In Michael Baker, Jerry Andriessen & Sanna Järvelä (Eds.), *Affective Learning Together: The Socio-emotional Turn in Collaborative Learning*. Routledge. 2013.

Feeling and Meaning in the Social Ecology of Learning:

Lessons from Play and Games

Jay Lemke

University of California, San Diego

INTRODUCTION

A more integrated conceptualization of processes of feeling and meaning-making is needed if we are to understand their joint role in learning. In settings where the consequences of each successive action are amplified by the responses of social partners or computer programs, longer-term trajectories of learning become more unpredictable and the role of feeling, affect, and emotion in co-determining them becomes more evident.

From computer games to play and learning in an informal after-school program, a more integrated view of feeling and meaning offers both better opportunities for understanding and greater challenges for researchers.

Feelings need to be reconceived as more active, interactive, distributed, situated, culture- and event-specific, and functioning on and across multiple timescales, just as we have similarly re-conceptualized meaning-making processes in recent years. Learning can no longer be defined as progress relative to fixed criteria when goals are not externally determined and activity trajectories are relatively unpredictable; such naturalistic learning needs to be identified retrospectively from actual outcomes and assessed by cultural value judgments.

I offer both a more unified theoretical model of meaning-and-feeling and accounts of research settings in which unpredictable learning is always occurring, but is also always subordinate to play, playfulness, and having fun. In these feeling-rich, free-choice settings, so unlike the affectively constrained, over-controlled conditions of classrooms and occasions of formal learning, we discover challenging opportunities to study the ways in which the minute-to-minute and month-to-month integration of social-affective feelings and semiotic meaning-making both do and do not cumulate into what we may retrospectively decide to call learning for the individual and for the group.

This chapter seeks to contribute to the overall aim of this volume: helping us to understand the role of our feelings as we work and learn together. I want to begin by making clear how I understand these phenomena and some of the terms we might use to describe them. Then I will present in some detail an

effort to re-conceptualize feeling and meaning-making processes in a more unified way, in order to better understand the inevitable learning of everyday social life. Finally, I hope to raise some questions about the relation of play and learning, as seen in my own recent research with young students in an innovative after-school program.

A FEW BEGINNINGS

We live in a culture with a history. We inherit certain beliefs and attitudes about work and play, learning and living, reason and emotion that may not serve us well as we try to describe and understand what happens when people interact together, making old and new meanings, feeling in various ways about one another and their task, and coming away from it all changed in smaller or larger ways.

Academic culture, at least in the United States, and from my observation also in most of northern Europe, either acquiesces in or has to work against a very long-standing attitude that feeling and emotion is somehow opposed to reason and interferes with it. We also tend to inherit the view that learning is a kind of work, and therefore that it is distinct from and opposed to play. In this view, work should be difficult and tension-producing, while play should be easy, fun, and relaxing. These two sets of attitudes are closely interdependent with one another in the discourses of our everyday culture, and I believe they permeate

academic culture as well and make the work of truly understanding these phenomena more difficult. They lead us astray.

Because of this a certain care with terminology is required. For example, I use the term *feeling* as the most general correlate of *meaning*, and I use both to name processes (i.e. as present-tense, active gerunds). I take feeling to include not just the classical emotions (fear, anger, desire, disgust, etc.), but bodily feelings such as drowsiness or nausea, and also what I would term the higher affects, those most determined by culture such as remorse or *weltschmerz*. I do not want to reify feelings – they are processes with ebb and flow, duration, variable intensity, and frequently defy rational classification or naming. But the very grammar of our language makes it awkward to do this and still speak fluently on these matters. In what follows I will try to clarify these points regarding feeling and meaning as two aspects of what I will try to argue is a single unified bodily-semiotic process.

Let me begin with the notions of reason and learning. Reason was one of the mental faculties in the psychology of an earlier day. It has been mostly replaced today by the notion of cognition, and the original sense of cognition as information processing, having proved inadequate, was later amended to include the notion of a broader sense-making or meaning-making, thus including the notion of active interpretation and the assignment of significance, and not merely the collecting and organizing of information. Likewise,

cognition could no longer be regarded as a phenomenon or process that happened solely in the head or in the mind. Materialist commitments have required some of us to locate it in neuro-physiological processes and others to conceptualize it as taking place in the broader interactions of a body in an environment. Cognition has been re-imagined in the last decades as embodied, situated, distributed, and heavily culture-specific (Bickhard and Terveen 1995, Bruner 1990, Clark 2008, Hutchins 1995, Lave 1988, Lutz 1988, Sheets-Johnstone 2009). Personally, I no longer find the original term *cognition* suitable for this new view, and I prefer the term *meaning-making*.

Notice that insofar as meaning inherently involves significance, it is always the case that meanings carry some feeling-sense with them: we feel their relative importance (or lack of it), the desirability of any imagined state of affairs, whether it is ordinary or surprising, normative or transgressive, serious or humorous, and so on. There are no meanings without feelings, or perhaps more aptly, we do not make meaning without having some feelings about the process and its result. Nevertheless, we have not felt the need to revise our notions about feeling and emotion to bring them more in line with our new vision of meaning-making. Feelings and emotions are still for the most part not regarded as active, material, embodied, situated, distributed, and culture-specific. And so they remain all the more difficult to integrate into our analyses of cognition or meaning-making. [See the chapter by Cahour, this

volume, for an excellent review of current psychological theories of emotion and efforts to relate it to cognition.]

What happens to the notion of *learning* when we shift to the newer view of cognition as meaning-making? Logically, it also has to move from being some internal mental change to be something that is mediated by our interactions with people and artifacts, something that is situated and distributed. Should we say that brains learn? That computers learn? That systems learn? What is the right unit of analysis? The question is unanswerable I think unless we integrate the notion of learning into a view of meaning-making that is not strictly tied to persons or organisms. Whatever processes we choose to call learning are taking place in complex, extended systems, which include human organisms (for present purposes; of course non-human organisms learn, too) in interaction with their environments. Such systems, we now know, are organized on and across multiple levels of organization in terms of processes on multiple timescales. If we wish to speak of cellular learning, we must equally speak of group learning and societal-scale learning. There is no preferred level: learning happens in fact across many levels in such systems (Lemke 2000a).

So the notion of learning itself becomes a bit shaky. Does all change count as learning? Only adaptive change? Is learning, at the whole-organism level, synonymous with development? Does change that lasts only briefly count as

learning, or must the visible effects of learning persist over times long compared to the time of the learning process itself? What about kinds of learning that themselves require very long times, are intermittent, and perhaps cumulative over a lifetime? I believe it is in fact rather arbitrary what kinds of change we choose to call learning. What we seem to do, when we are being careful about this, is to identify a persistent pattern of "behavior" or "activity" (which itself has to occur on and across many organizational and time-scales of a complex system going well beyond the organism), and then retrospectively trace contributing experiences, activities, events in which it or its putative precursors are visible (if we have the necessary over-time records) to some series of originary experiences. Whether we call just those supposedly initial experiences learning, or so name the whole sequence ("maintained learning"?) is again somewhat arbitrary, it seems to me. What is the point of "learning" that doesn't last? How long does it need to last? Does it last if we never see it again? How do we determine the beginning or the end of the sequence, which we might call the *learning trajectory*?

Much of the concern in this volume is with group, joint, or collaborative learning. We see multiple organisms interacting with one another and with bits of their immediate material environment. What we don't see but readily infer is that what is happening also depends on memories, habits, and the ways in which utterances and images are interpreted in relation to past experiences and imagined futures. We see a whole system evolving in time, even if we are

culturally disposed to focus on just the individual human organisms in it, one at a time. We also see, as interpreting members of a culture, that all this activity also makes sense as a time-stream of feelings: the participants' feelings for one another, moment to moment and longer term. Their feelings about their task and actions and the actions of others. Their feelings about the tools and artifacts around them, about the topics and ideas and symbols and propositions, about the meanings being made, and about themselves. Nor can we neglect here to include our feelings as researchers and analysts about all these other elements of the dynamical system we join ourselves into, either in real time or virtually through our records of events.

Actions are being performed, meanings are being made, feelings are being produced, all in deeply interdependent ways that sometimes produce what seems to us a smooth flow of activity and sometimes one that seems more erratic, broken, interrupted and (sometimes) resumed.

In my own research, first on computer games as actively engaged-with and powerfully-experienced media, and then with young students playing with such games and with one another and some older adults, I have found it impossible to understand the sequences of actions, meanings-made, and feelings separately (Lemke 2009, in press-a, in press-b). An integrated analysis is simply necessary. But to make such an analysis we need to overcome the traditional separation and opposition between Reason and

Emotion, cognition and affect, meaning and feeling. I turn now to a sketch of how I have been attempting to do this.

IS MEANING A KIND OF FEELING? OR IS IT THE OTHER WAY AROUND?

What role do those phenomena we variously call emotions, affects, or most generally *feelings* play in the ways we make meaning, the ways we make sense of and with the world and one another? How can we analyze rich media data that documents living activity without slighting either the feelings that incline us to particular actions or the meanings through which we interpret possible actions?

If a synthesis of approaches, heretofore separate, to both meaning (based in semiotics) and to feeling (from the phenomenology of experience) is to be possible, then I believe that a necessary first step is to re-conceptualize feeling along the same lines that we have done in recent decades for meaning.

Meaning is a process: meaning-making, or semiosis. It can no longer be regarded in sophisticated analyses as being in-the-head, or even mental in the old Cartesian sense of belonging to a plane of existence apart from the material. It should rather be recognized as being *distributed*: between

organisms and environments, subjects and objects, cooperating persons and mediating artifacts. The material substrate, i.e. the dynamical system in and through which meanings are made, includes what have traditionally been distinguished as "subjects" (with a misconceived monopoly on agency and intentionality), "objects" (wrongly regarded as passive or merely reactive), and "meditational means" (tools, symbolic representations, etc.).

Likewise meaning-making is *situated*, both in the sense of being influenced by the context of situation (setting, participants, affordances of objects), and in the sense of being distributed throughout the situation (indeed in some sense relevance to meaning-making, and to feeling, defines what is or is not part of the "situation").

It is an *active* process, not specifically in the sense of conscious intention and agency attributed only to humans, but in the sense that it is not simply a reaction to external stimuli: through it situations are changed, actions imagined, possible and probable relevant events anticipated, transfers of energy, matter, and information initiated, evaluations made.

Moreover, its modes of operation are not psychological universals, despite the desire of Christian theological universalism and humanist moral universalism to have it so. The specific processes and their deployment vary: across human

communities, individuals, situations, and moments. It is *locally specific*, and in common parlance *culturally specific*.

And so is feeling. If we are to bring the analysis of meanings and feelings into productive conjunction, we need to reject older elements of our own cultural tradition according to which feeling, and more specifically what we are taught to call "emotions", are in-the-head, mentalistic phenomena, purely individual and intra-organismic, passive reactions, and psychologically universal. We need to re-conceptualize feeling as an active process, distributed in a dynamical system that includes ourselves and others and the material elements of the settings and networks of mediating artifacts that make feeling, like meaning, happen as it does in each instance.

We need to re-conceptualize feeling as distributed, situated, active, material, and locally, including broadly culturally, specific.

I will generally use the term *feeling* rather than either *emotion* or the more fashionable *affect*, both to distance my discussion from these older prejudices, and to ground an approach to the "higher affects" (pride, sense of nobility, playfulness, reverence, etc.) and the classic emotions (love, hate, anger, fear, etc.) in more general, proprioceptive and animating processes (e.g. feelings of drowsiness or alertness, calm or frenzy). I do so in parallel with the broad

usage of *meaning* to cover everything from attentional focus or salience to evaluations and interpretations.

I hope it is clear that I am also taking both meaning and feeling processes to be "embodied" – just not embodied solely within the limits of single human organisms, though obviously, for us experientially, they are both very significantly dependent on perceptual and motor processes, on neurological and biochemical processes that do occur in some sense "within" us, though never, I think, insofar as they are relevant to meaning and feeling, without necessary connections to our interactions in and with a larger material environment.

Indeed, the perspective being offered here requires us to re-think what we mean by organism and environment, in biological terms, and especially what we mean by person and environment, in meaning-and-feeling terms. I will discuss this in more detail below, but enough for now to recall von Uexkull's (1928, 1982) notions of *Umwelt* and its less-well-known partners (*Wirkwelt* and *Merkwelt*). In brief, the organism interacts with its material environments in ways that make some of their physical features more or less salient as elements relevant to particular processes, and more broadly, the basis on which any boundary is drawn between inside and outside, me and it/you, changes from species to species, organism to organism, and event to event. We are originally and always integral parts of larger ecological (including

sociocultural) wholes, and our separability as individual persons or organisms is a very locally specific and variable construction. While I will refine this initial description later (see discussion of the 3-level Model below), for now we shall put wholes before parts, asking always what happens within wholes to differentiate out the parts.

Let me conclude this section by returning briefly to the initial question: if we re-conceptualize feeling to bring it more in line with newer understandings of meaning, then what sort of relationship between the two are we aiming at?

We could for example try to reframe feeling as a specific kind of meaning. This is done quite naturally in studies of the meaning of feelings, for example in analyses of the semantics of feeling terms in natural languages (Bednarek 2008, Martin and White 2005). It could also characterize the somewhat imperialistic efforts of the field of cognitive psychology to theorize emotions solely as evaluations, and thus as a specific variety of meaning-making (Frijda 2004; Lazarus and Lazarus 1994). There is, I believe, a certain usefulness in trying to understand what kinds of meaning-making are most convergent with active feeling processes. We can use the tools of linguistic semantics and more generally of multimodal semiotics to characterize the meanings that accompany, inform, call forth, modulate, interpret, and evaluate feelings.

On the other hand, we could try to reframe meaning as a kind of feeling, to ground the meaning-making process in what might seem to be phylogenetically earlier feeling processes, and to in fact imagine that bodily feelings were the first signifiers, prior to words, to gestures, and indeed to humans. I believe that this is also a useful exercise. But it happens not to be the case that feelings are phylogenetically prior. Semiosis is as old as life itself, if not older (Hoffmeyer 2008). And so are feelings. Not perhaps in the sense of experienced qualia, which require a relatively high degree of system complexity, but at least in the sense of consequential indices of system and subsystem conditions. In fact, it is in these simplest possible systems which can do both semiosis and aesthesis (i.e. feeling) that we find the very same processes functioning as both.

And so, I believe, is it likewise the case in all more complex systems: it is the same material dynamical processes that do both meaning and feeling, though the extended networks of inter-mediating sub-processes and their participant bits of matter get larger, longer, slower, and more complicated as we approach the case of people-in-settings, and perhaps go beyond it.

ORIGINS AND FUNDAMENTALS: FEELING

There is a certain rhetorical awkwardness in my project. Ultimately, I want to maintain that meaning and feeling are a single process. Minimally, my proposal is that it can be useful to think of them as two complementary and mutually informing aspects of a single process. But we all begin with rather different ideas about what each of them is, and so for a time I will need to discuss them separately in order to connect with our separate initial ideas about them.

Let me begin with feeling, then, because the view of it I am offering here is more radically divergent from common opinion, although 20 years ago I think my view of meaning would have been regarded as equally unconventional.

Let's start with a little naïve phenomenology. Most of the time, we are not in the grip of strong, named emotions. We are not feeling angry or frightened. We may be feeling energetic or lazy, alert or tired, hungry or restless. For all these feelings, we recognize that they have some sort of onset, perhaps unnoticed at the time, some sense of duration-till-now, some degree of, perhaps variable, intensity. We always feel somewhere on the cline between elated and depressed, hopeful and despairing, energetic and fatigued, hungry and sated. And most often somewhere in the unmarked middle range, call it Satisfactory, or call it nothing. No warning bells, no special conditions. But even this middle state is a distinct feeling, as we know from its absence or replacement by something more unusual.

We are taught to think of these feeling-conditions as conditions of our Selves or of our Bodies. But in fact they are always indices of the condition of us-in-the-world, of our actual and potential interactions with what we think of as our environment: other people, things, circumstances, places. We inherit the Cartesian error of thinking of our Minds or Selves as separate from our Bodies, as Descartes himself inherited it from centuries of Christian theology separating the Soul from the Body, the realm of Spirit from that of Matter. We do not sit inside our own bodies looking out. We *are* our bodies, actively scanning and looking *for*, looking around, reacting to visual impressions, anticipating them, comparing expectation to current impressions, etc. And of course we are a great deal more: all the rest that our bodies are doing in the process of being and staying alive, much of which is some sort of interaction with, action upon, or anticipation and imagination of what is happening "outside" us.

Both physics and biology tell us not to take the notion of the isolated organism too seriously, even while law, commerce, and religion want us to take the notion of our individual personhood, soul, and moral-legal-financial responsibility very seriously. But living organisms are dynamic, open systems: they exist only by virtue of their (our) transactions with the environment, only by continuously exchanging matter (air, food, waste), energy (heat, nutrition), and information (perception, action, language) with other elements of the

larger ecological and social systems to which we belong. Interrupt any of these for a short time and we rapidly become less human, less healthy, and finally much less (indeed not at all) alive.

What we are is the product of what we are doing now, and what we have done in the past that leaves its traces. But much of that is not “our” doing, but what has been done to us, has happened to us, has happened in fact in our interaction with the environment, each affecting the other, until it becomes impossible to say what came only from the doing of the organism and what came only from the doing of the environment. In developmental biology, each organism begins as an integral part of some other organism (for us, a mother), which is itself already tightly integrated into larger units (a family, a community, a culture or society), and we gradually become more specialized and differentiated as a part of the mother-ecology system.

After birth, the child gradually comes to function more independently of the mother, even while inheriting the mother’s family, community, places, language, and culture as it comes to interact with these in ways that very gradually become less totally intermediated by the mother. So the child comes to have its own unique integration, still as a part, into the same larger wholes as the mother.

I am presenting this picture of organisms as units within larger wholes because it is essential to understanding that feelings monitor not simply the organism as a somewhat artificially separable unit, but the status of the organism-in-environment system. They monitor relations and interactions, actual and potential, and as part of that function, of course, they also monitor some aspects that we can think of as more "internal".

But why do we have such feelings? What are their actual and evolutionary (i.e. past, ancestral), adaptive functions? If we feel tired, why does that matter? It matters because it is a relevant aspect of our stance to the environment, our readiness to respond to danger or opportunity in and from the environment. Likewise if we feel nauseous, that too is a feeling about our condition relative to the environment, and perhaps also to what we should be ingesting from it or not.

It has long been accepted that the strong, visceral, named emotions, such as fear and anger, desire and disgust are indicators of whether we should seek out or flee from something in the environment, whether we should attack or run away, swallow or spit out. In these cases even more clearly, feelings are about interactions and relations, they monitor the conditions of us-in-it, and not simply our imagined "interiors".

In this sense, feelings are most fundamentally signals or indices of part-in-whole relevant conditions. For us humans, in the right "external" circumstances, these signals or indices are "felt" as what philosophers call experiential "qualia". This is what we recognize as the feeling of our feelings, what anger or fear or nausea feels like, to us, on some particular occasion. But a system does not need to have the elaborate neurological-hormonal machinery of a human body to benefit from having and responding to such signals. A single cell certainly has feedback mechanisms, chemical signaling, sensitivity to local and protoplasmic concentrations of various chemicals, and ways of reacting to them, which serve the same function (Hoffmeyer 2008). And so on up the scale of organismic complexity throughout the whole kingdom of life, from unicellular to human. The qualia of feelings may differ from species to species, as they do, I believe, from person to person, and even from occasion to occasion.

I have so far in this account of feelings neglected somewhat one key aspect. Feelings are not passive, any more than perceptual processes are. We do not simply sit and absorb passing photons, sound waves and chemicals. We actively seek them out, we scan, we anticipate, we actively listen and sniff. The most unique property of living systems is that we are restless. We are constantly interacting with the environment, we are constantly actively doing. We are moving, we are animate. (For a brilliant discussion see Sheets-Johnstone 2009). We generate our feelings actively just as much as the

environment provokes them in us as responses. Feelings do not just monitor, they are the products and indexical signs of our interaction with everything around us.

From this account it should already be clear that feelings too are distributed (arising in a material system that goes beyond the isolated organism), situated (i.e. specific to the context of setting, place, other persons and things present), active (initiating, interactive), material (processes in and among material systems), and locally and culturally specific (different in detail across species, communities, individuals, cultures, and occasions). It may also seem that feelings are phylogenetically more primitive than meanings, and so cannot really be aspects of the same processes by which we make meanings. But this view underestimates radically the scope of meaning-making, i.e. semiotic processes in material systems. And it is to this complementary topic that I now turn.

ORIGINS AND FUNDAMENTALS: MEANING

We have become accustomed to thinking of the term *meaning* as a noun, a sort of abstract thing. But I try to use it consistently as a verb, an action process, something we do when we mean something. To remind us of this I will for now use the synonym, *meaning-making*, for the (material) process. And

meaning-making, in turn, is a less formal term for *semiosis*, provided we keep in mind that here semiosis will always mean the actual dynamical material processes of making meaning, and not simply the abstract phenomenon.

Perhaps the most useful starting point for understanding meaning-making or semiosis is Charles Sanders Peirce's (1992, 1998) basic account of it as a sign-process. Semiosis is the process by which something comes to stand for something else to someone (or some thing). Peirce's great contribution was to see semiosis as an inseparable unity of three, rather than two, elements. The more classic view of a sign was simply a relation between a signifier (the thing that stands for something else) and a signified (the something else), a binary relation. And the incoherent theories of representation, and even of truth, that many people still struggle with today, have never gotten very far past this misleading over-simplification (Bickhard and Terveen 1995).

There are a number of unsupportable assumptions in the binary view, beginning, as Peirce noted, with the simple fact that no signifier (he calls this the *representamen*) ever by itself points to what it is a signifier of, i.e. to its signified (which he calls its *object*). How are we supposed to know what the word "horse" refers to? Or a scribble on a piece of paper? How do we know which "real-world reality" some verbal proposition is supposed to represent or be "in correspondence" with? The signifiers can't tell us that. We have to interpret some signifier as being a sign of some particular signified or object,

or someone else has to tell us how to do this, or do it for us. In every case of semiosis there must be what I shall call, updating Peirce's terminology a bit for my purposes, an Interpreting System or *System-of-Interpretance* (hereafter, the S.I.).

The S.I. is the crucial third element, the one that "construes" (a term from Halliday 1978) a specific kind of relationship (not just "correspondence"; Peirce catalogues a couple dozen specific logical and material relationships) between signifier (representamen) and signified (object). In doing so, the S.I. produces a response, a reaction, an interpretation, a meaning, which Peirce calls the "interpretant".

So, what is the simplest material system that can do semiosis? Consideration of this question leads to some further basics for a material model of meaning-making.

How should we distinguish between simple material (Aristotle's "efficient") causation and a semiotically-mediated response by some system? Between a chair that tips over when kicked and a paramecium that swims in the direction of some potential food? What tests can we apply to say that some instance is an example of semiosis or not?

As we inter-act in the world we encounter a lot of perceptions, actions, phenomena, doings and happenings, processes and things, places and occasions. For some of them to count for us as signs of others, there has to be some set of associations (our nervous systems seems good at producing these), such that there is not, for us, an equal likelihood that anything can go with (i.e. follow closely in time, or appear nearby in space) anything else. There is not an equal probability or frequency of all possible combinations. There is not total chaos, but for us there is some degree of order. Mathematically, this means that there is some degree of "redundancy" or informational order: some things are more likely to go with (predict) some other things.

These more likely combinations can then be regarded as provisional units on a larger scale, and to them can then be associated still more elements that tend to more often be associated with them. If we then encounter some of these, we tend to expect the others. Our expectations come to be context-dependent. In seeing one thing, we take it as a sign of the whole cluster, or context; or alternatively, having recognized a whole, a context, from some of its signs, we then have a particular set of expectations different from what we would have in some other recognized context.

For any given item that we encounter (thing, happening, whatever), there are various associations it might have, predicting various other items, and *which predicts which* is itself a function of the context. This works both ways, of

course: seeing a pattern of associations, we infer a context; and inferring a context, we adjust our expectations. A particular set of associations predicts a context, and vice versa. Indeed a pattern of associations constitutes the context. In the language of semiotics, these are indexical relations: patterns of associations index contexts, and contexts index the various elements and associations that constitute them. Symmetric indexical contextualization. We are almost to meaning-making.

Will every S.I. construe experience in the same way? No, of course not. There is not one meaning-world for all organisms, or indeed for all individual people. Jakob von Uexkull's famous analysis of the *Umwelt* of a species argued persuasively that different species "see" the world differently. Not just because they have different sensory organs, but because different aspects of the environment are differentially relevant to them. Their worlds are different in terms of the *Merkwelt*, or what is perceptually salient (the "marks" we notice), the *Wirkwelt* (the action-world, how the world is for us in terms of how we act on it), and most generally the *Umwelt* (a notion of ecological "niche" that is more fundamentally interactive and less positivistic than the one that is often used).

If we now imagine variation across different systems for interpretance, then these systems are redundant with (i.e. index with some probability) the redundancy between contexts and relations between primary categories or

classes of items that are thus contextually redundant with one another. This is then a second-order contextualization (indeed it implies an extensive hierarchy of potential contexts of contexts of contexts, etc.), which Bateson (1972) referred to as “meta-redundancy”. This was my first clue to characterizing meaning-making as selective indexical meta-contextualization.

Yes, that is a mouthful, and very abstract. It is a logical formulation, following Peirce and Bateson, but it is also very specific: selective contextualizaton means the S.I. connects a particular signifier and a signified (representamen and object), that it more likely does so in a particular context, and how these combine with one another depends on the particular S.I. In fact, the S.I. is semiotically defined by how it does this. And if we have a lot of S.I.’s, then the particular pattern of connections associated with each may itself constitute a still higher order (meta-meta-redundancy) pattern, which we might call the culture of a community, with its divisions among roles and types of people who make different sorts of sense of their experiences.

But we started out to answer the question of what would be the simplest material system that could do semiosis? That could do selective, indexical, meta-contextualization? And what do we know, then, so far about such a material system?

It has to be capable of distinguishing an A from a B, i.e. it must be able to selectively respond to, or do, different things and processes. But it cannot be locked into a mechanical, 100% predictable, ways of doing this. It has to be able to recognize, classify, and respond differently in different contexts. Note that I mean these only functionally, I don't mean "consciously" or "intentionally". It has to behave as if it made differential recognitions, selective responses, taking some things or processes as the same for purposes of its functional response (same response to each member of a set), but still be capable of responding differently (to the whole set) in a different context.

Can we imagine that by this definition a system as simple as a paramecium or similar single-cell organism can do semiosis? Think of it as a system, a black-box, with inputs and outputs. Imagine that here is a molecule in the water around it; it reacts internally to that molecule in a way that starts its cilia moving faster. Which way does it move? Well, as it moves it encounters other molecules, and its membranes can "classify" these molecules as like or different from the first one. Spinning about a bit, there is a higher concentration of these molecules in "front" than "behind", and it moves that way, and so on, in effect following the concentration gradient of the molecules, as we would say, towards its source (say, a food object). But it is unlikely that a single-celled paramecium forms some sort of representation of the food source, the destination. Nevertheless, it is not moving as a mechanical response to the chemical reaction of the molecule(s) to its outer membrane. It

is integrating “information” from multiple molecule-encounters across time and space. It is itself much, much bigger than these molecules. And if the situation is different: if it’s not hungry, if it’s not got much energy reserve for swimming, if it also encounters “threat” molecules en route, then it will behave differently. Its response is context-dependent.

Consider then the analogous case for humans. You walk into a room, you breathe in an aromatic molecule along with some oxygen, the molecule interacts with a membrane of your olfactory bulb, you smell “coffee”, and you do what the paramecium does, tracking the scent to its source. Or not, if you don’t like coffee, if you’re feeling wired from already having had too much, if the social situation is such that it’s not appropriate just then, if you’re anticipating heartburn, etc.

What is striking in these cases is that the signified, or more exactly in Peirce’s terms, the interpretant, and behaviorally the visible motor response to the interpretant, occurs at a vastly different space-time scale from the encounter with the signifier. A molecule interacts with a membrane on a tiny microscopic scale, but the reaction occurs at the whole-organism scale, many orders of magnitude larger. And indeed the effect of contextualization, of context-dependence, depends, materially, on this. The paramecium finds food by integrating contextual information across space and time (“evaluating”

the gradient of the concentration, the presence of other molecules, its current organismic state in other respects). So do we. A molecule interacts with a membrane in our nose, on a vastly smaller scale than our response, which is integrated over our whole organism, and across time (in memory and through action); our response occurs adaptively and functionally (or not) on the whole-organism scale.

Materially, semiosis happens across space and timescales of at least a few orders of magnitude (powers of ten) and in complex living systems, across many more. And it must. The S.I. must be enough larger, and more durable in time, than the signifiers (interactions with these), so that it can assess and classify contexts, situation-types, involving itself and its interactions in its environment, across space and time, at least up to its own organismic scale, and in some cases well beyond (the space of exploratory behavior, the timescale of longterm memory).

Theoretical biologists such as Jesper Hoffmeyer (2008), Howard Pattee (1995), Stanley Salthe (1993), and others have argued that the emergence of life, or at least of functional cells, is co-occurrent with the first semiosis. Functionally, single cells make meaning, even if they do not have the complexity to represent it to themselves. Single cells, and maybe even large stretches of membrane, operate as S.I.'s. They do semiosis, they take A as standing for B in a context dependent way. Presumably, they learn, in the sense that

developmentally they come to effectively, functionally, recognize, classify, and contextualize.

I think we have here a model for the material process of semiosis, of meaning-making, in its most rudimentary form. It is not less primitive in evolutionary terms or system-complexity terms than the rudiments of feeling as we described them in the previous section. They are co-eval; they arose together in the very origin of life.

What is our human interpretant in the case of the coffee smell? In all, it's rather complex, and extends across time, but it would include not just the indexical sign relation of the (interpreted) smell to coffee (as substance and perhaps taste, in imagination), but also the feeling of, say, desiring coffee, the anticipation of the feeling of well-being from drinking the coffee. Or alternatively, the feeling of jitteriness and disinclination to the coffee, or the anticipation of embarrassment if going for the coffee would be socially inappropriate. If we were to exclaim, "Oh, great, coffee!" this response would be arising jointly from the feelings as well as the interpreted meaning of the smell-as-sign-of-coffee.

I am not denying that there are different specific mechanisms, neural routes, evoked hormonal and neurotransmitter secretions, associated actions (glancing about, looking to others for confirmation) and interactions, that engage some

of the same and some different parts of the body and the environment in those aspects of this very fully integrated process that we conventionally think of as the meaning-interpreting side and the feeling side of it.

But there is no fundamental divide, either materially in terms of scales and participating body elements, or functionally in terms of sense-making, evaluation, imagination, and impulse to further action. We do not make sense without the integration of feeling. We do not imagine meanings without this imagining being accompanied by some feeling. We do not evaluate by either meaning-processes or feeling-processes alone, but only by their unitary integration. The continuous flow of action (even when action is inhibition of movement) proceeds jointly from meaning-interpreting and feeling processes. Feelings are dependent largely on the same contextual factors as meanings in any particular occasion. The contexts we defined for meaning-making and their anticipated associations of A's and B's also include the feelings of these situations and expectations.

The process of meaning-making itself always has a feeling. It may in some cases be the feeling of calm disinterested inquiry (rarely enough!), but it is always a feeling, and more often it is the feeling of curiosity, of anticipation, of effortfulness, or of frustration. It can be the feeling of surprise, or dismay. The very pursuit of Reason is driven by Desire.

Nor are feelings ever meaningless. The same processes that produce the feelings we feel are there to produce the meanings of these feelings for us. A feeling is an active process, very often an active engagement with the world that tells us something about the condition of our inter-activity in that moment, or over some duration. What it tells us would not be useful if it was not also a meaning, and we can say that feelings are interpreted as signifiers of something more, some conditions and processes in the organism and between us and the environment on still longer timescales than those which generated the feeling initially.

I do not want to push too hard or too dogmatically for the identity of feeling and meaning processes. It is enough that we understand them to be of the same order, with no unbridgeable gulf or opposition between them, and always functionally integrated. Nothing that the one does can it do without the other. Feeling and meaning are co-eval, co-evolved, functionally complementary, co-determined, and co-determinative.

[For further discussion of the meta-contextualization model of semiosis and the role of cross-scale processes, see (Lemke 1993, 1995, 2000b).]

But have we lost the human interpreter here? Are we speaking only of interactions with the natural environment and neglecting the social? I hope not. I am instead try to argue that humans are not the only interpreters, that

interpretation in the sense of context-dependent construal of consequential and adaptive functional response is as widespread as life itself and perhaps found even more widely. Of course humans with our complex nervous systems learn to respond in much more finely calibrated ways, across contexts of contexts of contexts, classifications and evaluations of classification and evaluations, etc. Both in the meaning-making and the feeling dimensions of this process.

My effort here is to bridge between more structural-systemic views of meaning and feeling and more experiential-processual views. The former is the dominant tradition for semiotics, while the latter has been more influential in accounts of our feelings.

I have emphasized at the outset that feeling-and-meaning is not a purely individual phenomenon. Strictly speaking it never is. The material system in which meaning-making and feeling arise is always the organism-in-action-interacting-with-the-environment. The environment here significantly includes other humans and human-made, symbolically interpretable artifacts, and through them larger-scale, more slowly changing systems of cultural conventions, infrastructure processes, etc.

Group processes are a special case, and they invoke the biographical histories of the participating members, and so their social and cultural backgrounds, for each act of meaning- and feeling- mediated interaction. What is problematic,

often enough outside laboratory studies and special cases, is: Who are the participating collaborators? What couplings of their trajectories of activity count as collaboration, insofar as our concern is with the role of joint activity in learning? And this applies to the group as well as the individual as a unit of analysis for learning. Groups certainly learn in ways that go beyond learning by individuals, but I believe that the "group" in the sense of the set of interacting individuals is the wrong unit. The right unit is a wider material system, including the individuals, but also the mediating artifacts; and as we extend this system over time, its relevant connections and inputs expand in ways that can be difficult to limit (e.g. to the noise-level or temperature of the ambient environment).

So we come finally to some actual cases of people working, playing and learning together. The contingencies of our individual meaning-and-feeling interpretations and construals of one another's actions, gestures, and talk multiply the space of possible meanings we can make together and the possible feelings we can share together or engender in one another.

WORK, PLAY, AND LEARNING

When people work together we make meaning together and we generate feelings, shared or not, of which we tend to be aware and which make some

sort of difference in the probabilities for our next action. In this respect play and work do not differ. Particular instances may differ in the specific feelings involved, just as they do in the particular meanings at stake. All social activity leaves traces: in the participating organisms, in the material environment. Those traces are meaningful in the sense that they can usually be interpreted by members of a culture according to shared or at least complementary conventions. These may be memory traces in bodies, or they may be signs inscribed on paper, or they may just be a re-arrangement of the furniture. But these meaningful traces should, by our prior arguments, always also be "feelingful": when we encounter them we do not simply interpret their meaning in terms of matters of fact or states of affairs, we also respond to them emotionally and evaluatively.

Over time, next processes (e.g. the next meeting of the group, or the next hour of the meeting) become more or less probable depending on the meanings we make, including those made on the basis of traces left by previous processes. Again, work and play are not different in these basic respects, neither semiotically nor as felt. If learning is persistent change in how meanings are made and how actions are performed, it is also persistent change in how we feel about actions and meanings (and persons, things, and our selves). Does learning then take place in, or across, every action, every experience?

To some extent I think it does, if we focus not on isolated short-term events as being when learning occurs, but focus rather on over-time trajectories (over times long compared to what we might usually think of as a single learning event) that include everything that is happening in our lives. Some shifts in the probabilities of some kinds of future actions are always taking place. We decide, culturally and personally, which of these changes are important ones and which are not or only much less so. We look back from the vantage point of some important action or event and try to recapitulate which earlier events were the significant ones that initiated or sustained the trajectory leading up to this important one. Depending on what matters to us, we can say that we are never *not* learning. (Or at least that whatever we are experiencing is potentially changing the probabilities for future actions and events in some durable way.)

I am making this rather abstract argument because I want to be precise about what I mean by saying that work and play are no different as sites for learning. I don't believe we can know in advance whether what is learned in play or what is learned by serious work will ultimately prove to be the more important learning. Obviously every culture makes judgments about what kinds of learning are most important, and indeed in complex societies like our own, there are a lot of different systems of belief about such matters (religious, scholastic-academic, practical-everyday, professional, institutional-corporate, etc.). Even in our own dominant culture there are strong disagreements about

the relative importance of school-learning, on-the-job learning, or learning from inspired experiences. But there is a widespread, and I believe quite erroneous, belief that what is learned in play or in experiences whose main aim is pleasure is of little value relative to serious learning.

This issue has immediate implications for the concerns expressed elsewhere in this volume regarding how feelings can enhance collaborative activity that has some sort of problem-solving or task-completion goal. Some authors here argue (and I would agree) that it is not just the smooth integration of collaborative contributions that advances the goal, but also, indirectly, the inevitable tensions and conflicts that arise during group activity. I would also argue that it is not just the serious, get-down-to-business activity that advances the goal, but also the playful, let's-have-a-laugh activity. Perhaps more significantly, there is also often in academic discussions of these phenomena an implicit commitment to the successful achievement of the goal, and an implied recommendation that feelings be "managed" so as maximize the chances of success.

But that seems to me to be a potentially dangerous attitude. Very often participants in collaborative activity do not feel good about what is going on. We feel bored, frustrated, out of sorts. We would rather get up and leave. Our dominant culture teaches that we should suppress these feelings, that they are immature and that we ought to do our jobs anyway. But should we? The

affective dimension of our experience is tuned by millions of years of evolution to provide us with a feel for opportunities and threats. We tend to marginalize such feelings when they conflict with modern institutional demands on the grounds that these instincts did not evolve under modern conditions. But neither did our faculties for meaning-making evolve under modernity, and we certainly do not believe we should ignore their import for our decisions. Insofar as these two faculties are in fact one, the conclusion, I think, ought to be that our feelings are also well-adapted to modern conditions, that they operate just as well as our meaning-making does, and that they should just as much be taken into account in deciding on courses of action.

We do live in a society of injustice and widespread inhumanity, not just in distant parts of the world, or for the very poor, but for almost all of us. We live in an economic and political system which demands that in order to survive people do things they don't feel good about. And this is patently an artificial order of things. Societies do not need to be like this, certainly not nearly to the extent that our own is. Our feelings tell us what our reason confirms: that not all collaborative activity imposed on us by institutions is actually in our best interest, individually or collectively. From a research perspective, we need to understand when collaboration ought to fail rather than succeed, and paying attention to the role of feeling is essential for such an analysis.

WHEN PLAY COMES FIRST

In recent research conducted with colleagues and students at the University of California, San Diego in the Laboratory for Comparative Human Cognition (so named long ago by its founder, Michael Cole), the research team has been observing and participating in activities involving students ages 5 to 12 and university undergraduates at an after-school center in the city.

The young students stay on after the end of their formal school day to wait for working parents to come an hour or two later to pick them up. The undergraduates are enrolled in a class on communication and learning, which focuses on their own learning from field experiences in this after-school program. The school provides two staff members, the university provides two, and in addition members of the research team are regularly present. In fact roles often blur, with researchers, staff, and undergraduates interacting in often much the same ways with the kids. This model is a variant of the well-known "Fifth Dimension" model developed by Michael Cole and the lab over many years (Cole and Consortium 2006).

What we are all doing is playing. Playing with each other and playing, in our part of the after-school center, with educational computer games. Of course a lot else is also going on, with the same or overlapping participants: laughter exercises in a large open-space room, arts and crafts activities, performance

and drama activities, ball-playing, and innumerable playtime innovations of the kids' own devising. Some of it is chaotic. This is real-life, not a controlled experimental laboratory.

What is happening is documented in part by fieldnotes, written on a daily basis (twice per week) by the undergraduates in an online database (a page or two per day for each of 12-20 undergraduates) as well as by the researchers, and by video and some audio-only recordings, made once or twice a week by the research team, but also at times by the undergraduates and even now and then by the kids themselves.

In the first nine months of this research we have been exploring basic phenomena. What is happening? What is important (to us, to the kids, to the undergraduates)? What kinds of learning are taking place? What kinds of activities? What sorts of meanings are being made? What sorts of feelings are being produced? How are these various elements or aspects integrated with one another?

We had originally planned something quite different. We were offered the chance to try out a well-known educational computer game, *Quest Atlantis*, developed at Indiana University by Sasha Barab and his team, (Barab et al. 2007, Barab et al. 2010) in a regular class in the 7th or 8th grade of the school. But the Grade 8 teacher was teaching this class for the first time and preferred

to wait, while the undergraduates were already committed to the after-school program in terms of their time schedule. So we decided to see what would happen if we introduced a fairly serious (but also playful) learning game to a group of kids who were significantly younger than the age for which the game was designed.

The kids found the game fascinating. Especially the youngest ones were eager to go to the computer room at the school and try out something new. But this was after-school. It was not an academic program as such. These kids had already spent a long day in school and what they wanted to do was play. So they, and in time all of us, found ways to improvise around the original *Quest Atlantis* game to make it more fun.

The whole story is too long and interesting to be told here, but in short what happened was that the kids mostly played with each other and used the game and its virtual world as a springboard, a virtual play-space and inspiration for many kinds of play not specifically imagined by the creators of the game. In this, the undergraduates became their accomplices and play partners, as well as being their mentors and friends. The research team joined in to the extent we could do so and still manage to come away with some useful video records. What we saw was endless creativity, punctuated by briefer periods of boredom and sometimes outright rejection of the activity, but then resuming it when some further inspiration was found for fun and play.

We also saw a lot of learning, a lot of collaboration on tasks, serious problem-solving in the pursuit of play goals, and the energy, determination, creativity, and free spirit of kids at play. Play came first, but learning followed along.

When play comes first, the range and visible intensity of feelings is far greater than what you would see in a classroom or a well-organized, institutionally circumscribed "serious" learning activity. So the essential role of feelings in everything that happens is correspondingly far more obvious. So also is their inseparability from meaning-making and the conduct of activity. In classrooms or most institutional settings in our society, the range of "appropriate" or permitted emotion displays is very narrowly limited, especially for adults. With younger children in a relatively free-wheeling setting where only total chaos and unsafe or morally dubious activity are effectively policed by the staff, you see and hear everything from crying to whoops of joy and triumph, from close bonds of friendship to overt hostility; caring and tenderness to meanness and aggression, boredom and frustration to total concentration and engagement, silliness to insightfulness, anticipation to disappointment, simple selfishness to altruistic sharing and sacrifice.

Note that in my vocabulary of description I am mixing conventional emotion names with what are more usually activity names or qualities. I do this because the true range of feelings on display is vast. I have no sympathy for

efforts to define a mere dozen or fewer primary or fundamental emotions. That is a cultural project of Western universalism and quite untrue to the experience of participation in these complex activities. While it is likely the case that there are some biologically well-grounded feelings, from hunger to fear, which we inherit from our primate and mammalian ancestors, what those feelings mean to us, and all the culturally newer feelings that arise from participation in our complex social and technological milieu, form a vast system of differentiated feelings equally as complex as the semantics of a language or the meaning system of a culture. Indeed we have many feelings which are "too specific for words", that are as un-nameable in language as the shapes of clouds or mountains are un-describable. If you want to find the semiotic representation of the specificity of human feelings, you need to turn to the writing of poets and the works of artists, rather than the classifications of psychologists or the linguistic primitives of semanticists. Just as text, not words, are the units of meaning in language, so the subtle over-time arcs of multi-dimensional feelings, not biological primitives, are the units of human feeling.

Does this mean that realistic analysis of human activity, including learning and collaborative working together, needs the skills of a poet or artist to sense and represent? It may be so. I am already persuaded that writing textual articles, even with a few exemplary photographs, will be wholly inadequate to telling this story. Feelings, even more so than meanings, are expressed, and

felt, over time. To show them, video is a far more appropriate medium than text (with due deference to the poets) and is also richer in providing essential context than is the still photographic image. While academic publishers shy away from the costs of color plates in our books, and video on DVD discs remains a somewhat clumsy compromise for print works, online publishing makes multimedia presentations of research on human activity perfectly feasible today. It ought to become the norm in our field (Derry et al. 2010; Goldman et al. 2007).

COLLABORATIVE PLAY AND LEARNING

By the spring of 2011 the kids in our after-school program had been playing with the *Quest Atlantis* gameworld for several months and were getting bored with it. The focus of their emotional interest continued to be on playing with one another and on their social relationships with their peers and with the university undergraduates. One of the undergraduates came up with an idea to renew interest in the game: use the gameworld as a backdrop for the kids to make a movie, with their game avatars as the actors. This would require them to move their avatars into a common virtual space and perhaps enact a script, or improvise. But what actually happened was far more unpredictable and spontaneous and raises interesting questions about what counts as collaboration. Does there need to be a common goal for joint activity to count as collaboration? Can people learn together even if they are working against

one another's goals, as in a competitive activity? Am I a collaborator if my only contribution is to offer encouragement or make a joke that defuses tension among others?

One undergraduate, Ian, was doing a side project to make a video of our work at the site and so had borrowed a professional quality video camera, which he also planned to use to video-record a computer screen on which all the students' avatars would perform. But well before any script or plan could be worked out, I mentioned to the group that that day was Ian's birthday. Someone then proposed we hold a birthday party for him in the "Build World", a special area of the gamespace where the kids had built their own houses and castles, landscaping, domes and swimming pools. The chief architect of this space, an 11-year-old girl we will call Selena, proposed that the party take place around the pool she had attached to her treehouse, a central landmark in the Build World.

She was already there, and one by one three other kids, ages 8 and 9, "teleported" their avatars into the Build World and navigated their way to the treehouse and pool. One of them decided to start "dancing", an option in the avatars' behavioral menu. The others then asked him how to do this, and he both described it and moved over from his computer to theirs to show them. Selena also went over to show one of the other boys how. The four avatars now started dancing in and around the pool. Ian then asked if Selena, who was

in effect the host of the party, had any “refreshments”, and she shifted her avatar to a completely different “world” in the *Quest Atlantis* game to find what turned out to be pumpkin pie and used her skills as a virtual world builder to then place a pie near the pool.

A younger boy (Sean, age 9) now decided that one pie was not enough and used the building skills he had learned a few weeks before from Selena to duplicate the pie, eventually ending up with four identical pies (one for each of them). Throughout this, Ian was making video of the proceedings, and so was I. We were also both making suggestions, praising their dancing, talking about the pies and how other kids would be jealous they were not here for this, and more. The kids were commenting on each other’s dancing, on the party, wishing Ian a happy birthday, and responding to each other and discussing the pies. This was the first time that four avatars had gathered in one virtual place and co-enacted a joint activity. It was a major collaborative accomplishment, given their general computer skills and current skills with this virtual world, and it was a culmination of much that had gone before, including the creation of the treehouse, learning initially how to find one another in the vast online world, and learning how to create and manipulate objects in it. The first time even two avatars had managed to interact in the virtual world had been only several weeks before and it was still a rare event. *Quest Atlantis* had been designed mainly as a single-player game, not as a multi-player cooperative space.

Was this truly collaborative activity? Was there a common goal? Or were the various participants each enacting their own activities: Ian making a video, me stimulating the kids to have fun, Selena playing hostess, Sean showing off what he could do, the other boys playing with the ability to dance? I think that it makes the most sense to see here a set of intersecting and interacting trajectories of play. Avatars came and went at different times, all being at the pool together only briefly. The kids themselves moved around during the event and were frequently paying attention to different visual spaces, different real people and computer screens. They were moving through a hybrid reality, part peopled computer classroom, part partially and temporarily shared virtual space.

And yet this was collaborative play, or joint play, and not simply kids on parallel and independent trajectories. The trajectories influenced one another, through spoken exchanges and watching others' avatars on screen, as well as through doing things meant to be seen or enjoyed by others. Emotionally, there was a great deal of laughter and shouting playfully at one another. Egging one another on, feeling pride in demonstrating a skill or showing off, concentrating on performing a desired action correctly (both technically and visually-for-others) in terms of timing, placement, movement, and enactment. There was a shared and collaboratively produced mood of celebration,

laughter, and fun. The unity of the activity for all the participants was as much grounded in shared feelings as in shared meanings or actions.

Was there learning? By my earlier argument, we need to ask here how this event may have been part of one or more longer learning trajectories. Yes, two boys learned how to make their avatars dance, and learned it seemingly here and now. But Selena was also extending her trajectory of creating objects in one game world based on information found in another such world, and was learning to adapt it as a resource for social play in this situation. Sean was practicing duplicating an object and moving it around, a relatively new skill for him, and also adapting it in much the same way. All the kids were developing their skills of coordinating their avatars in time and space, and navigating to a common location, a process of learning extended over many weeks.

This last skill is one we can trace for two of the kids back to their first success at doing so seven weeks before, in a yet another "world" of the game. And we can trace it forward for them in particular one week later when they initiated a game of hide and seek, or chase and catch, in that same world, in the middle of which they were joined by two others and briefly once again four avatars were in the same place, and this time they used another behavior menu option to have their avatars do karate moves and play at being ninjas. That option is in

the same menu as the dance moves from the birthday pool party the week before.

There are other similarities between these events a week apart, primarily in the participants' social relationships and how they were using the game as a way to play with one another and challenge one another's competence, competing to see who could best the other in a game within a game. There was the same showing off, the same bravado and bravura, the same teasing of a friend who was also a sometime rival. And in both cases, this intimate competition did not take place face to face. The boys were at separate workstations, interacting visually through their avatars, though calling out to each other across the room. In the original experience several weeks previously, they had moved back and forth to each other's computer screens to see where the other was, but now they were competent enough and comfortable enough with their new virtual world skills to no longer need to do this. Once again there was a shared mood, different from the celebratory play of the birthday party, more one of playful competition.

There is no space here to present these events in detail, as I will hope to do elsewhere, but I believe that they illustrate both social and technical learning in collaborative play, where feelings are motivating actions whose consequences, including responses by others, engender further feelings along

interacting feeling-and-meaning trajectories. (For further discussion see Lemke 2009, in press-a, in press-b).

I cannot, however, imagine any purely descriptive or discourse-analytic presentation of this material that would be sufficiently intelligible to convincingly demonstrate these points, without showing the video data itself.

ISSUES OF EVIDENCE IN THE ANALYSIS OF COLLABORATIVE ACTIVITY

If we accept that feeling and meaning-making are so entwined and integrated in collaborative social activity, whether work, formal learning, or play, that we need to analyze both dimensions to draw valid conclusions about either, then we need to consider what counts as appropriate evidence in such studies. When I look at transcripts of these interactions, I can hear the voices, the enthusiasms, the doubts and antagonisms, the degrees of engagement and disengagement. But a reader without access to the video cannot. No formal system of notation will convey such matters as well as our inherent empathic response to seeing a video or being present at the event. When I look at still images extracted from the video data, showing key moments, or facial expressions of strong emotion, I can feel again something of what the image captures, but a reader may well interpret the images very differently, lacking their real-time dynamical context.

Action taking place in time: movement, dynamic shifting of voice pitch, stress, loudness, pacings and rhythms and breaks with them, continuities and temporal cause-effect sequences – all contribute to a phenomenological feeling for the event in a way that the static representations of transcripts and still images cannot. No doubt these other, out-of-time inscriptions have their important uses, to allow us to more readily see patterns across time and which may not depend on temporal dynamics more than simply through sequencing. But our reliance on them is also a function of the older technologies of print, on which we are fortunately no longer dependent.

I believe that the feeling dimension of activity is particularly sensitive to real-time dynamics and requires real-time media for the evidentiary support of inferences and claims. And because I see feeling and meaning as so inseparable in the course of action, I believe that our accounts of even the meaning-making aspects of an activity lose reliability if we do not take into account the unitary real-time flow of feeling-and-meaning.

I do not want to push this argument too far. Certainly a great deal can be done without direct access to video records of activity, and through partial representations of speech alone or speech and gross annotations regarding contexts of co-occurring activity. But I do believe that we need to understand what we may be missing in order to have confidence that analysis based on

such representations are sufficient for a particular purpose or correctly interpreted as evidence for some claim. (See also Lemke 2007).

I hope that the arguments in this chapter will provide a useful perspective for the many researchers who today are devoting so much effort to the important study of affect in our learning together.

REFERENCES

Barab, S., Dodge, T., Tuzun, H., Job-Sluder, L., Carteaux, R., Gilbertson, J., and Heiselt, C. (2007) 'The Quest Atlantis Project: a socially-responsive play space for learning' in B. E. Shelton and D. Wiley (eds.) *The Educational Design and Use of Simulation Computer Games* (pp. 159-186), Rotterdam, NL: Sense Publishers.

Barab, S., Gresalfi, M., and Ingram-Goble, A. (2010) 'Transformational play: using games to position person, content, and context', *Educational Researcher, 39*(7): 525-536.

Bateson, G. (1972) *Steps to an Ecology of Mind*, New York: Ballantine.

Bednarek, M. (2008) *Emotion Talk across Corpora*, New York: Palgrave Macmillan.

Bickhard, M. H., and Terveen, L. (1995) *Foundational issues in artificial intelligence and cognitive science* (Vol. 109), Amsterdam: Elsevier / North Holland.

Bruner, J. (1990) *Acts of meaning*, Cambridge, MA: Harvard University Press.

Clark, A. (2008) *Supersizing the Mind: embodiment, action, and cognitive extension*, New York: Oxford University Press.

Cole, M., and Consortium, D. L. (2006) *The Fifth Dimension: an after-school program built on diversity*, New York: Russell Sage Foundation Publications.

Derry, S., Pea, R., Barron, B., Engle, R., Erickson, F., Hall, R., et al. (2010) 'Conducting video research in the learning sciences', *Journal of the Learning Sciences, 19*(1): 3-53.

Frijda, N. (2004) 'The psychologists' point of view' in M. Lewis and J. M. Haviland-Jones (eds) *Handbook of Emotions* (pp. 59-74), New York: Guilford.

Goldman, R., Pea, R., Barron, B., and Derry, S. (eds) (2007) *Video research in the learning sciences*, Mahwah, NJ: LEA Publishing.

Halliday, M. A. K. (1978) *Language as Social Semiotic*, London: Edward Arnold.

Hoffmeyer, J. (2008) *Biosemiotics*, Scranton, PA: University of Scranton Press.

Hutchins, E. (1995) *Cognition in the Wild*. Cambridge, MA: MIT Press.

Lave, J. (1988) *Cognition in practice*, Cambridge, UK: Cambridge University Press.

Lazarus, R., and Lazarus, B. (1994) *Passion and Reason*, New York: Oxford University Press.

Lemke, J. L. (1993) 'Discourse, Dynamics, and Social Change', *Cultural Dynamics, 6*(1): 243-275.

Lemke, J. L. (1995) *Textual Politics: Discourse and Social Dynamics*, London: Taylor & Francis.

Lemke, J. L. (2000a) 'Across the Scales of Time: Artifacts, Activities, and Meanings in Ecosocial Systems', *Mind, Culture, and Activity, 7*(4): 273-290.

Lemke, J. L. (2000b) 'Opening Up Closure: Semiotics Across Scales' in J. Chandler and G. van de Vijver (eds) *Closure: Emergent Organizations and their Dynamics* (pp. 100-111), New York: New York Academy of Sciences.

Lemke, J. L. (2007) 'Video Epistemology In-and-Outside the Box: Traversing Attentional Spaces' in R. Goldman-Segall, R. Pea, B. Barron and S. Derry (eds) *Video Research in the Learning Sciences* (pp. 39-52), Mahwah, NJ: Erlbaum.

Lemke, J. L. (2009) 'Multimodality, identity, and time' in C. Jewitt (ed) *The Routledge Handbook of Multimodal Analysis* (pp. 140-150), London: Routledge.

Lemke, J. L. (in press-a) ‘Multimedia and discourse analysis’ in J. P. Gee and M. Handford (eds) *Routledge Handbook of Discourse Analysis*, London: Routledge.

Lemke, J. L. (in press-b) ‘Thinking about Feeling: affect across literacies and lives’ in O. Erstad and J. Sefton-Green (eds) *Learning Lives: transactions, technologies, and learner identity*, Cambridge, UK: Cambridge University Press.

Lutz, C. (1988) *Unnatural Emotions*, Chicago: University of Chicago Press.

Martin, J. R., and White, P. R. R. (2005) *The Language of Evaluation: the appraisal framework*, New York: Palgrave Macmillan.

Pattee, H. (1995) ‘Evolving Self-reference: matter, symbols, and semantic closure’, *Communication and Cognition, 12*(1-2): 9-27.

Peirce, C. S. (1992) *The Essential Peirce: Selected Philosophical Writings* (Vol. 1), Bloomington, IN: Indiana University Press.

Peirce, C. S. (1998) *The Essential Peirce: Selected Philosophical Writings* (Vol. 2), Bloomington, IN: Indiana University Press.

Salthe, S. (1993) *Development and Evolution*, Cambridge: MIT Press.

Sheets-Johnstone, M. (2009) *The Corporeal Turn*, Charlottesville, VA: Imprint Academic.

von Uexkull, J. (1928) *Theoretische Biologie*, Frankfurt: Suhrkamp.

von Uexkull, J. (1982) ‘The theory of meaning’, *Semiotica, 42*(1): 25-87.