hands wide, indicating that this was just a suggestion. Adam responded with, “We can work out relatively, ‘cause that’s some serious math unless you’re good at that, I don’t know how to figure that out...” After trying (and failing) to calculate the relative distance based on the speed of light, both Gloria and Adam are momentarily stymied. Adam returns to the question, reads it aloud softly, then reaches for a piece of paper stating, “Alright, we got paper. Let’s work something out here...We can be creative, too, right? Yeah.” At this point, Adam begins to draw a series of circles on the page, counting out nine planets.

Gloria responds to his actions with periodic nods and quiet statements of affirmation. Both have their gaze turned down to the tabletop. This initial drawing episode closes with Adam stating, “We could do this. We could do earth is *that* distance.” Both Adam and Gloria laugh at the idea that their answer would simply be pointing at “that distance” (although this could have been a very reasonable response to the question). Their conversation continues with

¹ All names have been changed to protect privacy of participants.

them returning to their attempts at calculations, trying to incorporate into the drawing the few half remembered measurements that they collectively came up with. As they wrap up their conversation, Gloria asks, “Does it count?” and Adam responds by lifting the paper to the camera, asking, “Do you see right there?” as he reads off their calculated distance in kilometers.

5.1.2 *Henry and Mary*

In contrast, Henry and Mary discuss which question to select, focusing on two key factors: whether either of them know anything about the topic and what format an appropriate response would need to take. With regards to the solar system question, Henry offers the idea of astronomical units and Mary states, “Well, we could go with that [pointing to the solar system question] because, I could have any, auhm, well I certainly don’t know the science behind it but I could describe it. We could do a nice descriptive...” Henry shows his agreement by clearing off the table top in front of them, a gesture indicating that he is ready to address the question. Just as Mary reaches for a piece of paper, wondering if they should “jot it down,” Henry turns in his chair to face the large white board mounted on the wall behind where they are sitting. He makes the unequivocal statement that “I really like white boards [turns back to Mary]. I am a huge white board person.” Mary gestures to the white board, inviting him to go ahead.

As he stands and locates a dry erase marker, she suggests that they start with something “specific” like the astronomical unit. Henry writes a verbal statement on the board, capturing the definition of an astronomical unit (AU). As Henry says, “And then we can probably draw a diagram...,” his back is turned to Mary. He draws a series of circles on the white board, verbally identifying

each planet as he draws it, then draws and labels a bracket indicating one AU. They debate about how best to depict the idea of “in relation to the whole solar system” with Mary challenging Henry with, “But if it were just how far, if we just needed to answer this question [tapping her finger on the piece of paper on which the question is printed], you’ve, based on your drawing, and in relation to the whole solar system which essentially is the whole white board.” She continues to verbally walk through the drawing, describing the ways in which the notion of relativity could be described based on what Henry has drawn. She makes a distinction between “logical sense” and “scientific sense,” contrasting that to the way one would explain the answer to a kindergartener.

At the end of a series of statements by Mary about the various ways the drawing could answer the question, Henry responds with “Yeah, but I think we have to come up with a better answer, though. Do you want to dig deeper?” Like Adam and Gloria, they express a belief that the drawing is not an adequate response. In the end, Henry and Mary are both satisfied when they construct a sentence that verbally describes the relationships that Henry has depicted in his diagram. Finally Henry states, “I think we answered the question.”

5.1.3 *Gavin and Walter*

In the third example, Gavin and Walter also selected the solar system question and gave some thought to what format an appropriate response would take and whether they could generate an appropriate answer. Walter proposes that they could come up with a “ranking,” and Gavin suggests that they respond with “a brief little overview.” Walter begins with the statement, “We believe the earth is the third planet closest to the sun,” while looking at Gavin. After this bold start,

they both falter when it comes to how many planets are in the solar system (somewhat understandable considering the recent demotion of Pluto.) Both gaze at the table top, prolonging the discussion of Pluto by a few seconds. Finally, Gavin, asks, “Do we know the order? Are we allowed to write?” The researcher indicates that writing is fine, and Gavin reaches for paper and pencil, orienting the paper directly in front of him as he begins to draw a series of circles.

Gavin struggles to label the planets in order, with Walter offering some tentative suggestions. Gavin makes some judgment calls independent of Walter’s input, making best guesses at some of the planet names and skipping over others, saying “...we’ll just put them off to the side.” As Gavin exhausts his knowledge of the order of the planets, Walter asks, “Can we name the three we’re missing?” as he points to three unlabeled circles that Gavin has drawn on the paper. He repeats, “Can we name those three we’re missing right now? And we, kinda put them in those three blanks?” After a pause of a few seconds, Gavin replies with, “Huh, we got a pretty good sketch right here.” The paper is still oriented directly in front of Gavin. Walter voices agreement, in spite of the fact that he just explicitly asked for more details. It is important to note that this pair gave the impression of camaraderie and comfort with each other. They laughed and made eye contact throughout their three conversations. The lack of coordination that is evident in the exchange described here did not appear to hinder their ability to interact with each other and their report was quite cordial.

In the end, Gavin announces their response by saying, “How far is the distance... So it’s about half way in between, out of this whole thing,” as he draws a long line along the left side of the paper, spanning the distance where he has drawn the circles. While each of the three groups use their drawing in

coordination with an indexical statement (i.e., “this,” “that”) to state a response to the question, Gavin and Walter are unique in that they are satisfied enough with this drawing-indexical response to immediately conclude the conversation once they have visually represented the relevant relationship.

5.1.4 *General observations*

Each of these three conversations shares certain similarities (e.g., the topic and the need for negotiation between strangers). They differ, however, in the strategies deployed by members of each pair in response to the prompt and in response to each other. Drawing is strategically put into play throughout the interactions in different ways. Mark making is deployed in the first instance as a “Plan B” when the first attempt at calculating a response fails. In the second conversation, drawing is used as a means to get more specific, focusing the conversation and delineating the boundaries for a response. And the third pair use drawing to maneuver in a kind of playing field or sandbox, allowing one participant to spill out what he knows about the topic in a non-linear way, identifying the gaps in his knowledge. His partner responds by attempting to fill in gaps, and both use the visualization to determine if they have enough information to formulate a response.

One way to talk about these differences is through the notion of discourse strategies or discourse management. In Chapter 3, a number of concepts related to establishing and maintaining conversational involvement were introduced. Framing is the process of identifying and applying an appropriate set of expectations to a given communicative episode (Goffman, 1974; Tannen, 1993). Footing describes how interpersonal relationships, or ‘alignments,’ are

negotiated (Goffman, 1979; Tannen & Wallat, 1993, p. 60). And stance refers to “taking up a position with respect to the form or the content of one’s utterance” (Jaffe, 2009b, p. 3). Throughout this discussion, interactions will be compared in terms of the implicit and explicit decisions that the participants made regarding discourse maintenance and management related to framing, footing and stance, and the role that the activity of drawing played in that process.

Before moving on to this analytic framework, some general statements and observations can be made about the conversations in the data set. In spite of the staged setting, there is clear evidence that participants were able to establish rapport, were able to address the questions, and as evidenced by laughter and joking, as well as body language such as mirroring, gave the appearance of coordination. While some pairs or individuals were more likely to challenge or interrogate statements made by their partner or even claims they themselves made, there were few expressions of explicit disagreement and no examples of direct confrontation.

Most conversation pairs displayed identifiable patterns of nonverbal communication behaviors, such as frequency and type of gesture, shifts in gaze, body position, echoing and mirroring. Many of these patterns were established during the first of the three conversations. With each successive conversation, variations from the norm established in the first conversation were observed and noted. None of the pairs made drastic changes to the patterns established during the initial part of their exchange and most variations could be explained as evidence of growing rapport, comfort with the setting and protocol, and engagement with the topic.

Initially, the decision to create a standardized setting for data elicitation was intended to create a realistic experience for participants, while eliminating some of the “noise” that would occur in a natural setting. For example, in a natural setting conversations might involve more than two people, interruptions may occur, and pre-existing relationships might influence interactions to a degree that would be very challenging to account for. Through analysis, it became clear that this standardized setting also had the additional effect of minimizing some differences across conversation features while highlighting or providing opportunities to see others more clearly.

Specifically, there was not a lot of variation in proxemics throughout the conversations. The degree and types of variation that are generally considered noteworthy in studies of body positioning and spacing were, in most cases, absent from the data collected during this study. Chairs were positioned around a table and with the exception of one pair, all of the participants took a seat at the beginning of the session and remained there until the end. Four out of the five pairs faced each other at approximately the same angle throughout the interaction, with the primary variation occurring when one or both leaned in or back from their initial position. Only one participant, in Group 3, stood to use the white board mounted on the wall. His partner remained seated, and he maintained a relatively consistent distance between them as he walked the length of the white board. Their primary variation involved him turning his back to his partner while he was writing or drawing on the white board.

Throughout the next sections, an analytic framework based on the research questions will be presented, including several examples from the data. True to the iterative nature of the grounded theory approach, findings revealed

themselves throughout the analytic process. The study's research questions provided the scaffold needed to weave these findings together into the unified statement presented here describing what is happening when we draw during face-to-face conversations. Multimodal discourse analysis of the fifteen video-recorded conversations highlighted the interconnectedness of modes of communication and revealed that while the form of specific instances of mark making varied, patterns of communicative practices involving image-creation do exist. The remainder of this chapter is devoted to a description and discussion of patterns related to specific image-enabled activities. The following chapter looks at these activities as a means of establishing and maintaining conversational involvement. The last analysis chapter identifies affordances of image-enabled practices.

5.2 Communicative activity and common ground

The first phase of analysis focused on the research question: *What communicative activities are taking place when people draw during face-to-face conversations?* In Chapter 3, a model of image-enabled discourse was introduced which highlighted the need for research focused on communicative activities associated with the creation of visual images within the context of information-driven exchanges between two or more people. This study was designed to contribute to existing visual studies research (and by extension to other fields with a vested interest in visual information and images) by focusing on image-enabled communicative activities, an area study that is currently under-investigated. The first analytic product resulting from this research is a summary of activities associated with drawing. This next section focuses on describing and defining

these activities. Drawing on the connection Clark established between joint activities and the creation of common ground (see 3.5.1 *Common ground and external representations*), a preliminary relationship is then introduced between these image-enabled communication activities and the management of conversational involvement by participants. The nature of these nested and layered interactions is explored further in the next chapter.

5.2.1 *Image-enabled communicative activities*

As explained in Chapter 3, according to Hanks, *communicative activity* refers to the improvised and interactive nature of communication. Communicative activities are “semi-structured processes” (1996, p. 230) encompassing the intentions, habits, and strategies that constitute conversational engagement. Activities reflect an implicit understanding that when we are involved in communication with others we are participating in an interactive, collaborative undertaking. In Chapter 3, framing and footing were discussed as examples of communicative activities centered on managing conversation involvement and alignment.

A summary of the image-enabled communicative activities observed in the recorded conversations is provided in Table 5.3. These categories reflect joint communication activities embodied through the process of mark making. This list includes only those activities associated with the *making of the mark*, and does not reflect analysis of communicative behaviors associated with any of the ways that, once created, the drawing might have been deployed within the conversation. This was a purposeful analytic choice in order to maintain the

focus of the study on the activity of image making. In spite of this focus, the artifact did come into play when examining the affordances of image making practices (see Chapter 7).

These seven activities are a refinement of the five behaviors identified during the preliminary study (see Table 3.1). The current schema improves on that initial set of image-enabled communicative behaviors by 1) being based in direct observation rather than self-report; 2) integrating behaviors described in the preliminary investigation (although they appear under different names in the current schema); and 3) adding additional observed activities that were not evident in the narratives.

Table 5.3. Image-enabled communication activities.

Activities	Frequency across all drawing conversations
<i>Clarifying</i> – Addressing a gap or missing information by providing additional information or details.	6
<i>Inventorying</i> – Consolidating, gathering, listing all that is known. Pooling known information. Create a scaffold for laying out known and unknown elements.	5
<i>Showing</i> – Literally and visually representing a tangible object. (i.e., easier to show it than to say it.)	5
<i>Integrating</i> – Merging existing ideas.	3
<i>Connecting</i> – Explicitly and tangibly showing conceptual relationships. Show connections that have been synthesized. Not literal, physical connections.	3
<i>Translating/Transforming</i> – Changing the form or format of a message, often for the purpose of verification.	3
<i>Hijacking</i> – Seizing control of conversation. An attempt to independently determine the focus of the discussion.	1
TOTAL	26

Evidence of these activities confirms that the deployment of image making during face-to-face conversations occurs for a variety of reasons and at different stages of the communicative process. In some cases, as discussed later in this chapter, activities were nested in each other and at times spanned across higher-level discourse structures. This evidence also shows that while these activities are not unique to visual modes of communication, the embodiment of these activities through the creation of a drawing is unconventional in the sense that it reflects a deviation from basic conversation principles.

Each of these activities is now described in more detail. The following chapter will talk about the specific ways in which these drawing-enabled communicative activities are implicated in the management of conversational involvement, such as the creation or maintenance of frames of reference.

5.2.1.1 Clarifying

Participants used mark making to *clarify* their ideas by providing new, supplemental or additional information in a visual form. This was the most frequently observed drawing activity in the conversations in this study. Drawing was used to address gaps in knowledge as participants worked together to frame a response to question prompts. As Norris explains, a mode is a system of representation, and multiple modes can be deployed during communication episodes. Modes can be interdependent on each other in many different ways (2004, p. 51). In the cases where drawing is used in the process of clarifying, the mode of visual presentation is used to provide *new* or *additional* information. This activity is different from verifying which involves repetition or redundancy.

Clarifying, as used here, refers to providing additional information in order to make use of an emerging concept or representation.

When Min-Cha and Nadine were talking about why the organs in the human body were located where they are, they began by gesturing to their own bodies when referring to specific organs. They mirrored each other as they pointed to their own torsos as they discussed the position of the heart within the chest cavity. However, when it came to the specific location of other internal organs like the lungs, intestines, and pancreas, drawing came into play. First, Min-Cha drew a picture of the intestines, asking Nadine to confirm the name of the organ. Then Nadine drew a depiction of how the organs in the torso relate to each other. The clarifying activity occurred when Min-Cha asked, “This is the heart?” to which Nadine responded by saying, “That was supposed to be the heart and *those* are the lungs,” as she added details to her drawing. She continued by adding ribs to her drawing, explaining that they are there “to protect the heart and other organs” (4_3, 30:05).

This activity was not represented in the preliminary list of behaviors associated with mark making. Direct observation of interactions allowed the process by which conversational involvement is negotiated to be broken down into discrete activities. The narratives collected during the preliminary study tended to focus on overall intentions or outcomes in a way that glossed over the more incremental processes used by individuals in conversation to arrive at coordinated points of alignment. Therefore, in looking back at the list of behaviors identified in the narrative accounts of exchanges involving drawing, both consensus building and synchronizing probably involved some level of clarification. The self-reported details of those conversations did not bring to the

surface that aspect of image making, however, focusing instead on the achievement of the coordination, rather than the means used to get there. Direct observation provided a more nuanced view of how that coordination and involvement is created. This is discussed further in Chapter 6.

5.2.1.2 Inventorying

Inventorying is the activity most closely associated with the use of drawing to consolidate, gather or list what is known about a topic. Mark making allowed participants to create a visible, tangible scaffold for laying out what was known, and to identify where specific gaps in collective knowledge or experience remained. The ability to create a tangible, visible representation of their shared frame of reference is an example of the activity of image making being used to establish conversational involvement and coordination.

Inventorying occurred in discussions of the solar system, human organs and dream houses. In all these cases, the conceptual or physical components of a system were laid out on the page (or whiteboard) so that both participants could see and discuss. While not as inherently collaborative as the activity of integrating, inventorying was often deployed as a means to establish common ground for continued conversational involvement. In recounting conversations that involved drawing, participants in the preliminary study did not discuss this drawing-related behavior. This may be due to the close association between the activity of inventorying what is known and the more mundane tasks of managing discourse on a basic level. In other words, it might not have been considered “significant” behavior when compared with describing other conversation features. Regardless of why it did not appear in the narratives, the

direct observation of conversations in the main study provided opportunity to identify this as one of the more frequent types of image-enabled communicative activities in the dataset.

5.2.1.3 Showing

Showing was another frequently occurring activity in the dataset. This referred to situations where drawing was used to convey literal and visual information about a physical form. This activity was most clearly seen in instances where one participant was showing another what shelves look like or where the organs in the human body are located. Showing through drawing also occurred when participants described the physical features of a dream house. A similar behavior was identified in the preliminary narratives, where the action of conveying information in a mode as close as possible to its original expression was referred to as *visualizing*. In the current schema, showing is used to describe this activity, capturing the communicative context of the behavior more accurately than the term *visualizing*. Showing implies an interactive dimension and directedness to the activity. Showing also conveys a sense of revealing as a drawing unfolds. While the completed drawing may come into play subsequently during the conversation, the activity of showing as it is used here refers to the initial creation of the image that is a visual depiction of an actual object.

5.2.1.4 Integrating

When Gloria and Adam decided to take on the question, “How far is the earth to the sun in relation to the whole solar system?” they each acknowledged that they only knew a few facts about the solar system. Neither felt that they had enough

information on their own to construct a complete response. They ended up *integrating* their knowledge by drawing a picture of the solar system to which both of them added details and made calculations. By externalizing the bits and pieces of information they each brought to the conversation, the pair was able to merge their ideas and come up with a response with which they were both satisfied.

In many ways this is the most collaborative drawing activity observed in the conversations. It was often deployed in situations where neither participant had a complete idea or adequate domain of knowledge to respond to the question. Drawing enabled a means for pooling information (another type of activity described in the discussion of inventorying), and, importantly, constructing something new from the various parts and pieces contributed by individuals. It has been noted in some of the other examples that when participants were faced with a topic to discuss which neither felt they were really able to answer, particular strategies were used in order to “make something up.” This often involved drawing (and the connection between creative action, invention and mark making is discussed further in Chapter 7.)

In the preliminary study narratives, behaviors associated with building consensus and synchronizing most likely involved some sort of integrating activities (without directly observing the conversations being described, it is difficult to confirm this). Both behaviors required the ability to 1) establish common points of reference, 2) aggregate input from multiple sources, and 3) build isomorphic bridges between knowledge domains. Drawing enabled these things to be accomplished by providing a means for externally representing individual knowledge in order to combine it into a representation of collective

understanding. The activity of integrating through drawing encompasses consensus building and synchronizing, as well as any other behaviors that enable the merging and coordination of ideas to make something new.

5.2.1.5 Connecting

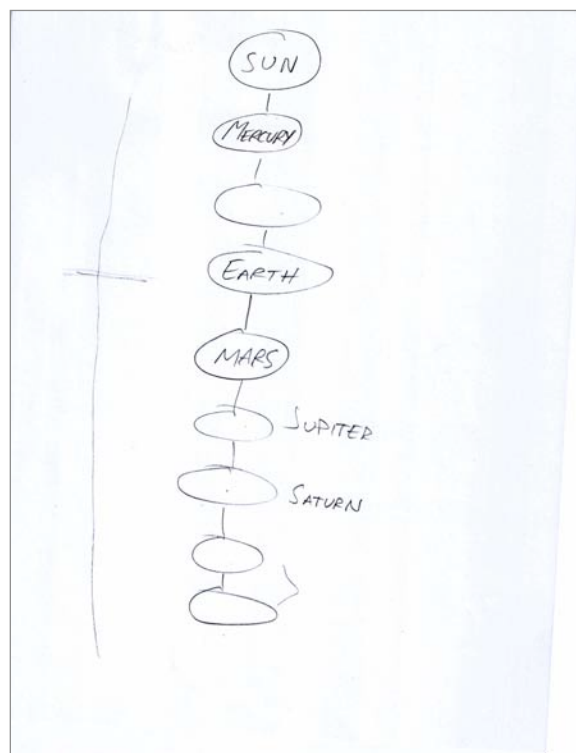
In some cases where drawing was deployed in conversations, an image was created in order to show tangible, physical relationships, such as the joints in a bookshelf or the location of organs within the body (and this is called *showing*, discussed above). There were other cases, however, where the relationships being depicted through drawing were not literal or concrete. In these situations, visual representations were used as a means of *connecting* conceptual relationships. Mark making was used to give form to the synthesis of information occurring as the conversation progresses.

Drawn images represented connections between abstract ideas generated by the conversation. For example, when Gavin and Walter were discussing the question about the distance from the earth to the sun in terms of the whole solar system, they began by trying to piece together the information they had aggregated about the order of the planets (an example of *inventorying*). Walter explicitly states that because the question asks for the distance in relative terms, “maybe we just give a, like a ranking, you know” (5_1, 2:59).

While they were uncertain about the distance from the earth to the sun, they knew that they could at least represent the order of the planets by mapping out the parts of the solar system and indicating a relative measure of the space between the star and the planet. They drew a series of evenly distributed circles, connected by short lines (Fig. 5.1) This was not strictly speaking a physical

representation of the distance, as the planets are in fact positioned at irregular and shifting intervals. In fact, the linear presentation shown in their drawing is far from the actual elliptical structure of the solar system, where each planet is in an oblique orbit, rarely (if ever) aligning in the way shown in the image. When Gavin points to the drawing he has created and says, “So it’s about half way in between, out of this whole thing, you know” (5_1, 5:19) he is pointing to a representation of the space based on an ordering of the planets (a conceptual notion), not the actual physical position of them. With their image, they are able to synthesize a response using a visual depiction of the conceptual distance.

Fig. 5.1. Walter and Gavin’s solar system drawing



The behavior identified in the preliminary study that is closest to the notion of connecting abstract concepts is building consensus. This is most likely a

specialized type of connecting behavior. Both involve using a visual representation in order to make connections between conceptual ideas or frameworks. Consensus has the added connotation of fulfilling some type of normalizing function. In the conversations in the main study, this normalizing aspect was encompassed under the activity of integrating, described above.

5.2.1.6 Translating/transforming

Generally speaking, verbal communication was the primary mode of interaction between individuals in the study, however there were instances where a verbal expression was “repeated” in a visual format through drawing. For example, Henry and Mary knew the concept of an astronomical unit (AU) was somehow related to answering the question about the distance from the earth to the sun in relation to the whole solar system. Mary was not sure what the definition of an AU was, but Henry thought that it was the distance from the earth to the sun. After he shared this information with her verbally, he wrote it on the white board in words. Then, saying “And then we can probably draw a diagram...” (3_1, 4:28), Henry drew a rudimentary diagram of the solar system, adding a bracket and label “One AU” to indicate the distance from the earth to the sun. This activity was identified as *translating/transforming*.

The conversation section or segment that included the activity of translating/transforming involved verifying understanding of a concept. And in fact, the behavior identified in the preliminary study that most closely aligns with this activity is *verifying*. This was the term used to describe situations where the form of a message was changed in order to confirm understanding. Translating and verifying through drawing requires the ability to accurately

transform a representation from one language or mode to another. In the earlier study, in recounting their stories people provided additional information regarding the goal of the drawing (to verify), an aspect of intentionality that was not observable in the main study. Therefore, although similar to verifying in many ways, this image-enabled activity is re-named here as translating / transforming in order to avoid assumptions about intentionality associated with specific actions.

5.2.1.7 Hijacking

Hijacking refers to a situation where a participant unilaterally seizes control of the conversation by using drawing to re-orient the focus of the conversation. When Denise and Mike were talking about how to build the most stable set of shelves, Mike went on a tangent about an unrelated topic. Denise patiently listened to Mike for a few minutes, however she eventually hijacked the conversation and brought it back on topic. She did this by moving her pencil towards the paper on the table in front of her, signaling a physical shift of orientation for both of them. Then she began to draw, enacting a shift of mode. As her drawing took form she said, “I think, you could either, (.) You know, have the, the three boards, you know, do that little shelving frame” (1_3, 30:06). The combination of her words and her drawing introduced a new topic of conversation (reframing the conversation), successfully saving the conversation from Mike’s tangent. Denise’s words and her actions combined to signal that she was attempting to independently set the topic and direction of the conversation.

Returning to the categories of image-enabled behaviors identified during the preliminary study, *persuading* was determined to be closely associated with

hijacking. As with hijacking, persuading required an ability to independently amplify or diminish parts of a representation. Persuading referred to situations in which someone used drawing to re-focus the attention of another to more closely align the conversation to a specific ideal (i.e., “I was trying to get them to understand how it *should* be, so I drew a picture...”). Both hijacking and persuading involve an independent action that is taken by someone in order to manipulate the primary focus of the conversation. In this way, drawing is used to influence levels of awareness and attention related to conversational involvement in both a physical and a conceptual sense (Norris, 2004).

In the stories collected during the preliminary study, participants tended to describe persuading behaviors related to drawing in terms of intentions or goals that related to convincing someone of something. In these cases, the motivation for drawing was described in terms of conveying information in a neutral, non-judgmental or non-accusatory manner. This association was not reflected in the directly observed conversations in this study, but more instances of hijacking would need to be observed in order to expand on this aspect of the interactions. Maintaining an analytic focus on communicative activities (rather than conditions of intentionality) resulted in the behavior described in the narratives to be recontextualized as a type of hijacking activity. In other words, the intention may have been to persuade, but the action took the form of capturing control of the conversation.

5.2.2 *External representation of common ground*

The notion of common ground was first introduced in Chapter 3 and is returned to now in order to open a discussion regarding how the activities described

above contribute to conversational coordination and involvement. According to Clark, the ability to interact through language relies on the presence of *common ground*, which enables consistent coordination through a conversation and accumulates as a result of the joint activities that comprise communication. Clark (1996) explains that common ground manifests in three ways. *Initial common ground* refers to the prior knowledge, beliefs and assumptions that are taken for granted by participants in the joint activity. *Current state* of the joint activity is what participants understand to be true about the present state of the action being undertaken. And *public events so far* refer to the shared communicative events that have taken place in the conversation up until the current moment (p. 43).

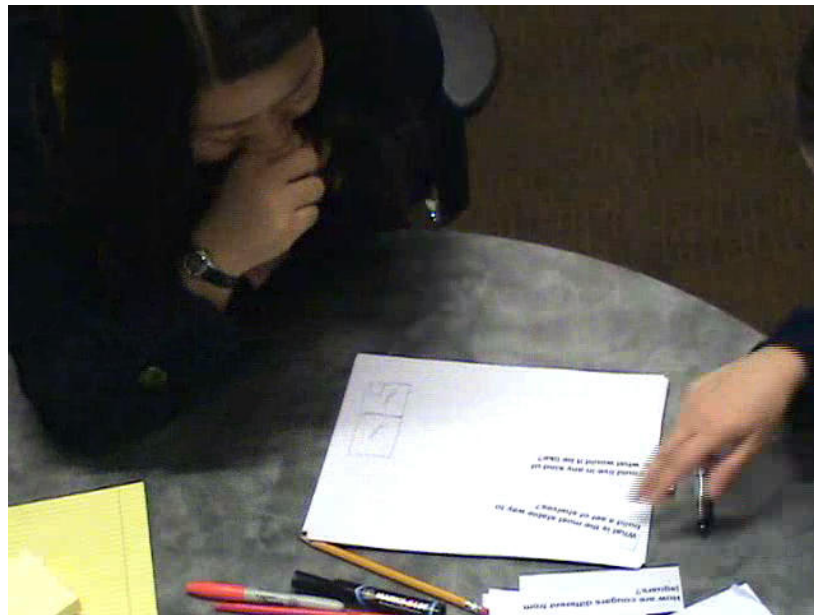
An interactive dimension marks all of the image-enabled communicative activities identified in the previous section, either explicitly (i.e., integrating) or implicitly (i.e., inventorying). They are joint activities, and according to Clark, the accumulation of these joint activities results in the creation of common ground. Drawing is performed within a communicative context, in order to establish, maintain, or alter a connection with a conversational partner. This connection is generally referred to as conversational involvement. Therefore, it can be said that the joint activities embodied through mark making contribute to common ground. What is very interesting about this is that the embodied nature of drawing means that this particular type of joint activity results in a physically manifested expression of common ground. The accumulation of drawing activities, while helping participants engage with each other, also results in the creation of an artifact representing their co-creation of common ground.

As discussed in Chapter 3, Clark pays particular attention to the external representation of current state through embodied, physical form (pp. 46-47). According to Clark, physical environments or configurations can act as tangible representations of common ground, such as cards in card games, altars in churches or witness stands in courtrooms. The location of furniture or objects within these environments can also be used to interpret changes in the current state. For example, chairs might be pushed closer together as an interaction becomes more intimate. Objects can also represent common ground and can be viewed, touched or manipulated to reflect changes in the current state. For example, when a meeting is winding down, people often begin to gather their belongings, reflecting a shared understanding of the current state of the interaction. One of the most important aspects of external representations of common ground is that they are ordinarily accessible to all participants at the same time and in parallel. When an external representation is also persistent, it also has the ability to serve as a record of public events so far.

External representations of common ground were evident across conversations that both involved and did not involve drawing. For example, during each of their three conversations, Min-Cha and Nadine made use of a blank, white paper to frame or "hold" the "objects" of their conversation. The two women arranged the questions that were printed on small slips of paper on the tabletop within the frame of the paper. They removed the questions once a topic was selected, and in two cases returned to the white paper during the course of responding to the question in order to draw (an activity involving creating and maintaining common ground). At one point, they also brought the questions back into the frame of the paper, laying them out again, as they discussed

possibly switching to a different question (Fig. 5.2). The literal and physical “common ground” represented by the blank page provided a focal point for the exchanges, furnishing a stage or platform for both pre-fabricated objects like the questions and ad-hoc created artifacts like their drawings.

Fig. 5.2. Min-Cha and Nadine reconsidering the conversation prompts



Common ground can be conceptualized as both the shared communicative space of a conversation, and as the physical environment or stage on which an interaction takes place (Goodwin, 2007; Murphy, 2005). Goodwin has discussed the components of the *activity framework* (2003), including the material environment and set of physical gestures implicated in an interaction. Clark refers to the shared space of a conversation as the *domain of action* (1996, p. 355) and Hanks calls it the *actional field* in which “the body serves not as the theme of reference and description but as the indexical ground relative to which other things are referred to and described” (1996, p. 254). Throughout the remaining

analytic discussions this notion is referred to as the “communicative stage” for interactions. The next phases of analysis will focus on showing the ways that the participants in the study used drawing to move around within this stage or field of action, both literally and figuratively.

The notion of a communicative stage represented through paper and pen opens a number of unconventional possibilities for managing discourse. For example, when Mike and Denise were talking about the most stable way to build a set of shelves, she used pencil and paper to draw while Mike was talking out his ideas about how to build the most stable set of shelves. Denise periodically glanced up at Mike as he spoke. While Mike was speaking, he gazed out the window and made a series of relatively articulated gestures to show Denise how he envisioned a strong shelf to be constructed. He did not show any indication of being aware that she was not always looking up when he gestured. When he finished explaining his idea, she oriented the paper to be more squarely in front of him and showed her idea, verbally describing as she pointed to the drawing.

Denise showed signs that she was listening to Mike as he was speaking, and Mike did not exhibit any outward evidence that he felt slighted by her lack of attention. It was clear based on her actions after he completed his thought that her attention had been primarily on her drawing, however, and that as he was talking, she was thinking about her own idea of the best way to build a set of shelves. The paper on which the drawing took place started out as a private or personal space for Denise to develop her ideas. This allowed her to break from the conventions of the conversational exchange while still maintaining conversational engagement and not alienating her partner.

By externalizing her thought process and making it material, she embodied a shift in the direction and structure of the exchange. If this communicative activity had taken place solely through a verbal exchange, with Denise muttering to herself as Mike explained his idea, there would have been much more potential for conflict. Drawing enabled Denise to appear moderately polite while she prepared to alter the communicative space or stage of the interaction.

Later, this “private space” became public and shared: it became the external representation of the current state of their shared experience. Interestingly, Mike responded to Denise’s drawing by taking the pencil in hand himself and drawing out the idea he had been trying to explain verbally. The pair proceeded to integrate their ideas, negotiating the best ideas from both, and use the drawing to help create a jointly designed bookshelf.

This is an example of how drawing can be used to circumvent convention and to interact in a way that it would be difficult to do using spoken language or gestures. Again, we can see how the rectangle of paper becomes a physical manifestation, or external representation to use Clark’s term, of a shared actional field that is used to create common ground and maintain conversational involvement. It provides a space for the activities described in this chapter to be performed.

During verbal communication, the boundaries of the communicative stage are often invisible, being established through various discourse strategies. Gesture can be used to delineate boundaries using visible, three-dimensional form, such as when someone waves another into a conversation or holds up a hand to indicate unwillingness to engage with a certain topic. Movement, however, is often momentary and fleeting.

As evidenced by the conversations in this study, one of the values of mark making as a communicative tool is that it can be used to effectively delineate the communicative stage, both conceptually and physically, because it is both stable and tangible while also remaining mutable. Drawing provides a parallel and simultaneous experience of the communicative stage, which in turn translates as a stable external representation of common ground. In this sense, mark making was used to bridge the invisible/intangible, internalized intellectual space of the conversation with the physical, external space of the page. It is an external representation of the current state of the common ground accumulating between the conversational pair. The act of mark making, therefore, can be both an activity of communication and an activity of demarcation.

This discussion has used the notion of common ground and external representation in order to explain the ways in which the activities identified earlier in the chapter make use of the physical and tangible aspects of drawing in order to manage conversational involvement. The drawing activities discussed here directly contribute to the creation of common ground, as well as documenting its existence. As Hanks, Clark and others point out, discrete communicative activities do not exist in isolation and are implicated in higher-level communication structures that are nested, layered and span across individual discourse segments. Conversation participants are able to coordinate and maintain involvement across and through these episodes as a result of discourse management strategies. The next chapter will explore the ways in which these visually embodied activities are embedded in overall communication structures.

Chapter 6 Mark making and conversational involvement

In the previous chapter, the idea of common ground was used to describe how, during conversations, an accumulation of joint activities creates a “shared space” necessary for communication. A series of image-enabled activities was identified and used to show how these activities contribute to the creation of common ground. Specific drawing activities contribute to this process through the discursive functions that they enable (i.e., clarifying, translating, connecting). The analytic concept of *staging* was introduced, referring to the creation of common ground as a process of setting literal and figurative boundaries for an exchange. In some of the conversations, drawing was observed to function as a tangible external representation of this shared space, creating a physical stage or platform for continued negotiation and interaction between participants. In these instances, the activity of drawing explicitly embodied common ground.

The findings presented up to this point also indicate that image-enabled activities reside within other nested and overlapping communicative structures that evolve during a conversation (see Goffman, 1974; Gordon, 2002, 2008). As discussed in Chapter 3, establishing a frame of reference for a conversation enables us to make inferences and effectively interpret what is happening throughout an exchange. These higher-level expectations are used to establish and maintain conversational involvement and coordination over time.

Understanding the relationship between discrete image-enabled activities (like

those identified in Chapter 5) and higher-level discourse strategies like framing, footing and stance-taking requires the ability to describe the context in which mark making occurred within the conversations analyzed. By understanding the ways the situated activity of drawing resides within overarching conversation structures, patterns of use can be identified. Doing so is an important step towards articulating what is distinct about drawing as a communicative practice. This chapter focuses on the second research question: *What role do these activities play in managing conversational involvement and alignment?*

The data elicitation protocol used for this study resulted in a collection of conversations that included drawing and a group that did not. In order to compare approaches to discourse management across these groups, a systematic approach was established for identifying markers associated with different framing behaviors in these conversations. Then, further analysis focused on revealing associations between these more generally observable framing practices and the specific drawing activities highlighted in the previous section.

This multimodal study contributes to our overall understanding of framing in discourse by revealing the ways that frames are altered throughout a conversation through linguistic and paralinguistic means. Tannen and Wallat (1993) and Gordon (2002, 2008) show how framing happens moment-by-moment in interaction and how people shift in and out of different frames as they interact. Their work, however, focuses on linguistic features and structures. This study shows that drawing can be seen as a resource for managing frames and maintaining conversational alignments. This has strong implications for understanding collaboration and the role of multimodal information artifacts in small group communication. The first step of this process involved identifying

communicative structures that were common across all the conversations. This established a baseline for comparing conversation where drawing did occur, with those where it did not.

6.1 Identifying framing behaviors in the data

Observations made during iterative analysis revealed a set of bounding and focusing practices that occurred in virtually *all* of the conversations in the study and were associated with managing the evolution of interactions. As introduced in Chapter 3, framing is a concept from sociolinguistics that refers to the process of identifying and applying an appropriate set of expectations to a given communicative episode (Tannen & Wallat, 1993), enabling a shared point of reference to be established. Discussions of footing shifts (Goffman, 1979) highlight specific types of variations in the frame of reference for a conversation related to either the participation framework (who is an “official” participant) or production format (what the expected form or structure for the conversation will be, such as monologue or dialogue). These concepts will be used to extend the discussion of communicative stages introduced in the previous section.

In the process of defining the problem space suggested by the conversation prompt, each pair of participants set a conceptual stage, or frame of reference, for their conversation. As an exchange unfolded on this stage, different types of communication strategies were deployed in order to maintain conversational involvement and influence the structure of their interactions. A schema was developed to describe specific markers of framing behaviors in the video-recorded conversations. The analytic task during this phase of coding was to determine the mechanisms by which each pair established underlying

expectations for their interaction. While Tannen and others have focused on linguistic markers of framing (see Tannen, 1993), the conversations in this study were examined to isolate both verbal *and* non-verbal behaviors specific to these interactions that contributed to the introduction, maintenance or stepping outside of interpretive framing structures.

As described in Chapter 4's discussion of analytic methodology, a pattern of five basic aspects of framing appeared in every conversation in the dataset:

1. Statement of the **topic**, or domain, of the exchange– This most commonly took the form of one of the participants reading the question aloud.
2. **Agreement** to engage by both participants– In most conversations this took an explicit form, with each person stating in some way, at some point “Yes, I can engage with you on this topic.”
3. Delineation of the **boundaries** of the conversation– This involved the negotiation of what was needed or necessary in order to answer the question.
4. Establishing **stance**– This occurred when a person entered into active engagement in the conversation, most frequently through epistemic declarations such as “I know...” or “I think.”
5. Introduction of a **vector**, or trajectory, for the conversation– For some conversations, the direction of the conversation was set in the very beginning and did not change, while in others the trajectory was adjusted and altered throughout the discussion.

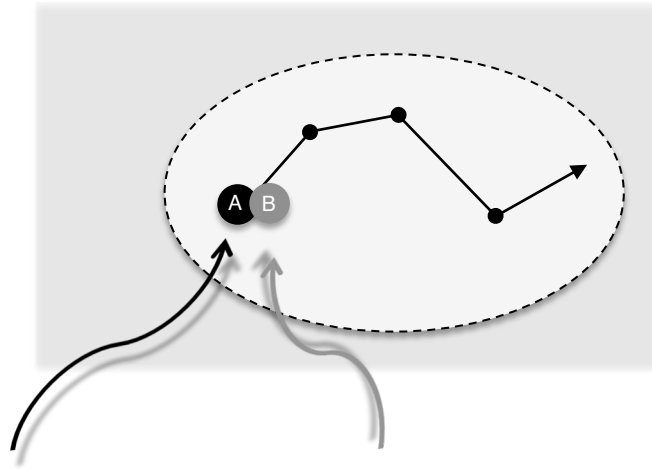
Statements of conversation *topic* were relatively straightforward, most often taking the form of one participant reading the conversation prompt question

aloud. Similarly, explicit *agreement* generally took the form of each of the participants saying something to the effect of, “OK, yes let’s talk about that question.” Drawing activities did not coincide or co-occur with statements of topic or expressions of agreement. In most cases these first two markers appeared in the beginning of the conversation and did not shift or change throughout the exchange. There was one instance where this did not hold true. One pair selected a conversation prompt, began to discuss a response, and then returned to the stack of questions, considering a switch to a different prompt. They discussed a second alternative question briefly, before switching back to the question they had initially selected.

More substantial variations and correlations with drawing activities were observed among the last three markers: establishing (or re-defining) the *boundaries* of the conversation; establishing (or shifting) *stance*; and introducing thematic *vectors* that influenced the direction of the conversation. A graphic (Fig. 6.1) depicts the elements of coordination observed in the data. Although this diagram is static, these elements can become realigned over time. The domain of the conversation is represented by a grey rectangle. The curving arrows represent stance-taking by Participant A and Participant B that results in interactants positioning themselves with respect to each other and the conversational environment. The white oval represents boundaries within the problem domain, negotiated throughout the process of their interactions. The segmented black arrow depicts the path the conversation takes as the interactants engage with each other along specific thematic vectors. Each of these aspects of framing will be described in more detail, in terms of the conversations in the

dataset. This is followed by a discussion of frame management strategies involving image-enabled activities.

Fig. 6.1. Framing dimensions



6.1.1 *Boundaries*

As depicted in Figure 6.1, a conversation happens within a given domain, and demarcation of the boundaries of that domain involves finding and recognizing the edges of the performance space within that domain (the white oval).

Throughout their interactions, participants continually defined and adjusted the limits of their communicative stage by setting parameters for their discussion.

While the topic domain of the conversation (represented by the grey rectangle in Fig. 6.1) was largely determined by the conversation prompt, the questions used to generate discussion could have been addressed from any of a number of possible perspectives. A process of delineating boundaries (the white oval in Fig. 6.1) helped to establish expectations about what would be needed in order to successfully address the question being discussed.

For the conversations in this study, establishing boundaries or limits for interactions included 1) determining the form or format for an acceptable response, 2) deciding what would make an adequate response, and in some cases, 3) declaring a sub-domain within the topic highlighted by the conversation prompt based on the particular knowledge base of the participants. Later, the activity of boundary creation will be contrasted to the process of introducing vectors for the conversation, which involves setting a direction for the interaction to move through the space established by these boundaries.

In establishing boundaries, each pair needed to determine what information was necessary in order to respond to the prompt, and whether the response they formulated contained that information. In reality, these boundaries shifted, expanded and contracted as interactions evolved. Discourse activities associated with manipulating the communicative stage of an exchange included setting new boundaries; altering the initial conversation space by pushing boundary lines outward or contracting them; challenging existing parameters; and reinforcing current territory through repetition.

The boundaries of the conversation tended to be most malleable at the beginning and at the end of the engagement, as participants initially established the parameters for their response and then evaluated whether they had adequately addressed the topic. This was often observed through verbal expression, with statements at the beginning of the conversations such as “I’m thinking it would need to be...” (1_3, 29:19) or “I wonder if we get credit if we just say...” (3_1, 2:44). Boundary negotiation towards the end of the conversation often involved challenges like Mary’s question to Henry, “You think we’ve answered it, don’t you?” (3_2, 7:11) which was followed by a review

of what had been discussed and a debate about whether it adequately responded to the question. Clarifications were also common towards the end of the conversations, such as the questions posed by Nadine towards the end of her conversation with Min-Cha about how clouds form: “But then how does it do the, that one step of making clouds?” followed by “Well, what are clouds, exactly?” (4_1, 7:44).

The process of establishing and negotiating boundaries through physical action was observed across a number of the conversations. For example, when a participant reached for pen and paper during a conversation, he or she often indicated a belief that a suitable response could involve writing or mark making. In fact, most of the pairs explicitly talked about the best format for their response, such as when Adam suggested to Gloria, “We can work it out relatively, ‘cause that’s some serious math unless you’re good at that, I don’t know how to figure that out...” (2_3, 18:25). His statement reflected a desire to discuss the question in relative terms (revealing an expectation that this would be a suitable way to respond), rather than the absolute format of a mathematical expression. Adam also established a boundary related to mathematical computation when he declared, “I don’t know how to figure that out...” In this case, his delineation of a boundary was based on the prior knowledge (or lack of knowledge) he was bringing to the conversation (also a statement of *epistemic stance*, see next section).

While Gloria was more willing to do the calculations, they both shifted the boundaries of the conversation at this point away from numbers to a discussion that allowed them to focus on the location of the planets in relation to each other. This involved making a verbal list, and then drawing a diagram. The

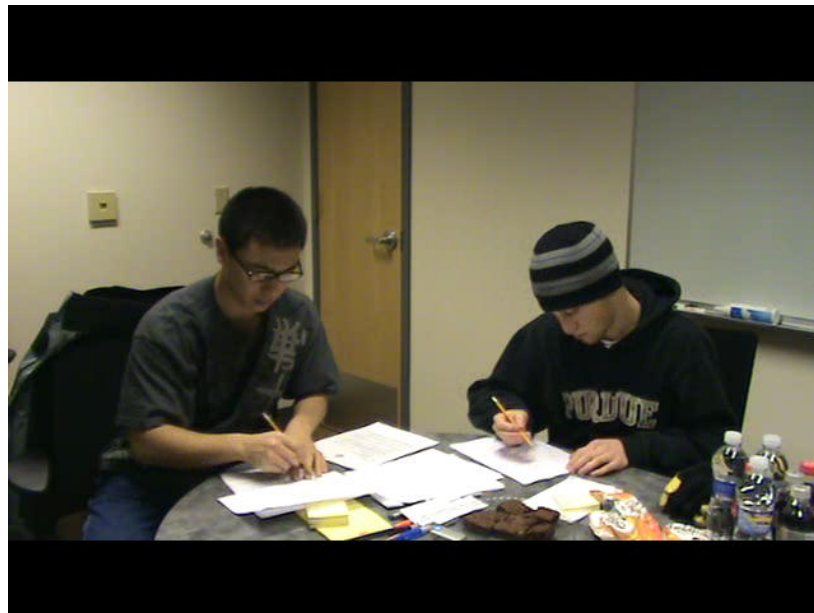
introduction of a new modality also brought a new set of expectations about the frame of reference for the conversation. These shifts happened with fluidity, with the embodied nature of both list making and drawing signaling changes in the expected boundaries of the conversation. Eventually Gloria and Adam did circle back to incorporate some numbers in their response, mapping their earlier attempts at mathematical expressions to the visual representation they had created. In the end, they used a combination of formats for their response, extending the specific boundaries of the conversation as the exchange progressed. This is an example of the fluency we have with multimodal discourse strategies and the ways in which demarcation of conversation boundaries can occur across more than one mode of communication.

In another case, Gavin was quite direct with his partner, Walter, when it came to negotiating their approach to the question about what their dream house would be like. He suggested that they “each just draw our dream house,” (5_2 6:46). Walter agreed and they quickly got to work creating individual drawings of their ideal homes (Fig. 6.2). The rest of the conversation was heavily mediated by the drawings that each young man created through the course of the interaction. Their discussion culminated when they exchanged their drawings and walked each other through their respective pictures. During this process, they negotiated the boundaries of their response by examining, clarifying and supplementing their drawings as they went.

Goodwin discusses this process of alignment across modalities in terms of embodied participation frameworks, saying that in order to produce joint action, interactants “make use of talk and other sign systems, such as gesture, that are tied to the particulars of that talk” (2007, p. 57). The ensuing talk is interpreted in

terms of the entirety of the conversational environment, including both verbal and physical elements. The action of reaching for pen and paper, therefore, establishes those vehicles as elements within the communicative stage or platform of the conversation. In the conversations examined for this study, this helped to define the expectation for the engagement as the participants continued to interact with each other.

Fig. 6.2. Walter and Gavin drawing their dream homes



The notion of an embodied participation framework means that when developing models of collaboration and engagement, the complete conversational environment needs to be considered in order to properly contextualize the resources, actors, intentions, goals and outcomes of an interaction. Kraut and colleagues (Fussell, et al., 2000; Gergle, et al., 2004; Kraut, et al., 2003) acknowledge this in their studies of shared visual space as a resource for collaborative engagements. Breaking this environment down into incremental

dimensions, such as the delineation of conversational boundaries, can provide a more comprehensive basis for incorporating embodied participation frameworks into future studies of collaborative work.

6.1.2 *Stance-taking*

Stance was defined in Chapter 3 as “taking up a position with respect to the form or the content of one’s utterance” (Jaffe, 2009b, p. 3). According to Irvine (2009), stance-taking includes the assessment or evaluation of the circumstances of discourse and the positioning of oneself within that situated context. Stance-taking has to do with entering and remaining active in the participation framework created by the series of exchanges and interactions that comprise the conversation. This is illustrated in Figure 6.1 by the curved lines representing the movement of participants onto the conversational stage. This is a literal representation of the notion of “stepping into the ring” of the conversation. By taking a stance, a participant implicitly or explicitly commits to contributing to and participating in the conversation. Although not represented in this static diagram, stance-taking occurs through dynamic social interactions. The examples below illustrate these types of shifts.

Within the data, the analytic concept of stance was first specifically associated with the act of picking up a writing instrument in preparation for making a mark. In this sense, stance-taking was initially conceptualized as a “stepping onto” the communicative platform, reflecting a readiness on the part of the participant to perform within the context of the conversation. In fact, Jaffe highlights the direct connection between stance-taking and performance theory (Jaffe, 2009b, p. 11). She states that “linguistic and paralinguistic displays of

stance can mark an utterance as performance, which implies a high degree of reflexivity with respect to form" (p. 11). A more in-depth discussion of the performative aspects of drawing will be provided in Chapter 7 (see 7.1.1.5 *Performative/Static*). For the current phase of analysis, which focuses on identifying framing behaviors associated with drawing, the important part of Jaffe's statement has to do with the idea that expression of stance within an interaction can be performed across multiple modes of expression. Goodwin's work (2007) also supports the notion that stance can be expressed through body position and gesture.

Informed by this sociolinguistic notion of stance as a common discursive action, evidence of stance-taking was discovered across all the conversations, in both verbal and non-verbal communicative activities. Linguistic markers of stance-taking in the conversations included statements such as "I think we could..." or "I believe..." and paralinguistic signals involved picking up a pen and making a visible, tangible mark. As a result, the analytic theme of stance evolved to represent the implicit or explicit declaration of willingness or ability to participate, the moment where a participant "steps into the ring" of engagement. As will be shown, in some cases this movement is figurative and in others literal.

Verbal expression of stance often took the form of a declaration of prior knowledge, such as when Denise opened a discussion with Mike about how to build a stable set of shelves by stating, "I've built sets before, for theatre," (1_2, 29:04), signaling that she had prior knowledge which she considered relevant, and that she was willing to put it on the table in order to engage with the topic. Statements like this are associated with *epistemic stance*, which refers to "qualities

of one's knowledge, such as degrees of certainty as the truth of a proposition and sources of knowledge including perceptual knowledge, hearsay knowledge, commonsense knowledge, and scientific knowledge, among other phenomena" (Ochs, 1996, p. 419). Epistemic stance is associated with a person expressing a position with regards to the "truth-value of a proposition and the speaker's degree of commitment to it" (Irvine, 2009, p. 53). It is also associated with knowledge construction and the positioning of oneself as having specifically relevant experience, perspective or expertise (Jaffe, 2009a, p. 123), which can influence social interactions.

For example, in the beginning of Adam and Gloria's conversation about how clouds form, he asked her, "Do you know how clouds form?" inviting her to take a stance by asking about her prior knowledge. She replied with, "Yeah. I have, know a little about it from geology class," (2_2, 12:30). Mary also extended a stance-taking invitation to her partner when she and Henry were considering whether or not to choose the question about the distance from the earth to the sun in relation to the whole solar system. She asked, "Are you an expert in any of these?" He replied, "Not particularly, I mean, I have a basic idea..." (3_1, 2:56) then explained how he would go about responding to that question. A few moments later, Mary explicitly joins him by saying, "Well, we could go with that [referring to the solar system question] because, I could have, uhm, well I certainly don't know the science behind it but I could describe it," (3_1, 3:28).

Stance in the form of declaring prior knowledge also worked in reverse. There were situations where participants declared their lack of preparedness or ability to engage through stance-negating statements such as "I have no idea about this question" (2_3, 20:21), "I'm no meteorologist" (4_1, 6:20) when it

comes to describing how clouds form, or “I don’t know the order at all” (5_1, 3:48), in reference to the planets in the solar system. Statements like these were not always followed by a complete lack of participation, and in fact, as discussed later in this chapter, verbal statements of stance negation were often contradicted by physical actions of engagement, such as when a person says, “Oh, I don’t know anything about the order of the planets,” then proceeds to draw a diagram of the solar system, admittedly skipping the labels on some of the planets, but still providing a basic structure for the system.

Other instances of stance-taking involved taking a philosophical position or opinion on an issue central to the primary topic of discussion as a means to become engaged. This can be observed when Denise and Mike addressed the question of why the organs are located where they are in the human body. Mike engaged by saying, “For me, as a Christian, I usually say ‘cause God put them there and he knows where things are best to be,” (1_2, 18:28). This young man went on to acknowledge that there are other ways to respond to the question, but this initial statement signaled that he had entered the conversation. Nadine also marked her stance-taking with a declaration of belief during her conversation with Min-Cha about their dream homes. Her explicit step into the conversation occurred with the statement, “I guess my ideal house would have, like, its own mini library attached to it,” (4_2, 17:32).

Stance also took a physical, embodied form, calling to mind Goodwin’s connection between footing, stance and physical position (see 3.5.3 *Stance*). As discussed in Chapter 3, body position and physical location and alignment of material objects can express stance. This is evident when Adam, entering into conversation with Gloria, picked up a pen as he said “So we have...” and then

proceeded to draw (2_3, 20:51). His actions with regards to the pen and paper constituted a state of engagement not explicitly reflected in his words. Likewise, after Henry declared he was a “huge whiteboard person,” he stood, picked up a dry erase marker and positioned himself to write or draw on the board (3_1, 4:06). His words alone do not necessarily declare his intentions, but his actions left little doubt of his position within the exchange. Mike also made a statement about his intention to engage through nonverbal means, offering, “Let’s see if I can draw it,” as he reached for a pencil in order to sketch out an idea that he had unsuccessfully tried to describe to Denise with words (1_3, 33:02).

The next example reflects an approach to discourse management that was only observed once in the data. As Walter and Gavin entered into their conversation about what their dream house would be like, they actually established individual stance almost simultaneously. Once they had agreed on the topic, Gavin handed Walter a piece of blank white paper and took one for himself. In unison, they each picked up a pencil from the pile of writing implements in the middle of the table. Moving together, they leaned forward over their paper, pencils in hand, ready to draw. Gavin said jokingly, “Don’t steal any of my ideas,” glancing up at Walter. Walter grinned, as they both looked down at the paper in front of them. Walter paused a moment with his pencil hovering over the surface of the page, than began to list out loud the rooms in his house. He paused again, then both Gavin and Walter began to draw, in a manner similar to children engaging in parallel play, exhibiting awareness of each other, but not interacting directly (5_2, 5:53).

Within the data there were also cases where a single statement or action could be interpreted as both boundary-making and stance-taking. Two examples

are provided to illustrate the nested, or what Goffman (1974) might call the “laminated,” nature of some of these framing behaviors. Mary’s stance-taking statement described above, “I could have, uhm, well I certainly don’t know the science behind it but I could describe it,” also served to establish a boundary for the discussion. Not only did she explicitly state that she was willing to engage by describing something (as opposed to explaining it or synthesizing it), she also implied that she believed that such a response would be useful within the bounds of their conversation. Adam also makes a dual purpose statement when he says, “Alright, we got paper. Let’s work something out here,” (2_3, 20:39) during his conversation with Gloria about the solar system. Like Mary, he explicitly expressed his willingness to engage in a creative way by saying “Let’s work something out” while also invoking the possibility of using paper to write or draw, implicitly indicating that he expected this to be an acceptable format to “work something out.”

6.1.3 *Vectors*

The vector of the conversation refers to the movement or momentum of the conversation, within a specific domain space, and within the established boundaries or limits of the discussion. This last marker to be discussed refers to an observable attempt to influence the direction or trajectory of the course of the conversation. In this sense, “observable” can refer to verbal or nonverbal communicative behaviors. The diagram (Fig. 6.1) represents the incremental extension of the conversation’s thematic vector by the segmented arrow illustrating the path of movement the two interactants take within the boundaries they have established. Points along the path represent specific

moments where an action or statement by a participant results in a thematic vector being introduced, extended or shifted. Once set, the trajectory of the conversation can be altered, reinforced or abandoned. Again, creating boundaries involves constraining the frame of reference for the conversation, while introducing vectors involves enabling the conversation to move or evolve within those limits.

Conversational vectors manifested themselves in the data in four ways: 1) establishing a new direction for the conversation within the topic space; 2) extending an existing conversational vector by introducing a new, but related, concept to the conversation; 3) challenging or clarifying a current direction or trajectory; and 4) attempting to re-establish a “derailed” trajectory. While conversational vectors may be introduced or initiated by one person, the successful adoption of a vector within an exchange depends on corroboration between interactants. Compared to observations of framing behaviors related to boundaries and stance, activities related to vector were not often embodied.

New vectors were most commonly introduced or offered during the opening phases of the conversations. For example, when Nadine and Min-Cha start to work on the question of why the organs are located where they are in the human body, Nadine is quick to state, “Because that’s what evolution decided would be best,” (4_3, 25:43). In spite of the definitiveness of this statement, it opened the door to a discussion of natural selection, which was followed by a more generative examination of human anatomy.

Mike and Denise established an initial vector during their discussion about the most stable way to build a set of shelves. Denise introduced the idea that stable shelves require adequate support. Mike acknowledged that being

concerned about how well the shelves will support things is an important thing to consider, introducing the idea of shape: "...I'm thinking it would need to be in the shape of a rectangle" (1_3, 29:19). With this statement, Mike corroborates that support is important and extends this vector by suggesting that shape is relevant to support. His next attempt to extend the conversation along these lines, however, was not as successful. He surmised, "Although pyramids are strong, too, but you can't really put too many books in a triangle," (1_3, 29:25). The tangent introduced by the idea of triangle shaped books led Mike and Denise further away from a suitable response, and required Denise's intervention in order to get back on track (see 5.2.1.7 *Hijacking*).

Another example illustrates the ways that multiple, relatively unrelated trajectories may be attempted throughout a conversation. When Adam and Gloria started to discuss the question about the distance from the earth to the sun in relation to the whole solar system, Gloria offered, "I know how, how long it takes, ah, light..." (2_3, 17:46), introducing the idea that the speed of light might be a place for them to start. This is an example of a vector being established. Gloria's statement "I know..." is also an example of epistemic stance-taking. They followed this trajectory for several minutes until they both recognized that they did not have the necessary information in order to make the calculation. Next they tried verbally listing the elements of the solar system, changing from a conversational direction focused on the speed of light, to one related to the order of the planets. In both of these cases, the approach to responding to the question that is offered, speed of light and then order of the planets, is at a slightly oblique angle to the primary goal of the conversation, to make a statement about the relative distance from the earth to the sun in relation to the whole solar system.

This second trajectory also failed when it did not result in enough information about the relative distance between planets. It was only when they changed vectors once again, resorting to making a diagram, honing in on the physical representation of the order of the planets, that they were able to combine the various bits of information they had, making some progress towards calculating an appropriate response.

Along the way, these adjustments to the primary point of concentration for their exchange were also accompanied by modifications to the boundaries they had established. Establishing boundaries had the effect of setting limits for what the pair was “responsible” for (i.e., the form or format for a final response), while setting vectors for the discussion influenced the movement of the conversation within that space (i.e., how exactly they would get at that response).

Once a conversational direction, or trajectory, gained traction, participants still needed to keep the discourse moving forward. This was often accomplished by one of the participants making a new but related contribution to the discussion, essentially extending the primary conversational vector. This is what was happening in the example above when Mike and Denise created a chain of vectors during their discussion of shelving. There were also examples of situations where a vector was extended as a result of the physical creation of a constructed sequence of related elements, such as listing the planets in the order they are from the sun (3_1, 4:28), or reciting the rooms in one’s dream house as though walking through the hallways (5_1, 7:09). These are examples of Clark’s notion of external representation of current state through a physical representation. As discussed in Chapter 3, the current state of a joint activity is what participants understand to be true about the present state of the action

being undertaken. In these examples, the drawing develops as an external representation of what both participants are agreeing to be true or useful in terms of responding to the question. In essence, the drawing serves as a map of the conversation so far.

These examples also begin to show how challenges or clarifications to a primary conversational trajectory have the ability to move an interaction forward or force the participants to start over. This had real implications for the frame of reference being applied to a given exchange. If someone challenged the direction in which the conversation was moving or required clarification of the current state of the exchange, referred to during analysis as *vector challenges*, it could reflect a disconnection between the expectations that both individuals were bringing to the interaction, including assumptions about how to succeed in crafting a response.

The most common expression of vector challenges involved relatively straightforward questions such as “But is that the most stable way?” (1_3, 31:25); and “What if the wall falls over?” (1_3, 31:49). These were often followed by a new trajectory or vector being opened as a result of a perceived flaw in the current approach. Clarifications were also often posed as questions: “Can we name the three we’re missing? Can we name those three we’re missing right now?” (5_1, 5:01); “Should we say within the whole solar system?” (3_1, 7:01); and “So, how fast did you say the speed of light was?” (2_3, 22:07). Clarifications did not always result in the current vector being abandoned, but they often catalyzed a re-examination of the boundaries for the response being constructed.

Occasionally the conversations lost focus and the intended direction of trajectory of the exchange got derailed as one or both of the participants followed

a conversational tangent. This was the case in Mike and Denise's conversation about the pyramid shaped bookshelf. Denise got the conversation back on track, however, by abandoning Mike in his discussion of triangle shaped books in order to return to the problem at hand. In Chapter 5, this was identified as a hijacking activity. Here, this activity is revealed to have a role in higher-level discourse management strategies. Once she had hijacked the conversation, Denise returned to the previously established trajectory of support, offering suggestions of how a stable set of shelves could be structured (1_3, 30:19).

Min-Cha and Nadine provide another example of a derailed conversation brought back in line. After several minutes spent discussing their dream homes, Nadine's mention of a library in her ideal home prompted Min-Cha to return to the question about building a stable set of shelves. It is a natural connection to make. The two young women spent several minutes discussing a response to the shelf question, abandoning the dream house prompt for the moment. Nadine gets things back on track by returning to Min-Cha's earlier description, asking, "So would your house be like an apartment above a studio or would it be just one separate building?" (4_2 20:39).

As was discussed previously, there were also instances in the data where a single action or statement influenced more than one aspect of framing, including establishing a vector for an interaction. For example, early on in the conversation Nadine and Min-Cha had on the topic of their dream houses, Nadine said, "I guess, my ideal house would have, like, its own mini library attached to it," (4_2, 17:32). Within this single statement, she established a stance ("I guess") and offered a vector for the discussion ("mini library"). Shortly after, she provided an extension for that vector by adding that she also wanted "comfortable furniture"

in her library. This is another example of the laminated or overlapping nature of many framing activities.

6.2 Line-by-line examination of framing behaviors

Before moving on to a detailed look at the relationship between frame management practices and the specific image-enabled activities identified in Chapter 5, an extract from one of the conversations involving drawing will be presented to illustrate how the framing dimensions of boundary, stance and vector appear in the data. This example includes a passage of transcript that involves drawing.

The extract (Extract 6.1) comes from the beginning of the conversation between Mike and Denise. They have chosen to talk about the question regarding the most stable way to build a set of shelves. During this segment, Mike introduces the idea of shape as an important consideration at Line 2, establishing a criterion for their final response, which is a boundary maneuver according to the analytic framework just described. In the same statement he also suggests that a rectangle might be a good shape, establishing a vector in the direction of rectangles. At the same time, Denise also takes an action that contributes to establishing boundaries, when she reaches for a pencil. This introduces the idea that something besides verbal expression might come into play during their discussion. This can also be seen as signaling a footing shift related to the production format of the exchange (see 3.5.2 *Footing and code-switching*), not because of the shift in mode, but because that shift in mode also reflects a new set of expectations about the interaction related to the organization of talk.

Extract 6.1. Mike and Denise addressing the question about stable shelves

1 (0:29:19.7)	
2 M: Yeah, prob-probably, I'm thinking it would need to be in the shape of a	29:19
3 rectangle.	STANCE-M: "I'm thinking"
4 ((D reaches for pencil))	BOUNDARY-M: "shape"
5	VECTOR: "rectangle"
6 (0:29:23.5)	
7 D: I agree	BOUNDARY-D: (reaches for pen)
8 ((hand holding pencil is poised above paper, but with palm turned upward in	
9 resting position))	
10	
12 (0:29:25.0)	29:25
13 M: Although pyramids are strong, too, but you can't really put too many	VECTOR: pyramids
14 books in a triangle.	
15	
16 (0:29:30.4)	
17 D: Yeah.	
18	
19 (0:29:31.8)	29:31
20 M: Unless they're shaped like triangles, too, ((laughing)) which I've never	VECTOR-EXT: Shaped like a
21 seen a book shaped like a triangle, you know, from the side.	triangle
22 ((holds both hands up, palms facing, about 3 or 4 inches apart, turns	
23 them as a unit to the side))	
24 From the front it could be a triangle,	
25 ((moves left hand out in front of him, palm facing him, uses index finger of right	
26 hand to indicate shape of pages when book is open. mimics turning page))	
27 the pages are triangles, but you know, when you're shelving books you	
28 do it sideways.	
29 ((bringing both palms as if praying, emulating the book, and mimics placing that	
30 book on an imaginary shelf in front of him))	
31 I've never seen a book that's slanted-	
32 ((holding flattened left hand vertically and brings flattened right hand at an	29:44
33 angle of about 45 degrees towards it, to meet at finger tips))	VECTOR-EXT: "like" (begins
34	to draw)
35 (0:29:44.7)	STANCE-D: (begins to draw)
36 <<D=SHOW>>	
37 D: Oh, like (.)	
38 ((beginning to draw))	
39 ((both laugh))	
40	
41 (0:29:46.5)	
42 D: [The books would go like this	
43 ((drawing a triangle))	
44 ((laughing))	
45 M: [You know, you open the first page and it's like=	
46 M: =it's only two lines at the bottom,	
47 ((makes a small rectangular shape with the fingers of both hands, turning to	
48 make eye contact with D, who is looking down at the paper she has drawn the	
49 triangle on, holding the pencil hovering over the surface but not making a mark))	
50 ((chuckle))	
51 and then=	
52 M: [=at the back of the book=	
53 D: [((laughs))	
54	
55 <</D=SHOW>>	
56	
57 (0:29:52.5)	
58 M: It's a long page	
59	
60 (0:29:53.8)	
61 D: Oh! ((laughs))	
62	
63 (0:29:54.6)	
64 M: That would be kinda weird ((laughs))	
65	
66 (0:29:57.7)	30:06
67 D: It would get frustrating, you'd have to flip	STANCE-D: "I think" and

68	((mimicking flipping the pages of a book with one hand))	(draws)
69	so many pages to finally get to like the meat of the story	BOUNDARY: "you could either"
70	((giggling))	
71		
72	(0:30:02.4)	VECTOR: "board" and "shelving frame" and (drawn examples)
73	M: It's like, I've read one chapter, that's half the book ((lets out a long laugh))	
74		
75	(0:30:06.7)	
76	<<D=HIJACKING>>	
77	D: I think, you could either, (.) you know	
78	((sound of pencil on paper is audible, sounds like two strong strokes))	
79	have the, th:::e (.)	
80	((more sounds of pencil on paper))	
81	boards,	30:20
82	((more pencil sounds))	BOUNDARY-CHALLENGE: "but"
83	you know, do that little shelving frame,	
84	<</D=HIJACKING>>	VECTOR: "maybe cut"
85		
86	(0:30:19.5)	
87		
88	M: [Uh-hm	
89	D: [°This is the worst drawing°	
90		
91	(0:30:20.2)	
92	D: But,((laughs)) and maybe cut inserts into it,	
93	((pencil sounds))	
94	like slits, or you could, does that make sense?	
95	((scratching sounds))	

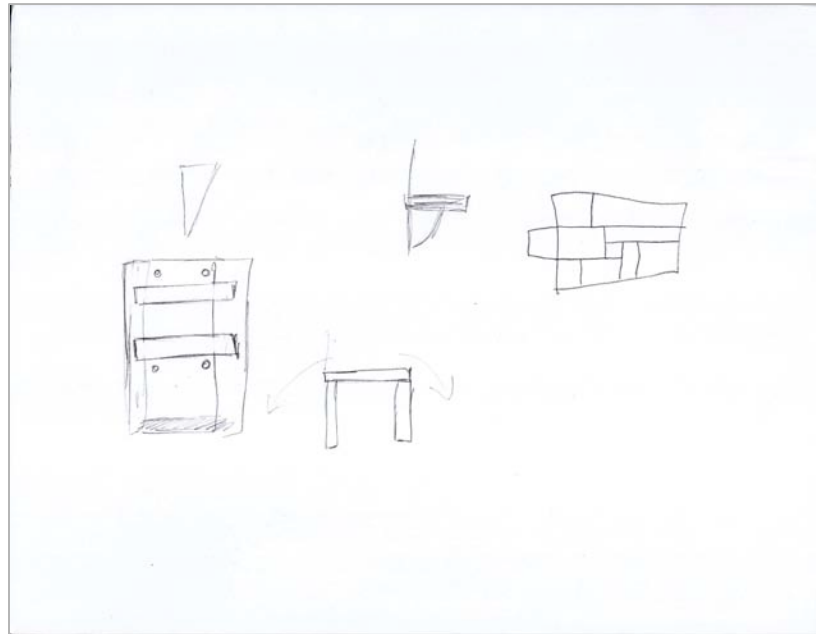
Denise does not actually start drawing at this point. Mike provides a new vector related to the idea of the shape of the shelves with a mention of the strength of pyramids at Line 13. He extends this vector in Line 20 suggesting that the books themselves could be shaped like triangles. This begins a tangent that continues until Line 77. During this tangent, Mike pursues the idea of triangle shaped books, remarking that he has never seen one (Line 31) and using his hands to pantomime what it would be like to read such a book. This is an example of highly articulated gestures, which were annotated in earlier rounds of transcription. In response to Mike's statement that he had never seen a triangular book, Denise begins to draw a picture of one at Line 38. This is an example of drawing being used to *show* something that is visual in nature. Denise's comment at Line 37, "Oh, like..." indicates her extension of the pyramid-vector, while her move to draw also embodies a particular type of stance taking.

In drawing a picture of something that Mark has just said he has never seen, she is both expressing that she knows how to envision such a thing (a type of epistemic stance) and she is also shifting the footing of the conversation by using an alternative mode of communication that is not as directly interactive as verbal communication. This indicates a shift of both the participation framework and the production format of the conversation (Goffman, 1979). As Goodwin (2007) points out, shifts like this can be seen as stance taking. He explains that when "...such [footing] arrangements are physically constituted through how participants mutually position their bodies toward each other and the environment that is the focus of their work, one can begin to discuss these structures as, quite literally, types of stance" (p. 61).

As discussed previously, Denise and Mike talk about triangle-shaped books for a few moments, and then at Line 77-83, Denise makes three closely aligned actions related to boundary, stance and vector, bringing the conversation back to the task at hand. She begins to draw, re-establishing her stance. She offers an alternative suggestion, again asserting her stance as well as introducing a new direction for the conversation. And in proposing this new direction, she is indirectly making an attempt to slightly adjust the boundaries of the conversation environment. What is notable about this passage from Lines 77-83 is that she does this across modes of expression, combining fragmented spoken phrases with mark making in order to accomplish this bit of discourse management. In Chapter 5 this instance of drawing was identified as "hijacking" because Denise seized control of the conversation in order to bring it back on task. Here, we can see that her hijacking action is deeply embedded in a complex discourse structure and the activity of drawing is serving multiple functions. The

drawing that was created during this discussion is provided here (Fig. 6.3) to highlight the concept underlying this approach to analysis: the ways in which we currently represent and view visual information artifacts do not always reflect the complex roles images and image-production play in our daily conversations.

Fig. 6.3. Drawing from Mike and Denise's conversation about stable shelves



6.3 Frame management and image-enabled activities

Returning to the beginning of this discussion, the goal of this analytic process was to establish a way to make comparisons across conversations where drawing occurred and those where it did not, in order to isolate specific affordances of image-enabled communication. The remainder of Chapter 6 focuses on how frame management maneuvers directly relate to image-enabled activities. The extract above gives a sense of the interconnectedness of these discourse features. While much of the literature on framing and stance focuses on the linguistic

strategies used to enact these strategies, one of the contributions of this work is to show the ways in which drawing is deployed in order to establish and maintain conversational involvement and coordination.

Three types of discourse management related to framing were brought to the surface during this phase of analysis: 1) introducing a new framing structure (or frame of reference); 2) contributing to or reinforcing a dominant framing structure; and 3) temporarily stepping outside the dominant framing structure as an aside. In most cases, the three framing activities described here initially occurred in the beginning of the conversation, as participants established boundaries for the discussion, took a stance with respect to the participation framework of the exchange, and set a vector for the exchange within the conversational stage. These dimensions of framing also shifted and changed throughout the conversation as participants respond to each other and to the evolution of the discussion.

If an initial frame of reference failed to support the conversation as it evolved, participants changed the trajectory or boundaries of the conversation space, and in some cases rejected it completely and started over with a new frame of reference. Similarly, if a participant reached the limits of his or her knowledge base, stance negation might occur, where a position previously taken is relinquished, usually with a statement such as, "Now, I don't really know anything about *that*." Or, the opposite, a previously negated stance could be restated as a positive stance, "Oh, if we want to talk about it that way, I can do that!" These shifts and adjustments reflect the ongoing management of frames throughout the discussion.

Drawing activities were deployed as a means to enact each of the three types of frame management strategies and examples will be given to illustrate how this was observed in the data. Returning to the seven conversations that specifically included drawing, the 26 instances of drawing activities presented in Chapter 5 were mapped to these three frame management strategies (Table 6.1).

There were 8 instances where drawing was deployed in order to introduce a new frame of reference; 16 instances were observed where drawing was used to contribute to the dominant frame by reinforcing points of reference, extending boundaries or bridging gaps; and 2 instances where drawing was deployed as a means for signaling an aside involving temporarily stepping outside the dominate frame. Table 6.1 shows frequencies of co-occurrences between drawing activities and these framing behaviors across the 26 instances of drawing.

Table 6.1. Co-occurrences of drawing activities and framing behaviors

	Establishing new frame of reference	Maintain or reinforce primary frame of reference	Step outside primary frame of reference
Hijacking	1	-	-
Translating	-	3	-
Showing	2	2	1
Clarifying	-	5	1
Integrating	-	3	-
Inventorying	5	-	-
Connecting	-	3	-
Totals	8	16	2

By examining the conversations in terms of framing behaviors, two specific image-enabled communicative practices are highlighted: 1) using drawing to inventory what is known about a topic as a means to establish a frame of

reference for a discussion, and 2) maintaining conversational involvement and coordination by creating a drawing in order to clarify the meaning or intention of an exchange. Both of these practices are discussed in more detail in the next section. A third special case is also discussed: the use of drawing in order to step outside a dominant frame of reference. Although this happened less frequently than other framing practices observed in the data, these instances highlight drawing's abilities to circumvent more conventional discourse structures. Examples from the data highlight the role that mark making plays in these three types of framing practices.

6.3.1 Building a visual inventory

In spite of the standardized nature of the conversations, a number of factors influenced the way in which the discussions evolved, including the degree of familiarity each participant had with the topic, the number of attempts needed to establish the boundaries of the exchange, and the pace at which each person took an identifiable stance within the engagement.

Of the five occurrences of drawing being used to inventory as a means to establish a frame of reference for the discussion, three took place during conversations that addressed the same question, "How far is it from the earth to the sun in relation to the whole solar system?" Interestingly, each conversation reflected a different discourse structure. False starts, unilateral maneuvers, and reluctance to commit all impacted the organization of talk across these conversations. These variations are evident in the three examples provided here to illustrate the ways this type of image-enabled communication appeared in the data.

As mentioned above, for Adam and Gloria, the conversation began with trying to calculate a numeric value based on half remembered equations and measurements, mostly having to do with the speed of light. When that failed, they tried again to establish a frame of reference by simply talking about planets and what makes a planet. The recent revocation of Pluto's status as a planet was a topic of discussion in all of the conversations about this question. As stated above, both of these attempts to establish a frame of reference involved adjustments to the boundary and vectors of the discussion. These are cases where interactants attempt to make modifications to the structure of their engagement as they try to establish a viable frame of reference.

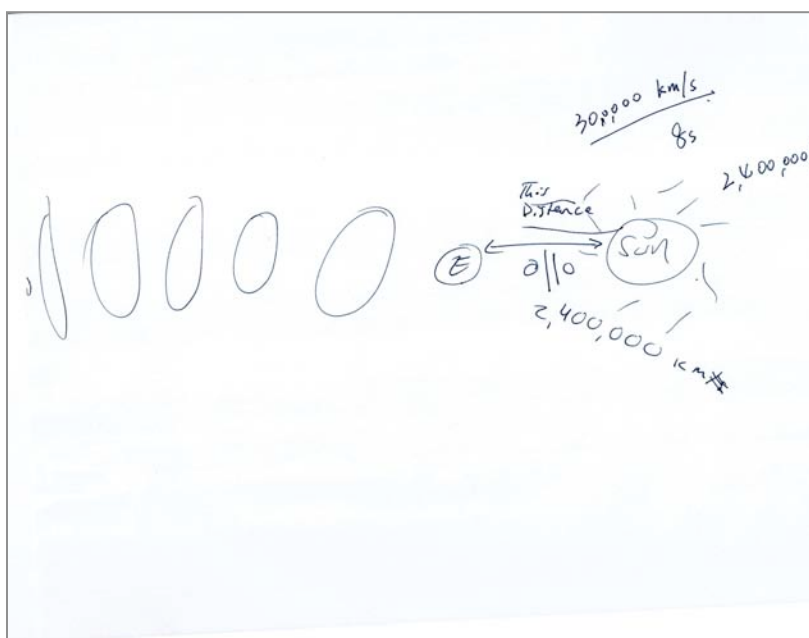
When these tacks (or trajectories, to use the analytic terminology) failed, Adam reached for pen and paper, saying, "Alright, we got paper. Let's work something out," (Fig. 6.4). This third attempt to establish a platform for addressing the question succeeded, with Adam mapping the general location and shape of the planets, and Gloria adding notes based on the measurements they had posited during the initial part of the discussion (Fig. 6.5). Within Adam's gesture, all three dimensions of framing are evident. He attempts to establish a new set of boundaries for their interaction (i.e., using paper and pen will contribute to suitable response). He embodies a stance taking action (i.e., he is both volunteering to draw and making an implicit claim that he has the ability to construct knowledge in this mode). And he is introducing a new vector for the discussion (i.e., introducing the notion that depicting the physical order of the planets is a way to arrive at a suitable response).

Once these annotations had been made and vetted by both Adam and Gloria, he leaned back, with eyes still gazing down towards the drawing and

Fig. 6.4. Adam reaching for paper



Fig. 6.5. Adam and Gloria's completed drawing



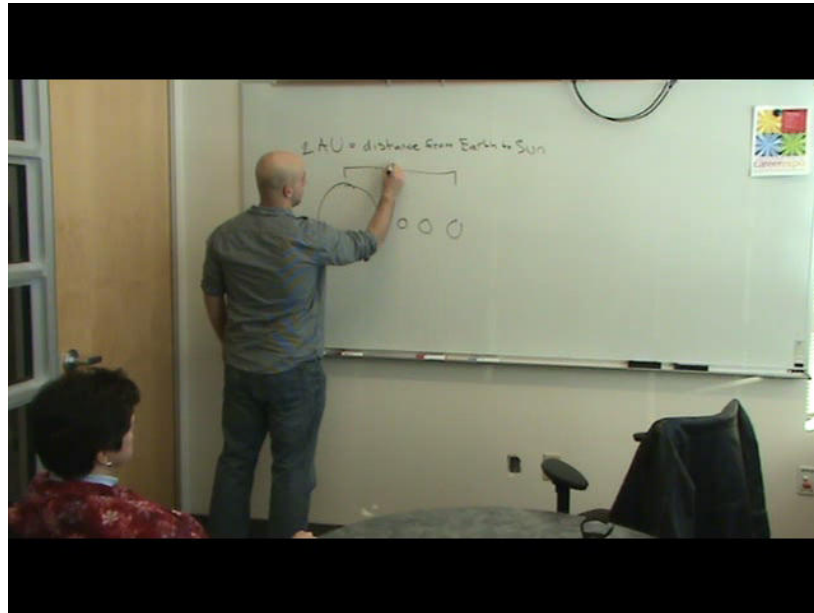
said, “We could do this... We could do earth is *that* distance.” The conversation continued for several more minutes as they worked to convert the visual

representation of their response to a single numeric value. This is an example of the activity of drawing being used to inventory, but also shows how that activity is embedded in higher-level discourse structures enabling conversational coordination.

In the second conversation addressing the solar system question, the discourse structure constructed by Henry and Mary was far more straightforward and linear. Once they agreed to work with that prompt, there was a slight pause followed by Mary reaching for pencil and paper, asking “Should I jot it down?” At the same time, Henry pushed himself to standing. He responded by saying “Well, I was actually thinking...I really like whiteboards. I’m a huge whiteboard person.” With this action, Henry not only took a stance with regards to his participation in the conversation, but also implicitly set a boundary for the discussion, suggesting that an appropriate response could or should involve using the white board.

Like Adam and Gloria, Henry and Mary also started with a unit of measure, in this case the astronomical unit (AU) that they defined as the distance from the earth to the sun. Henry proceeded to map a diagram of the solar system in order to visually represent one AU and show that unit of measure in relation to the whole system (Fig. 6.6). This is an example of drawing being used to inventory a collection of concepts considered relevant to the discussion. He is also framing the discussion, embedding this process of inventorying what is known within his framing actions related to establishing epistemic stance, delineating boundaries around their topic space and setting a direction for further interactions.

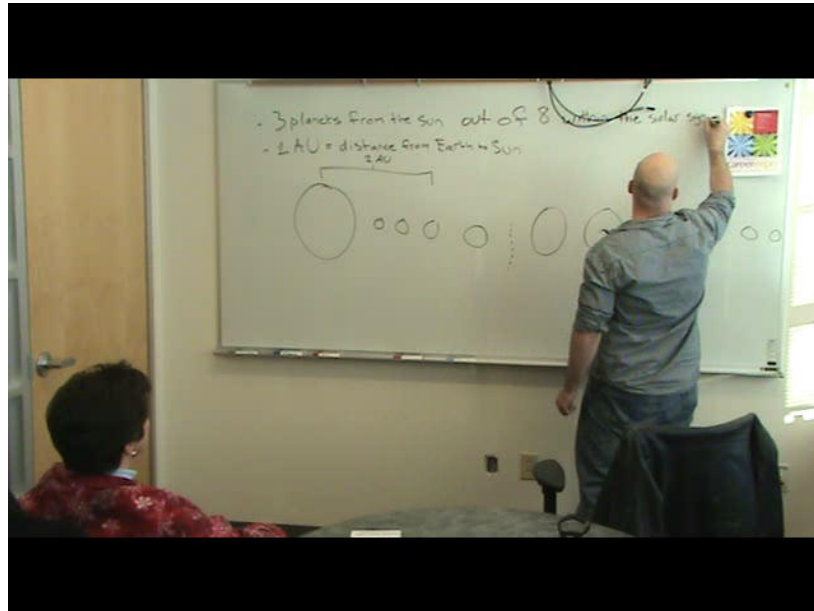
Fig. 6.6. Henry in front of white board



As he drew, Mary remained seated at the table, comparing Henry's unfolding depiction of the solar system with the original question. Although they have a perfectly acceptable visual response to the question, like Adam and Gloria, Henry and Mary spent the last several minutes of the conversation discussing requirements for an adequate response. Mary says, "But if it were just how far, if we just need to answer this question, you've, based on your drawing, and in relation to the whole solar system which essentially, the whole white board." Even though Mary was the one to point out that Henry's drawing encompassed the entirety of the question, she was also the one to question whether the statement reflected by the drawing was complete enough. Ultimately, Henry ended up writing a sentence on the white board directly above the diagram that reiterated what he had represented in the drawing, that the distance from the earth to the sun is one AU (Fig. 6.7). In this example, the final response offered by the participants was expressed in a different mode than

the one used to arrive at their answer. The use of drawing was an important tool, however, for reaching that conclusion.

Fig. 6.7. Henry writing final response as verbal statement



The last example involves Walter and Gavin. Their conversation was similarly straightforward, in part because all of their exchanges were considerably shorter than any of the other pairs. In observing their exchanges as the conversations were originally being recorded, the two young men seemed to be congenial with each other and have a comfortable rapport. When the transcripts of their interactions were examined, however, and when the notion of common ground and mutual frames of reference were used to focus analysis, it became clear that Gavin was quick to act unilaterally in order to move the conversation forward. This was evident in their discussion about the relative distance from the earth to the sun.

After selecting the question, Gavin and Walter began by trying to name the planets in order from the sun. Walter suggested that perhaps they could “just

give a, like a ranking..." (5_1, 2:59). Gavin looked at Walter in response and said, "A brief little overview? Alright, yeah." In terms of establishing a frame of reference through boundaries and vectors, their approach was similar to Henry and Mary's, except they did not immediately use a visual representation in order to help them organize this inventorying. They attempted to verbally establish boundaries for their discussion, but became stumped as they tried to verbalize this idea of "overview" or "ranking," with a series of trailed off sentences and false starts. They also spent some time talking about Pluto, and its recent demotion. In some ways this was similar to Mark's digression about triangular books in the first example. While it nominally extended an established vector in the conversation, talking about Pluto did not contribute to the pair coming up with a suitable response.

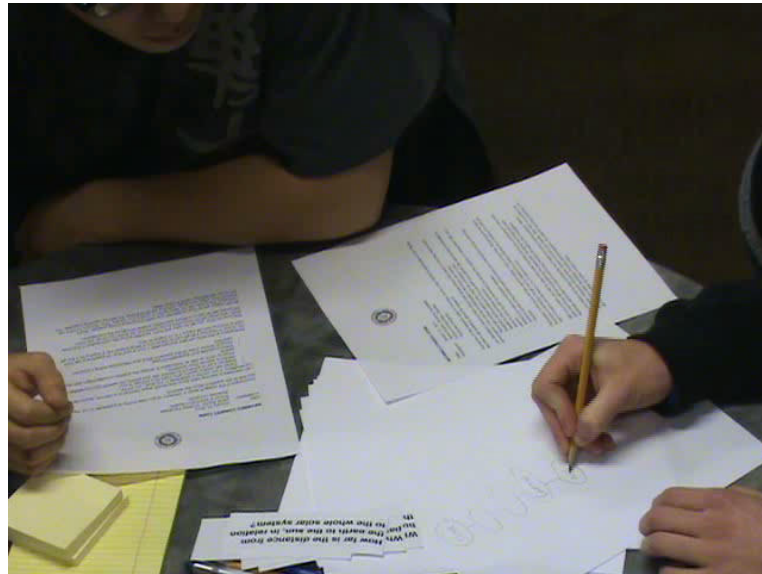
The momentum of the conversation had stalled and both were gazing at the table top, when Gavin took action, reaching to the center of the table where the paper and pencils were piled. Even as he took an undeniable discursive stance by placing paper in front of himself and using a pencil to begin to draw a series of circles on the page, he stated "I, I don't know the order at all." This negation of his epistemic stance was countered by his continuing to draw as he spoke aloud the names of the planets. This is an interesting example of embodied stance enacted through the activity of picking up a pencil and drawing overpowering or overriding weaker, and contradictory, linguistic stance-taking. Goodwin discusses this in terms of embodied participation frameworks, stating that "Such multimodal action is efficacious in large part because it... creates a visible, public locus for attention and action that includes both relevant structure in the environment and the actions and bodies of other participants" (see Goodwin,

2007; Murphy, 2005; Norris & Jones, 2005; Scollon, 2001). The power of the physical action of making a mark comes from its ability to access attention and action across more than one mode of expression.

At one point Gavin got stuck, asking Walter, “What comes next?” (5_1, 3:48). Walter expressed uncertainty, but took a stab at guessing, “I think the first one may be Mercury?” (5_1, 4:13). Gavin quickly accepted this, adding it to the drawing as he confirmed, “Let’s go with it” (5_1, 4:20). He continued down the page, creating more circles and connecting them with short vertical lines. The paper was squared and oriented directly in front of Gavin, as Walter leaned forward, watching (Fig. 6.8).

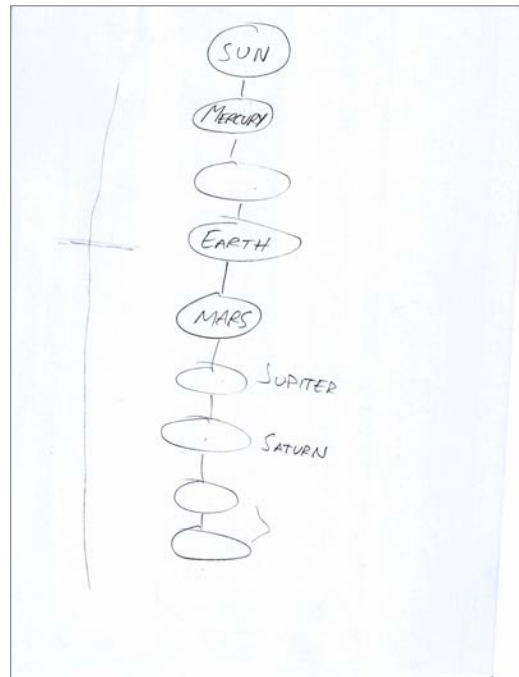
At one point, Walter asked if they could return to a few of the circles towards the top of the page that had not yet been labeled. He asked repeatedly: “Can we name the three we’re missing? Can we name those three we’re missing right now? And we, kinda put them in those three blanks?” After a brief pause during which both were looking down at the paper, Gavin said, “Huh, we got a pretty good sketch right here.” Walter agreed in spite of his earlier request to fill in the blanks. One way to interpret this acquiescence is that the drawing empowered Gavin with an embodied epistemic stance that was convincing to Walter in spite of his misgivings. This notion combines the concept of epistemic stance with Goodwin’s description of embodied participation frameworks. Examples of embodied epistemic stance like this one emerged through the analysis of drawing as communicative practice.

Fig. 6.8. Gavin drawing planets as Walter looks on



Unlike Adam and Gloria or Henry and Mary, this pair did not spend time discussing the suitability of their response. They were content to leave their answer in the form that they had initially conceived it. By way of summarizing their response, Gavin explained, "...it's about half way in between, out of this whole thing," as he drew a line down the left side of the paper (Fig. 6.9). In contrast to the first two examples, the constructed image *was* the final response with the action of drawing the line along the side of the diagram embodying their answer to the question, "What is the distance form the earth to the sun in relation to the whole solar system?"

Fig. 6.9. Walter and Gavin's finished drawing



6.3.2 *Using drawing to negotiate and clarify conversational expectations*

Once a frame of reference had been established (by indicating domain, agreement, boundary, stance and vector), the organization of talk that followed reflected similarly varied approaches to maintaining conversational involvement and coordination. Any effort to contribute to or maintain an established frame of reference depends on a set of expectations being established in the first place. It also required participants to remain committed to that framework in spite of perceived gaps or flaws that might be exposed as a conversation progresses.

In the conversations analyzed in this study, participants needed to negotiate differences in the way they perceived boundaries or focal points of exchanges as conversations evolved. For example, one person might consider Pluto a planet while another does not. In some cases, participants also needed to

re-establish conversational alignments weakened by challenges or attempts to redirect by their partner. This type of destabilization can result from one person questioning whether the information being used is accurate or appropriate. Another type of frame maintenance involved bridging gaps in knowledge that became visible as the conversation progressed. This was most evident in discussions regarding whether a given statement (verbal, visual or numeric) was an adequate response to the conversation prompt.

In the cases where drawing was used to clarify the content or intention of an interaction, five out of the six occurrences corresponded to these sorts of frame maintenance behaviors. This makes sense, as the activity of clarifying was defined as “addressing a gap or missing information” in section 5.2.1.1 *Clarifying*. Unlike the examples provided to illustrate visual inventorying, instances of visually clarifying in the context of frame maintenance appeared across four conversation topics (with two separate instances within a single discussion):

- What is the most stable way to build a set of shelves?
- How far is it from the earth to the sun, in relation to the whole solar system?
- Why are the organs in the human body located where they are?
- If you could live in any kind of house, what would it be like?

Two of these four examples are offered by way of illustrating how image-enabled clarification helped to maintain conversational involvement by embodying aspects of the framing process.

Mike and Denise used drawing throughout their conversation about the most stable way to build a set of shelves, with Denise being the first to put pencil

to paper. In the passage where drawing was used to clarify, it was Mike who took pencil in hand to explain his idea in more detail. Mike initiated the conversation by verbally speculating about the shape of the bookshelf, first suggesting a rectangle but then offering, “Although pyramids are strong, too, but you can’t really put too many books in a triangle.” Mike commented that he had never seen such a thing, and Denise responded by turning her gaze down and beginning to draw to show Mike how such a triangular bookshelf could work, stating, “The books would go like this...” (Fig. 6.10). She is clarifying what she believes he means by drawing a picture of it. This helps the pair coordinate and maintain involvement.

Fig. 6.10. Denise begins to draw



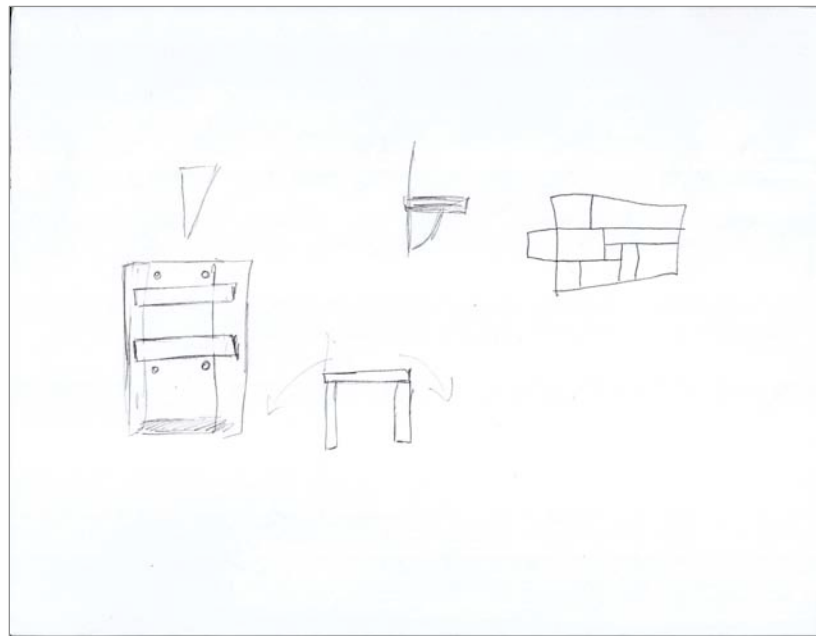
Later Mike got sidetracked, however, wondering aloud about the utility of the triangular-shaped books that might be stored on such a pyramid shelf. He veered off topic, while Denise continued to draw. In fact, Mike stayed off topic

long enough that she took a strong stance in getting the conversation back on course by abandoning the pyramid-shaped shelves and introducing a new idea as she drew (an instance of establishing a new frame of reference by hijacking the conversation away from Mike's musings). Drawing was initially used to maintain the frame of reference, but eventually even this was not enough. Interesting, drawing was then used to establish a new beginning for the interaction.

As was evident when Gavin took a similarly strong stance by beginning to draw in the conversation he had with Walter about the solar system, Denise also made a stance-negating statement that contradicts her physical actions by stating, "This is the worst drawing." Just like Gavin, she continues to draw in spite of this self-deprecating claim. As she constructed her image depicting a more traditional, rectangular set of shelves, she provided a voice-over description, explaining how each component would fit together as she added elements to the picture. However, her speech was fragmented and eventually trailed-off as she remained focused on drawing. Mike glanced down at her drawing intermittently as she continued to work. As Denise's verbal commentary subsided, Mike's picked up and he devoted less and less attention to her drawing, talking about an idea he had seen on television during an episode of a program about home decorating. Eventually he was primarily gazing out the window, only periodically glancing down at the drawing she was making. Again, Denise brought the conversation back to the question at hand by looking up at Mike and asking him, "But is that the most stable way?" She clarified the idea of stability by referring back to her drawing, demonstrating how the shelf brackets she has included would be attached to the wall providing

strength to the unit (Fig. 6.11). She reinforces the frame of reference for the conversation and guides the exchange back in the direction that they had originally set. In doing so, she confirms Mike's presence within the originally established bounds/ stage of the conversation.

Fig. 6.11. Mike and Denise's completed drawing



In the last example of drawing being used to maintain or reinforce the primary frame of reference, Min-Cha and Nadine addressed the question, "Why are the organs located where they are in the human body?" Clarification through drawing did not appear in their conversation until the end of the exchange. This was their third conversation, and they had shown a quiet rapport throughout, though both young women appeared quite shy. The slow start for this exchange was probably due to the fact that the prompt was assigned to them, rather than one that they selected. Like many of the other pairs, Nadine and Min-Cha started with what they knew. Nadine started the conversation by bringing up the idea of

evolution. However, Min-Cha immediately asked, “Why?!” After this, it took several minutes for the initial framing structure for their conversation to be established. Both young women expressed discomfort with science, essentially resulting in stance negation throughout this first passage of the conversation. Without either one of them stepping into the ring, so to speak, the conversation got off to a slow start.

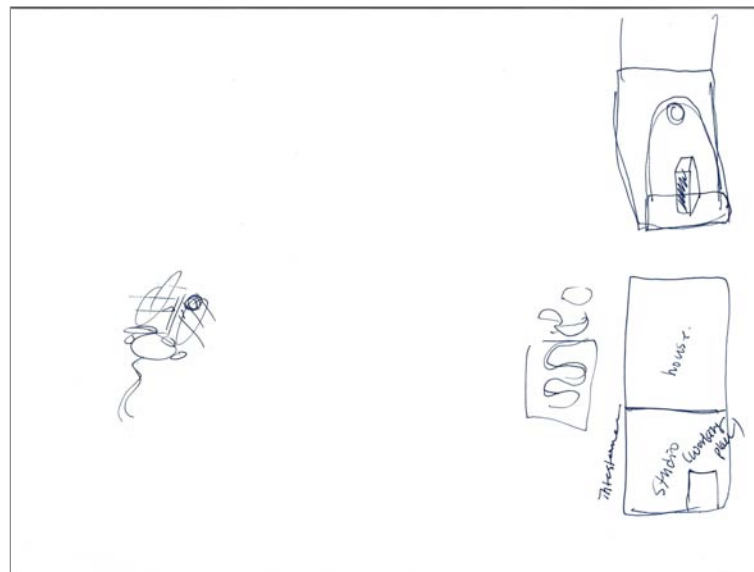
Nadine tried to push through, however, providing a short description of natural selection, but Min-Cha did not reflect back a similar level of engagement. It was only when they started to talk about the location of a specific organ, the heart, that the connection between the women grew and the conversation progressed. As they talked about the location of the heart, they used their hands to reference their own bodies, and in doing so mirrored and echoed each other, non-verbal signs of coordination and mutual frame of reference.

As they talked about the heart, they also started to reference other organs in the chest cavity, gesturing with their hands to indicate approximately where the lungs, stomach, etc., resided within their own bodies. Drawing came into play when Min-Cha experienced uncertainty about the name of a specific organ. She drew a squiggle on the paper in front of her and Nadine identified this as the intestines. Directly after this, Nadine picked up the pen and also drew, claiming space on the opposite side of the paper from where Min-Cha had drawn (Fig. 6.12). She mapped out the organs located in the torso, with some degree of detail. Min-Cha was impressed with her drawing saying, “Wow, you’re fantastic!” But like many of the other drawers in the study who expressed a lack of confidence in their own drawing skills, Nadine replied with, “Not so much...” And like those others, she continued to draw.

Fig. 6.12. Nadine drawing the locations of the human organs



Fig. 6.13. Min-Cha and Nadine's completed drawing



It was once Nadine completed her drawing depicting the organs in the human torso that Min-Cha asked for clarification by saying, “This is the heart?” Nadine responded with “That...” at which point both women had their pen tips

pointing at the same part of Nadine's drawing within a fraction of an inch of each other, "was supposed to be the heart. And those are the lungs." Their actions and body positions indicate a strong sense of coordination. Although Min-Cha asks for clarification, this presented an opportunity for the two women to strengthen their alignment, which is expressed both verbally and physically. The drawing provides a shared point of reference for this alignment. As she explained what she meant, Nadine drew a circle around the parts of the drawing she was referring to, clarifying the information she had provided. The action reinforces the frame of reference. Min-Cha also drew a circle around that portion of the drawing, saying, "Ah! Right," (Fig. 6.13), again physically and verbally expressing coordination with Nadine. Nadine further clarified, "And there are like the ribs. To protect the heart and the other organs," as she added ribs to the drawing. Then she sat back in her chair as she replaced the lid on the pen. The conversation concluded just a few minutes later with Min-Cha declaring, "I think that's the answer."

6.3.3 *The special case of the drawn aside*

There were two examples of drawing being used to temporarily step outside of the dominant framing structure. The first occurred during a conversation between Min-Cha and Nadine, this one addressing the question: *If you could live in any kind of house, what would it be like?* The young women took turns verbally describing the attributes of their respective dream homes. For Min-Cha, a fiber arts major, this included a studio. For Nadine, a library science masters student, her dream home included a large room for books. As they discussed their visions for an ideal place to live, they asked each other clarifying questions, provided

examples of other people's homes they liked, and shared scenarios reflecting what they thought their lives would be like if they could live in the spaces they described.

The drawn aside took place towards the middle of the conversation. Min-Cha had described her dream studio on the second floor of her dream house, and Nadine had countered with the idea that that would not work for her, since she expected to have a large library with a lot of books. Min-Cha immediately identified the problem with that, saying, "...the book(s) is really heavy." Nadine agrees that she would probably want to keep the library on the first floor or get an elevator, conceding that an elevator in a two-story house might be "a bit much." However, the notion of an elevator sparks Min-Cha's imagination and she suggests that Nadine might want to have "like a food elevator." Nadine says, "Oh, a dumbwaiter?" They confirm that this is what Min-Cha has in mind and the conversation turns to imagining having parties in the library, with the food being delivered in the dumbwaiter.

The aside occurred when Min-Cha returned to the idea of the dumbwaiter, not in the context of further developing Nadine's vision of her dream home, but because she thought that the device was "a good idea," in a more general, practical sense. She sought to clarify her vision of the parts and shape of the dumbwaiter by drawing it (Fig. 6.14).

The paper on which Min-Cha drew was not oriented toward Nadine in any way, and Min-Cha's move to draw was not in any way related to the statement made by Nadine right before Min-Cha put pen to paper. Nadine had said, "Yeah. I've been at parties in, in libraries..." And Min-Cha responded with "It's a good idea, the elevator, stuff," as she reached for the pen, uncapped it and started

drawing. Nadine shifted gears, watched Min-Cha draw while providing quiet affirming vocalizations, such as “Huhm.” (Fig. 6.15)

There were several minutes where no one speaks as Min-Cha moved to cap the pen and sit back, trying to leave her dumbwaiter drawing and return to the main thread of the conversation. However, in spite of repeated attempts, each time she aborted the motion of capping the pen, and returned pen to paper in order to add some other detail to the drawing. Nadine appeared to find this amusing, chuckling as she watches Min-Cha.

Fig. 6.14. Detail of dumbwaiter drawing

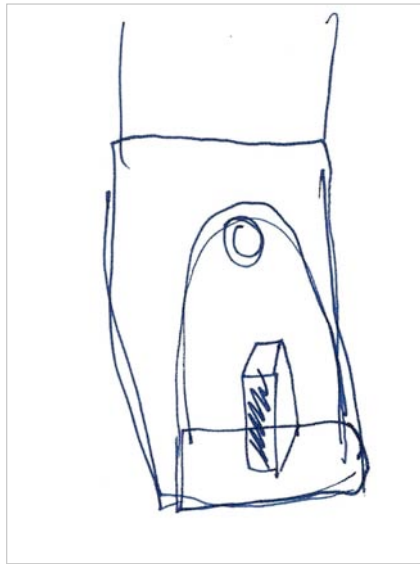


Fig. 6.15. Min-Cha drawing



Eventually, Nadine refocused the conversation and brought them back to the task at hand, ending the aside by saying, “We both seem to want pretty simple things, though...” The conversation continued for several more minutes, during which they discussed details about home decor and the equipment for Min-Cha’s dream studio. The exchange concluded with Min-Cha laughing, saying, “It’s my dream house,” as a way to explain what had become a rather elaborate set of tools and machines in her studio. Nadine looked at Min-Cha with a smile and said, “Yeah, could be whatever you want.”

The second instance of a drawn aside occurred during Mike and Denise’s conversation about the most stable way to build a set of shelves. When Mike speculated about the pyramid shaped shelf, he wondered about what kind of book would be able to sit on such a shelf. He said, “I’ve never seen a book shaped like a triangle, you know, from the side...I’ve never seen a book that’s slanted.” At this point he has veered away from the primary focus of the

discussion (which had been the characteristics of a stable set of shelves) to follow another thought, having to do with some sort of fantastical triangle-shaped books.

Denise joined him outside of the established frame of reference when she responded, “Oh, like...” and proceeded to draw the thing that Mike has said he has never seen, showing him what a triangular-shaped book on a pyramid-shaped shelf would look like. Recognizing that this train of thought had taken them outside the original frame of reference for the conversation, Denise got the conversation back on track by returning to the original frame of reference (interestingly, also by drawing), as discussed in a previous section. In this example, the drawing provides a means and a space for Denise and Mark to pursue a possible approach to answer the question, creating a temporary breach in the production format and participation framework of their exchange. When this shift in footing did not result in a generative trajectory for the discussion, they were able to return to their previous frame of reference and re-establish alignment.

6.4 Visualization as discourse strategy

An important aspect of both sets of findings presented up to this point is that they provide evidence that image-enabled communicative practices are embedded in and closely related to broader discourse strategies, both verbal and non-verbal. These findings also increase our understanding of specific discourse strategies that involve the creation of visual artifacts. When we look at visual communication as an information-driven practice, we also need to be aware of

the context in which these images are created, for there is a high degree of interaction between visualization and other modes of communication.

Initial stages of analysis concentrated on identifying specific communicative activities associated with drawing. For example, drawing was used to *inventory* or consolidate what was known about a given topic; to *clarify* specific ideas or concepts; and to enable someone to *translate* a thought into another format in order to verify its accuracy. The image-enabled activities identified were then described in terms of the overall discourse structures of the conversations. Drawing played a key role in the processes by which participants established and maintained frames of reference and conversational involvement. The analysis of framing behaviors revealed that drawing frequently coincided with near simultaneous shifts across boundary, stance, and vector. By positioning a piece of paper, picking up a pencil and making a mark to represent a specific thought, a participant essentially established a preliminary boundary (positioned paper), took a participatory stance (picking up and using pencil), and set a vector or initial trajectory for the conversation (drew an image of something). These instances of tight coupling of different types of framing behaviors served as a starting point for identifying specific attributes of the drawing that appeared to be most salient to these interactions.

In providing evidence for the ways in which visual communication is embedded in other types of discourse structures, these observations raise the question of what, if anything, is unique about image-enabled communication? All of the activities and strategies associated here with drawing are also accomplished through other modes of communication. What makes drawing different? Which specific affordances or attributes of image-enabled

communication (specifically drawing) facilitate the use of these strategies? These issues were addressed by focusing on the observable affordances of drawing that came into play during the recorded conversations.

In the next chapter, the specific characteristics of drawing that enable it to be used as a communicative strategy are presented. This discussion will focus on the dual nature of drawing as both artifact and activity, highlighting the performative and unconventional qualities of mark making that were observed in the conversations in this study. It will be argued that these are the qualities that make drawing a powerful tool for communicating but are also the very characteristics that create significant challenges to the ways we traditionally work with information artifacts and processes.

Chapter 7 Affordances

While the previous analyses revealed how deeply *embedded* the activity of drawing can be within conversation structures, it is also undeniable that a drawing somehow exists *outside* the typical structure of a verbal conversation. The last phase of analysis focused on identifying what is distinct about image-enabled modes of communication, responding to the question, “Which affordances of drawing are most salient for image-enabled discourse strategies?” In Chapter 3, the notion of *affordances* was introduced in the context of a discussion about modes of communication. Every mode of expression has unique affordances that contribute to the ways it can be used to convey meaning. Affordances of an environment or material, such as the attributes of a discursive environment as discussed in the previous chapters, are “what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill” (J. J. Gibson, 1979, p. 127, italics in original). Answering this last research question involved isolating what communicative affordances are provided to interactants by the mode of drawing within the conversational platform or stage. In other words, what affordance(s) does drawing offer within the communicative environment? This chapter will describe a series of attributes associated with drawing and introduce the notion that in terms of conversational resources, drawing can be viewed as both an enduring *artifact* and a dynamic *activity*.

7.1 Affordances of drawing

Using the transcripts, video recordings and analyses up to this point as resources, a set of terms were collected to describe the various affordances observed at play in the conversations involving drawing. A growing list of affordances of image-enabled communication emerged from the data, bringing to the surface some compelling contrasts. An initial collection of attributes included both *persistence* and *mutability*, two concepts that seemed to have contrasting, if not conflicting, characteristics. Drawing was also associated with *non-linearity* or an *unordered state*, but also with *sequentiality*. After repeated viewing of the interactions and a series of sorting exercises with the full list of affordances observed in the data, these apparent inconsistencies could be explained by returning to the basic premise posed in the gap analysis: image making produces both a *visual artifact* which is discrete and able to exist independently from that structure, and a *communicative activity* that is embedded in overall discourse structures. Once the list of affordances was viewed as a combined collection of attributes of both artifact *and* activity, a series of pairings were identified that highlight contrasting attributes reflecting this duality. The image artifact and image-making activity are not separated in practice, however, when viewed in terms of enabling affordances, these two aspects of image-enabled discourse are analytically distinct.

Table 7.1 shows a list of the affordances of image-enabled communicative artifacts and activities observed in the data. Aspects of the affordances of drawing activities have also been discussed previously. These concepts were introduced in reference to the roles that the activity of image making can play in

discourse, discussed throughout Chapters 5 and 6. Casting these attributes as specific affordances helps to integrate the previous analyses with the current discussion.

Table 7.1. Affordances of image-enabled communicative activities

Activity	Artifact
Sequential	Unordered
Intermittent	Persistent
Mutable	Stable
Embedded	Discrete
Performative	Static
Unconventional	Iconic

Visual representation is an embodied process wherein ideas, thoughts and expressions are given physical form. The action of mark making instantly leaves a visible, tangible record of a communicative expression, unlike verbal utterances or gestures. This means that as drawing is deployed during a conversation, it has the ability to simultaneously function as a stable, persistent waypoint (characteristics of the artifact) that allows participants to remain coordinated and involved, and as a mutable, dynamic interaction (characteristics of the activity) that plays out on a communicative stage, establishing coordination and involvement. The process of image making is different from other modes of communication in that it produces both situated activity and discrete artifact, each having distinct and sometimes contradictory attributes or affordances. Further, the two states of artifact and activity can be deployed within a single conversation or interaction, at virtually the same time.

This duality can be a powerful and flexible communication tool as seen in the conversations in this study. This dual nature of drawing as simultaneously artifact and activity can also explain why the meaning of images is sometimes so difficult to capture and represent; it can be challenging to understand image making using traditional information behavior and representation frameworks. This is what is unique about image-enabled discourse: it is a mode of communication that has the ability to exploit the flexibility and unconventional qualities offered by its dual nature, while also remaining integrated into standardized and expected conversation and communication structures.

In using the word *artifact* here, an attempt is made to focus attention on the physical object of the drawing, the term referring quite literally to an object made by a human being. The analyses in the previous chapters provide some insight into the nature of the activity of drawing, and these observations will come into play as the discussion of affordances of these activities unfolds. Determining the affordances of the drawn artifact requires more discussion.

Interpretation of drawn artifacts occurs in a number of areas including art history and criticism (see the classic example of Arnheim, 1969), child development (Freeman & Cox, 1985; Golomb, 1992; Hopperstad, 2008; Kellogg, 1970; Milbraith & Trautner, 2008), and psychological and cognitive assessment of both children and adults (Freedman, 1994; Jolley, 2010; Oster & Gould, 1987; Selfe & Clowes, 1977). In many of these discussions, attention is devoted to the mimetic qualities of the drawn image (how closely it represents real life), the ability for a drawing to reflect internal psychological or cognitive states, and the meaning embodied by both abstract and figurative representations. Most of these studies mention the social and cultural awareness that children gain by learning

that they can participate in society through the symbolic thinking exhibited in visual representation (see Milbraith & Trautner, 2008). In these studies, however, relatively brief mentions of socialization through the act of visual representation are generally left behind in favor of detailed analysis of specific symbolic elements. Children are positioned implicitly or explicitly as artists working alone, with the primary focus of investigation being the relationship between what is “in” the child’s head and what is “on” the paper.

As presented in the theoretical framework introduced in Chapter 3, such formal aspects of images certainly are relevant to an overall model of image-enabled discourse. The content of images is important. And the relationship between the drawer and what he or she is drawing is often complex and nuanced. As Arnheim (1969) points out, there are important differences between descriptive gestures, positioned as precursors to line drawings, and actions that leave tangible marks. He observes that, “The portrayal of an object by gesture rarely involves more than some one isolated quality or dimension, the large or small size of some thing...” (p. 117). He contrasts this to drawn images that leave a durable trace, showing “more explicitly than gestures what the imagery of thought might be like” (p. 118). Arnheim proceeds to explain that the ways in which drawings represent the “imagery of thought” are not necessarily ordered or sequential, but reflect a range of dynamic cognitive processes and psychological states.

However, the focus of the current analysis is not the internal, cognitive landscape. It is also not the relationship between the person drawing and their individual symbol systems. The motivation of this study is to reveal the ways in which drawing is used as a means of social interaction. Because of this, detailed

analysis of the content of drawings created during the conversations recorded in this study lies outside of the scope of the current investigation. Where Arnheim focused on the cognitive processes embedded in the act of depiction, here the focus is on the communicative practices which give rise to the drawing itself. Future work will attempt to integrate these interactive dimensions of image-enabled discourse with formal analysis of the content of visual images. For the moment, it will be enough to clarify and explicate the communicative role of the drawn artifact within the discursive landscape already presented in the previous chapters. In this sense, the affordances of the drawn artifact literally refer to the attributes of the physical, tangible object. The remainder of this chapter is devoted to exploring the artifact/ activity dichotomy as observed in the conversations in the study.

7.1.1 Activity and artifact

The artifact/ activity dichotomy provides a lens through which to structure the identified affordances according to whether an activity versus an artifact was being described. For example, the activity of drawing is sequential, performative, and embedded, while the drawn artifact is unordered, persistent, and discrete. In the next section, each of the pairs presented in Table 7.1 will be examined individually, and then a final example will illustrate how multiple pairs of contrasting affordances can be exploited during a single exchange. Some of these pairing include attributes that are very similar, for example persistence and stability. By coupling these attributes with contrasting affordances, more subtle differences are revealed. Although persistence and stability are similar, their contrasting attributes of intermittence and mutability are more distant. In this

way, this series of pairings are intended to reveal the range of affordances brought to the surface by the artifact/affordance perspective.

7.1.1.1 Sequential/Unordered

One of the most distinct attributes of static images is that visual information is often presented in a non-linear format. This *unordered* quality of images refers to the ability that some images have to represent information “all at once,” not relying on a specific linear starting point or sequential unfolding in the same way that verbal expression can. An ad hoc visualization might include annotated labels or measurements, but the primary mode of communication or expression is the image. In this sense, the image has a more object like quality than written expressions do. While choices made by the creator of the image may guide the eye in a specific direction (for example many web pages are designed to optimize the fact that we often direct our eyes to the upper left corner first), the interpretation of the picture does not always depend on being “read” in a specific direction.

This quality of unorderedness was observed when one person waited for the other to complete a drawing before commenting on it: the visual expression was not complete until the entire image was put on the page. The non-linear format of the drawn image also came into play when the primary focus of a conversation was influenced by something drawn previously. By referencing a detail of the drawn image, alignments and frames of reference could be maintained despite somewhat abrupt shifts in topic. The drawn artifact supported and in some cases inspired this discontinuity, while still enabling conversational involvement to be maintained.

This is not true of the activity of drawing, however, where a *sequential* construction of the image can be exploited as part of the discourse structure. The activity of drawing was at times used to emulate a sequential building of ideas or instructions. This was most readily apparent when participants were describing how to build or make something, adding elements to the drawing in the same order that they would follow if they were physically constructing an object. For example, when pairs were addressing the question, “What is the most stable way to build a set of shelves?” many used drawing (accompanied by a verbal narration) to explain how they would go about constructing a set of shelves, with the order of drawn elements reflecting the order of their hypothetical shelf-building process. In terms of the image-enabled framing behaviors discussed in the previous chapter, the sequential nature of the activity of drawing enabled interactants to extend vectors and create common ground through the accumulation of joint actions. In contrast, the unordered nature of the drawn artifact enabled participants to view both the history of their interaction and the current state of engagement simultaneously.

7.1.1.2 Intermittent/Persistent

Not only can drawing be used to represent a sequential chain of thought, as just discussed, this unfolding of the timeline can happen in fits and starts. This reflects the *intermittent* quality of drawing. At times during conversations, the activity of drawing was interrupted by another train of thought, gesture, or verbal interjection, but returned to later in the exchange. This is analogous to the code-switching discussed by Gumperz (1982) where bilingual interactants shifted between languages or sublanguages depending on the topic, the

circumstances or the participation frameworks evident in a conversation. Under dialogic circumstances, the action of making a mark often reflects a type of temporary “mode switch.” The conversations in this study showed many examples of people drawing periodically over the course of their discussions, starting and stopping, returning to a drawing or creating a new one. This type of discontinuous expression can be challenging to maintain in verbal modes, but a drawing can gradually evolve in a syncopated process while still retaining communicative power. This supports the idea presented in Chapter 3 that communicative practices do not always unfold in predictable ways, but are the result of improvisation and aggregated experiences.

Taking advantage of the intermittent nature of the activity of drawing generally necessitates exploiting the *persistent* quality of the drawn artifact. Persistence refers to the steadfast ability for marks made on a surface (or images displayed on a screen or printed on a paper) to endure over time. The durable quality of the drawing enables participants to maintain multiple levels of attention and awareness, across different modes of expression, throughout the course of an exchange (Goodwin, 2007, p. 59). As Norris points out, the flow of attention and awareness during an exchange is a dynamic process (2004, p. 95). The persistent drawing remains available even when it is not the primary focus of the conversation. It sits unchanged and unwavering. The drawing activity can start and stop because continuity of expression is ensured by the indelible quality of the mark made. As Arnheim pointed out (1969, p. 118), this durable quality allows the drawing to represent thoughts and expressions with more detail and higher resolution than a fleeting gesture is able to do. In the data, this persistence was evident when participants used the drawing to manage body position, gaze,

orientation and attention, in addition to using it as a physical record of what had occurred so far in the conversation. Clark (Clark, 1996) referred to this as external representation of public events so far (see Chapter 3), necessary for creating the accumulation of joint actions that leads to the creation of common ground. The persistent record of the drawn artifact allowed participants to maintain conversational involvement by providing a physical record.

7.1.1.3 Mutable/Stable

In the conversations in this study, drawing was used to capture details or agreed upon parameters as a conversation evolves. One moment the drawn artifact was used to confirm boundaries or maintain a frame of reference (requiring a degree of constancy), and the next moment the plastic, malleable nature of the drawing activity was exploited in order to add to a picture, erase parts of it, or reconfigure some aspect of it. Drawing was also often deployed at times when a degree of flexibility and open-endedness was required. While establishing frames of reference relies on a degree of stability, the evolution of interactions also requires flexibility.

The drawn artifact was deployed in ways that exploited its relatively *stable* qualities, meaning it has the ability to not only endure, but to exist in a consistent, constant state. Persistence, a related affordance, is associated with a mark enduring over time, not fading like speech. Stability adds an association to state of change, implying that the artifact not only does not fade, but it remains in a constant state. In one of the conversations in the study, Denise uses the stable quality of the drawn object in order to firmly establish and maintain a frame of reference for the conversation, keeping her partner Mike from

wandering off-topic. Even when Mike veered off-topic, she was able to call on the frame of reference represented by the drawing in order to keep his diversion from becoming the primary thematic thread of the conversation. Stability also allows the drawing to be used to document the progress of the conversation by being an external representation of current state.

The changes made to a drawing throughout the duration of an interaction often reflect the ebb and flow of ideas during that exchange. While Denise exploited the unchanging character of the artifact in order to maintain Mike's attention, she was also able to change and alter the image in response to the evolution of their conversation, reflecting the *mutable* character of drawing. In the terminology introduced in previous chapters, by supplementing and augmenting the drawing she could extend and even alter the vector of the conversation, maintaining a sense of continuity and conversational alignment.

7.1.1.4 Embedded/Discrete

The framework for describing the role of drawing within overall discourse structures described in Chapters 5 and 6 reflect the *embedded* nature of this activity when it is used for communicative purposes. In the conversations in this study, drawing practices occur in relation and response to communicative activities expressed through language, gesture, and body position. The drawings themselves, however, are *discrete* objects independent of the conversation itself. While the conversation (including the activity of mark making) can be seen as an ephemeral event tied to a specific point in time, the drawing exists beyond and separate from this event.

For example, when Gavin and Walter decided to tackle the question, “If you could live in any kind of house, what would it be like?” they both immediately reached for paper and pencil and began to sketch their dream house. They maintained conversational involvement with each other by narrating their drawing activities and by periodically glancing at each other’s drawing. Here we can see the embedded quality of the drawing action. However, when it came time for them to confirm that they each fully understand the other’s requirements and wishes for an ideal home, they physically swapped drawings. They could do this because the drawings existed as discrete objects. Interestingly, the next part of the conversation exploited the embedded drawing activity again when Gavin examined Walter’s drawing, asked some questions, and realized that Walter has neglected to put a door on his house. By way of clarifying, Gavin added a door to Walter’s drawing, stating, “Ah, yeah, we’ll put it like right here” (5_2, 9:53). The drawing reentered the discourse structure of the conversation and served as a stage for Gavin and Walter’s continued interactions.

7.1.1.5 Performative/Static

In the initial discussion about setting a communicative stage, interactions were compared to a performance unfolding on a theatrical platform. When one thinks about watching a performance on a stage, the type of interaction that takes place is also not typical of many conversations. Engagement looks different.

Performers do not, traditionally, speak directly to members of the audience.

Actors or dancers establish and maintain a frame of reference for the audience.

Performers often talk of the connection they feel with the audience, the sense of

attentiveness and involvement that is generated collectively through very different means than those typically deployed in face-to-face interactions. A similar type of performative attention was observed in these conversations when drawing was deployed. The person watching the drawing unfold behaved similar to an audience in a theatre.

This notion of *performance* was further reinforced through observations of body positioning and orientation during episodes of drawing. These passages were marked by a distinct lack of eye contact, lack of verbal contextualization cues, long pauses, and vague indexicals. These could be seen as signs of decreasing coordination, involvement and attention. However, the cumulative effects of the frame of reference established and maintained through drawing activities combined with the overall discourse structure, revealed that drawing rarely corresponded with a decrease in coordination between participants. The notion of performance can be used to explain why coordination looks different in these interactions.

Drawers also consistently made disclaimers about the poor quality of their drawing as they got started (even those who were trained in art and design). In the earlier discussion, a connection was drawn between stance and performance. Jaffe states that “speaker stances are... performances through which speakers may align or disalign themselves” (2009b, p. 4) in terms of one or more social identities. She makes further connections between performance theory and stance saying that “The notion of sociolinguistic stance is a fundamentally performative one in the sense that a stance-based perspective views social identities as discursively constructed rather than fixed” (p. 11). As presented in

the previous chapter, the act of picking up an instrument and making a mark is seen as an embodied form of stance-taking.

The performative nature of embodied stance-taking can be seen in comments from drawers indicating a self-awareness, and in many cases a self-consciousness, about how well they will perform the task they are about to enact. For example, at one point Denise said, “This is the worst drawing...” (1_3, 30:19). Mark’s statement, “...let’s see if I can draw it,” (1_3, 33:02) also reflected an awareness that the person doing the drawing is attempting a challenging task. As she watched her partner draw, Min-Cha said to Nadine, “Wow, you’re fantastic!” Nadine responded with, “Not so much...” (4_3, 29:45). Statements like these indicate awareness that the person doing the drawing is performing a feat. Even comments such as Gavin’s admonishment to Walter, “Don’t steal my ideas,” (5_2, 7:02) as they set off to draw their dream houses, reflects a self-awareness of the performative aspects of drawing. In contrast, there was not a single example where a participant expressed similar self-consciousness about using proper grammar or outwardly doubted their ability to verbally express themselves, even in the cases where English was a second language.

This performative quality associated with the activity of drawing is contrasted to the *static* nature of the drawn artifact. As mentioned in the beginning of this discussion, the static quality of the drawn artifact is very closely aligned with its persistence and stability. It is when these specific attributes are paired with contrasting affordances of the drawing activity that nuanced differences emerge. When the drawing is being used as a waypoint, it cannot change over time, it is not interactive, and it does not provide cues as to the level of involvement that is being cast on to it. Its role is to be a point of reference.

Returning to the preliminary study discussed in Chapter 3, statements regarding the perceived authoritative, unbiased and neutral qualities of images can be viewed in terms of the static quality of the artifact. This can also be seen in the conversation in this study. Towards the end of their conversation, Adam references the drawing he and Gloria created while responding to the question about the distance from the earth to the sun in relation to the whole solar system. He states, “See you do this (picking up the pen and making a few quick marks on the page). This distance equals (makes a few additional marks, appears to be writing) *that*,” (2_3, 23:17). Here the indexical “that” is specific and emphatic. Adam’s statement relies on the static nature of the image in order to establish a stable relationship between elements on the page.

7.1.1.6 Iconic/unconventional

Symbols, such as stop signs and signs for hospitals and public toilets, are examples of extremely conventional, *iconic* images (Norris, 2004). The meanings of icons are established through repeated, consistent use. Icons rely on stability of interpretation across multiple contexts in order to retain value. Because of this, creativity and novelty are not often associated with images of this type. In the conversations in this study, the arrow was the most frequently drawn iconic symbol. In contrast to the notion of the iconic image, the introduction of drawing into a predominantly spoken conversation was an *unconventional* discourse strategy.

Clark asserts that spoken, face-to-face conversation is the basic, primary form of language use, more essential than other types of language use such as the

written word, speeches, or telephone conversations. Characteristics of this basic form of language use include (Clark, 1996, p. 42):

1. *Copresence*– The participants share the same physical environment.
2. *Visibility*– The participants can see each other.
3. *Audibility*– The participants can hear each other.
4. *Instantaneity*– The participants perceive each other's actions at no perceptible delay.
5. *Evanesence*– The medium is evanescent- it fades quickly.
6. *Recordlessness*– The participants' actions leave no record or artifact.
7. *Simultaneity*– The participants can produce and receive at once and simultaneously.
8. *Extemporaneity*– The participants formulate and execute their actions extemporaneously, in real time.
9. *Self-determination*– The participants determine for themselves what actions to take when.
10. *Self-expression*– The participants take actions as themselves.

According to Clark, every other type of language use is a variation on this structure. If any of these features are missing, special skills or procedures are required and the result is considered “unconventional.” Drawing violates the conditions of audibility, evanesence, and recordlessness, earning the distinction of being communicatively unconventional.

The notion that drawing enables someone to step outside the conventions of a conversation was examined in the discussion of framing behaviors in Chapter 6. In some cases, stepping outside of convention took a literal form. The activity of drawing enabled the speaker to temporarily step outside the conventional frame of reference for the conversation in order to address tangents or parenthetical threads of the discussion or to try out a new approach. This is one way in which the activity of drawing is unconventional (literally referring to the stepping outside of discourse conventions).

Drawing can also be seen as unconventional in terms of the code or “mode” switch originally introduced in Chapter 3. By switching the mode of expression from the dominant verbal form that most face-to-face conversations rely on, a break from convention is signaled. As discussed by both Gumperz (1982) and Goffman (1974, 1979), switches like this can be seen as strategic discourse management choices, resulting in shifts of footing or framing. In this sense, unconventional refers to being different from the dominant form.

There is yet another way that drawing can be described as unconventional. In her work looking at child development and the acquisition of drawing skills, Golomb (1992) explains that children do not acquire skills of visual representation by following conventions, but instead through relatively unstructured play with mark making. Golomb writes that, “In the domain of drawing we are faced with shapes that are endowed with an expressive power that is not primarily derived from conventional usage, a finding that leads to a major distinction between the linguistic and graphic systems” (p. 26). Perhaps this is one reason that many of the participants expressed uncertainty or self-

consciousness as they began to draw. The lack of convention or standards is both freeing and daunting.

This characteristic of being free from rules or expected structure was seen in the data as people routinely turned to drawing when faced with uncertainty or the need to “make something up.” The notion that drawing involves stepping outside of the norm carried with it a connotation of creative action and invention. This can be seen in statement such as: “We’ve got paper, we can draw pictures right?” (1_1, 4:05) when faced with a series of unknowns; “Alright, we got paper. Let’s work something out,” (2_3, 20:39) referencing the possibility of creating a response; and “We can be creative too, right?” followed by the speaker beginning to draw (2_3, 20:51). These are all markers of the unconventional quality of the activity of drawing in discourse.

7.1.2 Example of contrasting affordances

In many cases, these contrasting characteristics or affordances were evident in the very same instance of drawing, or in very close proximity. In this way the distinction presented here between artifact and activity is primarily analytic, as noted in the beginning of this chapter. The following example, from the conversation between Denise and Mike about the most stable way to build a set of shelves, is provided in order to further illustrate the ways in which contrasting affordances of activity and artifact appeared in conversations. The following contrasting pairs of affordances are highlighted in the narrative:

- Sequential/Unordered
- Intermittent/Persistent
- Mutable/Stable

- Embedded/Discrete

When Denise and Mike were discussing the most stable way to build a set of shelves, they found themselves on a tangent about triangular shaped books. Mike suggested the idea of a pyramid shaped bookshelf as a particularly strong and stable form. He gazed out the window as he speculated at length about the triangular shaped books that would go on such a shelf. Denise brought the focus of the conversation back to the topic of stable shelving by beginning to draw a picture of a shelf that she thought would be strong. Mike trailed off as Denise's drawing took shape (Fig. 7.1).

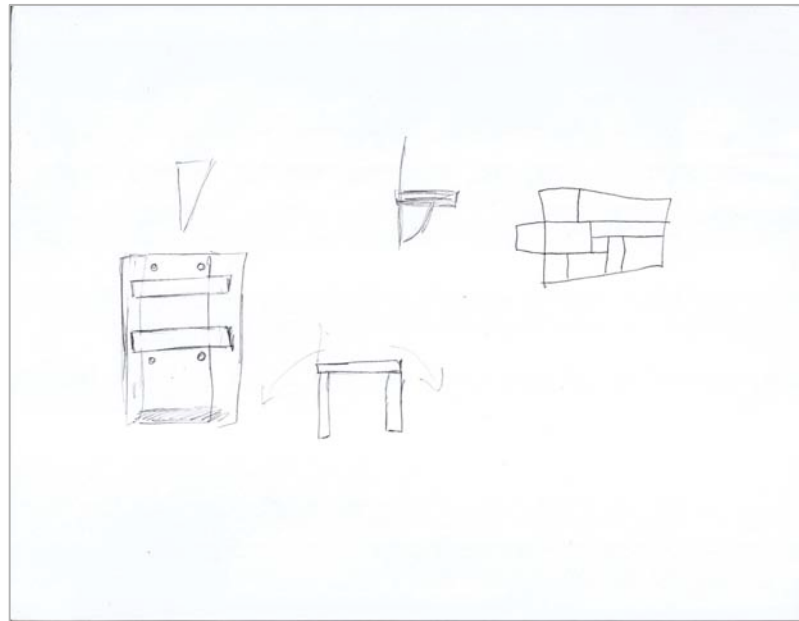
Fig. 7.1. Video still of Mike and Denise



Denise drew for about a minute as she spoke, verbally describing the structure as she added features to her picture, emulating the process of physically constructing the form. She was exploiting the *sequential* nature of activity of drawing. In fact, her words alone are relatively indecipherable

without the accompanying evolution of her drawing: “I think, you could either, you know have the, the boards, you know do that shelving frame...” (1_3, 30:06). Even if you look at the drawing after the fact, it is not entirely clear to what her verbal statements are referring (Fig. 7.2). Denise’s drawing activities were *embedded* in the overall discourse structure, relying on the intermodality of her words, gestures and drawing to deliver her message.

Fig. 7.2. Mike and Denise’s completed drawing



However, Mike replied with a series of affirming vocalizations and clarifying questions as she drew, indicating that he was involved and participating in the conversation. He understood what she was doing. The sequential affordance of drawing allowed Denise to emulate the activity of building a shelf, enabling Mike to become engaged in her thought process.

It was the *persistent* quality of the drawn object that allowed Denise to firmly establish and maintain a frame of reference for the conversation, keeping

Mike from wandering off-topic. Using terminology from the previous discussion, the drawing allowed Denise to maintain footing, even when Mike interjected affirmations or questions. Because a physical, tangible, persistent object was the byproduct of Denise's strategic framing practice, the pair was able to coordinate and remain involved in the conversation.

Eventually, Mike joined into the conversation more actively by taking the pencil from her (at her invitation) and made a drawing beside hers to show his idea for the shelves, reflecting the *intermittent* quality of drawing activity within the overall conversation framework. However, the drawn artifact also left a record of her process, giving Mike access to various stages of her chain of thought, not just the last thing she said, when he was ready to contribute. This is because the drawing artifact has attributes of being *unordered* in contrast to sequential and persistent in contrast to intermittent. In the final stages of the conversation, Denise incorporates aspects of Mike's suggestions into her drawing, through the affordance of *mutability*, and that becomes the authoritative, *stable* version of their idea. Although their conversation ended long ago, the *discrete* drawing still exists.

7.2 Summary of findings

Hanks' notion of communicative practice makes a distinction between activities performed through interacting with language and other dimensions of verbal communication, namely form and ideology. In explaining the relationships between these three dimensions of communicative practice (activity, form and ideology), Hanks points out that while instances of language use are the result of the combination of all three dimensions, they are analytically distinct. In other

words, by definition, the attributes of communicative activities are different from those of communicative ideology or linguistic form. A model of image-enabled discourse based on this approach to describing communicative practice was introduced in Chapter 3. The theoretical argument made a case for focusing on image-enabled communicative activities in order to support this model. This position reflected an expectation that close examination of activities would yield different analytic insight than would result from studying the image artifact.

The identification of the contrasting affordances described here provides evidence of the analytically distinct nature of image-enabled communicative activities, providing empirical support for the theoretical model of image-enabled discourse. Not only can this framework be used to explain the presence of these contrasting affordances, but it also establishes a bridge between the image-enabled activities identified in this study and previous research focused on the image artifact.

The findings described in these last three chapters were presented according to the research questions that guided the overall research design. The following questions were addressed through multi-phased inductive analysis:

RQ1: What communicative **activities** are taking place when people draw during face-to-face conversations?

What are people doing, communicatively speaking, when they are drawing? Hanks' notion of communicative activity and Clark's operationalization of joint activities provide a basis for defining and discussing seven communicative activities associated with drawing that were observed in the data. These are the things that people are doing,

communicatively speaking, when they create ad hoc drawings during their conversations. They are:

- *Clarifying*– Addressing a gap or missing information by providing additional information or details.
- *Inventorying*– Consolidating, gathering, listing all that is known. Pooling known information. Creating a scaffold for laying out known and unknown elements.
- *Showing* – Literally and visually representing a tangible object (i.e., easier to show it than to say it).
- *Integrating*– Merging existing ideas.
- *Connecting*– Explicitly and tangibly showing conceptual relationships. Show abstract connections that have been synthesized. Not literal, physical connections.
- *Translating/Transforming*– Changing the form or format of a message, often for the purpose of verification.
- *Hijacking*– Seizing control of conversation. An attempt to independently determine the focus of the discussion.

RQ2: What role do these activities play in managing **conversational involvement** and **coordination**?

How do these activities relate to the overall organization of discourse with each conversation? In order to address the second research question, the analysis looked at these episodic activities in relation to overall communicative structures. Clark's concept of common ground sets in motion a chain of observations that show how these mark making activities

can play important roles in higher-level communicative strategies related to conversational involvement and engagement. Specifically, concepts of framing (Goffman, 1974; Tannen & Wallat, 1993); footing (Goffman, 1979; Goodwin, 2007), and stance (Jaffe, 2009b) were used to establish an analytic framework for identifying and comparing conversational structures in the conversations studied. Findings show that drawing is used to establish, maintain and alter the primary frame of reference for an exchange by using visible, persistent spatial representations to bridge invisible boundaries created by differences in knowledge domains.

The most important aspect of both of these sets of observations (RQ1 and RQ2) is that they provide evidence for the notion that image-enabled discourse is embedded in and closely related to broader communication strategies, both verbal and non-verbal. All of the activities and strategies presented in these discussions in relation to drawing can also be accomplished through other modes of communication. Therefore, these findings also raise the question of what, if anything, is unique about visual modes of communication? What makes drawing different? This was addressed by the third research question, discussed next.

RQ3: Which **affordances** of drawing are most salient for image-enabled discourse strategies?

Is drawing used differently than other modes of communication? This question was addressed by focusing on the observable affordances or attributes of drawing that came into play during the recorded conversations. Within the interactions, drawing existed as both an activity

and an artifact, sometimes even simultaneously. Further, the salient attributes of drawing as an activity (sequential, performative, embedded in the greater conversation structure) were at times sharply contrasted to features of the drawing artifact itself (unordered, persistent, discrete) being exploited at the same time or in close proximity. This dual, and in some cases contradictory, nature of drawing as simultaneously artifact and activity explains one of the reasons why the meaning of images can sometimes be so challenging to capture and represent. It also speaks to what is unique about image-enabled discourse.

In addressing these questions, the concept of image-enabled communicative activities has evolved from a theoretical proposition to an empirically supported construct. This chapter introduced a number of avenues for describing and examining the role image making plays in communication. These findings provide a scaffold for further investigation of the creation of images as an ad hoc information behavior. The potential applications of the concept of image-enabled discourse and communicative activities will be discussed in the final chapter. Implications for information science research and practice will be outlined, along with a discussion of future research.

Chapter 8 Conclusion

You are having lunch with a colleague, taking a break from a long day of frustrating meetings during which your team just cannot seem to get on the same page. The conversation turns to the project you are both struggling to launch. As the conversation evolves, you reach for a napkin, dig a pen out of your pocket and make a few hasty marks, eliciting a nod of agreement from your colleague as you draw. The creation of the drawing proves to be a watershed moment, helping you re-contextualize the situation and come up with a solution to the impasse. After your meal, you and your colleague return to the team, armed with a more concise way to explain your perspective. The drawing is left on the table, along with the tip.

This study has shown that in these situations, people are doing more than producing a visual artifact. By creating an image within the context of an ongoing dialogue, the action of visual representation performs key communicative tasks related to the construction and exchange of information. The findings presented in the previous three chapters have shown that those tasks go beyond mere illustration to include dynamic discourse management strategies. For example, drawing enables us to coordinate with each other, to introduce alternative perspectives to a conversation and even to temporarily suspend the primary thread of a discussion in order to explore a tangential thought without disrupting the prevailing frame of reference for the exchange.

Because of this, the intended meanings or purpose of specific elements within a constructed visualization cannot always be easily derived solely from the artifact itself. At times, the primary communicative impact of an ad hoc visualization lies in the *activity* of making a mark, rather than in the *artifact* itself.

Rich descriptions of visually enabled conversation and social interactions can greatly inform and influence the design of multimodal information and communication technologies (ICT). The goal of this research is to expand the ways that the creation and use of visual information are understood and supported by these systems through identifying and describing image-enabled discourse activities. This research contributes 1) a theoretical framework for the study of image-enabled discourse, 2) a methodology and research design for investigating the creation of visual information in situated contexts, and 3) insight into possible directions for improving existing visually enabled ICT. Additionally, this study has yielded a standardized multimodal dataset documenting image-enabled communication activities, available for future research.

Implications of these contributions will be discussed in this concluding chapter, along with directions for future work. While the first two contributions have the potential to influence a broader range of multimodal discourse research, particular attention will be devoted to implications related to the development and improvement of visually enabled ICT. After a brief discussion of limitations, opportunities for extending the research in three potential areas of impact will be addressed:

- *Creation of visual information*—This study showed that the practice of producing ad hoc visualizations during the natural flow of conversation represents a class of communication activities associated with the creation of information, an under-investigated area of research in the field of information science. The rapid increase and availability of sophisticated content-creation tools and user-generated material on the web is just one practical reason to devote more attention to this important phase of the information lifecycle.
- *Representation of visual information*— Although affordances of the image artifact can contrast or even contradict properties of image-making activities, both can contribute to the perceived meanings of an image. Representations of images (such as those used in image retrieval and information visualization systems) can and should acknowledge the dual nature of constructed visualizations as both artifact and activity.
- *Image-enabled coordination*— This study shows that interactions related to coordinating may appear different when visually enabled means are put into play (e.g., lack of eye contact does not signify lack of connection; signs of coordination such as echoing or unison might cross modal boundaries). The full range of communicative activities associated with the creation of visualizations (not just those related to “showing”) need to be adequately supported by visually enabled ICTs such as virtual collaboration tools and information visualization interfaces.

8.1 Limitations

Early in the design of the study, the decision was made to focus on qualitative methods. A discourse-oriented methodology was used to frame the range of communicative practices associated with the creation of ad hoc visualizations in face-to-face conversations. The protocol was designed to enable video camera and audio recording equipment to systematically capture the creation of ad hoc visualizations, allowing for repeated viewing during analysis. An iterative, detailed approach to transcription yielded rich documentation of these interactions. The benefits of this approach, as well as the measures taken to mitigate bias and maintain reliability of the data and analysis, were described in Chapter 4. Each of these decisions also carries limitations.

Standardized setting and use of prompts may have influenced the interactions between participants, such that the conversations that were analyzed for the study may not entirely reflect naturally occurring exchanges. The detailed approach to analysis, which was based on established discourse analytic methods, constrained the number of conversations that could be considered within a reasonable amount of time. These choices produced rich descriptions of a series of image-enabled interactions; established support for a theoretical model of image-enabled discourse; and provided a number of leads for future work (see below). They also limited the generalizability of the current findings. One of the most important goals of the next phases of this research will be to apply the methods and theoretical framework of this initial study to naturally occurring situations in order to expand the generalizability of the findings reported here and address these limitations.

In the absence of existing research on visualization as a means of social interaction, this study was motivated by a need to establish and confirm the complexity of image-enabled discourse practices. The three-phase analysis was designed to identify and describe the different ways that drawing can be deployed within conversations. Findings demonstrated connections between framing behaviors and image making within face-to-face conversations, explicitly positioning the attributes of the image artifact in contrast to the dialogic characteristics of image making as a communicative activity. In doing so, visualization of information was shown to be an integral and sophisticated means for the exchange of information between individuals.

However, the study did not yield a mutually exclusive set of discrete descriptive categories. Findings were presented in a series of three perspectives from which we can view image-enabled discourse practices (as communicative activity, as framing behavior, and as artifact/ activity dichotomy), arguing that examining visual information phenomena through these lenses demonstrates how much is being missed with current frameworks. Each of these perspectives also represents a compelling starting point for further work aimed at producing the types of high structured categorizations needed for many systems-based applications. For example, mapping the identified affordances of image-enabled discourse to a larger corpus through automated processes (such as machine learning) will require greater specificity and forced-choice categories within a structured schema. It would be possible to derive such classifications using the current study as a basis, but further research is needed to produce actionable classifications. Heuristics designed to measure the impacts of these affordances in terms of interactive interfaces will also need more refined nomenclature and

definitions. Experimental studies informed by this preliminary framework will have the ability to test the relative importance and interrelationships between affordances, however, producing output that could be used in these situations.

In the following discussion, several directions for future research are described. Each of these directions for future research is dependent on the initial grounding provided by the current qualitative study, which casts a spotlight on the act of image making as an information behavior and on the creation of visual information as a sophisticated and nuanced communicative practice.

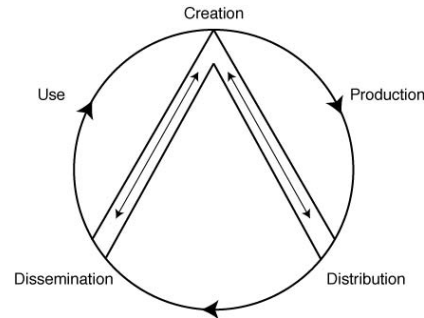
8.2 Construction of visual information

The practice of creating ad hoc visualizations during the natural flow of conversation represents a class of communication behaviors associated with the construction or creation of information, an under-investigated area of research in the field of information science. The rapidly increasing availability of sophisticated content-creation tools and user-generated material on the web is just one practical reason to devote more attention to this important phase of the information lifecycle. Participatory websites such as Flickr, Facebook, and YouTube are well-known examples of dynamic databases accessible through the web and populated, if not exclusively then predominately, by user-contributors. The power of media technologies is no longer solely in the hands of technologists (boyd & Ellison, 2008). The individual is now able, on an unprecedented scale, to construct and distribute his or her own creative products. Media theorists have pointed out that as a result of the emergence of these Web 2.0 applications, the term “user/participant” has supplanted “viewer/consumer” in discussions of today’s media environment, where the boundaries between commerce, content,

and information are being redrawn (van Dijck, 2009). When viewed in this light, the limited insight we have regarding the process of information creation is noteworthy. More than at any other period in history, we have the ability to seamlessly participate in every step of the information cycle from start to finish.

The information cycle is one of the primary unifying theoretical concepts in the field of information science. Although various models reflect slight differences in the precise number and names of the various stages, there is general consensus that the process starts with the creation of information and ends with its use (Rubin, 2004). The beginning of the cycle, involving the initial construction of information, is notably under-represented in current information science research (Case, 2002; e.g., Fisher, Erdelez, & McKechnie, 2005; Rubin, 2004). This can be attributed to the specialized roles the information creator has had in the past, for example as a novelist, composer or scholar. As was noted in Chapter 1, Rubin highlights changes in the ways that the formerly linear authorship cycle is understood as a result of the Web environment. (2004, p. 4). With the rapid development of interactive, collaborative tools and technology, opportunities to create information and share it with others have increased exponentially. The dynamic nature of information in social media environments, for example, has raised the profile of this stage of the information cycle (e.g., Agichtein, Castillo, Donato, Gionis, & Mishne, 2008; boyd & Ellison, 2008; Cha, Kwak, Rodriguez, Ahn, & Moon, 2007). Rubin's view of the information cycle is notable because it takes into account changes in the weight, distribution and relationships between these phases as a result of the Web, which he states "has dramatically altered the relationships between creators, products, distributors, disseminators and users" (2004, p. 4) (Fig. 8.1).

Fig. 8.1. Rubin's information life cycle (2004, p. 4)



As the ability to participate in the earlier stages of the information cycle becomes more egalitarian and ubiquitous through broader availability of access to interactive and collaborative web-based tools, there is a greater need to identify behaviors, expectations and needs associated with this phase of the information cycle. Information creation will continually increase in importance and relevance to any field interested in developing and studying the next generation of information technology. This is no less true for images than it is for text-based technologies.

This study contributes to information science theory by identifying a relationship between artifact and activity that positions the act of creating as an information behavior that can be seen as a distinct phase of the information lifecycle. The study also contributes to method by providing an example of protocols for focusing on this part of the information cycle. This research has shown that the action of creating visual representations in the form of ad hoc visualizations is implicated in a host of communicative activities. In creating a visual information artifact, participants clarified, persuaded, challenged and coordinated with their conversation partners, among other communicative tasks. Analysis identified a series of attributes associated with the activity of image

making and a set of affordances of image artifacts. The contrast between these two lists was distinct. On a basic level, this provides empirical justification for examining the creation of visual information through different lenses than the ones we use for image-based information artifacts.

The goal of future work in this area will be to use the foundation established by this study of image-enabled discourse to determine how, when and in what form information about the context of creation could or should be added to current image-based document models and other types of image representation. Building off of Jorgensen's work (1998, 2003), it would be compelling to investigate whether people assigned different attributes or metadata to images they had created, as opposed to constructed images that were created by others. Do the attributes assigned to an image by its creator reflect any of the affordances of the drawing activity identified in this study?

Research related to visual literacies was also presented in Chapter 2. Visual literacy typically refers to the ability to read and interpret images such as maps, charts and information graphics. As shown by research in this area, there are principles of evaluation underlying these tasks, and these concepts can be taught in order to increase visual literacy. A goal of visual literacy research is to enable people to learn how to determine whether an image represents what it is intended to show. In the more education-focused visual literacy research, an additional goal is to teach students how images can be used to solve certain types of problems or express certain concepts. While some of these studies talk about the ways that students use images within the context of creative problem solving, few discuss what motivates students to create their own images or what criteria

students bring to images in order to determine if they are a useful strategy to accomplish a task.

The study reported here has the potential to impact the way we think of visual literacy by providing a contextual basis for describing practices associated with visualizing information. Although we often hear about how our information environments are increasingly visual, some of the statements made during the conversations in this study support the idea that there appears to be an inherent distrust of visual representation when it comes to definitive, formal statements. In many of the conversations in this study that involved drawing, there was explicit talk about the quality of the image itself (generally occurring at the beginning of the drawing episode) as well as talk about the adequacy of the image to serve as a response to the question (usually occurring towards the end of the conversation). Participants discussed whether the drawing was “enough,” referring to whether it was adequate to answer the question. In most of these conversations, although the image created during the course of the conversation generally contained all the information needed to answer the question, often the pair continued working until they found specific words to describe their picture. The root of the distrust some of the pairs seemed to have for information in a visual format was noted as an interesting topic for future research. Issues of trustworthiness, credibility, and accuracy could guide further analysis of the current dataset.

Future studies could also be designed to investigate similar dynamics in specific contexts or between specific groups. In this sense, this study is an incubator for further research in this area, raising questions such as: Are constructed images or ad hoc visualizations accepted by certain groups more

than others? Does educating people about the basics of visual literacy have an impact on whether they can successfully evaluate the credibility of images in the popular media? Examples from current events could also become data, such as the 2011 controversy surrounding the release of photographs of Osama Bin Laden after he was captured and executed by U.S. Military forces. In all of these cases, the goal of future research would be to reveal the ways that provenance and information about the specific context of creation influences judgments made about the veracity, authenticity, usefulness or accuracy of visual information. Regardless of our preconceptions about the reliability of visual information, do drawings help or hurt us in arriving at singular, definitive statements? Are we more likely to create visualizations if we think there is room for creativity or inventiveness in a response? Does a creator perceive an image as more or less credible than other audiences for the image? Is it easier to assume that an information graphic is accurate if it is presented as a completed image rather than if its creation is witnessed?

8.3 Representing visual information in complex systems

The differences between image-making activities and image artifacts revealed in this study also have implications for the evaluation and representation of visual information. As with text-based artifacts, an important part of preparing visual information for use in complex systems involves identifying the structure of the information object, evaluating it for quality and credibility, and representing that information in some way within a system. For human processing of visual information, as discussed in the previous section, this includes defining and teaching visual literacies. In computational contexts, this involves designing,

building and testing digital representations of visualizations. In both cases, a greater understanding of contextual or situated criteria can improve fluency, functionality and effectiveness.

Text-based information systems such as IBM's Watson, Google's autocorrect, and even the increasingly ubiquitous voice control systems on many smartphones are testaments to what can be accomplished by tackling difficult information problems. At one point, the work needed to build functioning versions of these systems seemed daunting. While advances in modeling and representing complex textual information have produced impressive results, performing the same operations with multimodal information is still considered a tough problem.

The history of computing and information science has shown us the value of understanding the human behaviors associated with complex information problems. Many of the most sophisticated applications began with rudimentary attempts to make computers more "human." The research reported here was undertaken under this same belief, that understanding human behavior can be an important step to developing the next generation of technological advances. This study is a contextualized investigation of human-to-human information exchange that can provide clues about naturally occurring information behaviors that could inform the standardization of image presentations used by complex systems. For those working to improve multimodal information systems, having the ability to more clearly represent the situated meaning of visual information within natural contexts has the potential to enable more nuanced and complex systems. The specific image-enabled activities identified in the first phase of

analysis establish a starting point for developing schemas that take into account the context of creation when modeling visual information.

As discussed in Chapter 2, content-based methods are the prevailing approach to representing visual artifacts within image retrieval systems. These techniques rely on automatically detecting visual features evident in digital representation of images. However, as the studies cited in the literature review showed, this approach is not foolproof. Because of the challenges associated with working with visual information, non-textual information is not nearly as well represented as text-based information in document models used in multimodal systems. Many of the researchers in this area acknowledge that having a way to incorporate contextual information regarding the specific meaning of an image would improve the functioning of these retrieval systems. Especially for those working on multimodal information extraction and fusion (see section 2.6.1 *System-based approaches*), greater insight into the co-dependence and co-occurrence of information delivered across multiple modes of communication would enable the creation of systems that more accurately and effectively deliver needed information at appropriate times. The study offers an initial set of parameters to guide the development of schemas for representing non-textual information.

Systems that handle multimodal information extraction and retrieval are highly technical applications, while this study is deeply qualitative. Therefore, putting these findings into practice will require further development and adjustments. Future research in this area could involve working with computer scientists to create, test, and evaluate document models that incorporated aspects of the context of creation into the representation of the image artifact. The

findings in this study related to situated characteristics of the activity of image making and the deployment of images could also provide insight into evaluation methods by helping to determine when or how one image might be more useful than another.

8.4 Image-enabled coordination

As was mentioned in the beginning of this chapter, there is a strong connection between the study of interpersonal communication and many of the questions that concern researchers interested in informal information sharing. In order to provide ICT that assist people in communicating effectively and efficiently, it is necessary to understand the ways in which people engage with each other across multiple modes and in a range of settings. The model of image-enabled discourse and the artifact/activity juxtaposition introduced through this research establishes a starting point for deeper exploration of visualization in social contexts. As discussed above, this framework provides a means to map specific image-enabled communicative activities to attributes of the image artifact. For the current study, it was necessary to focus attention on describing image-enabled activities, a previously under-explored aspect of visually enabled communication. This was an important theoretical contribution of the study and makes the next stages of research possible.

A completed model of image-enabled discourse requires that interactive episodes involving image making be examined from all three perspectives represented in Hanks' notion of communicative practice 1) the ideological role of the image in communication, 2) the structure and form of the image artifacts themselves, and 3) the communicative activities involved in image-making

activities. The current study of image-enabled communication practices establishes an initial association between types of interactions and patterns of coordination that rely on image making. Next steps will involve integrating analysis of interactions with information about the artifact itself. This will extend to looking at image-enabled social interactions in a range of domain-specific professional and personal settings.

It was noted in Chapter 2 that technologists working on information visualization applications do not always take a full range of user behaviors into account when developing systems. The framing behaviors identified in the second phase of analysis showed that visualization practices are deeply integrated in communication practices. This finding has implications for future studies of user behaviors associated with information visualizations. For example, Walny et al. (2011) analyzed whiteboard drawings in order to gain insight into recurrent techniques and graphic elements evident in “natural” visualization practices. The researchers discuss the benefits of learning more about the specific situations during which the drawing were created, in order to clarify and inform the schemas they developed and intend to deploy within information visualization applications. A clear next step for the research discussed here would be to merge these methodologies, producing a comprehensive view of the life span of a typical whiteboard drawing, including the type of artifact analysis conducted by Walny et al., as well as an investigation of the communicative practices that produced the drawings using the methodology introduced in this study. Such a combined study could not only fuel improvements of existing tools, it may also reveal new ways in which this type of visualization practice could be supported in the future.

Similarly, ethnographic studies of visually sophisticated best-practice communities like collaborative design groups, architecture firms, and engineering teams could serve as the basis for comprehensive and integrated investigation of image-enabled discourse that includes analysis of both artifact and activity. In fact, as a starting point, additional analysis of the current dataset could focus on specific types of interactions, such as the mechanics of decision-making evident in the exchanges, comparing across conversations where drawing took place and those where it did not.

While the initial study used specific prompts that constrained the problem domain of the conversations, an ethnographic approach could also be used to focus on particular multidisciplinary domains (such as public health or medical contexts, for example) in order to reveal the ways in which the creation of images within these situations is used as a means to communicate and manage decision-making. Building on the current study, analysis of situated visualization practices in small group collaborations has the potential to expand our understanding of perceived authority and biases associated with visual modes of communication. The framing behaviors identified in the current study could again serve as a starting point for examining the ways that visual information is used in collaborative decision-making. This has direct implications for understanding multimodal social interactions, expanding notions of visual literacy, and informing critical perspectives on the role of image making as a form of social engagement. Exploration of decision-making and visualization practices in small groups would increase our understanding of perceived authority and credibility associated with visual communication.

One of the basic findings of this study, that image-making activities are embedded within other communication structures, specifically highlights the importance of viewing collaborative work (both virtual and face-to-face) as a form of multimodal engagement. The physical nature of image making, and the tangible, persistent quality of the image artifact represent an embodied mode of communication that should be of particular interest in the development of ICT, especially those that facilitate virtual collaboration. This study shows that interactions related to coordinating may look different when visually enabled means are put into play (e.g., lack of eye contact does not signify lack of connection; signs of coordination such as echoing or unison might cross modal boundaries). The full range of communicative activities associated with the creation of visualizations need to be adequately supported by visually enabled ICTs such as virtual collaboration tools and information visualization interfaces.

The methodology used here could serve as a basis for discipline-spanning research that specifically addresses issues related to interface design for collaborative and distributed interactions. While the current study was designed and carried out within the context of sociolinguistic and interpersonal communications research methodology, study of image-enabled coordination has particular relevance for the development of multimodal interfaces within the domains of computer supported collaborative work (CSCW) and human-computer interaction (HCI) (again, see discussion in Chapter 2). Future work could apply the current image-enabled discourse methodology informed by sociolinguistic approaches to examining multimodal communication with specific applications related to interface design and task-based HCI and CSCW research.

For example, as was noted in the beginning of this dissertation, image creation during distance collaborations is currently supported by a range of virtual whiteboard applications, but few who have used these tools report that they are as easy, intuitive, or useful as a napkin and pen in a face-to-face conversations. As this study has shown, this is not surprising considering the complexity of discourse practices that are implicated in the activity of image making. As was noted above, viewing whiteboard practices as a type of image-enabled discourse could inform the improvement of those interfaces. Future research investigating the role of image making in cross-discipline or cross-functional collaborations could also take advantage of prior research on boundary objects. Image making could be examined in terms of its ability to function as a tool for spanning domains and coordinating in environments where information comes from multiple sources in many different modes. Study of multimodal interactions within high-stakes, cross-disciplinary contexts, such as emergency response teams, could greatly inform the development and management of ICT designed to support these types of groups. Such studies would have implications for a host of collaborative work applications in addition to contributing to research on information credibility.

8.5 Conclusion

When a system is built to augment or supplement interpersonal interactions, the line between information behavior and communicative practice is blurred. For this reason, understanding human interactions is an integral part of the development of many information and communication applications. While the technologies that support these tools are important, it is equally essential to

understand the nuances of the situated interactions that the systems support. Observations of human-centered communicative practices, even those not yet mediated by technology, can influence the evolution of a range of computer-enabled tools. For new applications, these observations can draw attention to important aspects of human information needs and behaviors that need to be supported. For existing tools, human-to-human interactions can serve as a valuable baseline or evaluation standard for continual improvement.

By establishing a framework for describing affordances of the image activity separately from the attributes of the image artifact, this research has shown that visualization needs to be viewed in the context of broader communication practices in order to produce a more comprehensive understanding of visual information. In Chapter 2, the increasingly strong relationship between visibility, technology and collaboration was established. In this sense, the communicative practices examined for this study, while not mediated by technological tools or applications, can inform the ways that visual practices are supported and visual objects are represented in complex information systems.

This exploratory work has the potential to impact a range of research associated with information and communication technologies. This short summary of possible areas of future research reflects the breadth of opportunities opened by this investigation of visual communication practices, illustrating the value of theory-driven work in the emerging area of visual studies. Information science is a notably multidisciplinary field of study, which requires cogent and coordinated input from reference discipline such as communications and visual studies. Foundational studies like the one presented here can help to establish a

footing for shared visual research and methodologies in the future.

APPENDICES

Appendix A. Preliminary study protocol and interview guide

Introduction

I am interested in learning more about how people naturally use images to during the course of normal conversation. I am gathering stories about situations where people start to draw when they are talking with another person. I am going to ask you to think about a specific time when you were involved in a conversation with someone and one of you drew a picture during the course of the exchange.

I'll be asking you some specific questions about the conversation, but first I will give you an idea of the type of situation I am looking for. When you have a particular conversation in mind, you can stop me and we can get started with the questions.

I'd like you to think of a specific time when you were involved in a one-on-one conversation with another person when a drawing or drawings were created during the course of the exchange. This should be a situation when you were interacting face-to-face with a peer and you were both focused on the same topic of conversation. Examples of topics include, but aren't limited to:

- a work related problem
- recounting a story
- a description of a person, place or thing
- how to get to a certain location
- how to fix something
- how to make something

A drawing is:

- A visible and persistent mark
 - A hand gesture is not a drawing.
 - Making a series of descriptive scratches in dirt is drawing.
- May include alpha-numeric marks but does not have to be read from left to right.
 - A phone number is not a drawing because it needs to be "read" from left to right to make sense.
 - A diagram showing numbered measurements for the construction of a box would be drawing because it does not need to be "read" from left to right.

Do you have any questions about the kind of situation I am describing?

Interview script

1. Can you tell me about the conversation where a drawing was created?
 - a. Who was the conversation with?
 - b. What is your relationship to that person?
 - c. What was the reason for having the conversation?
 - d. What was the setting of the conversation?
 - e. What was the topic of the conversation?
 - i. How familiar were you with the topic of the conversation?
 - ii. How familiar was the other person with the topic of the conversation?
2. What started the conversation?
3. I'd like to get a few more details about the creation of the drawing during the conversation.
 - a. What prompted the creation of a drawing?
 - b. What was happening right before the first mark was made?
 - c. What was happening while the drawing was being created?
 - i. *If you initiated the drawing:*
 1. What were you thinking about when you decided to draw a picture?
 2. What were you trying to do with the drawing?
 3. Did it work?
 4. What else did you try to get the same result?
 5. What made you stop drawing?
 6. Could you recreate the drawing now?
 - ii. *If you observed the drawing being created:*
 1. What were you thinking about while the drawer was creating the image?
 2. What do you think the drawer was trying to accomplish?
 3. Did it work?
 4. What else did they try to get the same result?
 5. What made that person stop drawing?
 6. Could you recreate the drawing now?
 - iii. *If you created the drawing with the person you were conversing with:*
 1. What were you thinking about while the drawing was being created?
 2. What were you trying to accomplish by creating the drawing together?
 3. Did it work?
 4. What else did you try to accomplish the same thing?
 5. What made you stop drawing?
 6. Could you recreate the drawing now?
4. Was there a point when the drawing was no longer useful or being used

within the context of the conversation? How did you know?

- a. What happened in the conversation after you were finished with the drawing?
 - b. What happened to the drawing?
5. How did the creation of the drawing help or hurt (affect) the progress of the conversation?
6. How did the conversation end?
 - a. Did you continue the conversation after the drawing was created?

Appendix B. Protocol for main study

Part 1: Introduction and instructions

Note: Because of the need to observe drawing practices during conversations in the most naturalistic setting possible, participants will not be told the true focus of the study until after they have completed the procedure. Please see Part 2: Exit Interview for details about how they will be informed of the actual focus of the study, including benefits.

[Participants will be given a chance to introduce themselves to each other and chat a bit before the protocol officially begins.]

I am interested in learning more about how people share information during informal face-to-face conversation.

Participation in this study will involve being:

- Paired with another person (who might be a stranger to you)
- Assigned a question to discuss with your partner (No specific prior knowledge is needed to discuss these questions.)
- Asked to come up with an explanation to answer the question in collaboration with your partner
- Providing your explanation/answer during a brief exit interview
- Asked to answer a few additional questions about your interactions during that exit interview.

Before we get started, please review the informed consent form.

[Participants will be given ample time to read informed consent form and ask questions.]

To begin, you and your partner will be given a set of five questions to review. You will be asked to pick one to discuss together. Your task is to work together to come up with an answer to the question. You will not need any special knowledge or skills to respond to the question. If you do not know the answer, just do your best to come up with an explanation with your partner. You will be asked to share your explanation at the conclusion of the conversation.

You can use anything on the table or in the room to work through your response. You will be given approximately 15-20 minutes to discuss the question. Just let me know when you have arrived at your response.

After you complete this first round, you will be given another set of five questions and asked to repeat the process. For a third round, you will be assigned a question.

After completing all three rounds, both of you will be debriefed in a joint exit interview.

Part 2: Exit Interview

Note: This debriefing and interview will take place with both participants present.

[This series of questions will be repeated for each of the three conversations]

1. How did you pick this question?
2. How familiar were you with the topic of the conversation?
3. Can you walk me through what you talked about while you were trying to answer the first question?
4. What was the answer you ultimately came up with to respond to your question?
5. Can you compare your experiences answering each of the questions?

[For all conversations:]

1. Was there a point in the conversation when you felt that you and your partner were really coming together in terms of answering the question?
2. What was happening in the conversation right before this point?
3. How did this happen?
4. What did you/your partner do in order to accomplish this?
5. When did you/your partner stop coming up with new ideas?
6. What happened next in the conversation?
7. Was there a point when you/your partner stopped referring the question entirely?
8. How did you decide that you were finished with the conversation?
9. Did you have any trouble explaining your answer after completing the procedure?

[For conversations where drawing did happen:]

1. What was happening in the conversation right before the first mark was made?
2. What was the intention of the drawing?
3. Did you/your partner try anything else in order to accomplish this?

4. Do you think there was anything different about the information in your drawing and the information you shared with each other verbally?
5. What do you think the drawing enabled you/your partner to do?
6. When did you/your partner stop working on the drawing?
7. Was there a point when you/your partner stopped referring the drawing entirely?
8. Did you use the drawing for anything else after that?
9. Did you use the drawing when you explained your answer? If so, in what way? If not, why not?
10. How do you think the creation of the drawing helped or hurt the progress of the conversation?

Appendix C. Candidate conversation prompts & evaluation results

Candidate conversation prompts	Mean score N=26	Standard Deviation
What is the most stable way to build a set of shelves?	3.04	0.720
What does the house where you grew up look like?	3.00	0.849
How far is from the earth to the sun, in relation to the whole solar system?	2.96	0.958
What would be the most interesting route around the world?	2.85	0.881
If you could live in any kind of house, what would it be like?	2.73	1.041
How do you parallel park a car?	2.58	0.902
Why are the organs in the human body located where they are?	2.54	0.948
Why do molecules stick together?	2.54	0.989
How does a car engine turn the wheels on a car?	2.50	1.030
How do airplanes fly?	2.38	1.023
How do clouds form?	2.31	0.884
How does the defragmentation of a hard drive work?	2.27	1.218
Describe a place that you've visited in a dream.	2.27	1.041
How do you get a sailboat to go really fast?	2.23	0.992
How do the various parts of the US government work together?	2.19	0.801
Where is the hottest place on earth?	2.12	1.177
How are cougars different from jaguars?	2.12	0.711
What exactly is a glacier and how have they influenced the shape of the continents?	2.00	0.894
What determines weather patterns around the globe?	1.92	0.977
How does gravity work?	1.92	1.017
What's the best way to get a campfire going?	1.88	0.909
How do plants create oxygen?	1.81	0.939
How does the population distribution of the US relate to poverty levels?	1.77	1.107
Where does honey come from?	1.69	0.970
How do the most important milestones in US history relate to other world events?	1.58	0.987
Why is the desert hot?	1.54	0.811
How does the theory that dinosaurs descended from birds work?	1.50	0.762
Why is the sky blue?	1.35	1.018
How does the stock market work?	1.27	0.827
What are the main differences in world views between eastern and western religious thought?	0.77	0.652

Appendix D. Transcription conventions

Conventions used for annotating transcripts followed a modified and simplified version of the Jeffersonian scheme, as presented by Ten Have (2007). This system is frequently used in conversation analysis. Notations used in transcripts are listed below.

Sequencing	
[	A single left bracket indicates the point of overlap onset. Line break indicated end of overlap.
=	Equal signs , one at the end of one line and one at the beginning of the a next, indicate no “gap” between the two lines. This is often called <i>latching</i> .
Time intervals	
(0sec)	Numbers in parentheses indicate elapsed time in silence by seconds
(.)	A dot in parentheses indicates a tiny “gap” within or between utterances
Characteristics of speech production	
<indentation>	Indentation indicates discourse phrases or utterance units. Also used to align verbal and non-verbal expressions that occurred simultaneously (nonverbal behavior annotated on the line following the verbal statement, indented to align vertically)
<u>word</u>	Underscoring indicates some form of stress, via pitch and/or amplitude
::	Colons indicate prolongation of the immediately prior sound
-	A dash indicates a cut-off
.	A period indicates a stopping fall in tone.
,	Comma indicates a continuing intonation, like when you are reading items from a list
?	Question mark indicates a rising intonation
°	Utterances or utterance-arts bracketed by degree signs are relatively quieter than the surrounding talk
Transcriber’s doubts and comments	
()	Empty parentheses indicate the transcriber’s inability to hear what was said.
(word)	Parenthesized words are especially dubious hearings or speaker identifications
(())	Double parentheses contain transcriber’s descriptions rather than, or in addition to, transcriptions. Non-verball annotations are contained in double parentheses.

Appendix E. Example of verbatim transcript

Transcript imported from Transana, a software application designed for video analysis and transcription.

WHO Mike (M) and Denise (D)
 QUESTION Shelves
 DRAWING Yes
 START 28:43
 END 35:02

VERBATIM

(0:28:56.6)

M: The most stable way to build a set of shelves. I'm not a carpenter(.)
 but,

(0:29:04.6)

D: I've built sets before, for theatre ((short soft laugh))

(0:29:10.1)

M: Yeah,

(0:29:10.5)

D: Uhm, (.) you would need, you would need support, you would need to ahm,

(0:29:19.7)

M: Yeah, prob-probably, I'm thinking it would need to be in the shape of a rectangle.

(0:29:23.5)

D: I agree

(0:29:25.0)

M: Although pyramids are strong, too, but you can't really put too many books in a triangle.

(0:29:30.4)

D: Yeah.

(0:29:31.8)

M: Unless they're shaped like triangles, too, ((laughing)) which I've never seen a book shaped like a triangle, you know, from the side. From the front it could be a triangle, the pages are triangles, but you know, when you're shelving books you do it sideways. I've never seen a book that's slanted-

(0:29:44.7)

D: Oh, like (.)

(0:29:46.5)

D: [The books would go like this

M: [You know, you open the first page and it's like=

M: =it's only two lines at the bottom,
 and then=

M: [=at the back of the book=

D: [((laughs))

(0:29:52.5)

M: It's a long page

(0:29:53.8)

D: Oh! ((laughs))

(0:29:54.6)
M: That would be kinda weird ((laughs))
 (0:29:57.7)
D: It would get frustrating, you'd have to flip so many pages to finally get to like the meat of the story
 ((giggle))

(0:30:02.4)
M: It's like, I've read one chapter, that's half the book ((lets out a long laugh))

(0:33:00.5)
D: Oh, it's like carved out? Into like-

(0:33:02.0)
M: O::r, it's, let's see if I can draw it. (.)
 So you have
 °oh, nothing's straight° But anyway, imagine
 ((laughing)) that's straight, and then we have, like, uh, one here,
 like this, and maybe a long one,
 and then maybe they do something like this-

(0:33:16.3)
D: Right

(0:33:16.8)
M: and have, uhm, you know, different sized-

(0:33:19.9)
D: Right.

(0:33:20.4)
M: areas to put things in-

(0:33:22.3)
D: but how would those, ah, (.)

(0:33:24.0)
M: so, and on the outside, the frame itself is stable, 'cause it's a rectangle-

(0:33:30.8)
D: uh-hm.
M: and then inside each individual compartment, is=

(0:33:33.8)
M: [=basically a rectangle
D: [(something like this)

(0:33:36.3)
M: ahm (.) so:: it, you know, it's all got support through the one below it (.) and then=

(0:33:44.3)
M: [=() below on the wall
D: [So, it's=

(0:33:45.6)
D: like a little puzzle, kind of-

(0:33:48.3)
M: Yeah, it looks, it looks kind of weird, some, some people don't even make a rectangle, they have another one sticking out the si:de,
 you know, things like=

M: [=that
D: [ri:ght, right
(0:33:54.5)
M: But, as long as the main part of it, where the center of gravity would be in the middle, you have a rectangle shape, and then you built it into a wall or the floor, or whatever, and there you go!
(3sec)

(0:34:10.0)
D: Hmm.

(0:34:10.1)
M: So that's, that's my idea, most stable.

(0:34:11.8)
D: This one?

(0:34:12.8)
M: Well, bolting it into the wall-

(0:34:15.3)
M: [whatever shape it is=
D: [Bolting it, yeah, yeah

(0:34:16.2)
M: even if it's a triangle, or a circle

(0:34:17.5)
D: Yeah.

(0:34:18.6)
M: Especially if it's a circle ((laugh)) That thing would keep ro:lling!

(0:34:22.6)
D: ((D laughs)) Hopefully, things wouldn't fall off of it, though.

(0:34:26.8)
M: Yeah, it's hard to put something on a circular, circular shelf.
(3sec)

(0:34:33.8)
D: Unless it's circular, too.
((M chuckles))

(0:34:38.0)
D: Ahm. (.) I guess (.) I guess my answer would be, you know, cutting inserts into the wood and then bolting it.

(0:34:46.2)
M: Yeah.

(0:34:47.3)
D: Weighting it at the bottom. ((lets out a laugh))

(0:34:48.9)
M: Yeah-p. Seems to work. (.)

(0:34:52.8)
D: Cool. ((lets out soft laugh))

(0:34:56.6)
M: Yeah, that's our answer, bolting it to the wall () stable inside it.

(0:35:02.3)
END

Appendix F. Example of narrative transcript

Transcript imported from Transana, a software application designed for video analysis and transcription.

WHO	Mike and Denise
QUESTION	Shelves
DRAWING	Yes
START	28:43
END	35:02

NARRATIVE

- 28:43 Researcher is in the camera frame, handing the last question to the pair. They will not be selecting the last (third) question themselves, but will be assigned a question.
- 28:57 Mike and Denise read the question to themselves silently. After a short moment of pondering, Mike repeats the question out loud.
- 29:01 Like the other conversations, Mike is the first to speak. He states that he is not a carpenter, but trails off implying that he might have some experience with building in general. Denise responds by stating that she has built sets before. This is a clear example where the pair is comparing levels of expertise.
- 29:12 Denise begins by listing requirements for a strong set of shelves, starting with support. As she states this she REACHES FOR A PIECE OF PAPER. As Denise reaches for and pulls the paper towards the space on the table that lies between them, Mike begins to speak, speculating about the best shape for the shelves.
- 29:22 As he speaks about the shape, Denise also REACHES FOR A PENCIL. She does not make a Mike on the paper, but holds the pencil hovering over the paper, in her right hand, with her wrist resting on the edge of the tabletop. She is looking at Mike as he talks about the shape of the shelves. Mike is using relatively ARTICULATED GESTURES to describe/explain the shapes.
- 29:46 Denise MAKES A MARK ON THE PAGE, saying in response to Mike's description "Oh, like...." indicating that she is going to draw what she thinks he is describing with words. Mike continues to explain that the shape of the books would need to be unique in order to work in the shelf that he is describing, and that it might not actually be very practical. Denise is chuckling at his idea, while she makes what appears to be a single a mark on the page.
- 29:49 As Mike continues to talk about the absurdity of having books shaped in the way they would need to be in order to hit in the shelves, Denise returns to holding the pencil on her hand, hovering over the page with her wrist leaning on the edge of the table top. She turns to look directly at Mike as he mocks his own idea.
- 29:57 Mike continues to imagine the challenges posed by his triangular book, as Denise returns her gaze to the page, and appears to prepare her hand to continue her drawing. However, she does not make a mark, but joins in

- with Mike to imagine more complications related to the triangular book. Both are using relatively ARTICULATED HAND GESTURES through this segment.
- 30:08 Denise turns her eyes to the paper on the table and Mike appears to notice and ends his joking. Denise begins to DRAW and talk, providing a SPOKEN NARRATIVE as she draws, proposing some options for the shelves. Her sentences become fragments. Mike's gaze turns to the paper on the table.
- 30:19 Denise interrupts her own narrative as she continues to DRAW to remark on the low QUALITY OF THE DRAWING she is making.
- 30:20 But she does not stop drawing and continues her SPOKEN NARRATIVE.
- 30:23 She VERBALLY SEEKS CONFIRMATION from him ("Does that make sense?") to see if what she is describing partially with words and partially with her drawing is understandable to him. At times she erases some of her marks.
- 30:30 Mike asks clarifying questions as Denise continues to DRAW. He also offers a VERBAL DESCRIPTION OF VISUAL INFORMATION, proposing an additional component for the shelves, using vaguely ARTICULATED HAND GESTURES.
- 30:41 Denise continues to DRAW, and picks up her SPOKEN NARRATIVE again.
- 30:57 Mike appears less engaged in the details of the design at this particular point, his gaze is not exclusively directed at Denise's drawing. He begins to wonder out loud about other kinds of shelves, seeming to become aware that they have been assuming the shelves are for books. His gaze shifts to the windows and he begins to BRAINSTORM, calling to mind other shelves that he has seen.
- 31:07 Mike uses ARTICULATED HAND GESTURES while he provides a VERBAL DESCRIPTION OF VISUAL INFORMATION, discussing a type of shelf he has seen on a home decorating TV program. Denise does not DRAW while he is talking.
- 31:25 Denise questions whether this is the most stable solution.
- 31:30 Mike is gazing out the window appearing to be think of ways to improve on their idea, softly talking out loud about the problem. Denise begins to DRAW again. They are both begin this passage with softly SPOKEN NARRATIVE, but Denise stops talking and continues to DRAW, while Mike gazes out the window and thinks aloud about the problem. There is no indication that he is aware of what she is drawing.
- 31:39 Mike's gaze returns to the drawing, as he describes a thought he has about the most stable way. He uses a vaguely ARTICULATED HAND GESTURE to refer to the shelf that Denise has drawn. Denise's gaze slowly lifts from the page where she continues to DRAW, to Mike. She does not continue to DRAW, as she appears to be listening to Mike describe his solution.
- 31:48 Denise challenges Mike's solution by wondering what would happen if the wall falls down. They both recognize the absurdity of this and laugh.
- 32:03 During further discussion of bolting the shelving unit into the floor, Denise REFERS TO DRAWING.
- 32:14 Denise ADDS TO DRAWING, as they discuss the additional idea of weighting the shelf unit at the bottom.

- 32:28 After a brief pause where no one is speaking or drawing, Mike states that this would be his idea, indicating that at least as far as he is concerned they have come up with a response. Denise continues to ADD TO THE DRAWING. Mike adds to the idea by describing a specific asymmetrical design (VERBAL DESCRIPTION OF VISUAL INFORMATION) that might make the shelves they have designed even better. He uses ARTICULATED HAND GESTURES as he does this.
- 32:56 Denise tries to CONFIRM what Mike has said by DRAWING what she understands him to be describing.
- 33:01 Mike TAKES the pencil from Denise and DRAWS on the same paper she has been working on.
- 33:03 Mike comments on the QUALITY OF THE DRAWING, stating that none of the lines are straight.
- 33:07 Mike continues to DRAW while providing Denise with a SPOKEN NARRATIVE.
- 33:43 Denise questions and clarifies what Mike has presented (both verbally and visually), looking primarily at the paper, not at Mike.
- 34:08 Mike states "That's my idea." And PUTS DOWN the pencil. Denise immediately PICKS UP the pencil.
- 34:16 Denise returns to her drawing, erasing something she has drawn.
- 34:22 Denise PUTS DOWN the pencil.
- 34:28 Mike imagines a circular shelf, with ARTICULATED HAND GESTURE.
- 34:37 Denise SUMMARIZES her response.
- 34:48 Mike agrees.
- 34:51 Mike turns to researcher off-camera and indicates that have completed the conversation.
- 35:02 End

Appendix G. Example of transcript annotated with non-verbal behaviors

Transcript imported from Transana, a software application designed for video analysis and transcription.

WHO Mike (M) and Denise (D)
 QUESTION Shelves
 DRAWING Yes
 START 28:43
 END 35:02

ANNOTATED

(0:28:43.4)

J: **Alright, so::, last one, I actually am going to give to you, and then, ahm, let me know when you have, come up with your response to that one.**

(0:28:56.3)

D: **OK.**
 ((both are reading the question))
 (2 sec)

(0:28:56.6)

M: **The most stable way to build a set of shelves. I'm not a carpenter(.) but,**

(0:29:04.6)

D: **I've built sets before, for theatre** ((short soft laugh))

(0:29:10.1)

M: **Yeah,**

(0:29:10.5)

D: **Uhm, (.) you would need, you would need support, you would need to ahm,**
 ((reaching for pieces of paper))

(0:29:19.7)

M: **Yeah, prob-probably, I'm thinking it would need to be in the shape of a rectangle.**
 ((D reaches for pencil))

(0:29:23.5)

D: **I agree**
 ((hand holding pencil is poised above paper, but with palm turned upward in resting position))

(0:29:25.0)

M: **Although pyramids are strong, too, but you can't really put too many books in a triangle.**

(0:29:30.4)

D: **Yeah.**

(0:29:31.8)

M: **Unless they're shaped like triangles, too, ((laughing)) which I've never seen a book shaped like a triangle, you know, from the side.**
 ((holds both hands up in front of him, palms facing, about 3 or 4 inches apart, turns them as a unit to the side))
 From the front it could be a triangle,

((moves left hand out in front of him, palm facing him, uses index finger of right hand to indicate shape of pages when book is open. mimics turning page))

the pages are triangles, but you know, when you're shelving books you do it sideways.

((brings both palms as if praying, emulating the book, and mimics placing that book on an imaginary shelf in front of him))

I've never seen a book that's slanted-

((holds flattened left hand vertically and brings flattened right hand at an angle of about 45 degrees towards it, to meet at finger tips))

(0:29:44.7)

D: Oh, like (.)
 ((begins to draw))
 ((both laugh))

(0:29:46.5)

D: [The books would go like this
 ((draws a triangle))
 ((laughs))

M: [You know, you open the first page and it's like=

M: =it's only two lines at the bottom,
 ((makes a small rectangular shape with the fingers of both hands, turning to make eye contact with D, who is looking down at the paper she has drawn the triangle on, holding the pencil hovering over the surface but not making a mark))

((chuckle))

and then=

M: [=at the back of the book=

D: [((laughs))

(0:29:52.5)

M: It's a long page

(0:29:53.8)

D: Oh! ((laughs))

(0:29:54.6)

M: That would be kinda weird ((laughs))

(0:29:57.7)

D: It would get frustrating, you'd have to flip
 ((mimicking flipping the pages of a book with one hand))
so many pages to finally get to like the meat of the story
 ((giggle))

(0:30:02.4)

M: It's like, I've read one chapter, that's half the book ((lets out a long laugh))

(0:30:06.7)

D: I think, you could either, (.) you know
 ((sound of pencil on paper is audible, sounds like two strong strokes))
have the, th::e (.)
 ((more sounds of pencil on paper))
boards,
 ((more pencil sounds))
you know, do that little shelving frame,

(0:30:19.5)

M: [Uh-hm

D: [∞This is the worst drawing∞

(0:30:20.2)

D: But,((laughs)) and maybe cut inserts into it,

((pencil sounds))
like slits, or you could, does that make sense?
 ((scratching sounds))

(0:30:29.3)
M: ^oHm-hum.^o
 (3sec)
 ((just sound of pencil))
 ((both have gaze focused on the paper and what D is drawing))

(0:30:30.1)
M: So you could slide the shelves in?
 ((vaguely articulated sliding gesture with right hand))

(0:30:33.0)
D: Uhm-hm: and then it would be-
 ((drawing sounds are audible))

(0:30:34.8)
M: You'd have the thing sticking out to put them on, that works, too.
 ((uses right hand to make gesture of putting something on shelf, looking out window rather than at paper right now))

(0:30:38.0)
D: Uhm-hm.

(0:30:38.6)
M: Because sometimes those fall out and the shelves just bend and the books fall
 ((vaguely articulated gestures with right hand, ending with a falling motion))
 ((chuckles))

(0:30:42.3)
D: You could, you could build like a frame ((audible sounds of drawing)) and then (.) have a shelf up top.
 ((pauses in drawing and looks at page))
 (3sec)

(0:30:51.4)
M: Yeap.

(0:30:51.9)
D: But then all of this would fall on the floor ((laughs))
 ((draws lines as she refers to "this" falling on floor))

(0:30:55.2)
M: Well, I mean, that's why you use book ends.
 ((D appears to still be adjusting her drawing as M speaks))

(0:30:57.1)
D: That's right.

(0:30:57.9)
M: Yeah.
 (2sec)

(0:30:59.0)
M: So, set of shelves (.) Well, it doesn't have to be book shelves,
 ((D is looking at her drawing, makes a small adjustment. M is alternating between looking at the paper on which D has drawn and looking out the window while he thinks))
they could,=
M: [=you could just have=
D: [Yeah, that's-

M: =shelves on the wall. I've seen that on HGTV, they just have the triangular metal brackets,
 ((uses both hands to visually represent the design of the triangular shelf brackets he has seen on television))
 its flat on the top and then the triangle down, like that. Two places into the wall, and you have how ever many,
 ((keeps left hand steady while he uses right hand to indicate that there could be multiple units lined up one right next to each other))
 like two of those, if it's a short shelf, just right on top, three: if you have a long one.
 You don't want the shelf to bend in the middle.
 ((left hand is now resting on his lap and he uses his right hand to indicate the bend or sag of the shelf))

(0:31:25.3)
D: But is that the most stable way?
 (.)

(0:31:27.2)
M: It's a stable way...
 ((D laughs))

(0:31:30.2)
M: ºUhm, set of shelves...º
 ((scratching sounds as D begins to draw again. M gazes out the window))

(0:31:34.1)
D: ºwall brackets...º
 ((D continues to draw))

(0:31:35.0)
M: Yeah, probably, probably the most stable way would be to have your (.) shelf,
 ((audible sound of pencil scratches. M looks down at paper and gestures over it with right hand)),

(0:31:41.0)
D: Uhm-hm.

(0:31:41.2)
M: you know, your symmetrical, you know, whatever it is, and then, bolt it into the wall, so it doesn't fall over.
 ((M has both hands out in front of his body with palms flattened, vertical and facing each other. Combines with less articulated gestures to emphasize what he is saying. D has stopped drawing and is now looking at him as he speaks))

(0:31:47.2)
D: That's true.

(0:31:49.2)
D: [What if the wall falls over
M: [()=
M: =because a lot of shelves are to-=
 ((D short laugh))
M: =top-heavy

(0:31:54.0)
D: () Ahm, if the wall falls over ((laughing))? You'd probably need a new house anyway
 ((both giggle))
 (2sec)

(0:31:58.8)
M: Yeah, so,=

M: [=bolted into the wall or the floor
D: [like this sort of kind of thing with the-
 ((D looks back down to her drawing, referring to what she has drawn))

(0:32:06.1)
D: Yeah.
 (.)
 ((D moves her pencil over the surface of the drawing but does not make any additions or editing))

(0:32:08.1)
M: Boltting it into the floor, really only, doesn't, I mean, if it's really top heavy, it could still come out that way, so you wanna bolt it all the way down, into the wall-
 ((gestures with his right hand indicating all the way down the wall, moving eyes toward D's paper))

(0:32:17.5)
D: If you weighted it at the bottom,
 ((audible scratches as she modifies her drawing))

(0:32:19.4)
M: Yeah, weighting it at the bottom, ahm=
 ((audible scratches as D continues to modify her drawing))

(0:32:22.0)
M: [=making sure the weighty stuff is down there
D: [(
 ((more audible scratching sounds))

(0:32:23.7)
D: Yeah.

(0:32:26.2)
M: Ahm.
 ((D continues to draw))
 (4sec)

(0:32:29.2)
M: Yeah, that would, that would be my, my guess.

(0:32:33.0)
D: [(
M: ['cause I mean=
 ((D continues to draw as M gazes out the window))

(0:32:35.8)
M: [seems like, what some people are lacking nowadays is,
 ((loud noise as M's bag falls over))
 ((D continues to draw, audible sound of pencil scratching))
 °Oh, that was my bag°
 ((gives small gesture with right hand indicating that it was no big deal))
 the:, asymmetrical, is that the word for it?
 They, you know, they have the rectangle
 ((uses both hands to indicate the rectangular holes used as shelves. D stops drawing to look at him))
 and inside that, ahm, all these different sized holes
 ((both hands moving around in front of his face indicating variety of sizes and locations of the holes))
 for placing things, so it's not like a shelf all the way across, or shelf for the bookshelf-
 ((D looks up at M and stops drawing))

(0:33:00.5)

D: Oh, it's like carved out? Into like-
((draws the shape as she asks the question))

(0:33:02.0)

M: O::r, it's, let's see if I can draw it. (.)
((reaches for pencil in D's hand. D continues to have eyes turned to the paper, rests hand in chin and plays with her hair))
So you have
((begins to create his own drawing on the page, on the side of the paper closest to him, away from the drawing that D has been working on))
ooh, nothing's straight? But anyway, imagine
((laughing)) **that's straight, and then we have, like, uh, one here, like this, and maybe a long one,**
((drawing as he is talking))
and then maybe they do something like this-

(0:33:16.3)

D: Right

(0:33:16.8)

M: and have, uhm, you know, different sized-

(0:33:19.9)

D: Right.

(0:33:20.4)

M: areas to put things in-

(0:33:22.3)

D: but how would those, ah, (.)
((M pulls pencil up and away from the paper, goes back down to make one last mark, then sits back to look at what he has done))

(0:33:24.0)

M: so, and on the outside,
((pointing to parts of his drawing with the pencil tip))
the frame itself is stable, 'cause it's a rectangle-
((uses the pencil to draw a rectangle in the air))

(0:33:30.8)

D: uh-hm.

M: and then inside each individual compartment, is=
((pointing to part of the drawing with the tip of the pencil))

(0:33:33.8)

M: [=basically a rectangle
((M makes a small addition to his drawing))
D: [(something like this)

(0:33:36.3)

M: ahm (.) so:: it, you know, it's all got support through the one below it
(.) and then=
((when he refers to support, he uses his hands to indicate vertical supports))

(0:33:44.3)

M: [=() below on the wall
D: [So, it's=
((both have gaze focused on the drawing))

(0:33:45.6)

D: like a little puzzle, kind of-

(0:33:48.3)

M: Yeah, it looks, it looks kind of weird, some, some people don't even make a rectangle, they have another one sticking out the side,
((adding to his drawing))

you know, things like=

M: [=that

D: [ri:ght, right

(0:33:54.5)

M: But, as long as the main part of it, where the center of gravity
((gestures with right hand held cage-like, palm down, indicating center of gravity))

would be in the middle,

((gesturing to drawing with point of pencil))

you have a rectangle shape, and then you built it into a wall or the floor, or whatever, and there you go!

((vaguely articulated gesture with right hand, for emphasis))

(3sec)

(0:34:10.0)

D: Hhmm.

(0:34:10.1)

M: So that's, that's my idea, most stable.

((still holding pencil, with palm resting on table top. Gently moves the paper a couple of inches towards D))

(0:34:11.8)

D: This one?

((pointing to the drawing he made))

(0:34:12.8)

M: Well, bolting it into the wall-

((puts pencil down. D immediately picks it up again, holds it in her hand with eraser side down))

(0:34:15.3)

M: [whatever shape it is=

D: [Bolting it, yeah, yeah

(0:34:16.2)

M: even if it's a triangle, or a circle

((D is erasing small parts of her drawing))

(0:34:17.5)

D: Yeah.

(0:34:18.6)

M: Especially if it's a circle ((laugh)) That thing would keep ro:lling!

((D laughs as she continues to modify her drawing by erasing parts))

(0:34:22.6)

D: Hopefully, things wouldn't fall off of it, though.

((puts pencil down on table))

(0:34:26.8)

M: Yeah, it's hard to put something on a circular, circular shelf.

((then uses both hands to draw circle in the air))

(3sec)

(0:34:33.8)

D: Unless it's circular, too.

((M chuckles))

(0:34:38.0)

D: Ahm. (.) I guess (.) I guess my answer would be, you know, cutting inserts into the wood and then bolting it.

((D picks the pencil back up and uses the tip to refer to her drawing as she speaks. M is looking at her drawing as she speaks. Puts pencil down when she is finished speaking))

(0:34:46.2)

M: Yeah.

(0:34:47.3)

D: Weighting it at the bottom. ((lets out a laugh))

(0:34:48.9)

M: Yeah-p. Seems to work.

(.)

(0:34:52.8)

D: Cool. ((lets out soft laugh))

((D lifts her gaze to the researcher off camera))

(0:34:56.6)

M: Yeah, that's our answer, bolting it to the wall () stable inside it.

((Lifting gaze to researcher off camera))

(0:35:02.3)

END

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Syracuse University, School of Information Studies, Syracuse NY

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- Visiting Artist-in-Residence/Instructor, 2004. Experimental Drawing
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- Lecturer, 1999
- Graduate Instructor, 1995-1997
- Teaching Assistant, 1995-1997

Consulting

- Interactive Producer, Information Architect, Project Manager, Content Strategist. March 2000 to 2007, New York, NY
- Web Design & Programming Contractor. January to March 2000, New York, NY
- Systems Assistant and Internet Administrator. October 1997 to December 1999, Cody's Books, Inc., Berkeley, CA

VISUAL ART PRACTICE

Artist Residencies

- Three Walls Gallery, Chicago, IL, 2005–2006
- University of Southern Maine, Gorham, ME, 2004
- Montana Artists Refuge, Basin, MT, 2003
- Braziers International Artists Residency, Oxfordshire, UK, 2002

Selected Exhibitions Portfolio: www.jaimesnyder.com

- 2006 Overview, Three Walls Gallery, Chicago, IL
- 2004 Attic, University of Southern Maine, Gorham, ME
- 2003 Selected work, Montana Artists Refuge Residency, Basin, MT
- 2002 Group show, Braziers International Artists Residency, Oxfordshire, UK
Six Thousand Five Hundred: Artist's Project published by 9x9 Industries/Paraffin Arts Project, San Francisco, CA
- 2001 To the power of..., Cell Project Space, London, UK
- 2000 Slide Registry, The Drawing Center, New York, NY
Pierogi 2000 Flat Files, Brooklyn, NY
- 1999 Bay Area Now 2, Yerba Buena Center for the Arts, San Francisco, CA
As if the World Ended on the Fifth Floor, Blohard Gallery, Philadelphia, PA
- 1997 MFA Thesis Exhibition, Stanford University, Palo Alto, CA
- 1996 glean*, curated by Renny Pritikin, Four Walls, San Francisco, CA
- 1995 Test Your Vision, MFA Program Exhibition, Stanford Univ., Palo Alto, CA
Lighting & Set Design for The Plague by Albert Camus staged by The Lost Art of Puppet,
The Actors Center, Philadelphia, PA
Glass Alternatives, Nexus Foundation, Philadelphia, PA
- 1994 Painting Installations, LMNOP Performance/Installation Space, Philadelphia, PA
- 1993 Installations, University City Arts League, Philadelphia, PA

Visual Art Awards

- Carol Davis Scholarship, Montana Artists Refuge Residency, Basin, MT, 2003
- Edwin Anthony & Adalaine Boudraux Cadogan Fellowship, San Francisco Foundation, San Francisco, CA, 1996