Coming to Terms with 'Distributed Learning'

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Coming to Terms with Distributed Learning

1.0 Introduction

The importance of a common language is central to collaborative work. This does not imply that there should exist only one common language. A single language would impoverish the richness of our world, the meaningful perspectives provided by different cultures, different experiences. However, to exchange ideas and benefit from each others' perspectives and experiences, a common language is essential.

As children we learn the 'given names' for objects as well as how those objects are interrelated and various activities associated with them. These names, interrelations and associated activities are a reflection of the culture of our parents, or of those who raised us. A similar process occurs when we enter the 'specialized world' of a community of practice such as a discipline or practice. We are told the names of things, how they are interrelated, and engage in various activities that are associated with them. Lave and Wenger (1991) describe this process as legitimate peripheral participation. We learn this language, this culture, through participation in activities with others in the community. Over time we learn the nuances, the specific conditions, of these words and activities.

The ongoing negotiation of meaning between a student (novice) and a more experienced person ('master' or peer) is precisely the focus of Vygotsky with respect to the learning process. But, as Leont'ev and later Engeström point out (Engeström, 2005), the focus of this perspective is on the INDIVIDUAL and does not shed light on what happens in a wider social context, beyond the individual.

Continuing with the analogy of a child learning a language, the process of language acquisition tends to advance relatively smoothly until there is a collision of cultures. For example, if a child who learned English at home was suddenly moved to another country where Spanish was the predominant spoken language, the process of negotiation of meaning would suddenly break down. Familiar objects would have different names. This child would not be able to talk to playmates until he or she learned the new words for the familiar objects, learned the new activities associated with those objects and words.

Similarly, when we confront a different community of practice, we have a sense of disorientation and an inability to communicate effortlessly. The focus is on negotiation of meaning of the words; and even basic concepts must be re-examined to ensure intersubjectivity.

The recent globalization of the business world combined with increased specialization in the workplace resulting from technological advances has resulted in an unprecedented growth in both the number and scope of complex, interdependent systems. This requires collaborative activity across communities of practice, across cultures, with the inherent first difficulty of this situation — negotiation of meaning. And since negotiation of meaning is often equated with learning, workplace learning has received considerable attention in the past ten or fifteen years.

> "Many boundaries are collapsing in the world of work and, correspondingly, in the conceptual frameworks of research on work. The persistent dichotomy between micro-level processes and macro-structures is a case in point. We are witnessing rapid and powerful waves of emergence and adoption of such concepts as `learning organization,' `knowledge management,' and `social capital.' These are hybrids that cut across disciplines, from economics and sociology to cognitive science and ergonomics. **They draw on psychological notions of mental processes, yet they take institutions and communities rather than individuals as their units of analysis.** [Emphasis added.] (Engeström, 2000, p. 960)

1.1 Developing a Definition of Distributed Learning

First Cut – Synchronous Online Text Discussion by Seminar Members

In Fall 2005, a seminar (TEP 290) was offered at the University of California, San Diego with the following focus noted on the class website:

> "This seminar will address distributed learning, a perspective on learning that focuses on its distribution in space and time, and on the mediation of that distribution. The seminar will be organized around a set of visits to different research groups that address issues related to distributed learning."

The seminar members represented three universities and a variety of disciplines:

Core Members	University Affiliation	Department/Discipline
Monal Chokshi	UCSD	Cognitive Science
Barbara Edwards	UCSD	Education Studies
Douglas Grimes	UCI	Informatics
Libby Hemphill	Univ. of Mich.	School of Information
Robert Lecusay	UCSD	Communications
Reuven Lerner	Northwestern Univ.	Learning Sciences
Joanne Price	UCSD	Education Studies
Jude Yew	Univ. of Mich.	School of Information

Other UCSD Members	University Affiliation	Department/Discipline
Jerry Balzano	UCSD	Education Studies & Music
Sonja Baumer	UCSD	Lab for Comparative Human Cognition
Michael Cole	UCSD	Lab for Comparative Human Cognition
Beth Ferholt	UCSD	Lab for Comparative Human Cognition
Ginny Gordon	UCSD	Lab for Comparative Human Cognition
William Griswold	UCSD	Computer Science & Engrg.
Derek Lomas	UCSD	Visual Arts
Bud Mehan	UCSD	CREATE (Education Focus)
Kelli Moore	UCSD	Communications
Elaine Parent	UCSD	Lab for Comparative Human Cognition
Beth Simon	UCSD	Computer Science & Engrg.
Anjanette Urdanivia	UCSD	Provost Intern

As noted above, the seminar was "organized around a set of visits to different research groups that address issues related to distributed learning." While it was interesting to 'visit' the various research groups, there was a growing question among seminar participants regarding how these groups were related; in short, in what way were each of these research groups examples of distributed learning research? What was the unifying construct, unifying methodology, unifying perspective? We seminar participants began to realize that we did not share a clear idea of what constituted 'distributed learning.'

The core seminar members began the process of defining the term 'distributed learning' via a synchronous online meeting at the website TappedIn (refer to Appendix 4.1 for the text). The primary conclusion of this exchange was that learning involves change and that learning and cognition were different constructs. However, because we had no 'starting definition' to refine, and the time for discussion was limited to half an hour, there was no resulting first draft definition.

Second Cut – Email Exchange Among Seminar Members and Some SDLC Members

The discussion regarding a definition of distributed learning by the TEP-290 seminar members then led to an email exchange among some of the members of the proposed Science of Distributed Learning Center (refer to Appendix 4.2 for the text). In this instance, there were two proposed 'starting definitions' to critique:

> From: Jim Levin <jalevin@ucsd.edu>
> Subject: Definitions of learning and distributed learning
>
> > In the TI session today, the question came up about what is learning and what is distributed learning.

From the SDLCenter proposal:

> *Learning has been traditionally thought of as a change in an organism's knowledge and behavioral capacities brought about by experience. (Reisberg, 1999)*
>
> "Distributed learning" refers to a particular perspective on learning at many different levels, mediated by artifacts ranging from blackboards to computer networks.

My current definition of distributed learning:

> [Distributed learning is] a perspective on learning that focuses on its distribution in space and time and on the mediators that coordinate across that distribution.

In the email discussion, the following alternative definitions of distributed learning were considered:

> Alternate Definition 1:
>
> Distributed learning refers to **changes** in knowledge, behavioral repertoires, and propensities to engage in various forms of behavior that occur in individuals, groups, and institutions as a consequence of joint activity mediated by a wide range of artifacts. [Emphasis added]
>
> Alternate Definition 2:
>
> Distributed learning refers to **changes** in knowledge, skills, and motivation that occur in individuals, groups, and institutions as a consequence of activities distributed in space and time, coordinated by mediators.

While I believe that the first alternative definition (provided by Mike Cole) was likely written at some time before our TEP290 seminar exchange, I found it interesting that the concept of 'change' had been included, indicating a connection to 'learning.'

Alternative 2 was a collaborative edit of Alternative 1:

Alternative 1 Wording	Changed to….	Alternative 2 Wording
"changes in knowledge, behavioral repertoires, and propensities to engage in various forms of behavior"		"changes in knowledge, skills, and motivation"
"as a consequence of joint activity mediated by a wide range of artifacts."		"as a consequence of activities distributed in space and time, coordinated by mediators."

1.2 Definition Presented During NSF Site Visit, November 17, 2005

As noted above, the definition of distributed learning submitted as part of the Science of Distributed Learning Center (SDLC) proposal to the National Science Foundation was as follows:

> *Learning has been traditionally thought of as a change in an organism's knowledge and behavioral capacities brought about by experience (Reisberg, 1999).*
>
> "Distributed learning" refers to a particular perspective on learning at many different levels, mediated by artifacts ranging from blackboards to computer networks.

Although not part of the actual definition, note that the concept of 'change' was included in the paragraph immediately preceding the definition of distributed learning, to reiterate the foundational concept of learning.

On November 17th and 18th, 2005, the SDLC proposal was formally presented to the NSF Site Review Team. Various slides in the presentation described aspects of distributed learning:

> *Slide 5:*
> Learning is increasingly distributed
>
> - In space
> - In time
> - Across levels
> - Across organizations
> - Across types of learners
>
> *Slide 7:*
> What is distributed learning?
>
> - A perspective on learning that considers the distribution of learning and the mediation of that distribution to be a central issue for the science of learning.
> - This new perspective implies new theoretical integrations, new multi-method research approaches, and new ways of linking research to practice.

Slide 8:
Key points of the Distributed Learning perspective:

- Learning is distributed
- Learning is mediated

Slide 9:
Learning is distributed

- Across space
  - Dyadic Face to face
  - Small groups in a classroom
  - Distant
- Across time
  - Synchronous
  - Asynchronous
  - Mixed
  - At different time scales
- Across levels of analysis
  - Within a brain
  - Across people
  - Across groups
- Across organizations

Slide 10:
Learning is mediated

- Types of mediators
  - People: teachers, tutors, peers, outside experts
  - Paper & pencil & textbooks
  - Computers when face-to-face
  - Computer networks
- Mixtures of mediators that create
  - Multi-modal environments
  - Coordination across space and time

Two important aspects of distributed learning not particularly emphasized in the NSF Site Visit presentation include: *system perspective* and *historicity*. These aspects will be discussed later in this paper. Further, Slide 9 includes a reference to distributed learning "within a brain." This would appear to be a focus on individual learning rather than distributed learning. Without the distinction between a 'system focus' and an 'individual

focus,' distributed learning would then subsume all aspects of learning (as noted by one of the NSF Site Visit Team Members).

2.0 Reflections on the Definition of Distributed Learning

In describing 'organizational learning,' Argyris and Schon (1996) begin with 'what is an organization,' and then build on that foundation with, 'what is an organization that it can learn.' (I searched of a specific definition of 'learning' in this text but was not able to find one, other than an implied one that associated 'learning' with 'change'.) Using a similar approach to define distributed learning, I will first consider 'what is learning,' then 'what is distributed.'

2.1 What is Learning?

> "For all the talk of learning amongst educational policymakers and practitioners, there is a surprising lack of attention to what [learning] entails.… It is almost as if it is something that is unproblematic and that can be taken for granted. Get the instructional regime right, the message seems to be, and learning (as measured by tests and assessment regimes) will follow."
>
> – Smith, 1999

Perspectives on Learning

If you were to ask ten people, 'what is learning,' or 'how you know that learning has occurred,' you would undoubtedly receive ten different answers. In fact, Säljö (1979) did just that – he asked several adult students their definitions of learning. The responses were categorized as follows (Smith, 1999):

1. ***Learning as a quantitative increase in knowledge.***
   Learning is acquiring information or 'knowing a lot.'
2. ***Learning as memorizing.***
   Learning is storing information that can be reproduced.
3. ***Learning as acquiring facts, skills, and methods that can be retained and used as necessary.***
4. ***Learning as making sense or abstracting meaning.***
   Learning involves relating parts of the subject matter to each other and to the real world.

5. ***Learning as interpreting and understanding reality in a different way.*** Learning involves comprehending the world by reinterpreting knowledge.

These responses reflect learning as either a product or a process, or both. Another somewhat similar method of distinguishing types of learning was proposed by Ryle (1949): 'knowing *that'* versus 'knowing *how*.'

Conceived as a *product*, learning is something external to the learner, a 'package to be obtained':

> "It may even be something that just happens or is done to you by teachers. In a way learning becomes a bit like shopping. People go out and buy knowledge – it becomes their possession." (Smith, 1999)

Conceived as a *process*, learning is something internal to the learner, 'something you do in order to understand the real world,' (Smith, 1999). This process is generally measured in terms of changes in behavior as a result of interaction with the world.

The concept of change—changes in knowing *that* or knowing *how*, changes in internal or external knowledge representations (knowledge, skills, tools, etc.)—seems to be foundational to the definition of learning. To obtain a spectrum of definitions of learning, I made an Internet search of the term 'learning.' Using Google, I entered "define:learning" as the search. The follow are some of the resulting definitions:

Learning is:

- The process of acquiring knowledge or skill through study, experience or teaching. It is a process that depends on experience and leads to long-term changes in behavior potential.
- A change in neural function as a consequence of experience.
- Changes in a system that result in improved performance over time on tasks similar to those done previously.
- Acquiring knowledge or skill through study, experience or teaching. Whether a computer system "learns" or merely "induces

generalizations" is often a subject of debate, because typical generalization procedures and concept representations are simplistic and brittle.

- A relatively permanent change in cognition, resulting from experience and directly influencing behavior.
- An increase in the capability for effective action. Individual, team, and organizational learning can all be measured by the outcomes that result from effective action.
- A change in the behavior of the learner as a result of experience. The behavior can be physical and overt, or it can be intellectual or attitudinal.
- The act or process which develops or changes the behavior of the learner to a degree of permanence, usually with the intervention of an educator. Learning involves the child in totality and relates to facts, concepts, principles, attitudes, emotions and skills (Van Aardweg (1993: 136-139). Learning should be seen in terms of cognitive change.
- The change in behavior that results from experience and practice.
- A relatively permanent change to the frequency of actions brought about by instruction or reinforced practice.
- The relatively permanent change in a person's knowledge or behavior due to experience.
- Gaining knowledge or skills, or developing a behavior, through study, instruction, or experience.

One of the many debates associated with theories about learning is whether or not the person learning must be conscious of that learning. Alan Rogers (2003) contrasts 'task-conscious or acquisition learning' from 'learning-conscious or formalized learning' and portrays these informal and formal types of learning along a continuum:

> "At one extreme lie those unintentional and usually accidental learning events which occur continuously as we walk through life. Next comes incidental learning – unconscious learning through acquisition methods which occurs in the course of some other activity... Then there are various activities in which we are somewhat more conscious of learning, experiential activities arising from immediate life-related concerns, though even here the focus is still on the task...Then come more purposeful activities - occasions where we set out to learn something in a more

> systematic way, using whatever comes to hand for that purpose, but often deliberately disregarding engagement with teachers and formal institutions of learning... Further along the continuum lie the self-directed learning projects on which there is so much literature... More formalized and generalized (and consequently less contextualized) forms of learning are the distance and open education programmes, where some elements of acquisition learning are often built into the designed learning programme. Towards the further extreme lie more formalized learning programmes of highly decontextualized learning, using material common to all the learners without paying any regard to their individual preferences, agendas or needs. There are of course no clear boundaries between each of these categories." (Rogers, 2003, pp. 41-42)

Vygotsky and the ZPD

The focus of many learning theories has been on the individual, 'what the individual could do by himself or herself.' Vygotsky proposed a striking alternative to such thinking:

> "Over a decade even the profoundest thinkers never questioned the assumption; they never entertained the notion that what children can do with the assistance of others might be in some sense even more indicative of their mental development than what they can do alone." (Vygotsky, 1978, p. 85)

Following dialectical thinking, Vygotsky compared what the individual could do at present, without assistance, to that which the individual could accomplish with assistance (the dialectic). This zone was called the "zone of proximal development:"

> "It is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." (Vygotsky, 1978, p. 86)

Vygotsky was interested in matching opportunities for learning with the child's developmental level. Comparing the child's current developmental level (actual level) with the level that the child can reach with assistance of others establishes the *zone of proximal development (ZPD)*, the zone in which the child can learn. Teaching efforts that target either side of this zone are either inefficient, or beyond the reach of the child and

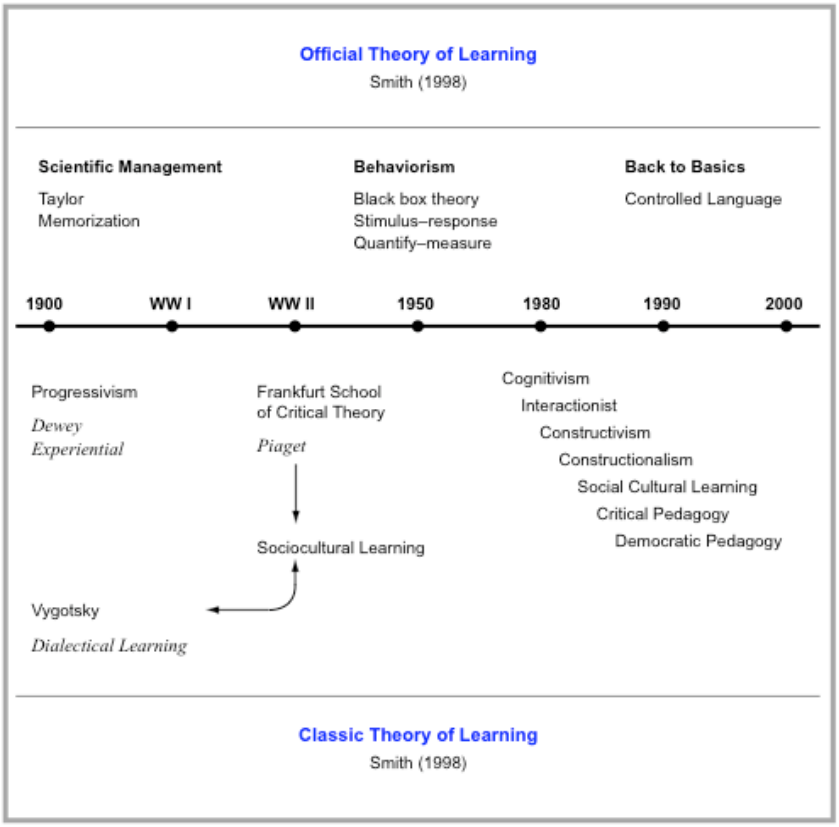
thus frustrating for the child.

A common citation to Vygotsky's work pertains to this point:

> "…the notion of the zone of proximal development enables us to propound a new formula, namely that the only 'good learning' is that which is in advance of development." (Vygotsky, 1978, p. 89)

Learning Theories in Practice

There are perhaps as many accounts of the history of learning theory as there are people who have written such histories. I will summarize here the history as described by Wink and Putney (2002). As shown in Figure 1.1, Wink and Putney (2002) portray two competing schools of thought at the turn of the century regarding the theory of learning: Scientific Management (above timeline) and Progressivism (below timeline).



Source: Wink & Putney (2002), p. 5

Figure 1.1 – The History of Scientific Management vs. Progressivism

Drawing from the historical context of the Industrial Revolution and its attendant focus on efficiency and 'interchangeable parts,' Scientific Management approached schools as 'workplaces of learning.' Efficient production of 'educated students' was the objective, the desired outcome. A standardized body of knowledge was to be transmitted to the students. Students were set in the classroom, in assembly-line fashion, ready to receive their packets of information. If the packets were not accepted, it was due to the receiver, not the supplier.

As indicated in the area above the timeline in Figure 1.1, Behaviorism and then Back to Basics (Standards Movement) approaches followed in the theoretical footsteps of Scientific Management. Proponents of this family of theoretical perspectives include Taylor, Thorndike, Watson, Skinner, and Pavlov. (Wink & Putney, 2002, p. 9)

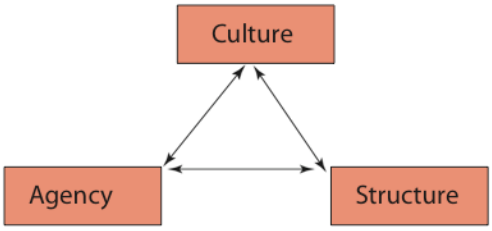
Progressivism, shown in the area below the timeline, stood in stark contrast to the theory and practice of Scientific Management. This school of thought, led by John Dewey, incorporated a child-centered, experiential approach to teaching and learning. It emphasized discovery and the construction of knowledge. Another approach that emphasized the construction of knowledge was Dialectical Learning, proposed by Lev Vygotsky. This school of thought is one of the foundations to Socio-Cultural Learning theory, as indicated by the arrow in Figure 1.1.

2.2 What is 'Distributed'?

Individual-in-Context

Learning theories stemming from Progressivism and Socio-Cultural Learning theory traditions tend to view the individual as learning in the context of everyday life. A diagram commonly used within the sociological and educational communities to illustrate

'individual-in-context,' that is, the individual embedded in the mutually-constitutive, reflexive nature of everyday life is shown below (Figure 1.2).



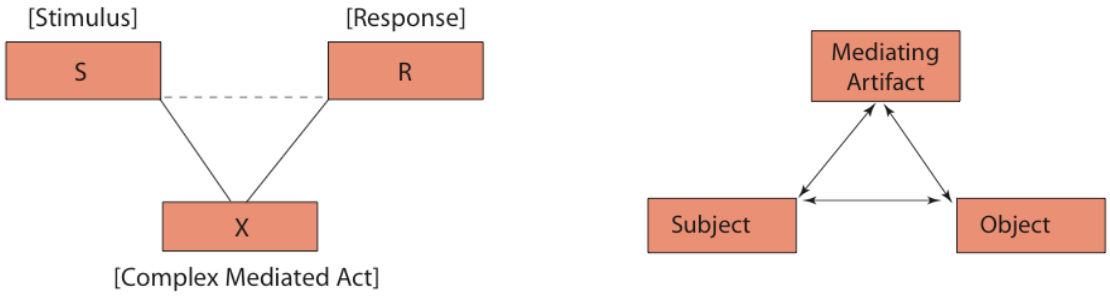
Source: Datnow et al, (2002), referencing work of Cole (1996)

Figure 1.2 – The Culture-Structure-Agency Triangle

This diagram portrays the interaction of individual agency, social structure and cultural processes and artifacts as interdependent and mutually-constitutive. No single element can be understood apart from its dynamic interaction with the other parts without serious distortion. If one element of the system is studied (that is, it is in the 'foreground'), the other elements of the system are always considered connected although currently in the 'background. '

Engeström (2005) points to Lev Vygotsky as the originator of the 'mutually constitutive' triangle:

> "Cultural-historical activity theory was initiated by Lev Vygotsky (1978) in the 1920s and early 1930s. It was further developed by Vygotsky's colleague and disciple Alexei Leont'ev (1978, 1981). In my reading, activity theory has evolved through three generations of research (Engeström, 1996). The first generation, centered around Vygotsky, created the idea of *mediation*. This idea was crystallized in Vygotsky's (1978, p. 40) famous triangular model in which the conditioned direct connection between stimulus (S) and response (R) was transcended by "a complex, mediated act" [shown to left in Figure 1.3]. Vygotsky's idea of cultural mediation of actions is commonly expressed as the triad of subject, object, and mediating artifact [shown to right in Figure 1.3]." (Engestrom, 2005, p. 60)



Vygotsky's model of mediated act

A common reformulation of Vygotsky's model of a mediated act

Figure 1.3 –A Comparison of Mediation Triangles

> "The insertion of cultural artifacts into human actions was revolutionary in that the basic unit of analysis now overcame the split between the Cartesian individual and the untouchable societal structure. The individual could no longer be understood without his or her cultural means; and the society could no longer be understood without the agency of individuals who use and produce artifacts. This meant that objects ceased to be just raw material for the formation of logical operations in the subject as they were for Piaget. Objects became cultural entities and the object-orientedness of action became the key to understanding human psyche." (Engeström, 2005, p. 60).

Activity Theory – Second Generation

Engeström (2005) points out that Leont'ev, following in the theoretical footsteps of Vygotsky, broadened the scope of the activity theory to include *collective activity*:

> "The limitation of the first generation [of activity theory] was that the unit of analysis remained *individually focused* [emphasis added]. This was overcome by the second generation centered around Leont'ev. In his famous example of "primeval collective hunt" (Leont'ev, 1981, p. 210-213), Leont'ev explicated the crucial difference between an individual action and a collective activity." (Engeström, 2005, p. 60).

Leont'ev applied Vygotsky's idea of mediation to collective activity; however, Leont'ev never provided a graphical representation of this broadened viewpoint. Using Leont'ev's work as a foundation, Engeström developed such a graphic, shown in Figure 1.4:

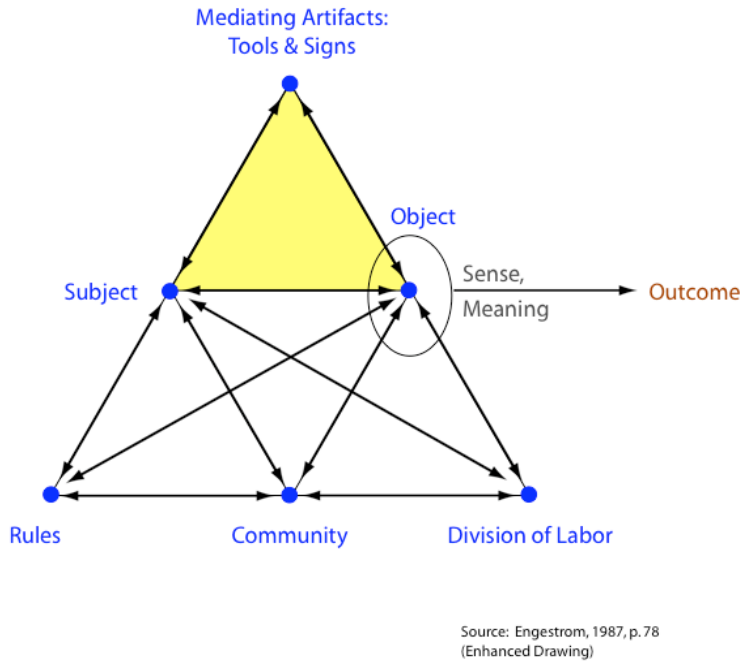


Figure 1.4 – The Structure of a Human Activity System: Expansion of Vygotsky;s Model by Leont'ev, Graphically Portrayed by Engeström

The upper portion of the Activity System diagram shown in Figure 1.4 has been enhanced from that provided by Engestrom (2005, p. 61) to emphasize the connection with the original mediation triangle proposed by Vygotsky. As can been seen, Vygotsky's triangle, focused on the individual, has been expanded to incorporate a wider perspective, a 'cultural-historical' perspective. In Western parlance, this 'wider perspective' is often termed the 'socio-cultural' perspective. Engeström has an interesting and very pertinent comment about this difference in terms ('cultural-historical' versus 'socio-cultural'), a

comment that pertains generally to methodologies, perspectives and construction of meaning that are themselves culturally and historically mediated:

> Activity theory evolved from the cultural-historical school of psychology. A key principle of this approach is *historicity* [emphasis added]. The concrete implications of this principle have been surprisingly little discussed, a notable exception being Sylvia Scribner's (1985) impressive article on Vygotsky's uses of history. When Asmolov (1987) recently presented a list of the principles of activity approach, historicism was mentioned at the end with half a sentence: "the principle of historicism, which pervades all investigations using the activity approach" (p. 99). – Such assertions cannot hide the fact that the principle of historicity, understood as concrete historical analysis of the activities under investigation, has mostly been neglected in empirical research based on or inspired by activity theory.
>
> There is one obvious and another, less obvious reason for this neglect. The obvious one stems from problems with rigid interpretations of the Marxist-Leninist view of history. Any conceptual framework which postulates a predetermined sequence of stages of sociohistorical development will easily entail suspicious notions of what is 'primitive' and what is 'advanced,' what is backward and what is good. Such notions reduce the rich diversity of sociocultural forms of life to a one-dimensional scale. This problem was already evident in Luria's classic studies in Central Asia (Luria, 1976), carefully and sympathetically criticized by Cole and Griffin (1980; see also Cole, 1988).
>
> It is surely appropriate to avoid rigid, one-dimensional sequences being imposed on social reality. But especially among Anglosaxon researchers adhering to the ideas of Vygotsky, the standard alternative seems to avoid history altogether. Differences in cognition across cultures, social groups and domains of practice are thus commonly explained without seriously analyzing the historical development that has led up to those differences.
>
> The less obvious reason for the neglect of history has to do with the point I mentioned above, namely the underdevelopment of models of the structure of an activity system. Historical analyses must be focused on units of manageable size. If the unit is the individual or the individually constructed situation, history is reduced to ontogeny or biography. If the unit is the culture or the society, history becomes very general or endlessly complex. If a collective activity system is taken as the unit, history may become manageable, and yet it steps beyond the confines of individual biography.
>
> – Engeström (2005, pp. 24-25)

This difference in the emphasis of the historical context is only one of several differences that arise from various theoretical traditions and cultural contexts: relativism versus historicity. Engeström (2005) highlights six dichotomies that "define the key dimensions of activity" (Engeström, 2005, pp. 19-27).

1. Psychic process vs. object-related activity.
2. Goal-directed vs. object-related activity.
3. Instrumental tool-mediated production vs. expressive sign-mediated communication.
4. Relativism vs. historicity.
5. Internalization vs. creation and externalization.
6. Principle of explanation vs. object of study.

Activity Theory – Third Generation

Engeström (2005) suggests that activity theory is beginning to transcend the second generation (expansion from focus on the individual to a wider context) and is in the formative stages of a 'third generation' of activity theory.

> "When activity theory went international, questions of diversity and dialogue between different traditions or perspectives became increasingly serious challenges. It is these challenges that the third generation of activity theory must deal with.
>
> "The third generation of activity theory needs to develop conceptual tools to understand dialogue, multiple perspectives, and networks of interacting activity systems. Wertsch (1991) introduced Bakhtin's (1981; 1986) ideas on dialogicality as a way to expand the Vygotskian framework. Ritva Engeström (1995) went a step further by pulling together Bakhtin's ideas and Leont'ev's concept of activity. Notions of activity networks (e.g., Russell, 1997) are being developed, and a discussion between activity theory and Latour's (e.g., 1993) actor-network theory has been initiated (Engeström & Escalante, 1996; Miettinen, 1999). The concept of boundary crossing is being elaborated within activity theory (Engeström, Engeström & Kärkkäinen, 1995, Gutierrez, Baquedano-Lopez & Tejeda, 1999) suggest the concept of 'third space' to account for events in classroom discourse where the seemingly self-sufficient worlds and scripts of the teacher and the students occasionally meet and interact to form new meanings that go

beyond the evident limits of both.

"These developments indicate that the door is open for the formation of the third generation of activity theory. In this mode of research, the basic model is expanded to include two minimally two interacting activity systems [Figure 1.5 below]."

— Engeström, 2005, pp. 62-63

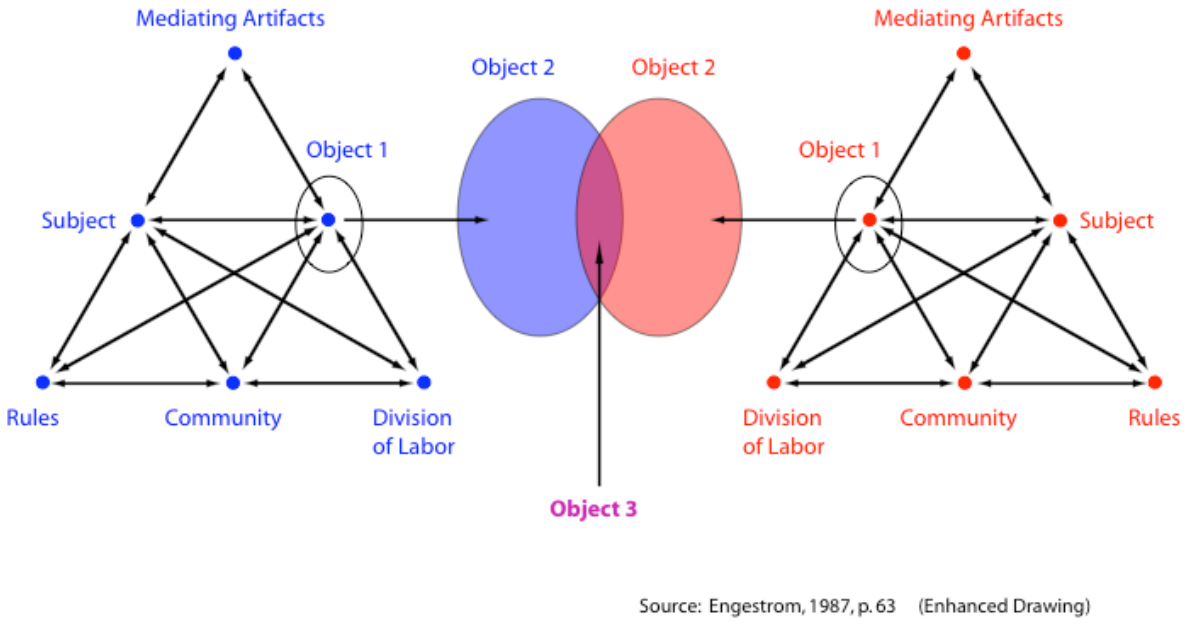


Figure 1.5 –Two interacting activity systems as minimal model for the third generation of activity theory

Engeström (2005) summarizes key features of the third generation of activity theory as follows:

The *first principle* is that a collective, artifact-mediated and object-oriented activity system, seen in its network relations other activity systems is taken as the prime unit of analysis…

The *second principle* is the multi-voicedness of activity systems…The multi-voicedness is multiplied in networks of interacting activity systems. It is a source of trouble and a source of innovation, demanding actions of translation and negotiation.

The third principle is historicity. Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history…

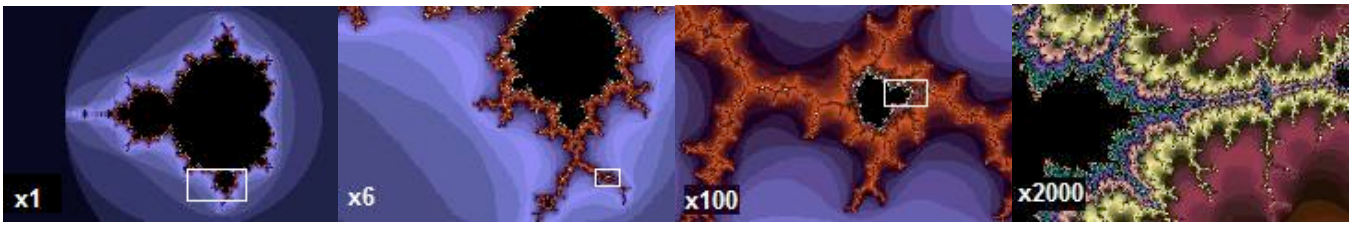
> The *fourth principle* is the central role of contradictions as sources of change and development. Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems…When an activity system adopts a new element from the outside (for example, a new technology or a new object), it often leads to an aggravated secondary contradiction where some old element (for example, the rules or the division of labor) collides with the new one. Such contradictions generate disturbances and conflicts but also innovative attempts to change the activity.
>
> The *fifth principle* proclaims the possibility of expansive transformations in activity systems…An expansive transformation is accomplished when the object and motive of the activity are reconceptualized to embrace a radically wider horizon of possibilities than in the previous mode of the activity. (Engeström, 2005, pp. 63-64)

Mutually-Constitutive Systems: Near and Far Perspectives

The Activity System diagrams provided in Figures 1.4 and 1.5 underscore one essential point: the reflexive, mutually-constitutive character each node. The focus on learning is a focus on the *entire system* rather than on a single element of it, as has been common with micro (individual), or macro (structure) perspectives in the past.

The mediation triangles shown in Figures 1.2 to 1.5 are intended to illustrate the interrelation of the parts to the whole. However, such artifacts have the power to shape thinking as well as to be shaped by it. Thus, in considering the 'match' between the diagram and reality, one might conclude that perhaps a diagram more aligned with *complexity* might better support thinking and inquiry about learning in a complex, dynamic system.

Fractals are considered the geometry of complex systems (Figure 1.6).



Source: Wikipedia, search "Fractals," downloaded from the Internet on 12.28.05

Figure 1.6 – Mandelbrot Fractal — "Even 2000 times magnification of the Mandelbrot set uncovers fine detail resembling the full set."

A passage from a book about fractals seemed appropriate to the issue of graphical representation:

> "…Modern box-like buildings are cubes or parallelepipeds. Good quality plasterboard is flat. Good-quality tables are flat and typically have straight or circular edges. More generally, the works of Man, as the engineer and the builder, are typically flat, round or follow the other very simple shapes of the classical schools of geometry.
>
> By contrast, many shapes of nature – for example, those shapes of mountains, clouds, broken stones, and trees – are far too complicated for Euclidean geometry. Mountains are not cones, Clouds are not spheres. Island coastlands are not circles. Rivers don't flow straight. Therefore we must go beyond Euclid if we want to extend science to those aspects of nature."

Interestingly, there are characteristics of fractals that seem reminiscent of characteristics being observed with respect to activity systems, including symmetry and self-similarity, turbulence, and simplicity/complexity.

Symmetry and Self-Similarity in Fractals

The Sierpinski gasket fractal, shown in Figure 1.7, is a very simple fractal but illustrates fractal symmetry and self-similarity.

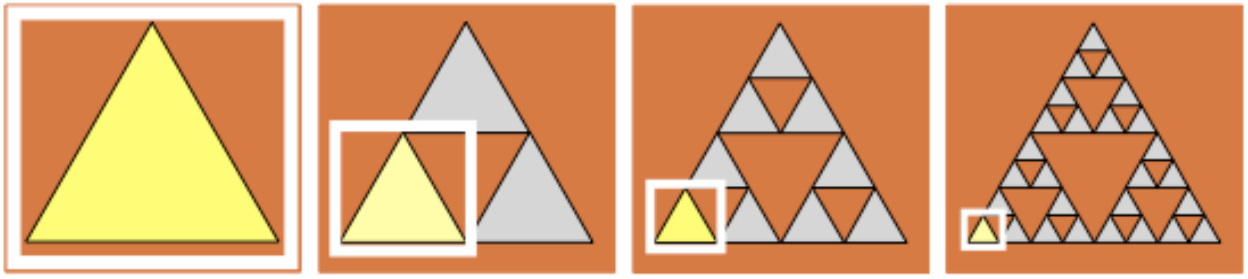


Figure 1.7 – Sierpinski Gasket Fractal

Turbulence in Fractals

Turbulence is another striking characteristic of fractals. Note the following passage concerning fractals and turbulence:

> One of the most important and baffling phenomena in fluid dynamics is turbulence: irregular, twisting flow-patterns far removed from the smooth 'laminar' flows beloved of the classical analysts. Until recently, turbulence has been studied by a variety of *ad hoc* analytical methods and probabilistic models, but relatively little attention has been paid to the geometry of turbulence. Yet the geometry contains hints of a deeper structure that the analytic approach misses. Turbulence involves motion on a wide range of scales, large and small. As Lewis Fry Richardson put it in 1922:
>
> > Big whorls and little whorls,
> > Which feed on their velocity;
> > And little whorls have lesser whorls,
> > And so on to viscosity.

> Could fractals be involved in the geometry of turbulence?
>
> This suggestion was made by Mandelbrot in about 1960. It re-emerged in a very different guise from the topological dynamics of the mid-1970s, and it now appears to be firmly established by careful experiments using a variety of 'small-scale' laboratory systems.
>
> — Clear Books (2004, pp. 22-23)

Combined Simplicity and Complexity of Fractals

The 1996 IMAX film, *Cosmic Voyage* (copyrighted and distributed in 2002 by Warner Home Video) includes images that seem to illustrate well the concept of combined simplicity and complexity. In one sequence, the camera pans out from one square meter at St. Mark's Square in Venice, Italy, and continues in this manner to the farthest reaches of the observed universe.

As the camera zooms out, many of the images are reminiscent of fractals (for example, shorelines are a classic fractal representation). But there is another fascinating aspect of the changing images that may be pertinent to activity systems: there is an alternation between the complex, intricate networks seen when viewing the complex systems *close up* (Figure 1.8) and the flat-looking spiral of large systems, such as the Milky Way Galaxy, when viewing the complex systems at a distance (Figure 1.9). This alternation of complexity and simplicity was true whether viewing objects at the macro-level (galaxies, etc.) or at the micro-level (sub-atomic particles, etc.).

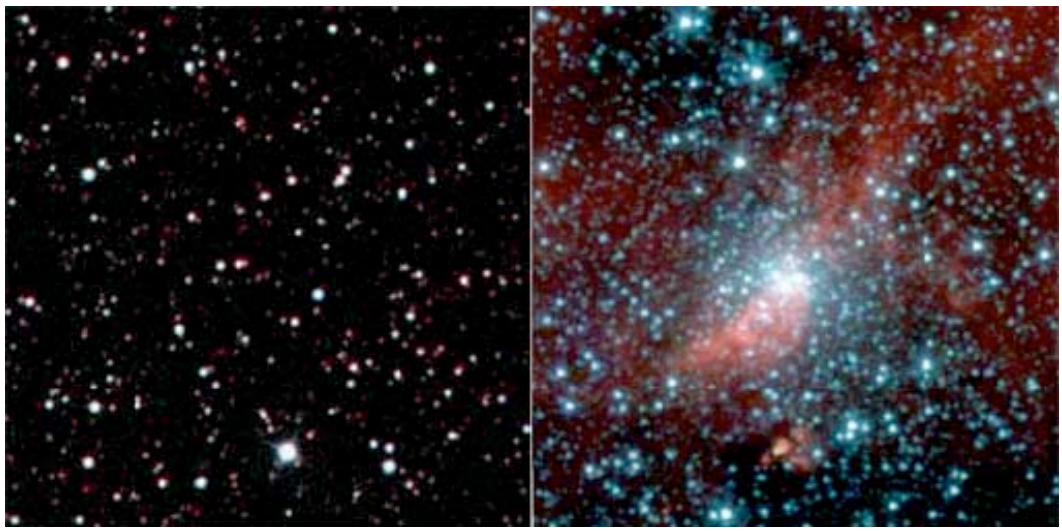


Figure 1.8 – Near-Focus Perspective: Clusters Within the Galaxy *(Source: NASA website)*

The image to the left in Figure 1.8 is a visible-light image, showing the bright stars against a backdrop of a dark sky. On the right, in the same patch of sky, a false-color image taken by NASA's Spitzer Space Telescope shows a globular cluster previously hidden in the dusty plane of our Milky Way galaxy.

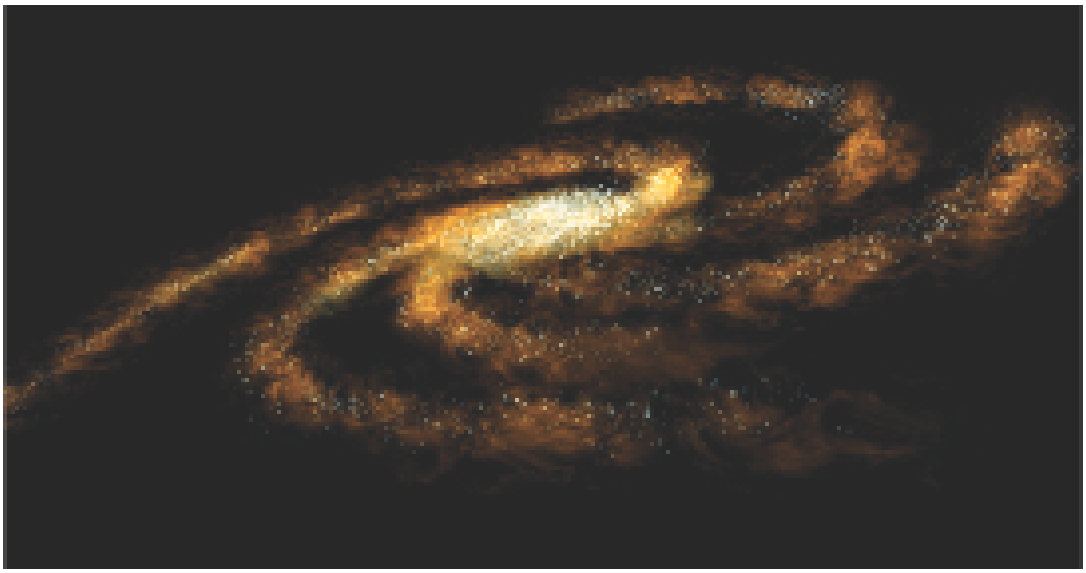


Figure 1.9 – Far-Focus Perspectives: Milky Way Galaxy *(Source: NASA website)*

Figure 1.10 is a deep-space image from the Hubble Space Telescope showing multiple galaxies. Note that the perspective is once again back to the detailed, network-type view of the complex system.

Figure 1.10 – Far-Focus Perspective: Multiple Galaxies *(Source: NASA website)*

The following passage from the fractal book (ClearBooks, 2004) could have been written for the astounding 'Zoom-Out Sequence' on the *Cosmic Voyage* IMAX movie. The IMAX movie and the fractal book are interrelated: they both describe systems in nature.

> *"Simplicity generates marvelous complexity"*
>
> "Let me now bring together the separate strings of my chapter. How did fractals come to play their role of "extracting order out of chaos'? The key resides in a very surprising discovery that I made thanks to computer graphics [mediation][comment added].
>
> The algorithms that generate fractals are typically so extraordinarily short as to look positively dumb. This means they must be called 'simple'. Their fractal outputs, on the contrary, often appear to involve structures of great richness. A priori, one would expect the construction of complex shapes to necessitate complex rules, but surprisingly, it is not so.
>
> What is the special feature that makes fractal geometry perform in such an unusual manner? The answer is very simple. The algorithms are recursive, and the computer code written to represent them involves 'loops'. That is, the basic instructions are simple, and their effects can be followed easily.
>
> Let these simple instructions be followed repeatedly. Unless one deals with the simple old fractals (the Cantor Set and Sierpinski gasket), the process of iteration effectively builds up an increasingly complicated transform, whose effects the mind can follow less and less easily. Eventually, one reaches something that is qualitatively different from the original building block. One can say that the situation is a fulfillment of what in general is nothing but a dream: the hope of describing and explaining chaotic nature as the culmination of many simple steps."
>
> Benoit Mandelbrot — Clear Books (2004, p. 65)

'Systems' Perspectives: Activity Theory and Organizational Learning

Two schools of research in learning have long-standing 'systems' approaches to their methodology:

- Activity Theory, and
- Organizational Learning.

Research in the tradition of Activity Theory, such as that of Engeström (2005) et al, would seem to exemplify a 'near-focus' system perspective of distributed learning. Such studies emphasize a network-emphasis in research. Research emphasizing a 'far-focus' system perspective of distributed learning (learning by the 'system'), as exemplified by the work of Argyris and Schön, would focus on the system as a whole rather than individual components in the setting of the system.

Near-Focus Perspective of the System: Activity Theory and "Expansive Learning"

Activity Theory and the ZPD

Engeström (2005) extends Vygotsky's idea of the ZPD to the Activity System. The ZPD is both collaborative and dialectic. Collaboration with a 'more capable peer' (a peer 'activity system' in this case) would necessitate interaction with at least one other activity system:

> "These developments indicate that the door is open for the formation of the third generation of activity theory. In this mode of research, the basic model is expanded to include two minimally two interacting activity systems." (Engeström, 2005, p. 63)

Further, the conditions of the ZPD would be characterized by a dialectic: the status quo confronted with something new that begins to create system tension, conflict, contradictions. This situation has the potential for expansion to a new status quo:

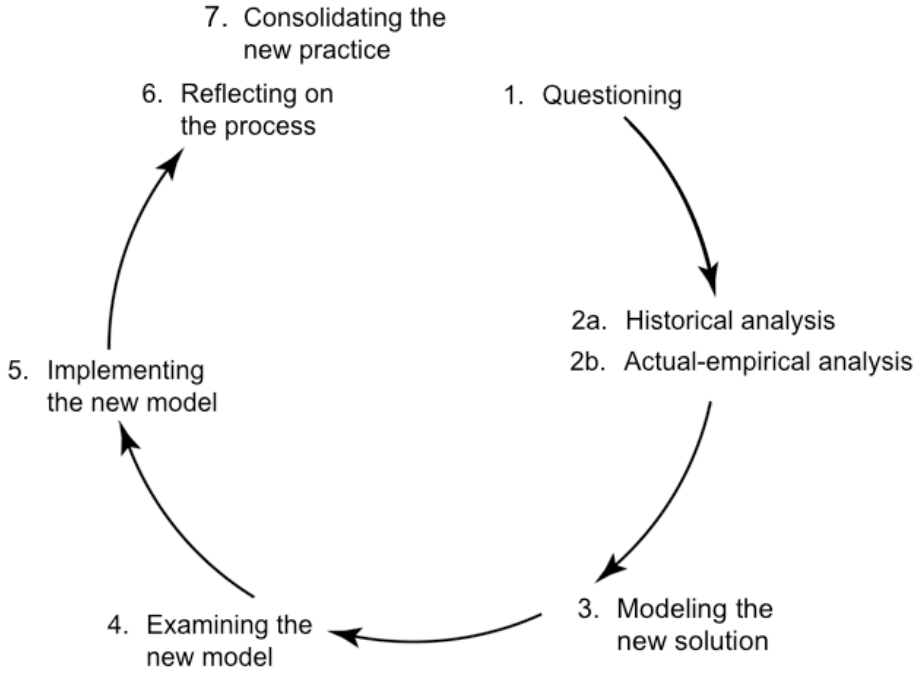
> "When an activity system adopts a new element from the outside (for example, a new technology or a new object), it often leads to an aggravated secondary contradiction where some old element (for example, the rules or the division of labor) collides with the new one. Such contradictions generate disturbances and conflicts, but also innovative attempts to change the activity.

…As the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort."

…An expansive transformation is accomplished when the object and the motive of the activity are reconceptualized to embrace a radically wider horizon of possibilities than in the previous mode of the activity. A full cycle of expansive transformation may be understood as a collective journey through the *zone of proximal development* of the activity."

Engeström, 2005, p. 64)

The actions of an expansive learning cycle are schematically depicted in [Figure 1.11].



Source: Engestrom, 2000, p. 970

Figure 1.11 Expansive Cycle of Learning Actions

Far-Focus Perspective of the System: Organizational Learning

Argyris and Schön distinguish the difference between a 'collection of individuals" and an organization:

> "Organizations are not merely collections of individuals, yet there is no organization without such collections. Organizational action cannot be reduced to the actions of individuals, even of all the individuals that make up the organization, yet there is no organizational action without individual action. When, then, does it make sense to say that a collection of individuals constitutes an organization that acts?
>
> "Consider a mob of students who are holding a spontaneous protest against their university's financial aid policy. At what point do they cease to be a mob and begin to be an organization? The mob is a collectivity, a collection of people who may run, shout, and mill about together. But it is a collectivity that cannot make a decision or take an action in its own name, and its boundaries are vague and diffuse. The mob begins to resemble an organization as it begins to meet three conditions. The individual members of the mob must:
>
> 1. devise agreed-upon procedures for making decisions in the name of the collectivity,
> 2. delegate to individuals the authority to act for the collectivity, and
> 3. set boundaries between the collectivity and the rest of the world.
>
> "As these conditions are met, members of the collectivity begin to become a recognizable "we" that can make decisions and translate their decisions into action.
>
> "When the members of the mob become an identifiable vehicle for collective decision and action, they become, in the ancient Greek sense of the term, a *polis*. Before an organization can be anything else, it must be 'political,' because it is as a political entity that the collectivity can take organizational action. Then it is the individuals who decide and act, but they do these things on behalf of the collectivity, as its agents. And in order for individuals to be able to decide and act in the name of the collectivity, there must be rules that determine the boundaries of the collectivity, when a decision has been made and when authority for action has been delegated to individuals. Insofar as members of a collectivity create such rules, which we call 'constitutional,' and become a *polis*, they have organized.
>
> "The rule-making that brings organizations into being need not be conscious, and constitutional rules need not be explicit. What is essential is that the members' behavior be *rule-governed* in the crucial respects."
>
> – Argyris and Schön, 1996, pp. 8-9

After defining what distinguishes an individual from a collection of individuals that comprise an organization (primarily codification of goals and other 'public maps'), Argyris and Schön describe how an organization can be evaluated as being effective or ineffective in purposeful activity. Here Argyris and Schön describe single-loop, double-loop, and deutero-learning characteristics and their importance in indicating effective behavior of the organization.

In *single-loop learning*, the primary focus of the organization is in identifying and correcting error. To the degree to which this behavior is codified and valued by the members of the organization, the organization is effective in accomplishing specific tasks. *Double-loop learning* includes not only identifying and correcting error but also looking for required changes in norms, rationales—the organizing principles—(and encoding those changes in the 'public maps') as it responds to internal and external factors. An organization is much stronger, and its prospects for long-term survival are considerably improved if it incorporates double-loop learning in its structure of ethics and behavior. A *deutero-learning* organization is one that has focused on learning how to learn (similar to the metacognitive aspect of teaching and learning principles. This 'learning to learn' capacity can be directed either at single-loop learning (*Deutero* learning, Model I). (learning to "be more effective in finding and correcting errors"), or it can be directed at double-loop learning ("learning to resolve conflicting norms for performance").

2.3 'Distributed Learning' –Definition by Recursive Loops

The question still remains, 'what is distributed learning?' To recap the ideas presented at the beginning of this paper, the definition of distributed learning included in slides presented at the November 17, 2005 NSF Site Visit:

> What is distributed learning?
>
> - A **perspective** on learning that considers the **distribution of learning and** the **mediation of that distribution** to be a central issue for the science of learning. [Emphasis added]
> - This new perspective implies **new theoretical integrations**, **new multi-method research approaches**, and **new ways of linking research to practice**. [Emphasis added]

Alternative definitions proposed by the Distributed Learning seminar (TEP-290) and SDLC (Science of Distributed Learning Center) interaction are as follows:

> Definition 1: (First definition proposed by Jim Levin)
>
> [Distributed learning is] a perspective on learning that focuses on its distribution in space and time and on the mediators that coordinate across that distribution.
>
> Definition 2: (Definition proposed by Michael Cole)
>
> Distributed learning refers to changes in knowledge, behavioral repertoires, and propensities to engage in various forms of behavior that occurs in individuals, groups, and institutions as a consequence of joint activity mediated by a wide range of artifacts.
>
> Definition 3: (Collaborative definition)
>
> Distributed learning refers to changes in knowledge, skills, and motivation that occur in individuals, groups, and institutions as a consequence of activities distributed in space and time, coordinated by mediators.

Having completed an investigation into learning in general and distributed learning, in particular, I would propose the following alternative definition:

> Distributed learning is a system-level perspective on learning focused on changes in knowledge, skills, or motivation that occur as a consequence of joint activities distributed in time and space and mediated by a variety of artifacts.

I have included the term 'system-level' to emphasize the particular perspective at issue. I chose not to use either the term "activity system" or "organization" in order not to favor either theoretical perspective or body of research as I believe both have much to contribute to our understanding of the intricacies of interdependent learning. Further, I agree wholeheartedly with the second bulleted item noted in the description of distributed learning to the NSF Site Review Team:

> "This new perspective implies new theoretical integrations, new multi-method research approaches, and new ways of linking research to practice."

It is only through collaborative activities across boundaries of disciplines and culture that we will begin to attain a common language of analysis that reflects the diversity of discipline traditions (including tools, methodologies and perspectives) necessary to understand distributed learning both within and throughout the system of human activity.

3.0 References

Argyris, C. (2004). *Reasons and rationalizations: The limits to organizational knowledge.* New York: Oxford University Press.

Argyris, C., & D. A. Schön (1996). *Organizational learning II: Theory, Method, and Practice.* (Part of a series on organizational development, E. H. Schein & R. Beckhard, Eds.) Reading, MA: Addison-Wesley Publishing Company.

Bateson, G. (1972). *Steps to an ecology of mind.* New York: Ballantine Books.

Clear Books Publishers (2004). *The colours of infinity: The beauty and power of fractals*. (Book based on the 1995 documentary film: *The Colours of Infinity*, Gordon Films, UK.) Bath, UK:Clear Books (ISBN 1-904555-05-5)

Cole, M. (1996). *Cultural psychology: A once and future discipline*. Cambridge: Harvard University Press.

Cole, M. (1988). Cross-cultural research in the socio-historical tradition. In M. Hildebrand-Nilshon & G. Rückriem (Eds.), *Activity theory: A look into a multidisciplinary research area*. *Proceedings of the 1st International Congress on Activity Theory*. Vol. 1. Berline (West): System Druck.

Cole, M. & Engeström, Y. (1993). A cultural-historical approach to distributed cognition. In G. Salomon (Ed.), *Distributed Cognitions: Psychological and educational considerations*. Cambridge: Cambridge University Press.

Cole, M. & Griffin (1980). Cultural amplifiers reconsidered. In D. R. Olson (Ed.), *The social foundations of language and thought*. New York: Norton.

Datnow, A., L. Hubbard, & H. Mehan, (2002). "Extending educational reform: From one school to many," in *Educational Change and Development Series*, A. Hargreaves, Ed. New York: Routledge Falmer.

Engeström, Y. (2005). (G. Rückriem, Ed.) *Developmental work research: Expanding activity theory in practice*. Volume 12 in a series published by the Intercultural Cultural-historical Human Sciences (ICHS). Berlin.

Engeström, Y. (2000). Activity theory as a framework for analyzing and redesigning work. *Ergonomics*, *43* (7), 960-974.

Engeström, Y. (1999). *Perspectives on activity theory*. Cambridge University Press.

Engeström, Y. (1987) *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit.

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

Lave, J., and Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Rogers, A. (2003) *What is the Difference? A new critique of adult learning and teaching*, Leicester: NIACE.

Ryle, G. (1949). *The concept of mind*. Chicago: University of Chicago Press.

Säljö, R. (1979). "Learning in the learner's perspective. I. Some common-sense conceptions', *Reports from the Institute of Education, University of Gothenburg*, 76.

Salomon, G., Ed. (1993). *Distributed cognitions: Psychological and educational considerations.* New York: Cambridge University Press.

Smith, M. K. , (2001). "Dialogue and Conversation," *The Encyclopedia of Informal Education*, **www.infed.org/bibio/b-dialog.htm**,

Smith, M. K. (1999). 'Learning theory', *the encyclopedia of informal education*, www.infed.org/biblio/b-learn.htm, Last update: January 30, 2005

Tyre, M. J. and von Hippel, E. (1997). Situated nature of adaptive learning in organizations. *Organization Science 8*(1), pp. 71-83.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.) Cambridge, MA: Harvard University Press.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

4.0 Appendices

4.1 Defining Distributed Learning: Synchronous Online Session

The following excerpt is from the transcript of a synchronous text interaction of members of the Distributed Learning Seminar, October 27, 2005:

JoanneP: I have a question about defining distributed learning in the first place. Is it different from distributed cognition?

JimL: Learning implies change; cognition doesn't.

JoanneP: That helps.

JimL: They're certainly closely related, but not identical.

JoanneP: I wasn't being facetious. It does help to separate those terms. Is all change then learning?

JimL: No, there's maturation, there's decay, there's random change, there are many changes that aren't learning, I suspect.

DouglasG: It seems that intentional change requires learning because you have to learn what is to be done to change a situation.

JimL: Here's from dictionary.com: learning
n 1: the cognitive process of acquiring skill or knowledge.

JoanneP: I thought I remember a definition that included purposeful action that doesn't invite unintended results.

JimL: I don't think all learning has to be intentional, but much learning is certainly intentional.

BarbaraEd: How does CogSci define Distributed Learning?

MonalCh: As far as I know, we don't have a definition for it...

JimL: We're jointly creating a definition here and now ;-)

JoanneP: There is a definition for distributed cognition. I wonder if it includes learning concepts.

MonalCh: If you look at Hutchins' distributed cognition stuff (e.g. Cognition in the Wild) there are lots of parallels which could be drawn (as we speak about them...)

RobertLe: I feel there's a difference between the overall CogSci approach to learning vs. the distributed cognition approach.

MonalCh: Yes.

MonalCh: There are lots of different theories/frameworks to look at learning from the CogSci perspective.

MonalCh: LOTS! :)

DouglasG: Robert, please correct me, but I believe that outside of Hutchins/Hollan and group, CogSci has traditionally used an information processing model focused on the individual.

RobertLe: Yup.

MonalCh: Yes, true.

4.2 Defining Distributed Learning: Email Follow-on

The interaction excerpted in Appendix A.1 led to the following email exchange among SDLC members:

To: (Distributed-Learning -Seminar core members)

Monal Chokshi <monal.chokshi@gmail.com>,
Barbara Edwards<bedwards@ucsd.edu>,
Doug Grimes <grimesd@ics.uci.edu>,
Libby Hemphill <libbyh@umich.edu>,
Robert Lecusay <rlecusay@ucsd.edu>,
Reuven M. Lerner <reuven@lerner.co.il>,
Joanne Price <jprice@activmanuals.com>,
Jude Yewjyew@umich.edu

Cc: lchcmike@gmail.com,
steasley@umich.edu

From: Jim Levin <jalevin@ucsd.edu>

Subject: Definitions of learning and distributed learning

In the TI session today, the question came up about what is learning and what is distributed learning.

From the SDLCenter proposal:

> *Learning has been traditionally thought of as a change in an organism's knowledge and behavioral capacities brought about by experience (Reisberg, 1999).*
>
> "Distributed learning" refers to a particular perspective on learning at many different levels, mediated by artifacts ranging from blackboards to computer networks.

My current definition distributed learning:

> [Distributed learning is] a perspective on learning that focuses on its distribution in space and time and on the mediators that coordinate across that distribution.

From: Mike Cole <lchcmike@gmail.com>

How about:

> Distributed learning refers to changes in knowledge, behavioral repertoires, and propensities to engage in various forms of behavior that occurs in individuals, groups, and institutions as a consequence of joint activity mediated by a wide range of artifacts.

From: jprice@activmanuals.com

Is the "organism" referred to an individual or does it equally refer to, for example, an organization?

From: Mike Cole <lchcmike@gmail.com>

My def avoided organism as a term.

Here's a variant:

> Distributed learning refers to changes in knowledge, skills, and motivation that occurs in individuals, groups, and institutions as a consequence of activities distributed in space and time, coordinated by mediators.

From: "Douglas Grimes" <grimesd@ics.uci.edu>

Jim,

I think your last proposed definition of DL is a good operational definition because it focuses on evidence of learning, much of which can be garnered in natural settings, as opposed to artificial ones like lab tests or school exams. It sounds close to the dCog approach, which I personally find dry because it implicitly discounts or ignores internal states, especially affect and volition. It treats individuals in terms of their formal organizational roles, not their attitudes toward those roles or the broader context of their lives. I personally prefer a more phenomenologically-oriented definition that at least acknowledges the importance of subjective feelings, which may or may not be in accord with observable actions. However, I don't have an alternative definition handy to improve on yours.

From: Mike Cole lchcmike@gmail.com

> Change occurS to occuR and I will sign on -- until we develop to the next, higher, stage.

From: "Douglas Grimes" <grimesd@ics.uci.edu>

Jim,

I like your proposed definition very much. However I question the last clause, "coordinated by mediators." I see "mediators" as a garbage-basket term that refers to anything that connects two otherwise less connected things. In the Vygotskian sense, it includes mental constructs and tools (language, art, thoughts, etc.), whether internal or external, as well as tangible tools and representations. That's already so broad as to be ambiguous without substantial clarification. The ambiguity is compounded if you consider other definitions from the dictionary, e.g.:

1. "one that works to effect reconciliation, settlement, or compromise between parties at variance"
2. "one that mediates; especially : a mediating agent (as an enzyme or hormone) in a chemical or biological process"

" Coordination" may also be problematic. As used, it seems to imply intentionality on the part of the mediator, whoever or whatever he/she/it may be. Is accidental or incidental mediation also included?

Given the murkiness of "coordinated by mediators," I suggest dropping the clause. The door is still open to later discussion of specific types of mediation without falling into the limbo of an overused and under-specified term.

If "mediation" is used later, I suggest specifying which of its major meanings apply, e.g.,

1. Human agents of change
2. Automated agents of change -- hardware, software, and electronic communication tools in the center's work; chemical, biological, or mechanical in the physical sciences and engineering
3. Processes of change
4. Shared representations -- artifactual tools, whether books, blackboards, email, or shared computer displays
5. "Internal tools" in the Vygotskian sense -- language, math, visual imagery, etc.

From: Jim Levin <jalevin@ucsd.edu>

Hi Doug,

Good point about the vagueness of the "coordinated by mediators", but it is exactly that vagueness that it seems to me that is the focus of the Science of Distributed Learning Center and many of its participants. I wouldn't want to leave it out for that reason. Your several definitions for mediator and coordination point to the wide range of possibilities for research.

Date: Fri, 28 Oct 2005 08:22:53 -0700

To: (SDLC folks) jalevin@ucsd.edu

From: Jim Levin <jalevin@ucsd.edu>

In the Distributed Learning seminar we've been having a discussion of what the definition for "distributed learning" is.

Here's our latest version:

Distributed learning refers to changes in knowledge, skills, and motivation that occur in individuals, groups, and institutions as a consequence of activities

distributed in space and time, coordinated by mediators.

Comments?

From: Mark Warschauer <markw@uci.edu>

Here's my quick try. I'll think more about this later.

Distributed learning refers to changes in knowledge, skills, (identity?), and attitude that occur in individuals, groups, and institutions as a consequence of activities distributed in space and time, facilitated by language, technologies, and other mediational means.

To: Mark Warschauer markw@uci.edu

From: Mike Cole lchcmike@gmail.com

Kinda like [that definition], Mark, sans identity. I know the discourses where it is useful, but as indicated in earlier note by Jim, we are aiming for an appropriately abstract (vague) level that has to be filled in..... at which points concepts like identity come to the fore.

To: mcole@weber.ucsd.edu

From: Mark Warschauer markw@uci.edu

Yes, I agree. In any case, identity can be subsumed within attitude, which I prefer as being more encompassing than motivation.

From: Joseph Goguen <goguen@cs.ucsd.edu>

Dear Jim, "coordinated by" sounds like the mediator is actively doing coordination work, which is not necessarily the case. How about " ... and time, facilitated by various mediators."?

From: "William G. Griswold" <wgg@cs.ucsd.edu>

It seems to me that the only substantive (and debatable) part of this definition is "coordinated by mediators". The rest of the definition is just a direct extrapolation of the two words. "Coordinated by mediators" is a theoretical perspective. I first questioned whether we would want to make such a theoretical commitment in the definition, but then realized that the definition is almost vacuous without it. So it can't go, or something more important has to go in its place.

Let me toss some possibly important things. These are just naive musing, really.

1. An identifiable group or organization may distribute its knowledge in the form of specialization. This implies that not everyone in a group may be intended to acquire (roughly) the same knowledge. An individual might prioritize and sequentialize (i.e., distribute) their knowledge over time in a "just in time" fashion, thus permitting them to put their knowledge to work before all the intended knowledge is acquired. Thus, the theory of distributed cognition has something to say about how distributed learning might take place to best support the realities of distributed work/cognition. Thus, should the definition include the distribution of learning over members of a group? Sounds messy, but food for thought.
2. The definition is not rooted in a concept of a body of knowledge or set of skills that is meant to be learned. Certainly my study of Aikido (a Japanese defensive martial art) is distributed in time and space from my study of woodworking.

But I don't think you meant for that in your definition. Yet, their are affordances of interleaving such learning activities. Time-continuous learning is exhausting; "changing gears" is good for clearing the mind and focusing attention. Relationships are seen between seemingly unrelated disciplines. Working the mind complements the health of the body, and vice versa. It is known that sleep is an important component of learning. Time for reflection is valuable.

3. Is "coordinated by mediators" the only theoretical commitment we want to make? I guess it is common to all the theories we've been discussing? And perhaps the concept is sufficiently powerful. I realized the other day during your presentation that teachers, metaphors, and models are all "mediators". According to #2 above, time is a mediator; or something afforded by time is a mediator. Certainly memory is a mediator. It is how two ideas in my head bump into each other and lead to new ideas.

From: Naomi Miyake <nmiyake@sccs.chukyo-u.ac.jp>

Might anyone have time to paraphrase the ending part of this definition for me? This could be just an English question. I'm interested in finding out which of the following two readings are "correct" in this case. Should this ending part be read as there are independent, not-yet-interacting activities distributed in space and time, which should be coordinated by mediators to make the claimed learning possible or activities distributed in space and time potentially contribute to the claimed type of learning, but having coordinating mediators help or both??

Personally I prefer the latter reading, because I tend to think learning can happen through non-mediated interaction when there is enough resource (including knowledge) on the learning side. Like a site having a problem finds a solution by just watching some other interacting part solves the similar problem. This does not appear to require much "coordination" by moderators but certainly requires some "interaction."