

EVERYDAY COGNITION AND SITUATED LEARNING

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6.1 INTRODUCTION

Everyday cognition and situated learning investigates learning as an essentially social phenomena that takes place at the juncture of everyday interactions. These learning interactions are generated by the social relations, cultural history, and particular artifacts and physical dimensions of the learning environment. Brent Wilson and Karen Myers (2000) point out that there are distinct advantages in taking this approach. Taking a situated learning viewpoint promises a broader perspective for research and practice in instructional design. The diversity of disciplines that are interested in a social or practice learning point of view include linguistics, anthropology, political science, and critical theory among others allow researchers and practitioners to look beyond psychology-based learning theories.

In this chapter, I would like to take a broader look than is normally done some of the researchers that are engaged in exploring learning and local sense making from a situated perspective. The intent of this chapter is to provide a taste of some of the rich work being done in this field in the hopes that readers may explore ideas and authors in further detail in order to provide new avenues for investigation and to more critically examine learning, teaching, and instructional design from a practice-based approach. The term “practice” is defined as the routine, everyday activities of a group of people who share a common interpretive community.

6.2 THESIS: WAYS OF LEARNING

I would like to present an organizing argument to tie together the sections to follow. The argument runs as follows:

6.2.1 Ways of Knowing

There are particular ways of knowing, or ways of learning, that emerge from specific (situated) social and cultural contexts. These situated sites of learning and knowing are imbued with a particular set of artifacts, forms of talk, cultural history, and social relations that shape, in fundamental and generative ways, the conduct of learning. Learning is viewed, in this perspective, as the ongoing and evolving creation of identity and the production and reproduction of social practices both in school and out that permit social groups, and the individuals in these groups, to maintain commensal relations that promote the life of the group. It is sometimes helpful to think of this situated site of learning as a community of practice which may or may not be spatially contiguous.

6.2.2 Ethnomethods

Borrowing a term from ethnomethodology (Garfinkel, 1994), I am suggesting that these particular ways of learning are distinguishable by the operations or “ethnomethods” that are used to make sense of ongoing social interactions. These ethnomethods are used with talk (conversation, stories, slogans, everyday proverbs), inscriptions (informal and formal written and drawn documents) and artifacts to make specific situated sense of ongoing experiences including those related to learning and teaching.

The prefix “ethno” in ethnomethods indicates that these sense-making activities are peculiar to particular people in particular places who are dealing with artifacts and talk that are used in their immediate community of practice (Garfinkel, 1994a, p.11). These ethnomethods or, to put it in different

words, these local methods of interpretation, that are used *in situ* to make sense of ongoing situations, are rendered visible to the investigator in the formal and informal representational practices people employ on a daily basis in everyday life (Henning, 1998a, p. 90).

6.2.3 Situated Nature of All Learning

The assumption is that learning in formal settings such as in schools and psychology labs is also situated (Butterworth, 1993; Clancey, 1993; Greeno & Group, M.S.M.T.A.P., 1998, see Lave, 1988, p. 25 ff. for her argument concerning learning in experimental laboratory situations and the problem of transfer). Formal and abstract learning is not privileged in any way and is not viewed as inherently better than or higher than any other type of learning.

6.2.4 Artifacts to Talk With

The gradual accumulation of practice-based descriptive accounts of learning in a diversity of everyday and nonschool situations within particular communities of practice holds the promise of a broader understanding of a type of learning that is unmanaged in the traditional school sense. Learning in nonschool settings has proven its success and robustness over many millennia. Multilingual language learning in children is one example of just this kind of powerful learning (Miller and Gildea, 1987, cited in Brown, Collins, & Duguid, 1989). How can we link these descriptive accounts of learning in a wide diversity of settings, as interesting as they are, so that some more general or “universal” characteristics of learning can be seen?

Attention paid to the representational practice of the participants in each of these diverse learning situations has some potential in establishing such a link. The representations that we are interested in here are not internal mental states that are produced by individual thinkers, but the physical, socially available “scratch pads” for the construction of meaning that are produced for public display. The representations of this type include speech, gesture, bodily posture, ephemeral written and graphical material such as diagrams on a whiteboard, artifacts, formal written material, tools, etc. What are the ways in which physical representations or inscriptions (Latour & Woolgar, 1986) are used to promote learning in these various communities of practice? These representations are not speculations by observers on the internal states produced by the learner that are assumed to mirror some outside, objective, reality with greater or lesser fidelity. The representations of interest are produced by the members of a community of practice in such a way that they are viewable by other members of the community of practice. Internal cognitive or affective states may be inferred from these practices, but the datum of interest at this stage in the analysis of learning is the physical display of these representations.

The representations that we are considering here are “inscribed” physically in space and time and may be “seen” with ear or eye or hand. They are not internal, individual, in the head symbolic representations that mirror the world, but are

physical and communal. A more descriptive word that may be used is “inscriptions” (Latour, 1986, p.7). Inscriptions must be capable of movement and transport in order to provide for the joint construction of making sense in everyday situations, but they also must retain a sense of consistency and immutability in order that they may be readable by the members of the community in other spaces and at other times. The act of inscribing implies a physical act of “writing,” of intentionally producing a device to be used to communicate. Extending Latour’s analysis, the immutability of inscriptions is a relative term— a gesture or bodily posture is transient yet immutable in the sense that its meaning is carried between members of a group.

These objects to “talk with” may consist of linguistic items such as conversation, stories, parables, proverbs or paralinguistic devices such as gestures and facial expressions. They may include formal written inscriptions such as textbooks and manuals and company policy, task analysis, tests and test scores which are usually a prime object of interest of educational researchers, but also may include a hand written note by a phone in the pharmacy that points to some locally expressed policy that is crucial for the operation of the store. Artifacts may also serve as representational devices. Commercial refrigeration technicians place spent parts and components in such a way to provide crucial information and instruction on a supermarket refrigeration system’s local and recent history to technicians in an overlapping community of practice (Henning, 1998a).

The device produced may be of very brief duration such as a series of hand signals given from a roof to a crane operator who is positioning a climate control unit or an audio file of a message from the company founder on a web training page or the spatial arrangement of teacher’s desk and the desks of students in a classroom or seminar room. The devices may be intentionally and consciously produced, but are more often done at the level of automaticity. Both individuals and collectivities produce these devices. The work of Foucault on prisons and hospitals (1994, 1995) describes some of these devices used for the instruction of prisoners and patients in the art of their new status.

Studies of the practice of language use (Duranti & Goodwin, 1992; Hanks, 1996), conversation (Goodwin, 1981, 1994), and studies of gestures and other “paralinguistic” events (Hall, 1959, 1966; Kendon, 1997; McNeill, 1992) are rich sources of new perspectives on how inscriptions are used in everyday life for coordination and instruction. Representational practice is an important topic in the field of science and technology studies. The representational practice in a science lab has been studied by Latour and Woolgar (1986) at the Salk Institute using ethnographic methods. An edited volume, *Representation in Scientific Practice* (Lynch & Woolgar, 1988a), is also a good introduction to work in this field.

Clancey (1995a) points out that a situated learning approach often fails to address internal, conceptual processes. The attention to communal and physical representational practices involved with teaching and learning and the production of inscriptions provides a way out of this dilemma. The study of the interpretive methods used by individuals to make sense of the representational practice, or what the American sociologist and ethnomethodologist Harold Garfinkel has termed the documentary method (Garfinkel, 1994a). The concept of

the documentary method provides an analytical connection between the internal, conceptual processes that occur in individuals and the external practices of individuals in communities.

6.2.5 Constructing Identities and the Reconstruction of Communities of Practice

The ways in which individuals form identities as a member of a community of practice with full rights of participation is a central idea of the situated learning perspective. In all of these descriptions, some type of individual transformation reflected in a change in individual identity is involved. Examples of the production of identity in the literature include studies of the movement from apprentice to journeyman in the trades, trainee to technician, novice into an identity of an expert, the process of legitimate peripheral participation in Jean Lave and Etienne Wenger's work (1991), tribal initiation rites, among others. All of these transitions involve a progression into deeper participation into a specific community of practice. In most cases the new member will be associated with the community and its members over a period of time. However, for the majority of students graduating from high school in the industrialized world, the passage is out of and away from the brief time spent in the situated and local community of practice at school. Applying a community of practice metaphor for learning in school-based settings without questioning the particulars of identity formation in these settings can be problematic (Eckert, 1989).

A second important and symmetrical component of the formation of individual identity by the process of ever increasing participation, is the dialectical process of change that occurs in the community of practice as a whole as the new generation of members joins the community of practice. Implicit in this "changing of the guard" is the introduction of new ideas and practices that change the collective identity of the community of practice. The relation between increasing individual participation and changes in the community as a whole involves a dynamic interaction between individuals and community (Linehan & McCarthy, 2001). Conflict is to be expected and the evolution of the community of practice as a whole from this conflict to be assumed (Lave, 1993, p. 116 cited in Linehan & McCarthy, 2001).

The process of individual identity formation and the process of a community of practice experiencing evolutionary or revolutionary change in its collective identity are moments of disturbance and turbulence and offer opportunities for the researcher to see what otherwise might be hidden from view.

6.2.6 Elements of a Practice-Based Approach to Learning

A practice-based approach to learning is used here in this chapter to describe a perspective on learning that views learning as social at its base, that involves a dialectical production of individual and group identities, and is mediated in its particulars by semiotic resources that are diverse in their structure, are physical and not mental, and meant for display.

There are a number of advantages to be gained by treating learning from a practice-based approach. The basic outline of this approach as been used successfully in studying other areas of human interaction including scientific and technical work, linguistics, and work practice and learning (Chaiklin & Lave, 1993; Hanks, 1987, 1996, 2000; Harper & Hughes, 1993; Goodwin & Ueno, 2000; Pickering, 1992; Suchman, 1988).

The first advantage is that the artificial dichotomy between in-school learning and learning in all other locations is erased. Learning as seen from a practice based approach is always situated in a particular practice such as work, school, or the home. Organized efforts to create learning environments through control of content and delivery with formal assessment activities, such as those that take place in schools, are not privileged in any way. These organized, school based efforts stand as one instance of learning as an equal among others when seen from a practice based approach. By taking this approach to learning, our basic assumptions about learning are problematized in so far as we refuse to accept school learning as a natural order that cannot be questioned.

A second advantage of taking this approach is to stimulate comparative research activity that examines learning that is situated in locations that are both culturally and socially diverse. A matrix of research program goals is possible that allows for comparative work to be done on learning that is located socially within or across societies with diverse cultural bases. For instance, apprenticeship learning can be examined and contrasted with other forms of learning such as formal school learning or learning in religious schools within a culture or the comparative work can be carried out between cultures using the same or different social locations of learning.

A third significant advantage of taking a practice-based approach is that learning artifacts and the physical and cultural dimensions of the learning space are brought to the center of the analysis. Artifacts employed in learning are revealed in their dynamic, evolving and ad hoc nature rather than being seen as material "aids" that are secondary to mental processes. The social and physical space viewed from a practice based approach is a living theater set (Burke, 1945) that serves to promote the action of learning in dynamic terms rather than appearing in the analysis as a static "container" for learning. The construction of meaning becomes accessible by examining the traces made by material artifacts including talk as they are configured and reconfigured to produce the external representational devices that are central to all learning. The study of the creation of these external representational devices provides a strong empirical base for studies of learning. This approach holds the promise of making visible the "seen but unnoticed" (Garfinkel, 1994, p. 36; Schutz, 1962) background, implicit, understandings that arise out of the practical considerations of their particular learning circumstance. A brief description of some of the salient elements to be found in a practice-based approach to the study of learning follows below.

6.2.6.1 A Focus on the Creation of Publicly Available Representations. A practice-approach to learning asks: How do people build diverse representations that are available in a material form to be easily read by the community of practice in

which learning is taking place? The representational practices of a community of learners produce an ever-changing array of artifacts that provide a common, external, in the world, map of meaning construction for both members and researchers alike. Attention to representational practices has proved fruitful for the study of how scientists carry out the work of discovery (Lynch & Woolgar, 1988a). David Perkins' (1993) concept of the person-plus is one example of this approach in studies of thinking and learning.

6.2.6.2 A Focus on the Specific Ways of Interpreting These Representations. A practice-based approach asks what are the methods that are used by members of a particular community of practice to make sense of the artifacts that are produced. What are the features that are in the background of situations that provide the interpretive resources to make sense of everyday action and learning. Harold Garfinkel has termed this process of interpretation the "documentary method" (Garfinkel, 1994a)

6.2.6.3 A Focus on How New Members Build Identities. A researcher who adopts a practice-based approach asks questions concerning the ways in which members are able to achieve full participation in a community of practice. Learning takes place as apprentice become journeyman, newcomer becomes an old-timer. This changing participation implies changes in the identities of the participants. How do these identity transformations occur and what is the relationship between identity and learning?

6.2.6.4 A Focus on the Changing Identities of Communities of Practice. Learning involves a change in individual identity and an entry into wider participation in a community of practice. A practice-based approach to learning assumes that the situated identities of communities of practice are in evolution and change. These identities are situated (contingent) because of the particular mix of the members at a given time (old, young, new immigrants, etc.) and by virtue of changes taking place in the larger social and cultural arena. What can be said about the role of the individual members in the changes in identity of a community of practice? Do organizations themselves learn, and if so how? (Salomon & Perkins, 1998).

6.2.6.5 A Preference for Ethnographic Research Methods. The methods used in ethnographic field studies are often employed in the study of the everyday practice of learning. Some studies include the use of "naturalistic" experiments in the field such as those carried out by Sylvia Scribner (1997) with industrial workers, or Jean Lave with West African apprentice tailors (1977, 1997).

6.2.6.6 Attention to the Simultaneous Use of Multiple Semiotic Resources. A practice-based approach pays attention to the simultaneous use of a diversity of sign resources in learning. These resources for meaning construction are located in speech and writing in the traditional view of learning. However, multiple semiotic resources are also located in the body in activities such as pointing and gesturing (Goodwin, 1990), in

graphic displays in the environment, in the sequences within which signs are socially produced such as turn taking in conversation, and in the social structures and artifacts found in daily life (Goodwin, 2000).

6.3 TERMS AND TERRAIN

A number of overlapping but distinct terms are used to describe thinking and learning in everyday situations. It may be helpful to briefly review some of these terms as a means of scouting out the terrain before proceeding to the individual sections that describe some of the researcher's work in the field of situated learning broadly taken.

6.3.1 Everyday Cognition

Everyday cognition, the term used by Rogoff and Lave (1984), contrasts lab-based cognition with cognition as it occurs in the context of everyday activities. Lave (1998) uses the term just plain folk (jpf) to describe people who are learning in everyday activities. Brown et al. (1989) prefer the term apprentices and suggest that jfps (just plain folks) and apprentices learn in much the same way. Jfps are contrasted with students in formal school settings and with practitioners. When the student enters the school culture, Brown et al., maintain, everyday learning strategies are superseded by the precise, well-defined problems of school settings.

Everyday cognitive activity makes use of socially provided tools and schemas, is a practical activity which is adjusted to meet the demands of a situation, and is not necessarily illogical and sloppy, but sensible and effective in solving problems (Rogoff, 1984). The term "everyday cognition" is used by the psychologist Leonard Poon (1989) to distinguish between studies in the lab and real world studies or everyday cognition studies. Topics for these studies by psychologists include common daily memory activities by adults at various stages in their life span and studies of observed behavior of motivation and everyday world knowledge systems. In summary, the term refers to the everyday activities of learning and cognition as opposed to the formal learning that takes place in classrooms and in lab settings.

6.3.2 Situated Action

The term "situated action" was introduced by researchers working to develop machines that could interact in an effective way with people. The term points to the limitations of a purely cognitivist approach. The cognitive approach assumes that mentalistic formulations of the individual are translated into plans that are the driving force behind purposeful behavior (Suchman, 1987). The use of the term situated action

... underscores the view that every course of action depends in essential ways upon its material and social circumstances. Rather than attempting to abstract action away from its circumstances and represent it as

a rational plan, the approach is to study how people use their circumstances to achieve intelligent action. (Suchman, 1987, p. 50)

Plans, as the word is used in the title of Suchman's book, refers to a view of action that assumes that the actor has used past knowledge and a reading of the current situation to develop a plan from within the actor's individual cognitive process to intelligently meet the demands of the situation. The concept of situated purposeful action, in contrast, recognizes that plans are most often a retrospective construction produced after the fact to provide a rational explanation of action. A situated action approach sees that the unfolding of the activity of the actor is created by the social and material resources available moment to moment. Action is seen more as a developing, sense-making procedure than the execution of a preformulated plan or script that resides in the actor's mind.

6.3.3 Situated Cognition, Situated Learning

The term situated cognition implies a more active impact of context and culture on learning and cognition (Brown et al., 1989; McLellan, 1996) than is implied by the term everyday cognition. Many authors use these terms synonymously with a preference in the 1990s for the use of the term situated cognition. These views again challenge the idea that there is a cognitive core that is independent of context and intention (Resnick, Pontecorvo, & Säljö, 1997). The reliance of thinking on discourse and tools implies that it is a profoundly sociocultural activity. Reasoning is a social process of discovery that is produced by interactive discourse. William Clancey (1997) stresses the coordinating nature of human knowledge as we interact with the environment. Feedback is of paramount importance; knowledge in this view has a dynamic aspect in both the way it is formed and the occasion of its use. Clancey sees knowledge as "... a constructed capability-in-action" (Clancey, 1997, p. 4). Note the evolution of the term from everyday cognition as one type of cognition occurring in everyday activity, to the term, situated cognition, which implies a general and broader view of cognition and learning in any situation. Situated cognition occurs in any context, in school or out, and implies a view toward knowledge construction and use that is related to that of the constructivists (Duffy & Jonassen, 1992). Tools as resources, discourse, and interaction all play a role in producing the dynamic knowledge of situated cognition. Kirshner and Whitson (1997), in their introduction to an edited collection of chapters on situated cognition (p. 4), elevate the approach to a theory of situated cognition and define it in part as an opposition to the entrenched academic position that they term individualistic psychology. In this chapter I will not make any claims for a theory of situated learning. Rather, I am interested in providing a broad sketch of the terrain and some of the authors working in this field.

Perhaps the simplest and most direct definition of the term situated learning is given by the linguist William Hanks in his introduction to Lave and Wenger (1991). He writes that he first heard ideas of situated learning when Jean Lave spoke at a 1990 workshop on linguistic practice at the University of Chicago. The idea of situated learning was exciting because it located

learning "at the middle of co-participation rather than in the heads of individuals." He writes of this approach that

...Lave and Wenger situate learning in certain forms of social co-participation. Rather than asking what kinds of cognitive processes and conceptual structures are involved, they ask what kinds of social engagements provide the proper contexts for learning to take place. (Lave & Wenger, 1991 p.14)

A focus on situated learning, as opposed to a focus on situated cognition, moves the study of learning away from individual cognitive activity that takes place against a backdrop of social constraints and affordances and locates learning squarely in co-participation. Hanks suggests that the challenge is to consider learning as a process that takes place in what linguists term participation frameworks and not in an individual mind. A participation framework includes the speakers "footing" or alignment toward the people and setting in a multiparty conversation. Goffman (1981) used this concept to extend the description of the traditional dyad of linguistic analysis to include a more nuanced treatment of the occasions of talk (Hanks, 1996, p. 207). The shift from situated cognition to situated learning is also a shift to a consideration of these participation frameworks as a starting point for analysis. One method of describing the substance of these frameworks is through the use of the concept of a community of practice which we will take up later in this chapter.

6.3.4 Distributed Cognition

Distributed cognition is concerned with how representations of knowledge are produced both inside and outside the heads of individuals. It asks how this knowledge is propagated between individuals and artifacts and how this propagation of knowledge representations effects knowledge at the systems level (Nardi, 1996, p. 77). Pea suggests that human intelligence is distributed beyond the human organism by involving other people, using symbolic media, and exploiting the environment and artifacts (Pea, 1993). David Perkins (1993) calls this approach to distributed cognition the person-plus approach, as contrasted with the person-solo approach to thinking and learning. Amplifications of a person's cognitive powers are produced by both high technology artifacts such as calculators and computers, but also by the physical distribution of cognition generally onto pencil and paper or simple reminders such as a folder left in front of a door. Access to knowledge, still conceived of in a static sense, is crucial. The resources are still considered from the perspective of the individual as external aids to thinking. The social and semiotic component of these resources is not generally considered in this approach.

6.3.5 Informal Learning

This term has been used in adult education and in studies of workplace learning. Marsick and Watkins (1990) define informal learning in contrast to formal learning. They include incidental

learning in this category. Informal learning is not classroom based nor is it highly structured. Control of learning rests in the hands of the learner. The intellectual roots for this approach are in the work of John Dewey and in Kurt Lewin's work in group dynamics, and Argyris and Schön's work in organizational learning and the reflective practitioner. Oddly, there is not much if any reference to the work of everyday cognition or situated learning in these works.

6.3.6 Social Cognition

The last of these terms is social cognition. There is a large and new body of literature developing in social psychology on social cognition. Early studies in social cognition imported ideas from cognitive psychology and explored the role of cognitive structures and processes in social judgment. Until the late 1980s these "cold" cognitions involved representing social concepts and producing inferences. Recently there has been a renewed interest in the "hot" cognitions that are involved with motivation and affect and how goals, desires, and feelings influence what and how we remember and make sense of social situations (Kunda, 1999). In common with a constructivist and a situated action/participation approach, the emphasis is on the role individuals play in making sense of social events and producing meaning. Limitations of space preclude any further discussion of social cognition as seen from the social psychology tradition in this chapter. One recent introductory summary of work in this field may be found in Pennington (2000).

6.3.7 Sections to Follow

In the sections to follow, I discuss authors and ideas of situated cognition and practice loosely grouped around certain themes. It is not my intention to produce a complete review of the literature for each author or constellation of ideas, but will highlight certain unifying themes that support the ways of learning organizing thesis presented in the section above. One important area of interest for most authors writing on situated cognition, and for the somewhat smaller set of researchers carrying out empirical studies, is the ways in which representations are produced and propagated through the use of "artifacts" such as talk, tools, natural objects, inscriptions and the like. A second common theme is the development of identity. A third common theme is the co-evolution of social practice and individual situated action as it is expressed by the current state of a community of practice.

6.4 EVERYDAY COGNITION TO SITUATED LEARNING: TAKING PROBLEM SOLVING OUTDOORS

In 1973 Sylvia Scribner and Michael Cole wrote a now-classic chapter that challenged current conceptions of the effects of formal and informal education. This paper, and early work by

Scribner and Cole on the use of math in everyday settings in a variety of cultures (Scribner, 1984; Carraher, Carraher, & Schliemann, 1985; Reed & Lave, 1979), asks: What are the relationships between the varied educational experiences of people and their problem solving skills in a variety of everyday settings in the United States, Brazil, and in Liberia?

Jean Lave extended this work to the United States in a study of the problem-solving activities of adults shopping in a supermarket (Lave, 1988). She concluded that adult shoppers used a gap closing procedure to solve problems, which turned out to yield a higher rate of correct answers than were achieved when the adults solved a similar problem in formal testing situations using the tools of school math. Lave developed an ethnographic critique of traditional theories of problem solving and learning transfer and elaborated a theory of cognition in practice (Lave, 1988). This work served as the basis for the development of situated learning by Lave (1991) and Lave and Wenger of legitimate peripheral participation (Lave & Wenger, 1991). Legitimate peripheral participation (LPP) is considered by Lave and Wenger to be a defining characteristic of situated learning. The process of LPP involves increasingly greater participation by learners as they move into a more central location in the activities and membership in a community of practice (Lave & Wenger, 1991, p. 29). Lave has continued her explorations of situated learning and recently has written extensively on the interaction of practice and identity (Lave, 2001).

6.4.1 Street Math and School Math

Studies on informal mathematics usage have been an early and a significant source for thinking about everyday cognition and the situated nature of learning. These studies have been carried out in Western and non-Western societies. The use of the distinction formal/informal is problematic. In this dichotomy, formal math is learned in school and informal math out of school. Using informal as a category for everything that is not formal requires us to find out beforehand where the math was learned. Nunes (1993, p. 5) proposes that informal mathematics be defined in terms of where it is practiced, thus mathematics practiced outside school is termed informal or street mathematics. The site, or as Nunes terms it, the scenario of the activities is the distinguishing mark. This has the advantage of not prejudging what is to be found within one category or the other and to a certain extent unseats the concept of a formal math from its position of preference that it holds as the most abstract of theoretical thinking. Formal math activity is redefined simply as math done at school. Another term that could be used instead of informal or everyday math is the term ethnomath, meaning mathematic activity done in the context of everyday life. The term is cognate with the term ethnobotany, for instance, indicating the types of local botanical understandings used by a group.

In order to investigate the relation between street math and school math, adults and children are observed using math, these people are interviewed, and certain "naturalistic experiments" are set up to lead people to use one or the other type of math. The aim is to see what various types of mathematic activities have in common.

If there are similarities in the processes of mathematical reasoning across everyday practices of vendors, foremen on construction sites, and fisherman, carpenters, and farmers, we can think of a more general description of street mathematics. Would a general description show that street mathematics is, after all, the same as school mathematics, or would there be a clear contrast? (Nunes, Schliemann, & Carraher, 1993, p.5)

Reed and Lave's work done in Liberia with tailors (1979) had shown there were differences in the use of mathematics between people who had been to school and who had not (see below). Carraher et al. (1985) asked in their study if the same person could show differences between the use of formal and informal methods. In other words, the same person might solve problems with formal methods in one situation and at other times solve them with informal methods. The research team found that context-embedded problems presented in the natural situation were much more easily solved and that the children failed to solve the same problem when it was taken out of context. The authors conclude that the children relied on different methods depending upon the situation. In the informal situation, a reliance on mental calculations closely linked to the quantities was used. In the formal test, the children tried to follow school-based routines. Field studies involving farmers, carpenters, fishermen, and school students have also been completed by the authors and have largely confirmed these findings.

Three themes stand out in this work. The first is the assumption that different situations or settings, occupational demands, and the availability of physical objects available for computation, influence the types of math activities that are used to solve problems. These settings and participants are diverse in terms of age (adults and children) and in terms of cultural location.

A second theme is that the practice of math is universal in all cultures and situations, both in school and out, and that a finer grained distinction than formal or informal needs to be made between math activities in various sites.

The third theme is the use of a "naturalistic" method that includes observational research combined with what Lave calls "naturally occurring experiments" (Lave, 1979, p. 438, 1997). This approach is preferred because of the recognition that the math practices are embedded in ongoing significant social activities. The change-making activities of the street vendors is linked to the intention of not shortchanging a customer or vendor rather than a high score on a school-based test. A fisherman estimating the number of crabs needed to make up a plate of crab fillet solves this math problem in a rich context that requires naturalistic or ethnographic methods as a research tool rather than statistical analysis of test results.

6.4.2 Sylvia Scribner: Studying Working Intelligence

Sylvia Scribner did her undergraduate work in economics at Smith and then found employment as an activities director of the electrical workers union in 1944. Later in the 1960s she worked in mental health for a labor group and became research director of mental health at a New York City health center. In her mid-forties she entered the Ph.D. program in psychology at the New School of Social Research in New York City doing her

dissertation work on cross cultural perceptions of mental order. She had a strong commitment to promoting human welfare and justice through psychological research (Tobach, Falmagne, Parlee, Martin, & Kapelman, 1997, pp, 1-11). She died in 1991. Tributes to her work, biographical information, and a piece written by her daughter are found in *Mind and social practice: Selected writings of Sylvia Scribner* (Tobach et al., 1997), which is one of the volumes in the *Cambridge Learning in Doing* series. This volume collects together most of her important papers, some of which were printed in journals that are not easily obtainable.

At the end of the 1960s and into the 1970s the "cognitive revolution" in psychology had redirected the interests of many psychologists away from behavior and toward the higher mental functions including language, thinking, reasoning, and memory (Gardner, 1985). This change in psychology provided an open arena for Scribner's interests. In the 1970s, Scribner began a fruitful collaboration with Michael Cole at his laboratory at Rockefeller University. This lab later became the Laboratory of Comparative Human Cognition and has since relocated to the University of California, San Diego. Scribner spent several extended periods in Liberia, first working with the Kpelle people investigating how they think and reason (Cole & Scribner, 1974) and then with the Vai, also in Liberia, examining literacy (Scribner & Cole, 1981). During these years, Scribner studied the writings of Vygotsky and other psychologists associated with sociocultural-historical psychology and activity theory and incorporated many of their ideas into her own thinking (Scribner, 1990). During her entire research career, Scribner was interested in a research method that integrates observational research in the field with experiments conducted in the field on model cognitive tasks.

A central theme of Scribner and Cole's research is an investigation of the cognitive consequences of the social organization of education. In their 1973 paper that appeared in *Science* (Scribner & Cole, 1973) they wrote:

More particularly, we are interested in investigating whether differences in the social organization of education promote differences in the organization of learning and thinking. The thesis is that school practice is at odds with learning practices found in everyday activities. (p. 553)

Scribner and Cole state that cross-cultural psychological research confirms anthropological findings that certain basic cognitive capacities are found in all cultures. These include the ability to remember, generalize, form concepts and use abstractions. The authors found that, even though all informal social learning contexts nurture these same capacities, there are differences in how these capacities are used to solve problems in everyday activity. This suggests a division between formal and informal that is based not on location of the activities or where they were learned, but on the particular ways a given culture nurtures universal cognitive capacities.

Scribner and Cole's research on literacy practices among the Vai people in Liberia began with questions concerning the dependency of general abilities of abstract thinking and logical reasoning on mastery of a written language (Scribner & Cole, 1981; also a good summary in Scribner, 1984). The Vai are unusual in

that they use three scripts: English learned in school, an indigenous Vai script learned from village tutors, and Arabic or Qur'anic literacy learned through group study with a teacher, but not in a school setting. Scribner and Cole found that general cognitive abilities did not depend on literacy in some general sense and that literacy without schooling (indigenous Vai and the Qur'anic script) was not associated with the same cognitive skills as literacy with schooling. The authors continued into a second phase of research and identified the particular linguistic and cognitive skills related to the two nonschooled literacies. The pattern of the skills found across literacies (English, Vai, Qur'anic) closely paralleled the uses and distinctive features of each literacy. Instead of conceiving of literacy as the use of written language which is the same everywhere and produces the same general set of cognitive consequences, the authors began to think of literacy as a term applying to a varied and open ended set of activities with written language (Scribner, 1984). At the conclusion of the research, Scribner and Cole called their analysis a practice account of literacy (Tobach et al., 1997, p. 202).

We used the term "practices" to highlight the culturally organized nature of significant literacy activities and their conceptual kinship to other culturally organized activities involving different technologies and symbol systems. Just as in the Vai research on literacy, other investigators have found particular mental representations and cognitive skills involved in culture-specific practice... (Scribner, 1984, p.13)

In the late 1970s, Scribner moved to Washington D.C. to work as an associate director at the National Institute of Education, and later, at the Center for Applied Linguistics. It was during this time that Scribner carried out observational studies on work in industrial settings. Scribner (1984) reported on this work and included a good summary of her research and ideas to date. In this paper, Scribner proposes the outline of a functional approach to cognition through the construct of practice. A consideration of practice offers the possibility "... of integrating the psychological and the social-cultural in such a way that makes possible explanatory accounts of the basic mental processes as they are expressed in experience " (Scribner, 1984, p. 13). Setting out with this approach to cognition, the practices themselves in their location of use become objects of cognitive analysis. A method is needed for studying thinking in context.

Scribner saw two difficulties with this approach. The first involves the problem of determining units of analysis. She proposes the construct of practice and the tasks that are associated with it to resolve this first difficulty. The second problem involves the supposed trade-off between the relevance of naturalistic settings and the rigor that is possible in laboratory settings (Scribner, 1984). The solution to this difficulty was found in the combination of observational, ethnographic, methods to provide information on the context and setting combined with experimental methods carried out at the site that were used to analyze the process of task accomplishment. Scribner saw the industry study which was done with workers in a dairy in Baltimore as a test of this method. The intention was to see if models of cognitive tasks can be derived empirically from a study of practices in a workplace setting.

Scribner and her fellow researchers chose the workplace as a setting to study cognitive activities because of the significance of these activities, the limited environment for practice that is offered by the tight constraints of the plant, and social concerns relating to the betterment of the conditions of workers. School experience is a dominant activity for children yet, for adults, work is the dominant activity. Due to the large percentage of time spent at work and the material and social consequences of work, work activity is highly significant for adults. In terms of research strategy, the choice of a single industrial plant meant that there is a constraint on activity and that in a certain sense the plant can be viewed as a semibounded cultural system. The social concern that motivated the choice of factory work as a site for study is the class related differences in educational attainment. Even though children from the lower rungs of the economic ladder don't do as well in school, they often go on to perform successfully complex skills in the workplace. A fine-grained analysis of how these successes in workplace learning take place could have implications for educational policy and practice in school and out. Scribner's varied background working with factory workers in unions probably played a part in the choice as well.

A note on the methods used is appropriate here as one of the main research objectives of the study was to try out a new practice based method of research. First, an ethnographic study was done of the dairy plant as a whole that included a general picture of the requirements in the various occupations for skills in literacy, math and other cognitive skills. Next, on the basis of the ethnographic case study, four common blue collar tasks were chosen for cognitive analysis. All the tasks, such as product assembly, involved operations with written symbols and numbers. Naturalistic observations were carried out under normal working conditions in and outside of the large refrigerated dairy storage areas for each of the tasks. Hypotheses, or as Scribner writes, "... more accurately 'hunches' " (Scribner, 1984, p. 17) were developed as a result of these observations. These "hunches" were generated about the factors in the task that might regulate how the task performance can vary. Modifications in the form of job simulations were made to test these hunches. A novice/expert contrast was also used. This contrast was performed between workers in different occupations within the plant. Workers in one occupation, such as product assemblers, were given tasks from another occupation, such as preloaders. A school and work comparison was also included. This group consisted of ninth graders chosen randomly from a nearby junior high school. These students received simulated dairy tasks with a paper and pencil math test. This paper and pencil math test was also given to dairy workers.

In addition to the methodological innovations of the study, some common features of the tasks studied offer a starting point for a theory of what Scribner in 1984 called practical intelligence. The outstanding characteristic is variability in the way in which the tasks were carried out. A top-down, rational approach to task analysis may not have revealed this diversity of practical operations. The variability in the way the dairy workers filled orders in the ice box for delivery or how the drivers calculated the cost of the order was not random or arbitrary, but served

to reduce physical or mental effort. Skilled practical thinking was found to "... vary adaptively with the changing proprieties of problems and changing conditions of the task environment" (Scribner, 1984, p. 39).

Scribner terms her idea of practical thinking as "mind in action" (Scribner, 1997). For Scribner, the analysis of thought should take place within a system of activity and should be based on naturally occurring actions. A characteristic of all of Sylvia Scribner's work is this willingness to delve into the particular forms of experiences that form social practices as they are lived out in everyday situations. The ways in which the objects in the environment (artifacts) contribute to the execution of the skilled task are crucial in Scribner's view of practical intelligence. Reflecting on the dairy studies, Scribner says that "The characteristic that we claim for practical thinking goes beyond the contextualist position. It emphasizes the inextricability of task from environment, and the continual interplay between internal representations and operations and external reality..." (Scribner, 1997, p. 330).

This concern with the interaction between the individual and the environment and its objects stems directly from Scribner's reading of Vygotsky and other writers associated with sociocultural psychological theory and what has come to be termed activity theory. Activity theory is seen as making a central contribution to the mind and behavior debate in psychology. Scribner says that "... cognitive science in the United States, in spite of its youth, remains loyal to Descartes' division of the world into the mental and physical, the thought and the act" (Scribner, 1997, p. 367). In activity theory, the division is: outer objective reality, and the activity of the subject that includes both internal and external processes. Activity is both internal and concerned with motivation yet at the same time external and linked to the world through a mediated component, tools and more generally artifacts including language. Scribner suggests three features of human cognition: (1) human knowing is culturally mediated, (2) it is based on purposive activity, and (3) it is historically developing (Scribner, 1990). Cultural mediators, in this view, not only include language but "... all artifactual and ideational (knowledge, theories) systems through which and by means of which humans cognize the world" (Scribner, 1997, p. 269). The theory suggests a methodological direction. Changes in social practices (purposive activity), or changes in mediational means (such as the introduction of calculators) will be occasions for changes in cognitive activity (Scribner, 1990). Research efforts can be aimed at these interfaces of changing practices and changing uses of artifacts as mediators.

6.4.3 Jean Lave and the Development of a Situated, Social Practice View of Learning

It would be difficult to overstate the enormous contribution that Jean Lave has made to studies of everyday cognition and situated learning and to the formulation of a social practice theory of learning. I don't have space here to do justice to the richness and diversity of her work, but I will highlight some of her important articles and books and underscore some of her salient ideas in this section.

6.4.3.1 *Tailor's Apprentices and Supermarket Shoppers.* Jean Lave, trained as an anthropologist, did research in West Africa on Vai and Gola tailors between 1973 and 1978. This research focused on the supposed common characteristics of informal education (Lave, 1977, 1996, p. 151). These assumed characteristics of informal education had been called into question by Scribner and Cole (1973). Does informal learning involve a context bound effort of imitation and mimesis that results in a literal, context bound understanding with limited potential for learning transfer? Is it true to assume that informal learning is a lower form of learning when contrasted with formal, abstract, school based learning? The results of Lave's research on apprentice tailors proved otherwise. The apprentice tailors started their learning fashioning simple articles of clothing such as hats and drawers and moved on to increasingly complex garment types culminating with the Higher Heights suit. These tailors were "... engaged in dressing the major social identities of Liberian society" (Lave, 1990, p. 312).

Far from simply reproducing existing social practices, they were involved in complex learning concerning the relations, identities and divisions in Liberian society. This learning was not limited to the reproduction of practices, but extended to the production of complex knowledge. (Lave, 1996, p. 152)

Reed & Lave (1979) examined arithmetic use in West Africa to investigate the consequences of formal (school) and informal (apprentice) learning. These studies compared traditional tribal apprenticeship with formal Western schooling among Vai and Gola tailors in Monrovia, Liberia. Arithmetic use was ideal for this study as it was taught and used in both traditional tailor activities and in formal school settings (Reed & Lave, 1979). In addition, arithmetic activity is found in all cultures and has been written about extensively. Reed and Lave also felt that arithmetic activity lends itself to a detailed description that makes comparisons possible. Traditional apprenticeship and formal schooling bear some similarities to each other: both involve long-term commitments, 5 years or more, and both involve the transmission of complex knowledge. They also differ in significant ways. Apprenticeship takes place at the site of tailoring practice in the shops, schooling takes place in a site removed from everyday activities although, of course it should be recognized that schooling itself is an important and dominant form of everyday activity. The juxtaposition of these two types of learning provide what Reed and Lave (1979) call:

... a naturally occurring experiment allowing the authors to compare the educational impacts of two types of educational systems of a single group within one culture. (p. 438)

In addition to the traditional ethnographic method of participant-observation and informal interviews, a series of experimental tasks with the tailors were carried out. Reed and Lave discovered that the tailors used four different types of arithmetic systems. The experimental tasks and the consequent error analysis and descriptions of task activities played a large role in discovering the use of these systems (Reed & Lave, 1979, p. 451). An iteration between observation and experimental tasks was used rather than using a linear succession of observation and

then following up with experimental tasks. The conclusion was that a skill learned in everyday activities, such as in work in a tailor shop, led to as much general understanding as one learned in a formal school setting using a “top down approach” (Reed & Lave, 1979, p. 452).

In the late 1970s and early 1980s Lave and a group of researchers undertook studies in California of adult arithmetic practices in grocery shopping, dieting, and other everyday activities in what was called the Adult Math Project (Lave, 1988; Lave, Murtaugh, & de la Rocha, 1984). The term, dialectic, used in the title the chapter in the landmark 1984 edited volume by Rogoff and Lave points to the idea that problems are produced and resolved by the mutual creation that occurs as activity (the choice shoppers must make in the grocery store based on price) and the setting (the supermarket aisles visited) cocreate each other. Activity and setting are dialectically related to a larger and broader concept called arena. The construct of setting and arena is taken from the work of the ecological psychologist Barker (1968). Setting is the personal experience of the individual in the market. The arena is the more durable, and lasting components of the supermarket over time such as the plan of the market that is presented to all shoppers by the structure, aisles, etc. of the supermarket. The setting, as contrasted with the arena, is created by the shopper as specific aisles are chosen (Lave et al., 1984). The authors found that adults in this study did not use a linear formal school based process for solving problems, but rather a process of “gap closing.”

The process of “gap closing” involves using a number of trials to bring the problem ever closer to a solution. The adults in this study demonstrated a high level of solution monitoring. This high level of monitoring, in the view of the authors, accounted for the very high level of successful problem solving that was observed (Lave et al., 1984). The supermarket setting itself stores and displays information in the form of the items that are under consideration for purchase. The supermarket setting interacts in a dynamic way with the activity of the actor to direct and support problem solving activities. Lave et al. make the very important point that this is true for all settings, not just supermarkets. All settings, they claim, provide a means of calculation, a place to store information, and a means for structuring activity (Lave et al., 1984, p. 94). These conclusions suggest that the study of cognition as problem solving in a socially and materially impoverished lab setting is unlikely to yield much information on the fundamental basis of cognition. The three components of activity: the individual, the setting (the phenomenological encounter with the supermarket), and the arena (the long term durability of the supermarket as it appears in many settings) are in constant interplay with each other. Dialectically, they cocreate each other as each impinges on the other. Learning as activity within a setting that is constrained by an arena is considered by Lave et al. as a particular form of social participation.

6.4.3.2 Missionaries and Cannibals: Learning Transfer and Cognition. Learning transfer has always been a sticky subject in psychology. How can it be proven that transfer takes place if an individualistic view of psychological problem solving is rejected? What is the validity of experiments in the psychology lab that purport to prove or disprove that transfer had

taken place? In response to this difficulty, Lave sought to outline anew field that she termed “outdoors psychology” (Lave, 1988, p.1). This term had been coined by fellow anthropologist Clifford Geertz in his collection of essays *Local Knowledge* (Geertz, 1983). Lave’s 1988 book, *Cognition in Practice*, is a concise refutation of the functionalist theory of education and cognition. The fact that Lave’s 1998 book and Rogoff and Lave’s 1984 edited book have been reprinted in paperback format and have found a new audience of readers attests to the pivotal importance of this research in everyday cognition and situated learning.

In the book’s very tightly written eight chapters, Lave (1988) examines the culture of the experimental lab and its assumed, implicit ideas about learning and then moves the discussion toward a social practice theory of learning. The invention of this new “outdoors” psychology which Lave tentatively terms a social anthropology of cognition (Lave, 1988, p.1) would free the investigators of cognition and learning from the artificial confines of the psychology lab and from school settings. The very fact that all of us have experienced the school setting makes this setting appear as natural to learning and blinds researchers to investigating the everyday character and social situatedness of learning and thinking (Lave, 1990, pp. 325–326, note 1). Cognition seen in every day social practice is “. . . stretched over, not divided among- mind, body, activity, and culturally organized settings . . .” (Lave, 1988, p.1). The solution to the problem of creating an outdoors psychology was to use the research tools of anthropology to carry out an ethnographic study of the lab practice of cognitive researchers who have studied problem solving. These laboratory problem solving experiments included a study of certain well known lab based problems such as the river crossing problem. In this problem, called missionaries and cannibals, missionaries and cannibals must be transported across a river on a ferry such that cannibals never outnumber the missionaries on shore or in the boat. The central topic for researchers studying problem solving in the lab is transfer of learning between problems of similar nature. Lave finds in her review of the work on problem solving that there is very little evidence that transfer takes place, especially when there were even small differences in problem presentation. Lave asks, if there appears to be little transfer between similar problems in tightly controlled lab experiments on problem solving, how is it possible to envision that learning transfer is an important structuring feature of everyday practice (Lave, 1988, p. 34)?

Lave concludes with the observation that learning transfer research is a part of the functionalist tradition of cognition. This tradition assumes that learning is a passive activity and that culture is a pool of information that is transmitted from one generation to another (Lave, 1988, p. 8). Functional theory presumes that there is a division of intellectual activity that places academic, rational thought in the preferred position. Theorists place schoolchildren’s thought, female thought, and everyday thinking in a lower hierarchical position (Lave, 1988, p. 8). This view disassociates cognition from context. Knowledge exists, in this functionalist view, in knowledge domains independent of individuals. The studies reviewed show little support for using the learning transfer construct to study actual, everyday problem solving. In order to move the discussion of cognition out

of the laboratory and off the verandah of the anthropologist, Lave proposes the development of a social practice theory of cognition. The argument is that activity, including cognition, is socially organized therefore the study of cognitive activity must pay attention to the way in which action is socially produced and to the cultural characteristics of that action (Lave, 1988, p. 177). Lave claims that “. . . the constitutive order of our social and cultural world is in a dialectical relation with the experienced, lived-in world of the actor” (Lave, 1988, p. 190).

6.4.3.3 Communities of Practice and the Development of a Social Practice Theory of Learning. The community of practice construct is one of the most well-known ideas to emerge from the discussion of situated cognition and situated learning. Lave & Wenger (1991) use the term legitimate peripheral participation (LPP) as a way of characterizing the ways in which people in sites of learning participate in increasingly knowledgeable ways in the activities of what is termed a community of practice. The concept of changing participation in knowledgeable practice has its origins in Lave’s work with apprentices in West Africa and in other anthropological studies of apprenticeship. The studies of apprenticeship indicate that apprenticeship learning occurs in a variety of phases of work production, teaching is not the central focus, evaluation of apprentices is intrinsic to the work practices with no external tests, and organization of space and the access of the apprentice to the practice being learned are important conditions of learning (Lave, 1991, p. 68). This view holds that situated learning is a process of transformation of identity and of increasing participation in a community of practice. Newcomers become old-timers by virtue of the fact that they are permitted by access to practice to participate in the actual practice of a group. One key feature of LPP is that the perspective of the learner, including the legitimate physical location of the learner from which action is viewed, changes as the learner becomes a complete participant. A second key feature is that a transformation of identity is implied. This transformation arises from the outward change of perspective and is one of the most interesting points being made by situated learning theorists.

The term community of practice is generally left as a somewhat vague statement in descriptions of situated learning. Lave and Wenger state that it is not meant as a primordial cultural identity, but that members participate in the community of practice in diverse ways and at multiple levels in order to claim membership. The term does not necessarily imply that the members are co-present or even are an easily identifiable group. What it does imply, for Lave and Wenger, is participation in a common activity system in which participants recognize shared understandings (Lave & Wenger, 1991, p. 98). The authors define community of practice as “. . . a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice” (Lave & Wenger, 1991, p. 98). A community of practice, according to Lave and Wenger, provides the cultural, historical and linguistic support that makes it possible to “know” the particular heritage that defines knowledgeable practice. Lave and Wenger say that participation in practice is “. . . an epistemological principle of learning” (Lave & Wenger, 1991, p. 98).

Lave’s research program in the 1980s moved from a consideration of traditional apprenticeship, such as those of weavers and midwives, to an investigation of the workplace and the school in contemporary culture. Lave finds that, when we look at formal, explicit educational sites such as contemporary school or formal educational programs in the workplace, it is difficult to find a community of practice, the concept of mastery, and methods of peripheral participation that lead to a change in identity. The reason for this apparent lack lies, in Lave’s view, in the alienated condition of social life proposed by Marxist social theorists. The commodification of labor, knowledge, and participation limits the possibilities for developing identities (Lave, 1991).

Lave argues that this becomes true when human activity becomes a means to an end rather than an end in itself. The commodification of labor implies a detachment of labor from identity and seems, from Lave’s view, to imply that the value of skill is removed from the construction of personal identity. Unfortunately, Lave does not cite any studies of contemporary apprenticeship learning in the United States to provide evidence for this claim. In a study of the situated work and learning of commercial refrigeration technicians, Henning (1998a) found that the formation of identity as knowledgeable participants was central to the increasing degree of participation in practice of apprentice refrigeration technicians. It appears, however, that in the school setting, the commodification of knowledge devalues knowledgeable skill as it is compared with a reified school knowledge used for display and evaluation within the context of school.

Lave and Wenger (1991) say that the problems in school do not lie mainly in the methods of instruction, but in the ways in which a community of practice of adults reproduces itself and the opportunities for newcomers to participate in this practice. A central issue is the acceptable location in space and in social practice that the newcomer can assume in a legitimate, recognized way that is supported by the members of the community of practice. Access to social practice is critical to the functioning of the community of practice. Wenger (1998) sees the term community of practice as being a conjunction of community and of practice. Practice gives coherence to a community through mutual engagement in a joint enterprise using shared resources such as stories, tools, words, and concepts (Wenger, 1998, p. 72).

The construct of a community of practice has provided a stimulus to thinking about the relations between activity in a culturally and socially situated setting and the process of learning by increasingly central participation in the practices of a community. The term, however, can be used to imply that there is a relatively unproblematic relationship between individual and community that tends to gloss over the actual process of the production of the varied and changing practices that make up the flesh and blood situatedness of people involved in joint engagement that changes over time. There is a certain disconcerting feeling in reading about the community of practice and its practitioners. At times, particularly in theoretical accounts, the practices and people referred to seem to be disembodied, generic and faceless. The empirical work that is infrequently used in a general way to support the theoretical claims is mostly recycled and vintage work. Unlike Sylvia Scribner’s work, which continued to

be empirically based for the duration of her career and which conveys a sense of real people doing real tasks and learning important things, community of practice theorizing stays comfortably within the realm of theorizing. Lave relies exclusively on data from the early work with Liberian tailors and other early apprenticeship studies as well as work in the 1980s done with adults using math in everyday settings. Wenger's empirical data for his 1998 book appears to be largely derived from his research with insurance claims processing done in the 1980s. It should be noted, however, that Lave, as we will see in the next section, has recently been engaged in work with identity formation in Portugal (Lave, 2001) which has included extensive field work. Phil Agre (1997) commenting on Lave's (and also on Valerie Walkerdine's) sociological analysis of math activities as situated practice, points to the promise of this line of research and theoretical work. However, Agre makes the important point that the sophistication of the theoretical work and the unfamiliarity of Lave and Walkerdine's respective sociological methods to their intended audiences also makes for tough going for the reader. The contrast that Agre draws in this article between Lave's thinking on mathematical activity and that of Walkerdine's is helpful in gaining a broader view of the complexity of Lave's thinking. Jean Lave's introduction to the 1985 American Anthropological Association Symposium on the social organization of knowledge and practice (Lave, 1985) also provides a helpful summary of the role that the early work on apprenticeship and on adult math practices played in the development of situated learning and everyday problem solving.

6.4.3.4 Learning in Practice, Identity, and the History of the Person. Lave asks in a 1996 chapter what the consequences are of pursuing a social theory of learning rather than an individual and psychological theory that has been the norm in educational and psychological research. Lave's answer is that theories that "... reduce learning to individual mental capacity/activity in the last instance blame marginalized people for being marginal" (Lave, 1996, p. 149). The choice to pursue a social theory of learning is more than an academic or theoretical choice but involves an exploration of learning that does not "... underwrite divisions of social inequality in our society" (Lave, 1996, p. 149). Just as Lave undertook an ethnographic project to understand the culture of theorizing about problem solving in *Cognition in Practice* (1988), here she asks a series of questions about theories of learning with the aim of understanding the social and cultural sources of theories of learning and of everyday life. Learning theories, as all psychological theories, are concerned with epistemology and involve a "third person singular" series of abstract questions to establish the *res* of the objects of the perceived world. The conclusion of Lave's inquiry was that it is the conception of the *relations* between the learner and the world that tends to differentiate one theory of learning from another. A social practice theory of learning stipulates that apprenticeship type learning involves a long-term project, the endpoint of which is the establishment of a newly crafted identity. Rather than looking at particular tools of learning, a social practice theory of learning is interested in the ways learners become full-fledged participants, the ways in which participants change and the ways in which communities of practice change.

The realization that social entities learn has been a topic for organizational studies for some time, but has not been a topic of educational theorists until recently (Salomon & Perkins, 1998). This dialectical relationship between participant (learner), setting, and arena first mentioned in 1984 (Lave, 1984) implies that both the setting, including the social practices of the community and the individual are changing rather than the individual alone. The trajectory of the learner is also a trajectory of changing practices within the community of practice.

This dialectical relationship is largely masked in school learning by the naturalization of learning as a process that starts and ends with changes within an individual. The consequence of this perspective taken from our own school experience and exposure to popular versions of academic psychology is that questions concerning learning are investigated from the point of view of making the teacher a more effective transmitter of knowledge. The solution, according to Lave, is to treat learners and teachers in terms of their relations with each other as they are located in a particular setting.

Ethnographic research on learning in nonschool settings has the potential of overcoming the natural, invisible, and taken for granted assumption that learning always involves a teacher and that the hierarchical divisions of students and teachers are normal and not to be questioned. The enormous differences in the ways learners in a variety of social situations shape their identities and are shaped in turn becomes the topic of interest. The process of learning and the experience of young adults in schools is much more than the effects of teaching and learning, but includes their own subjective understanding of the possible trajectories through and beyond the institution of the school (Lave, Duguid, Fernandez, & Axel, 1992).

The changing nature of this subjective understanding, and its impact on established practices in a variety of cultural and social situations, is not limited to schools and becomes the broader topic of research into learning. An investigation of learning includes an investigation of the artifacts and tools of the material world, the relations between people and the social world, and a reconsideration of the social world of activity in relational terms (Lave, 1993). In recent ethnographic work among British families living in the Port wine producing area of Portugal, Lave (2001) found that "getting to be British" involved both becoming British as a consequence of growing up British by virtue of school attendance in England, participation in daily practices of the British community in Porto, and also about the privilege of being British in Porto. Lave suggests that no clear line can be drawn between "being British" and between "learning to be British" (Lave, 2001, p. 313).

6.5 TALK, ACCOUNTS, AND ACCOUNTABILITY: ETHNOMETHODOLOGY, CONVERSATION ANALYSIS, AND STUDIES OF REFERENTIAL PRACTICE

A method of organizing the wealth of data obtained from empirical studies of various types of learning is needed to organize this material and to enable theoretical insights. Ethnomethodology,

and work in conversation analysis and referential practice, can provide just such an organizing theoretical perspective for this wealth of detail. Microethnographic observations of practices that include learning, identity formation, and dialectical change become possible while preserving a theoretical scheme that permits the data obtained to be considered in general enough terms so as not to overwhelm the investigator with the infinite particulars of experience.

6.5.1 Garfinkel and Ethnomethodology

One core problem in any study of everyday cognition determining the nature of social action. A central issue for research in everyday cognition is to determine how the “actors” make sense of everyday events. Harold Garfinkel, a sociologist trained at Harvard under the social systems theory of Talcott Parsons, broke free of the constraints of grand theorizing and wrote a series of revolutionary papers derived from empirical studies that challenged the view that human actors were passive players in a social environment (Garfinkel, 1994a). A very valuable introduction to Garfinkel and the antecedents of ethnomethodology is given by John Heritage (1992). Garfinkel’s emphasis on the moment by moment creation of action and meaning has informed and inspired the work of later researchers in the area of socially situated action such as Lucy Suchman and Charles Goodwin. Four tenets of ethnomethodology concern us here. These are (1) sense making as an on-going process in social interaction, (2) the morality of cognition, (3) the production of accounts and of account making concerning this action by actors, and (4) the repair of interactional troubles.

6.5.1.1 Ethnomethods and Sense Making. The term ethnomethodology is the study of the ways in which ordinary members of society make sense of their local, interactional situations. The members use what are termed “ethnomethods” or “members’ methods” to perform this sense-making procedure. Making sense of the social and physical environment is a taken for granted and a largely invisible component of everyday life. The term ethnomethods is taken to be cognate with such other anthropological terms as ethnobotany or ethnomedicine. For the ethnomethodologists and their intellectual descendents, the application of these ethnomethods is not restricted to everyday, “non-scientific” thought and social action (Heritage, 1992). Ethnomethods applies equally well to sense making in the practice of the scientific lab (Latour and Woolgar, 1986) or of oceanographic research (Goodwin, C., 1995). In a paper coauthored by Harold Garfinkel with Harvey Sacks, the use of ethnomethods by members participating in social interaction is shown to be “. . . an ongoing attempt to remedy the natural ambiguity of the indexical nature of everyday talk and action” (Garfinkel & Sacks, 1986, p. 161).

Indexical is a term used in linguistics to describe an utterance or written message whose meaning can only be known in relation to the particulars of located, situated action. The meaning of an utterance such as “That is a good one” can only be known through an understanding of the context of the utterance. The utterance is indexed to a particular “that” in the

immediate field of conversation and cannot be understood otherwise. Indexical expressions, and the problems these expressions present in ascertaining the truth or falsehood of propositions, have been a topic of intense discussion by linguists and philosophers (Hanks, 1996; Levinson, 1983; Pierce, 1932; Wittgenstein, 1953). These expressions can only be understood by “looking at” what is being pointed to as determined by the immediate situation. It does seem that the indexical quality of much of everyday interaction in conversation is centrally important to an understanding of cognition in everyday interaction.

Everyday interaction has an open ended and indeterminate quality to it. For this reason, constant misunderstandings normally arise in the course of conversation and social action. These misunderstandings or “troubles” must be resolved through the use of verbal and nonverbal ethnomethods. Ethnomethods are clearly shared procedures for interpretation as well as the shared methods of the production of interpretive resources (Garfinkel, 1994a). A key idea here is that these ethnomethods are used not in the sense of rules for understanding but as creative and continually unfolding resources for the joint creation of meaning. The use of ethnomethods produces a local, situated order (understanding) that flows with the unfolding course of situated action.

Sociologists such as Durkheim (1982) taught that the social facts of our interactional world consisted of an objective reality and should be the prime focus of sociological investigation. Garfinkel, however, claimed that our real interest should be in how this apparent objective reality is produced by the ongoing accomplishment of the activities of daily life. This accomplishment is an artful sense-making production done by members and is largely transparent to members and taken for granted by them (Garfinkel, 1994a). The accomplishment of making sense of the world applies to interactions using language, but also includes the artifacts that members encounter in their everyday life. This insight extended studies of situated and practical action to include the routine inclusion of nonlinguistic elements such as tools that play a role in the production of an ongoing sense of meaning and order.

6.5.1.2 The Morality of Cognition. Ethnomethods are used by members (actors) to produce an ongoing sense of what is taking place in every day action. A second question that arises in studies of everyday action is: How is the apparent orderliness produced in everyday action in such a way that renders everyday life recognizable in its wholeness on a day to day basis? The functionalist school of sociology represented by Talcott Parsons (1937) view the orderliness of action as a creation of the operation of external and internal rules that have a moral and thus a constraining force. On the other hand, Alfred Schultz (1967), a phenomenological sociologist who was a prime source of inspiration for Garfinkel’s work, stressed that the everyday judgments of actors are a constituent in producing order in everyday life. Garfinkel is credited with drawing these two perspectives together. The apparent contradiction between a functionalist, rule regulated view and a view of the importance of everyday, situated judgments is reconciled by showing that cognition and action are products of an ongoing series of accountable, moral choices. These moral choices are produced in such a way as to

be seen by other members to be moral and rational given the immediate circumstances (Heritage, 1992, p. 76).

Garfinkel was not alone in his view of everyday action. Erving Goffman had presented similar ideas in *The Presentation of Self in Everyday Life* (1990). In a series of well-known experiments (sometimes called the breaching experiments), Garfinkel and his students demonstrated that people care deeply about maintaining a common framework in interaction. Garfinkel's simple and ingenious experiments showed that people have a sense of moral indignation when this common framework is breached in everyday conversation and action. In one experiment, the experimenter engaged a friend in a conversation and, without indicating that anything out of the ordinary was happening, the experimenter insisted that each commonsense remark be clarified. A transcription of one set of results given in Garfinkel (1963, pp. 221–222) and presented in Heritage (1992) runs as follows:

Case 1: The subject (S) was telling the experimenter (E), a member of the subject's car pool, about having had a flat tire while going to work the previous day.

S: I had a flat tire.

E: What do you mean, you had a flat tire?

She appeared momentarily stunned. Then she answered in a hostile way: "What do you mean? What do you mean? A flat tire is a flat tire. That is what I meant. Nothing special. What a crazy question!" (p. 80)

A good deal of what we talk about, and what we understand that we are currently talking about, is not actually mentioned in the conversation, but is produced from this implied moral agreement to accept these unstated particulars within a shared framework. This implied framework for understanding is sometimes termed "tacit" or hidden knowledge but, as we can see in the excerpt above and from our own daily experience, any attempt to make this knowledge visible is very disruptive of interaction. An examination of situated learning must take into account these implied agreements between people that are set up on an *ad hoc* basis or footing for each situation. These implied agreements somehow persist to produce orderliness and consistency in cognition and action.

The interpretation of these shared, unstated, agreements on the immediate order of things is an ongoing effort that relies on many linguistic and paralinguistic devices. Earlier, I used the term inscriptions to refer to these physical representations that are produced by members of a community of practice in such a way that they are visible to other members. These representations are not the mental states that are produced internally by individuals, but are physically present and may be of very long or very short duration. When the assumptions underlying the use of these representations are questioned or even directly stated, communication is in danger of breaking down as we have seen in the above example.

As a consequence of the dynamic nature of everyday cognition and action and the interpretation of these everyday representational devices, troubles occur naturally on a moment to moment basis in the production of sense making in everyday action. These troubles in communication do not mean that there is any kind of deficiency in the members of the community of practice and their ability to make sense of each other's actions,

but is a normal state of affairs given the unstated, assumed nature of the frameworks for interpretation and the indexicality of the inscriptions used to help members make sense of what they are about.

6.5.1.3 Making Action Accountable and the Repair of Interactional Troubles. Garfinkel says that in order to examine the nature of practical reasoning, including what he terms practical sociological reasoning (i.e., reasoning carried out by social scientists), it is necessary to examine the ways in which members (actors) not only produce and manage action in everyday settings, but also how they render accounts of that action in such a way that it is seen by others as being "reasonable" action (morally consistent in a practical sense). In fact, Garfinkel takes the somewhat radical view that members use identical procedures to both produce action and to render it "accountable" to others and to themselves (Garfinkel, 1994a). This process is carried on in the background and involves the ongoing activity of resolving the inherent ambiguity of indexical expressions. As mentioned above, indexical expressions depend for their meaning on the context of use and cannot be understood without that context. Garfinkel is saying that indexicality is a quality of all aspects of everyday expressions and action and that some means has to be used to produce an agreement among "cultural colleagues" (Garfinkel, 1994a, p. 11).

Garfinkel identifies the documentary method as the interpretive activity that is used to produce this agreement between members as action and talk unfolds (Garfinkel, 1994b, p. 40). The concept of the documentary method is taken from the work of the German sociologist, Karl Manheim (1952). The basic idea of the documentary method is that we have to have some method of finding patterns that underlie the variety of meanings that can be realized as an utterance or activity unfolds. A constructivist could easily reformat this statement and apply it to learning in the constructivist tradition. The documentary method is applied to the appearances that are visible in action and speech produced by members of the community of practice. These are the physical representations or inscriptions that I have referred to above. These inscriptions point to an underlying pattern by members to make sense of what is currently being said or done in terms of the presumed pattern that underlies what is being said or done.

This production of meaning, according to Garfinkel, involves a reciprocal relation between the pointers (the appearances) and the pattern. As the action or talk unfolds in time, latter instances of talk or action (the appearances in Garfinkel's terms) are used as interpretive resources by members to construct the underlying pattern of what is tacitly intended (Garfinkel, 1994b, p. 78). The documentary method is not normally visible to the members and operates in the background as everyday cognition and action take place. It is only recognized when troubles take place in interaction.

There are two crucial insights that Garfinkel makes here. The first relates to the sequential order of interaction. What is said later in a conversation has a profound impact on establishing the situated sense of what was said earlier. The possible meanings of earlier talk are narrowed down by later talk, most often, but not always, without the need for a question to provoke the later talk

that situates the earlier talk. Take a moment and become aware of conversation in your everyday activities and of the unfurling of meaning as the conversation moves forward. An example of the importance of sequence in conversation is shown in this brief conversation taken from Sacks (Sacks 1995b, p. 102).

A: Hello
 B: (no answer)
 A: Don't you remember me?

The response of A to B's no answer provides a reason for the initial right that A had in saying hello. Consider the use of hello in an elementary classroom or on the playground in the neighborhood. What are the "rights" of saying hello for children and for adults? How does the "next turn" taken in the conversation further establish that right or deny it? A fundamental and often overlooked characteristic is the diachronic nature of all social action from the broad sweep of history to the fine grained resolution of turn taking and utterance placement in conversation. When it happens is as important as what happens.

The second crucial insight of the ethnomethodologists and researchers in conversation analysis is that troubles that occur in interaction are subjected to an ongoing process of repair. This repair process makes the instances of trouble accountable to some held in common agreement concerning just what it is that members are discussing. The empirical investigation of the process that members use to repair interactional troubles is a central topic for conversation analysis. This point of turbulence is an opportune moment for the researcher's ability to make visible what otherwise is hidden.

The specifics of meaning construction and the interpretive work and interpretive resources that members use to make sense of everyday action and settings for action are made visible in the investigation of these troubles and their repair. The *post hoc* examination of traditional educational research into the type and source of trouble in educational encounters in schools through the use of test instruments does not often provide access to the unfolding of meaning creation and the repair of interactional and cognitive troubles that occur as action unfolds in a school setting.

6.5.2 Conversation Analysis and Pragmatics

Everyday cognition studies can benefit from the insights of conversation analysis and the related field of pragmatics. The detailed transcriptions and microanalysis of everyday talk may be a barrier to an appreciation of the significant findings of conversation analysis, or CA as it is sometimes called, yet CA offers much that is useful for the study of everyday cognition.

John Searle (1992), writing on conversation, observes that traditional speech act theory deals with two great heroes, "S" and "H." "S goes up to H and cuts loose with an acoustic blast; if all goes well, . . . if all kinds of rules come into play, then the speech act is successful and non-defective. After that there is silence; nothing else happens. The speech act is concluded and S and H go their separate ways" (Searle, 1992, p. 1). Searle asks if, as we know, real life speech acts do not resemble this

analytical sequence, could we develop an account of conversations and the rules that are followed as these conversations unfold in the same way that individual speech acts have been analyzed? Searle's response to this dilemma was to develop a more formal approach to the general use of utterances in actual conversation.

Conversation analysis, on the other hand, directs its attention to everyday talk in naturally occurring day-to-day interaction. In a review of literature on conversation analysis, Goodwin and Heritage (1990) suggest that there is a recognition that face-to-face interaction is a strategic area for understanding human action for researchers in psychological anthropology and learning theory. Conversation analysis grew out of sociology and the work of Harvey Sacks, Emanuel Schegloff, and Gail Jefferson in the 1960s and has its roots in the ethnomethodology of Harold Garfinkel. Studies of conversation involve an integrated analysis of action, shared knowledge, and social context (Goodwin & Heritage, 1990, p. 283). Education has often been described as an unfolding conversation between a learner and a teacher-coach. An understanding of the organization of talk in everyday life promises to elucidate the design conditions that make for good educational conversations. I will briefly mention one or two central ideas of conversation analysis but encourage the reader to explore the literature in this field.

6.5.2.1 Methodological Accounts of Action. Harvey Sacks, mentioned above in conjunction with his work with Harold Garfinkel and one of the founders of conversation analysis, was not looking for *a priori* rules in an idealized version of everyday talk that exist as independent entities beyond daily life. Sacks was looking for rules in practice that appear to produce an interactional effect in a real episode of talk. He asked: what are the situated methods that were used to produce this effect in actual conversation? These situated methods, then, are considered the "rules" under which talk proceeds (Sacks, 1995c).

As with most researchers in the area of situated learning the preference is for data from field experiences. Much of the material used for Sack's work in conversation analysis comes from recordings of telephone conversations made to an emergency psychiatric hospital (Sacks, 1995a). The methods used to produce the "rules" of conversational talk are situated because of their dependence on the immediate, on-going interactions of others in the conversation. A stable account of human behavior can be developed by producing an account of the methods that people use to produce it (Schegloff, 1991, 1995). Sacks says of the scientific descriptions of talk that are produced by this method that:

And we can see that these methods will be reproducible descriptions in the sense that any scientific description might be, such that the natural occurrences that we're describing can yield abstract or general phenomena which need not rely on statistical observability for their abstractness or generality. (Sacks, 1995c, pp. 10-11)

The focus of Sacks, and conversational analysis, is the interpretive methods individuals use to produce action and, at the same time as producing action to render it accountable. An account of action makes it visible to other members of

the community of practice. These “background” methods of producing an account of action and making sense of everyday action seem to be prime methods in everyday learning. The “straight up,” literal, this-is-what-I-am-about-to-say, approach taken for granted in formal and school education inevitably produces discomfort and confusion as to what is actually being said.

An example of an explanation of some of these background methods given by Sacks is found in the comparison of the two brief conversations reproduced below. At the time Sacks was working with a suicide prevention center in Los Angeles and was concerned with problems in getting the name of the person who is calling for help. Sacks wanted to see at what point in the course of a conversation could you tell that the person was not going to give their name. Obviously, without the person’s name, the type of help that can be given is very limited.

First conversation:

- A: This is Mr. Smith may I help you
B: Yes, this is Mr. Brown

Second conversation:

- A: This is Mr. Smith may I help you
B: I can’t hear you
A: This is Mr. Smith
B: Smith (Sacks, 1995c, p. 3).

The first conversation is an instance of an indirect method of posing the question “Who is this” and the normal response of the caller giving his name. The opening greeting “This is Mr. Smith may I help you” produces a conversational “slot” that appears in the next turn of conversation. The caller would normally fill in this slot by responding with his own name and in the first conversation does so. In the second conversation, however, the caller uses an indirect method of claiming not to hear properly as a method of not giving his name in response to the opening greeting and in fact in most conversations that started in this fashion the caller’s name was never secured. The caller’s method of avoiding giving the caller’s name is reproducible in the sense that is recognizable in many calls to the suicide prevention center in which the person seeking help was not able to give his or her name. The caller provides a reasonable utterance (“I can’t hear you”) to fill the slot that would be normally used to identify himself and is thus able to continue the conversation. The rule or regularity of conversational action that emerges is a production used by the caller to produce a certain interactional effect, in this case an avoidance. The stable account of the callers behavior is made visible by the implied account of the avoidance: “I can’t hear you.” In Sack’s terms, the reproducible nature of this conversational action is not attested by statistical frequency of occurrence but by the fact that we can recognize this situated and embodied “rule” in other instances of talk.

6.5.2.2 *The Importance of Sequence in Conversation.*

An important finding from the work of conversation analysis is that “conversational objects” such as a greeting, the offer of a caller’s name are presented in particular conversational

“slots” and that their significance varies with the placement. As mentioned above, everyday action has a diachronic quality. The diachronic location of an action in a time series of unfolding activity is crucial. Action is situated in time as well as place.

This diachronic quality of conversation and everyday action has significant implications for the type of research methods that are suitable for the investigation of everyday cognition. The research tools must be able to identify the time dependent creation of activity and action.

One example of many of the importance of sequencing in conversation is given by Sacks (1995a). The greeting term “Hello” is relevant for all conversations in the sense that the use of a greeting is normally a part of every conversation. Sacks points out that there is no set length for a conversation and, in fact the exchange “A: Hello, B: Hello” can constitute a conversation. In a two-party conversation, the format is normally carried out in turns such that A then B and then A, etc., repeated. These alternations are called conversational turns.

The content of an utterance and its sequential location in the course of the conversation are both found to be relevant for the type of meanings that are mutually constructed by the participants. As an example, if we answer the phone as we normally do with “Hello,” this hello is taken as a greeting term. However, if we say “Hello” in the middle of the phone conversation, it is taken as a request to ascertain if someone is still on the other end of the line. A constructivist interpretation of learning must assume that there is some mechanism in a concrete sense that allows for the joint construction of knowledge in a learning situation. The exploration of the temporal, sequential quality of talk by conversation analysis provides the beginnings of the explication of the actual methods that people use to construct knowledge in these everyday situations.

6.5.3 A Baseline of a Practice Approach

The anthropological linguist William Hanks proposes a three-way division of language as (1) a semiformal system (the structure of language which is a traditional topic for formal linguistics), (2) the communicative activities of the participants, and (3) the way in which the participants create evaluations of the language structures and language use (Hanks, 1996, p. 230). The evaluations are ideological and take into account the broader range of values and beliefs. They may be misrecognitions or may be inaccurate, but are nevertheless social facts. These three analytical components of language use come together in what Hanks calls a moment of synthesis in “practice.” He points out that participants have a sense of what is possible in language or what might fail through experimenting with various forms of utterances in conversational practice. The account of the success or failure of an utterance in conversation that is made by the speaker and hearer is a product of these experiments in practice rather than the result of a formal system known to the participants.

Hanks maintains that formalist systems that depend on rules for combining categories of utterance types make this same claim; however, for these formal systems, the generative

capacity of the possible combinations is anonymous and does not take into consideration the indexical issues of time and place (Chomsky 1957; Hanks, 1996). In contrast to these general and formal analytical systems, Hanks proposes the concept of a person in practice who must estimate the potential effect of utterances based on the actual field of practice. The participants use the situated nature of language in use to make judgment calls in a particular situation. Notice the parallel with the creation of appropriate language slots in conversation described by Sacks. The slot created for the caller to respond with his name is produced in the use of language as the conversation unfolds. The idea here is that the judgment calls on what is possible in a conversation and in learning are produced by the local, situated unfolding of the conversation rather than a blind adherence to rules of interaction that lie outside of the situation. These possible language acts fall within a limited range and cannot be chosen from the total number of possible language acts. In other words, there are constraints on what is a possible utterance.

Finally, Hanks asserts that the participant in practice works within a diachronic situation. As mentioned above, this concern with temporal position is reflected in research work in conversation analysis and the concern with conversational sequence. Hanks links this diachronic quality to a sense of reflexivity. Donna Haraway terms the sense of reflexivity a partial perspective saying in reference to Hanks that:

We are accustomed to consider reflexive thought as a result of a conscious decision to think about our own approaches and actions, our own biases. The term that Hanks uses here refers to a situated sense of being in a particular place spatially. The term refers to the sense of the body that phenomenologists such as Merleau-Ponty use to describe active and situated knowing. We know things from a particular place. This place is both physical and bodily as well as social and intellectual. A partial perspective is what we have and in some sense this partial perspective in contestation holds the promise of objective vision (Haraway, 1991)

Hanks illustrates this practice approach to language use with examples from his work with the Maya and their language, also called Maya, which is spoken today in Mexico and parts of central America. For example, the terms used in the Maya language to indicate a front and back orientation for the body are not applied to a tree. Instead, the tree is given a front by the act of the woodsman's chopping it down. The word used is *taámbesik*, to cause the tree to have a front by the process of chopping, and involves the first cuts made on the tree on the side toward which it will fall (Hanks, 1996, p. 252). Once the chopping has begun, the term for bark is applied to designate the back of the tree. The final cut to the tree before it falls is referred to by a term that means "explode its back." Hanks is saying here that the shift in activity over the course of the tree cutting operation produces a semantic shift in frame of reference for potential use of terms for front and back in respect to a tree. The unfurling of the activity changes the meanings of the words used. It is reasonable to assume that a change in semantic framework as activity moves forward also takes place during learning. Exactly how these shifts take place and the creation of reproducible descriptions of these shifts in semantic frameworks in the course

of learning should be an interesting and fruitful topic of investigation.

6.6 PLANS, PRACTICES, AND SITUATED LEARNING

Lucy Suchman and many of her colleagues that have been associated with the Xerox Palo Alto Research Center during the creative years of the 1980s and 1990s focused their research interests on interactions that take place in ordinary practice, particularly those in the offices where the Xerox Corporation sold copy machines. These everyday interactions afford a view on the general scientific problem of how the situated structuring of action takes place (Suchman & Trigg, 1993, p. 144). In this section we will take a brief look at the empirical work and some of the theoretical conclusions of a number of researchers who are investigating everyday work practice.

6.6.1 Lucy Suchman: Centers of Coordination and the Study of the Structure of Action in Situated Practice

Suchman and her colleagues at Xerox were interested in learning how the practices at work sites, particularly those based on representational objects such as charts, whiteboards, schedules, etc., form the basis for the coordination of the activity at the sites (Suchman, 1993). How are activities articulated in such a way that an ongoing sense of social order is produced? Building on work in the sociology of science, Suchman is interested in the relation between practice and "devices for seeing" (Suchman, 1988, p. 305; Suchman & Trigg, 1993, p. 145). These devices for seeing include texts, diagrams, formulas, models and an infinite variety of other artifacts that are used to produce representations of the world at hand in everyday practice. A central focus of studies of work practice is the relationship between the physical underpinnings of work practice including artifacts of all types and the emerging structure of work activities (Suchman, 1997, p. 45). The artifacts in the work environment include not only tools but also architectural features, furnishings, video monitors, etc. This approach to work practices can be applied to any work site and may be very profitably used to analyze the coordination of practices in teaching and learning both in school and on the job with a detailed description of the ways in which inscriptions (physical representations) are produced and interpreted in everyday learning.

In her groundbreaking book, *Plans and Situated Actions*, Lucy Suchman (1987) challenged the cognitivist view that action is first generated solely by what takes place within the actor's head (Suchman, 1987, p. 9). Suchman states that when action is viewed from a cognitivist approach, people are thought to act on the basis of symbolic representations that are first internalized and processed solely at an individual level and then output as actions in the world. This approach assumes that people first use symbolic devices to prepare plans that are then

carried out in action. According to the cognitivist view summarized by Suchman, "... intelligence is something independent of any 'human substrate' and can be implemented in any physical substrate, most specifically, the computer in the form of artificial intelligence" (Suchman, 1987, pp. 8-9). Suchman carried out an anthropological study to verify if this is actually the case in everyday action (Suchman, 1987). She undertook an ethnographic study of how people interacted with an early version of an expert help system built into a photocopier. As a result of this ethnographic study, she discovered that the apparent structure of people's actions is an emergent product of their actions that take place in a particular time and with particular people and is not the result of some sort of abstract computational process performed on symbolic representations that takes place apart from the lived world.

In one study, Suchman and Trigg (1993) examined the representational practices of researchers in artificial intelligence (AI). This ethnographic field study focused on the ways in which these researchers used graphical representations that are jointly produced in the course of their work on whiteboards. The representations produced on the whiteboard were a socially organized, public activity. These representations served as "artifacts to think with" and were used as a collaborative resource in small group meetings. Suchman and Trigg found that the actual production of the diagrams on the whiteboard left behind traces of its production and use and served to explicate the work practices of the AI researchers. These traces point to the situated and contingent nature of the production of representational forms as tools for coordination and articulation.

In another study of the ground operations at a large metropolitan airport on the west coast (Goodwin & Goodwin, 1995; Suchman, 1993, 1997), Suchman and her colleagues found that the work of servicing arriving and departing airplanes involved the reading of an extensive array of representational devices. A central finding of their research was that the work of ground operations required the assembly of knowledge about airplanes and schedules by the juxtaposition and relationship of a wide range of technologies and artifacts rather than with one form of technology. Using video records and observational studies, Suchman and her fellow researchers show that competent participation in the work of operations requires learning a way of seeing the environment. Video records can be useful in studies of work and situated learning. A video record of the setting of the work activity using a stationary camera, records of work from the perspective of a person doing the work, records of artifacts as they are used in the work setting, and records of tasks (Suchman & Trigg, 1991).

The making of these video recordings and the research work of Suchman and her colleagues at Xerox has been guided generally by ethnography and interaction analysis. These two related research methods have proved to be particularly fruitful for studies of work practice. Ethnography, used in cultural and social anthropology, involves the detailed study of activities and social relations as seen within the whole of a culture or social world. Interaction analysis takes a detailed look at the interactions between people and between people and artifacts (Jordan and Henderson, 1995). Interaction analysis is derived from work in anthropology, conversation analysis and ethnomethodology.

Goodwin (1994, p. 607) has pointed out, however, that the placement of the camera and the type of shots that are chosen reflects the particular viewpoint of the person using the camera (p. 607).

6.6.2 Situated Learning and the Simultaneous Use of Multiple Semiotic Resources: Charles Goodwin, Marjorie Goodwin

Studies of the social and material basis of scientific practice have illustrated the interrelationship of situated social and cultural practices materials and tools in various fields of science and technology. The construction of knowledge in a scientific field can be described as an interaction between the practices surrounding the tools and materials of a particular scientific investigation and the cultural and historically established practices that define the scientific field (Suchman, 1998). Charles Goodwin shows these relations between artifacts and tools and the creation of scientific knowledge by looking at how scientists use tools in the day-to-day work of science.

Goodwin studied the work of oceanographers working at the mouth of the Amazon in one study. He examines how scientists on a research ship view a diversity of displays of the sea floor as representations on computer monitors in the ship's laboratory (Goodwin, C., 1995). The flow of images on the screens is accompanied by talk on a "squawk box" from a third person working in a different part of the ship. This person is positioning the scanning devices that are receiving the raw data from the sea floor that drives the computer monitors in the ship's lab. Goodwin points out that positioning in the social and physical space on and below the ship is central to the construction and interpretation of the scientific work that is focused on reading the representation created in the display of the sea floor.

Goodwin shows that the work of these scientists aboard the research ship depends upon the creation of new hybrid spaces that are constructed from multiple perceptual presentations. These hybrid spaces are constructed on the various computer screens by the scientists who respond to the positioning information that is a result of the interaction through talk with the third person, who is not a scientist and who is off stage. This third person is a crew member who raises and lowers the sensing device above the sea floor. The focus of Goodwin's analysis is not simply concerned with the abstract treatment of spatial organization as a mental entity produced in the individual minds of the scientists, but is extended to include an analysis of human cognition as "... a historically constituted, socially distributed process encompassing tools as well as multiple human beings situated in structurally different positions" (Goodwin, C., 1995, p. 268). The oceanographers aboard ship create a heterogeneous array of perceptual fields using a variety of tools (computer display screens, sonar probes etc) and a variety of social resources (verbal interaction with the crew member who is raising and lowering the probe).

The perceptual fields that are produced by the work of scientists with the particular tools and materials of their profession must be interpreted. These interpretations are used to produce what Latour and Woolgar (1986) term inscriptions. These

objects in the form of various documents are circulated and commented on in the scientific community of practice. The inscriptions are not one-for-one representations of a slice of the natural order, but are a product of interpretive actions. This process of interpretation and the resultant inscription is, in Lynch and Woolgar's words, "... a rich repository of 'social' actions" (Lynch & Woolgar, 1988b, p. 103). The work of producing an inscription from these diverse perceptual fields is a form of what Charles Goodwin terms "professional vision."

In an article by that name, (Goodwin, 1994) Goodwin takes a look at the work of young archeologists in a field school and the work of a jury as it considers legal argumentation presented in the first Rodney King police brutality trial that took place in Los Angeles. Goodwin takes a look at three specific practices which are used to produce an account of what has been seen. These are (1) coding (the creation of objects of knowledge), (2) highlighting (making specific items salient in a perceptual field), and (3) producing and articulating material representations which support and contest socially organized ways of seeing.

The task of the young archaeologists at the field school is to learn to describe the characteristics of dirt from a current archaeological site. These characteristics which include color, consistency, and so forth, are used to classify the strata of the samples. Gradations in the color of earth also give clues to the location of wooden building posts and other cultural artifacts that have long since disappeared. The work of classifying soil samples includes the use of tools and documents such as the Munsell color chart and bureaucratic forms used to record the results. Goodwin shows that this work is intricately bound up with the discursive practices of the senior archaeologists at the field school. Goodwin concludes that ways of professional seeing are not developed in an individual's mind as an abstract mental process, but that these ways of professional seeing are "... perspectival and lodged within endogenous communities of practice" (Goodwin, 1994, p. 606).

In the second half of the article, jurors in the Rodney King trial develop a certain way of seeing by virtue of the presentation of a videotape of the police beating of King coupled with the testimony of expert witnesses. Although the graphical evidence in the tape seemed to insure a conviction, in the first trial the jury found the police officers innocent. The prosecution presented the tape as an objective report that was self-evident. However, the defense lawyers presented the events of the tape as situated in the professional work life of the police officers. King's actions and possible intent was made the focus of the presentation through a method of what Goodwin calls highlighting. As a consequence, the officers who are performing the beating in the tape are made to fade into the background.

In both the field school and the courtroom, the ways of seeing that arise from situated practices lodged within specific communities must be learned (Goodwin, 1994, p. 627). The process of learning in the two situations is quite different and, according to Goodwin referring to Drew and Heritage, the different ways of learning depend upon the alternative ways human interaction is organized (Drew & Heritage, 1992).

Although the settings of learning found in the work of the young archeologists in the field school and in the work of the jurors in establishing the "facts" of the Rodney King police

brutality case are very different, Goodwin (1994) concludes that there are common discursive practices used in each setting. First, he finds that the process of classification is central to human cognition. These classifications systems are social, and are organized as professional and bureaucratic knowledge structures. They carry within their structure the cognitive activity of the members of the community of practice that organize them. Second, the ability to modify the world to produce material representations for display to a relevant audience is as crucial to human cognition as are internal mental representations. Goodwin (1994) goes on to say on this second point:

... though most theorizing about human cognition in the 20th century has focused on mental events—for example, internal representations—a number of activity theorists, students of scientific and everyday practice, ethnomethodologists, and cognitive anthropologists have insisted that the ability of human beings to modify the world around them, to structure settings for the activities that habitually occur within them, and to build tools, maps, slide rules, and other representational artifacts is as central to human cognition as processes hidden inside the brain. The ability to build structures in the world that organize knowledge, shape perception, and structure future action is one way that human cognition is shaped through ongoing historical practices. (p. 628)

Goodwin and other researchers describe a process of producing and interpreting representational artifacts in various work and everyday settings. Marjorie Goodwin (1995), for instance, examined how workers at a midsized airport made use of multiple resources produce responses in routine work encounters. These work encounters occur in two types of social spaces that the sociologist Erving Goffman (1990) has described as back stage areas and front stage areas. In the operations room, a backstage area is hidden from public view, responses to pilots' requests to know the status of gates is constructed differently than in the front stage area of the gate agents dealing with passengers.

Marjorie Goodwin (1995) demonstrates that the construction of responses to coworkers at the airport is embedded in particular activity systems that are located in a specific social space. A key idea is that people interact within what are called participation frameworks. Marjorie Goodwin extends Goffman's (1961) concept of situated activity systems to include not only a single focus of interactional attention, but attention to coworkers who communicate at a distance. Goffman, using the activity surrounding a ride on a merry-go-round as an example says:

As is often the case with situated activity systems, mechanical operations and administrative purpose provide the basis for of the unit. Yet persons are placed on this floor and something organic emerges. There is a mutual orientation of the participants and—within limits, it is true—a meshing together of their activity. (Goffman 1961, p. 97)

Goffman's concept of mechanical operations and administrative purpose are loosely analogous to the concept of arena (Barker, 1968; Lave, 1988, p. 152) mentioned above. Goffman's early formulation of situated activity systems are an important precursor to the concept of participation frame works used in conversation analysis and pragmatics (Goodwin, 1997, p. 114-115).

Issues of uncertainty in finding an open gate for incoming planes can be resolved in the operations room by suspending radio contact with the pilot and working out the possibilities with other workers in the back stage space of the operations room. In the front stage area of the gate agents, communications between coworkers on the type of compensation to be offered to passengers for lost places on overbooked flights are handled in a short hand code between coworkers in the presence of the passenger. In this front stage area, the semiotic resources for producing action must be created and interpreted in a structurally different manner than the semiotic resources in the back stage area of the operations room. In both these situated activity systems, Goodwin shows that multiple representational artifacts and systems are used to construct responses to coworkers. Goodwin sees a connection between her research on the use of artifacts and collaboration as a way to understand the world with research in everyday cognition by Hutchins (1990), Lave (1988; Lave and Wenger, 1991; Rogoff and Lave 1984), and Scribner (1984). Hutchins (1996) found in a study of distributed cognition in an airline cockpit that a process of propagating representational states is carried out through the use of a variety of representational media types. The structure of these representational types have consequences for collaborative cognitive processes in the cockpit:

Every representational medium has physical properties that determine the availability of representations through space and time and constrain the sorts of cognitive processes required to propagate the representational state into and out of that medium. (Hutchins, 1996, p. 32)

Hutchins (1995) feels that the emphasis on internal, mental, structures results from a lack of attention to the ways in which internal representations are coordinated with what is outside (p. 369).

In Goodwin and Goodwin (2000), the production of powerful emotional statements within a situated activity system is examined. Field data on three girls playing hopscotch and data from another field study on the interaction in the family of a man with nonfluent aphasia are examined in this article. Intonation, gesture, body posture, and timing all provide a set of semiotic resources that are embodied in situated activity system of the girls playing hopscotch. These same semiotic resources are also found in the interaction of an aphasic man with his family allowing him to interact at an emotional level without the need for an explicit vocabulary of words that display emotion. Goodwin and Goodwin point out that the analysis of the actual talk of the participants as opposed to second hand reports of talk show how displays of emotion are produced within interaction. By making use of the participation framework produced by the words of the family members, the aphasic man was able to communicate emotion through an embodied performance of affect using intonation, gesture, body posture and timing without the need for an explicit vocabulary (Goodwin & Goodwin, 2000, p. 49).

Hutchins observes that the original proponents of a symbolic processing view of cognition such as Newell, Rosenbloom, & Laird (1989) were surprised that no one had been able to include emotion into their system of cognition (Hutchins, 1995). The problem, according to Hutchins, is that history, context and

culture will always seem to be add-ons because they are by definition outside the boundaries of the cognitive system (p. 368). A learning theory that can't provide an account of emotion as it plays out in everyday interaction and cognition will be of limited value in understanding the breadth and diversity of learning experience in every life.

Anthropologically based field studies of the settings of talk provide a rich source of ideas about learning and everyday cognition that take place both in formal school and everyday settings. This perspective from studies in anthropological linguistics on situated action by the Goodwins described in brief above builds in part on the work of the Soviet sociohistorical tradition in psychology (Goodwin, 1994; Wertsch, 1981).

The Soviet sociohistorical tradition in psychology has produced much interesting work in activity theory and learning by Yrjö Engeström (1993, 1995, 1997, 1999) and others working in Scandinavia and the United States (Cole, 1997; Virkkunen, Engeström, Helle, Pihlaja, & Poikela, 1997). The International Social and Cultural Activity Theory Research Association, ISCAR (www.iscar.org), holds a very lively conference every 5 years. The journal *Mind, Culture, and Activity* published by Lawrence Erlbaum and Associates (www.erlbaum.com) carries many good articles on situated cognition and activity theory. The special double issue on vision and inscription in practice (Goodwin & Ueno, 2000) is of particular interest for the discussion above.

Goodwin and others have advanced the idea that there is a continuity between the use of multiple semiotic fields in institutional settings such as in work based settings and in everyday settings that are not work related. The flexibility that is made possible by the various ways that these semiotic fields can be combined and used to construct meaning is thought to produce this continuity across settings. Following this view, an examination of the particulars of interpretive action in a work setting such as that of the dairy workers studied by Scribner (1984) should reveal the same basic semiotic resource production and interpretive practices as those found in, say, everyday math by Carraher and Schliemann (2000) or Nunes et al. (1993).

Cognition and, by implication, all learning following this view is a social process at its root and involves the public production and interpretation of a wide diversity of representations that are in the world in a variety of material forms. The sequential time dependent process of the construction of meaning becomes available to the lay person and to the researcher alike through the traces left by the production of these sometimes ephemeral semiotic resources. The locus of interest in the field of the study of cognition has shifted dramatically in recent years from internal structure and mental representations that must be inferred through protocols and tests to representational practice as a material activity that leave material traces in sound and artifact creation. We must still take a partial perspective (Harraway, 1991) on this activity because we carry out the act of interpretation from our own situated vantage point. Harraway (1991) says that:

Social constructionists make clear that official ideologies about objectivity and scientific method re particularly bad guides to how scientific knowledge is actually *made*. Just as for the rest of use, what scientists

believe or say they do and what they really do have a very loose fit. (p. 184)

The “eyes” made available in modern technological sciences shatter any idea of passive vision; these prosthetic devices show us that all eyes, including our won organic ones, are active perceptual systems, building in translations and specific ways of seeing, that is, ways of life. (p. 190)

The viewpoint of privileged partial perspective is not to be confused with relativism which is in Harraway’s words, “. . . a way of being nowhere while claiming to be everywhere equally” (Harraway, 1991, p. 191) and is a denial of responsibility and critical enquiry.

The inferences that can be made, however, are rooted in tangible and demonstrable evidence through records such as videotapes, screen grabs of graphic displays, actual artifacts, transcriptions of talk, and so forth. A focus on the production and use of these semiotic resources means that the investigation of cognition and of learning offers the promise of research firmly based in scientific practice which involves the production of both evidence rooted in experience and the production of theoretical formulations from that evidence.

6.6.3 Learning as a Process of Enculturation: Situated Cognition and the Culture of Learning

It is not surprising that the corporate world has in some cases been a leader in championing the development and application of situated learning. Given the amount of corporate spending on education, the bottom line requires corporations to be very aggressive in evaluating the results of formal and informal learning. The learning that companies tend to be interested in is very much situated in a particular industry and the cultural and technical practices of a particular firm. A series of articles by Brown, Collins and Duguid (1989, 1991) and by Brown and Duguid (1991, 1993) emerged from the fruitful collaboration of research scientists at the Xerox Palo Alto Research Center (PARC) and anthropologists, psychologists, and other academics at the University of California, Berkeley and Stanford. The discussion centered on the role of practices and culture in learning. The work of Etienne Wenger on insurance claims processors (1990), Julian Orr (1990) with Xerox service technicians, and Jean Lave’s work discussed above (Lave, 1988, 1991) with apprenticeship and adult math provided the solid empirical base that was needed to develop a convincing argument that the culture of school based learning is, in many ways, a deterrent to learning that is useful and robust and that other models of learning are worthy of consideration.

The argument put forward by Brown et al. (1989, 1991) follows the conclusions of Jean Lave that situations can be said to coproduce knowledge through activity (Brown et al., 1989, p. 32). Learning and cognition are viewed as being linked to arena and setting, to activity and situation in such a way that they can be said to coproduce each other. Concepts and knowledge are fully known in use, in actual communities of practice, and cannot be understood in any abstract way. Learning is a process of entering into full participation in a community of practice. This view of learning as a cultural process provides

a link to research in many other fields beyond educational and learning theory. Authentic activity, following Brown et al. (1989) are the ordinary activities of a culture (p. 34). School activity is seen as inauthentic because it is implicitly framed by one culture, that of the school, but is attributed to another culture, that of a community of practice of for example writers or historians (ibid, p. 34). Students are exposed to the tools of many academic cultures, but this is done within the all embracing presence of the school culture. The subtleties of what constitutes authentic and inauthentic activity probably are not as important as the fact that the situation within which activity occurs is a powerful cultural system which coproduces knowledge. High school chemistry students carry in their book bags a representation of chemistry knowledge in their 35-pound high school chemistry book. However, the knowledge representations that would be normally used by a person who works in a chemistry lab are typically diverse, multistructured, and are formulated in a variety of shapes and formats. The structure and format of the textbook is just the opposite in that it is homogeneous from front to back and is not a very handy representation to use for actual chemistry work. The school culture, or what Jean Lave calls the ideology of the school, including the specifics of the textbook selection process, drive the specific or situated manner in which chemistry knowledge is represented for the high school student.

A thorny problem in epistemology is the nature of the mediation between the world and idea. The approach in educational theory historically has been to focus on abstract conceptual representations which are assumed to be of a first order and prior to anything “in the world.” The relation between these abstract, conceptual entities that exist in the mind and the practices, natural objects and artifacts of the world are left to conjecture and debate. Brown et al. (1989, p. 41) claim that an epistemology that is rooted in activity and perception is able to bypass the problem of conceptual mediation. This is thought possible by recognizing that knowledge or competent activity in a community of practice is an ongoing accomplishment that aligns publicly available, material representations with historically constituted practices that allow individuals to build valued identities. These changing identities and the movement into full participation are made possible by reciprocity in interaction and not by the accumulation of static bits of information. The problem of mediation between concept and world is no longer problematic because the construction of and use of interpretive practices provides the needed link between mind and activity to allow for the development of new views of knowledge production and the nature of knowledge.

Brown and Duguid (2000) have used the concept of reach and reciprocity to extend the idea of a community of practice. Communities of practice are, following Lave and Wenger (1991), relatively tight knit groups of people working together on a common or similar task. Brown and Duguid (2000) extend this idea to include what they term networks of practice. Networks of practice are made up of people who share certain practices and knowledge but do not necessarily know each other (Brown & Duguid, 2000, p. 141). Networks of practice have a greater reach than communities of practice and are linked by web sites, newsletters, bulletin boards, and listservs. The face-to-face interactions within a community of practice

produce reciprocity. Reciprocity involves negotiation, communication, and coordination. A community of practice is limited in number by the fact that we can have reciprocal relations with a finite number of people. Following Weick (1973), Brown and Duguid go on to say that when reach exceeds reciprocity, the result is a loosely coupled system. Communities of practice allow for highly productive work and learning. These networks and communities have their own particular boundaries and definitions and result in a highly varied topography. The local configuration of these communities develop what has been termed an ecology of knowledge (Starr, 1995) such as those found in Silicon Valley in California or Route 128 in Massachusetts. This ecological diversity and heterogeneity across boundaries does not have a good fit with the normalizing concept of universal schooling. In fact, Brown (2002) says that a diversity of experience and practice is of paramount importance in becoming a part of a community of practice. Learning and innovation is a central activity in these ecologically diverse communities. Brown and Duguid describe this kind of learning as demand driven. The learner's position in the community of practice entails legitimate access to, among other things, the communication of the group (Brown & Duguid, 1991).

The unstated normative view of learning for most of us is derived from our school experience. The view of learning often is that it is somewhat like medicine—it is not supposed to taste good, but it will make you better, or in the case of learning in school, remedy an inherent defect that the student has when he or she enters the class. From this point of view, learning is supplied (delivered) to the learners rather than being demand driven by learners. Brown and Duguid make the point that when people see the need for learning and the resources are available, then people will go about devising ways to learn in whatever way suits the situation. It is not enough for schools to justify what is to be learned by claiming that it is relevant to some real world activity. Learning becomes demand driven when the need to learn arises from the desire to forge a new identity that is seen as valuable. This type of desirable knowledge that is productive of competent practice has been termed “stolen knowledge” by Brown and Duguid (1993) in reference to a story told by the Indian poet Tagore on his musical training. Tagore learned to play despite the explicit intentions of the musician employed to teach him.

The creation of a valued social identity shapes learning and provides the interpretive resources that are embedded in a particular community of practice. These interpretive resources are used to make sense of the representations that are constructed in language, bodily posture, and artifacts by members of the community for public display. The local appropriation of the meaning of these representational displays in turn contributes to the construction of competent knowledge in use which furthers the formation of desired identities.

The creation of an identity that serves as an outward reflection of the process of learning in its totality is produced by an encounter with both explicit and implicit knowledge. Implicit knowledge, Brown and Duguid (1992) claim, can only be developed in practice and does not exist as an abstract entity apart from practice. The term implicit is used instead of the more

common term tacit knowledge. Tacit has the connotation of being hidden knowledge that could be revealed and made explicit. Brown and Duguid (1992) maintain that the act of explication of implicit knowledge changes the nature of the implicit codes that are used to interpret practice (p. 170).

As individuals move more centrally and confidently into participation in a community of practice, reciprocal processes of negotiation and feedback have an effect on the nature of the identity of the community of practice as a whole. Activity, setting, and knowledge coproduce each other in the dynamic arena of unfolding individual and community identity.

6.7 CONCLUSION: REPRESENTATIONS AND REPRESENTATIONAL PRACTICE

An examination of the representational practice of members of a community of practice promises a view of learning that is traceable to language and other artifacts that can be videotaped, transcribed and shared between researchers in ways that assumed mental states cannot. The success of this method is dependent on making a clear distinction between two senses in which the term “representation” can be used.

6.7.1 Two Senses of the Term Representation

It is important in discussing the construction of representations to discriminate between representations produced by an observer that are used to codify in words or in some other suitable form the actions of a group and the representations that are produced by the members of the group that make visible the “rational” and “logical” properties of action that is currently unfolding (Garfinkel, 1994a). Representations produced by an observer to construct, for instance, a knowledge base such as that used in a medical diagnostic program such as Mycin (Clancey, 1997) are of a different order and are not under discussion. Clancey warns that we must distinguish representations used by people such as maps and journal papers from representations that are produced by an observer and are assumed mental structures (Clancey, 1995b).

The representations that have been of interest in this chapter are produced in such a way that they are made visible to members of a community of practice (an interacting group) without the need for overt explication by the members of the group. Used in this second sense, the representations that are produced are physically present to the community although, as we have seen, the physical evidence is often not immediately recognizable by people who are the members of the community of practice. The nuanced changes in these representations appear to an outside observer as nonsensical or trivial to the task at hand, yet for the members these changes are an inscription in socially viewable objects. These semiotic resources in their diversity of form and structure are fundamental to the creation of an ongoing sense of what is actually happening from the participants current view. The description of these practical actions in and of themselves are not usually a topic of discussion.

The management of activities as an accountable practice (that is an activity that is defensible as a cultural reasonable activity) makes possible the organized and stable appearance of these activities. This management of activity is made possible by the ongoing production of representations in representational practice. In all of its aspects, this representational practice is social and dialectic.

Clancey illustrates clearly this sense of representations in his description of his own representational practice as a social accomplishment. He describes the process that shaped the diagrams reproduced in an article on knowledge and representations in the workplace (Clancey, 1995a). He clearly shows us how the diagram used to illustrate the divergent views of participants from multiple communities of practice who are working in a common design process has changed and evolved. The diagram is produced in a fundamental way by the process of social feedback that results from his use of the diagram in presentations. The diagram is made socially visible in a number of physical forms including a transparency and a whiteboard. The diagram is used to “hold in place” a variety of views. The varying conditions of use of the diagram and the affordances

produced by the material method of inscription of the diagram (transparency, whiteboard) facilitated social feedback.

6.7.2 Why Study Representational Practice as a Means to Understand Learning?

The key point in studying the artifacts, including language and gesture, printed documents, and more ephemeral inscriptions such as notes and diagrams written on a plywood wall or on a post-it note stuck on the side of a keyboard produced in specific activity systems by a members of a community of practice, is to reveal the interpretive processes used by members to make everyday sense of what is going on. When learning is seen from a participation metaphor (Sfard, 1998), the movement into full participation depends fundamentally on being able to read the representations that are socially produced for common display. The situated interpretive practices that are used are learned practices. As Charles Goodwin (1994) has pointed out, these interpretive practices operate in similar ways across many settings for learning.

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