Rearranged theories of cognition and distribution:

Distributed learning perspectives in the work of Engeström and Hutchins

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"There is no royal road to science, and only those who do not dread the fatiguing climb of its steep paths have a chance of gaining its luminous summits"

Karl Marx
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A recurrent problem in contemporary psychology and pedagogical research is the cumbersome focus on the individual as the unit of analysis and the following disregard for the influences of the larger cultural system. In response the establishment of a Science of Distributed Learning Center (SDLC) has been proposed, with the intended to “focus on the nature of learning as a distributed process across different levels of research analysis and across a wide range of content areas and learners” (Project summary 2005).

In the review of the compatibility of the participating research groups, the need for integration of the theoretical and practical backgrounds represented by the contributing participants was evident, yet it remained somewhat unclear “how theories of distributed cognition as different as Hutchins and Engeström -- focusing on external representation artifacts vs. much larger activity structures, respectively -- can be brought together”. Yet there is an understanding of the problem as potentially solvable once identified build into the question itself, as it continues to point out; “Integration across diverse theories/methodologies at globally distributed sites will need to be an on-going concern.”

In an internal electronic communication regarding the problem, it was noted that “What is shared between Hutchins and Engeström is more important than what is different: Both of them see distributed cognition as taking place in systemic formations of practice, made up of interacting humans and their (external and internal) artifacts. Both of them see these systems as developing in multiple embedded time scales.” (Engeström 10.02.05), showing the outline for a joined theory of distributed learning which satisfies both conjectures.
The paper at hand deals with an analysis of the separating discrepancies and uniting resemblance in the theoretical work of the activity-theoretical school, represented by Yrjö Engeström with the weight placed on his seminal work from 1987, “Learning by Expanding”, and the perspective of distributed cognition as a critique directed at traditional cognitive science, embodied in the work of Edwin Hutchins, discussed mainly from the view point of his important work centered around cognition in relation to ship navigation in his work “Cognition in the Wild” from 1995. The effort is directed at investigating the two frameworks in relation to their perspectives on distributed learning activities. In order to do so, the paper will follow the conjectural trajectories of the two theories and provide a historical focus on how the two theoreticians arrive at their respective conclusions in order to engage in an examination of whether - diverging backgrounds aside - these two theories might be able to, not only converse, but also fill an important gap between two otherwise conflicting schools of thought and create leeway for a third, unifying epistemological perspective on the problem of distributed learning that regards both the natural-historical perspectives on learning and cognition as well as the social-scientific derived viewpoint.

**Tracing the epistemology I:**

**Engeström and the expansion of activity theory**

In order to arrive at a better understanding of the current form of the two conjectures it will be beneficial be begin by simply asking “What are the fundamental questions or problems the two theories seeks to answer or solve?” Answering this might be done by undertaking a *comparative epistemological analysis*, as proposed by the biologist and science historian Fleck (1935), thus pursuing the trajectories back to their point of origin
in order to understand wherein the basic differences might consist, given that in multidisci-
plinary research projects like the emerging SDLC, involving teams or clusters of re-
searchers who are geographically as well as theoretically distributed, it is imperative that
each individual researcher has an appreciation of the content and implications of the axi-
oms proposed by colleague researchers – especially in the current case where the attempt is
specified as unifying traditionally separated research traditions, i.e. social, cognitive and
computer sciences, in order to seek out the approaches which used successfully in
one framework might help solve the problems facing other approaches (Project summary
2005).

Without a unifying general understanding of the modes of thought dominant in
each of the disciplines unnecessary confusion will be the inevitable out come. Following,
laying the theoretical trajectories bare by means of a comparative epistemology might
offer the understanding necessary for this purpose, which allows one to make use of more
details and more compulsory connections, as the history of science teaches us (Fleck
1935).

**Engeström and the roots of activity.**

In one of the earliest paper on the topic of activity theory published outside the
Soviet Union, “*Learning by Expanding*” (1987) Engeström identifies the point of origin
for his line of work in the works of Marx, specifically in the first and third paragraph of

“*Thesis on Feurbach*”:

(1) “The main defect of all hitherto-existing materialism [...] is that the

Object, actuality, sensuousness, are conceived only in the form of the ob-
ject, or of contemplation, but not as human sensuous activity, practice, not
subjectively. Hence it happened that the active side, in opposition to materialism, was developed by idealism — but only abstractly, since, of course, idealism does not know real, sensuous activity as such.”

(2) “The materialist doctrine that men are products of circumstances and upbringing, and that, therefore, changed men are products of changed circumstances and changed upbringing, forgets that it is men who change circumstances and that the educator must himself be educated. Hence this doctrine is bound to divide society into two parts, one of which is superior to society. The coincidence of the changing of circumstances and of human activity or self-change can be conceived and rationally understood only as revolutionary practice.” (Marx 1886:13)

With this in mind, Engeström directs a critique at the sciences of the past century, pointing out that they have failed to conceive of a coherent theoretical instrument enabling us to deal with the developmental processes of a society in a constant state of flux, and that the agents inflicting these changes in return is a product of the activity surrounding him, which also must be addressed by the science. Thus, standing on the shoulders of the dialectic materialism as an approach to the historical and sociological problem of the human sciences, Engeström embarks on a quest to reform the Soviet activity theory. Where Vygotsky provided the original the original impetus towards a theory centered around contextualized human activity as the origin of the higher psychological functions, stressing that the explanation of a intricate phenomena as the human mind “is supposed to lie not in its reduction to single elements but rather in its inclusion in a rich net of essential rela-
tions” (Luria 1974), Leontiev is seen as the father of the activity theory itself. Leontiev elaborates the Vygotskian approach and states that the development of consciousness is based on an interpretation of the way “actions of other people are perceived and through them also the actions of the subject himself. Now they are communicated, signified by means of gestures or oral speech. This is a prerequisite for the genesis of internal actions and operations that take place in the mind, on the “plane of consciousness” (Leontiev 1978: 79). Leontiev further argued that an activity in which a person is involved is reflected in their mental activity, that is to say the material reality is presented to consciousness, but only in its vital meaning or significance as a cultural interpretation, based on previous experience.

What generally characterizes the activity-theoretical approach to the human subject is that they, the subjects, are understood by the actions they engage in, which often are abstractions of goal orientation and do not in themselves satisfy a need, but contribute towards the eventual satisfaction of a one, qua Leontiev’s famous example of the clapper participating in a hunt: In itself the clapping will not bring food to any table but within the larger arrangement the collaborative effort that is a hunt is constructed in a way that will. This goes to show how human actions must be interpreted in a social context of a shared work activity or distribution of labor, which leads to a distinction between activities, which satisfy a need, and actions that constitute the activities (Ibid). To this Engeström adds, “Human labor, the mother form of all human activity, is co-operative from the very beginning. We may well speak of the activity of the individual but never individual activity; only actions are individual.” (1987:66, original emphasis), providing an understanding of the units which societal achievements may be broken into.
Where Leontiev fails to produce an adequate unified model retaining all the basic elements of activity, Engeström constructs what has been known as the *expanded model of activity* – *expanded* in the sense that it moves into territories hitherto uncharted by activity theory (See figure below. Adopted from Engeström 1987). Engeström never takes to direct a critique at the traditional activity theory, but it seems clear that he finds the theory somewhat lacking a properly defined unit of analysis that will make it practically applicable by adding another component, the community, and allowing for analysis of who shares the activity by calling for clearly defined borders in a complex that will consist of a multitude of activity systems. The essential task is, says Engeström, “always to grasp the systemic whole, not just separate connections” (1987: 78).

In sum, this expanded triangle of theory is *the* unit of analysis; scaling down to a smaller view point, e.g. undertaking an analysis of the triangular relationship depicted in the top as the “subject - instrument – object” relationship would never reveal the full spectrum of power influencing this relationship, thereby blinding the analysts to crucial actions shaping the outcome of the activity system in which this relation is only a part.
Bridging troubled waters – A fundamental cohesion.

Before moving on to the discussion of how Hutchins theory of distributed cognition arrives at its answers, it will be helpful to begin with a point to which both theories seem to be connected: if we draw forth the second paragraph from Marx’ “Thesis on Feuerbach”, which Engeström excluded when discussing the conditions for his inquiry, we see Marx stressing the importance of setting forth into scientific inquests from a point fixed in a world of praxis, not speculation:

*The question whether objective truth can be attributed to human thinking is not a question of theory but is a practical question. Man must prove the truth, i.e., the reality and power, the this-sidedness of his thinking, in practice. The dispute over the reality or non-reality of thinking which is isolated from practice is a purely scholastic question* (Marx 1886:13).

Engeström support for this point is given *a priori*, but compare this to Hutchins, when he says “the real power of human cognition lies in our ability to flexibly construct functional systems that accomplish our goals by bringing bits of structure into coordination [...] a proper understanding of human cognition must acknowledge the continual dynamic interconnectivity of functional elements inside with functional elements outside the skin” (1995: 316). There seems to be a basic agreement between the two theories to focus on the dynamic aspect of human activity and, more important, to begin the analysis by assuming that any and all relationships that will be addressed has its origin in practice, in the this-sidedness of thought – thus we see them both leaving behind the century old Cartesian debate springing from the notion that man is “*a substance whose whole essence or nature consists only in thinking, and which, that it may exist, has need of no place, nor is*
dependent on any material thing; so that "I," that is to say, the mind by which I am what I am, is wholly distinct from the body” (Descartes 1637), in favor of a theoretical stance that has the objective activity of man as constituent for higher mental functions, so that – to play on the words of Descartes - the mind by which I am what I am is not only wholly inseparable from the body, but also brought to life by the world in which it nests, and that all cognitions are originated in a social realm; “culture is a cognitive process [...] and cognition is a cultural process” (Hutchins 1995: 354). The idea is to point out that even though many suppositions separate the two as both theoreticians and practitioners they may still be seen in the light of a common epistemological light as based upon a critique of the method used by traditional social and cognitive science and thus sharing the common goal of placing cognition and culture as mutual productions and as the common unit of analysis.

Tracing the epistemology II:

Hutchins and the revolution: a critique of cognitive science.

The historical development of Hutchins theory on the distribution of cognitive labour as the unit of analysis is less explicit than it is in Engeström’s line or reasoning. Where Engeström is concerned with developing an already existing theoretical material, Hutchins is, in somewhat ironic contrast, concerned with a project that might be seen as a revolutionary praxis of scientific nature. The project he sets forth to fulfill is the formulation of a very specific critique directed at what might best be viewed as the thought collective (Fleck 1935) comprising a large part of contemporary cognitive science: “Much of cognitive science is a attribution problem: we wish to make assertions about the nature of cognitive processes we cannot, in general, observe directly. [...]In this attribution game,
there has been a tendency too put much more inside than should have been there” (1995: 355f). The notion of the thought collective is borrowed from Fleck's ingenious work on the construction of facts in scientific contexts. Hutchins' scheme is exactly that: cognitive science is indeed a contemporary construct, and a wrong one at that. Fleck's cardinal point, as well as Hutchins', it seems, is, that the all knowledge is conceived on a basis of shared beliefs, constituting a thought collective in the form of a community of persons mutually exchanging ideas or maintaining an intellectual interaction. Any scientific fact is thus a fact only as a function of the cognition of the subjects, or in his own words “cognition must not be constructed as only a dual relationship between the knowing subject and the object to be known. The existing fund of knowledge must be a third partner in this relations a basic factor of all new knowledge”(Fleck 1935: 39) Following this line of thought, any given scientific fact is on the one hand a construct that has emerged over time and now wields a certain power over the thought style, i.e. the cognitive patterns of any given group of people, and on the other hand never more factual than a differing cognition might succeed the current, i.e. change the cognized shape of a flat world into a round one. Hutchins seem to know this better than any when he, discussing the foundations of his proposed adjustments to the field of cognitive science, says “in order to construct a new framework I will have to deconstruct the old one.”

Hutchins thus understands the problem facing the thought collective that is the field of current cognitive science as deeply rooted in a set of incorrect assumptions originated in a commitment to the notion of all intelligence being trapped on the inside of a inside/outside dichotomy, leaving little or no room for the influences posed by culture. Here we see an explicit tie between Hutchins theory of distribution, to the basic statement
in Engeström activity theory: when the “intelligence” is distributed throughout the entire system, pulling out a single person from the system in order to assess the extent of their knowledge on a certain problem gives no evidence on how a given solution is likely to be achieved once the subject is performing in the ecology in which the problem arises. The distancing to the laboratory experiment is the natural starting point for both theories, and Hutchison points out, in words that could have been put forth by Engeström, that all theories regarding cognitive processes must firstly consider the divisions of labor, whether the labor is physical or cognitive, because this is seen to “require distributed cognition in order to coordinate the activities of the participants. Even a simple system of two men driving a spike with hammers requires some cognition on the part of each to coordinate his own activities with those of the other.” (1995:176)¹. When we compare this to Fleck when he states that “a thought collective exists whenever two or more people are actually exchanging thoughts” (ibid: 44), we see a where somewhat of common tie might have their historical root; the ideas are not only shared, they are somewhat of an scientific-historical echo pointing towards common, yet unrecognized, ancestors. Similarly nothing in Engeström’s theory speaks against conceptualizing a system of activity comprised of two individuals as the unit of analysis, as long as the completeness of the system is in question, but never the less contrasts Hutchins somewhat in mainly discussing the unit of analysis as one that grasps large-system dynamics (Cole & Engeström 1993).

¹ This notion might give the impression that the of the minimal system constituting a back drop for analysis is two persons – however in a yet unpublished chapter Hutchins points out that “An individual working alone with material tool is also a distributed system as is an individual working alone without material tool. So is an individual brain situated in the body, or the brain without consideration of the body because cognition is distributed across areas of the brain” (2005: 2)
Revolt and progress.

After affirming that “by moving the boundary of the cognitive unit of analysis out beyond the skin of the individual, we discover a largely unexplored realm of emergent cognitive effects” (2005)\(^2\), Hutchins raises the question of where, then, we should be looking for answers to the questions about the organization of behavior in this great unknown. Having initially delimited the importance of the historic background of Hutchins revolutionary praxis, I will now take that somewhat back by briefly following the trajectory of the theory to its origins in classic cognitive science in order to understand where, indeed, the science of distributed cognition will be looking for its answers. However, Hutchins does not separate out individual sources to the pitiful current state of affairs in the field, but limits himself to point a few constituting factor out – first of all the symbolic representation, i.e. the notion that what is inside the head is modeled after entities outside the head, leading to the idea of the mind as somewhat of a digital entity which showed the way to the next big mistake, namely an approach to cognition as both comparable to and explainable by an analogy of the mind as a complex of software programs which, as the natural conclusion following this line of reasoning, would be somewhat replicable on computer systems given the correct prior understanding of the task one was trying to simulate. Thus constraining research in the cognitive properties and capabilities of the human mind, research was now forced to accept a range of limitation, which in return would breed a cascade of peculiar understandings. For instance Newell & Simons point that the mind is merely a symbol processing system and “symbol systems are an interior milieu, protected from the external world, in which information processing in the

\(^2\) The quote is from a paper that begins with the words “Draft: do not quote” – which makes exactly the opposite a necessity. And it is a exceptionally clear and clever paper.
service of the organism can proceed” (Newell et al. 1989: 107), thus cutting both the motor system and any perceptual influences off. The last 30 years of cognitive science, says Hutchins, has been haunted by the attempt to remake the person in the image of the computer (1996: 363), and time is ripe for a paradigmatic shift (Kuhn 1962) – but where to? When Hutchins himself never clearly points out where he intends to send the curious to look for an answer to the problem of establishing the all-encompassing basis for this new field of distributed cognition, he never the less gives a clear hint, saying

“I will argue that several important aspects of a new organization are achieved not by conscious reflection about the work but by local adaptations to the emerging conditions of the work itself. The solution reached is one that we recognize in retrospect as being just the sort of solution we would hope designers could produce, yet is it a product of adaptation rather than of design.” (1996: 317)

So, on the one hand cognitive science must abandon the tradition that shaped a thought collective around the possibility of designing a solution to the problem of mind, and instead focus on how evolutionary process might bring forth the answers; in other words cognitive science must look towards the natural sciences rather than the cause-and-effect thought style predominant among the computer scientist and physicist. This point seems further instantiated by the work of one of Hutchins students', C. M. Johnson, in a paper concerned with the study of distributed cognition being applicable to the learning processes that unfolds among non-human primates tied to co-perception and translation of observed behavior into similar action. The discourse is at one time derived from
socio-cultural studies but also directed towards establishing of comparative phylogenetic study of distributed learning.

**Method and strategy I:**

**Hutchins' cognitive video ethnography**

After now having broken the science of cognition free from the ties of design solutions and laboratory experiments, and replaced it in its proper ecology, the question of methodology remains. Naturally Hutchins' work relies on case studies of ecologically situated performances. If we dive into an example provided by Alac & Hutchins regarding the process of learning correct interpretation of scanned images of the human brain in function, based on fMRI\(^3\), we get a series of outlines for the distributed cognitive approaches to the problem:

*To observe the cognitive process, much of which is instantiated in the environment of practice, we record digital video and describe the way in which scientists use fMRI technology to model the human brain. […] We document how an expert and a novice use a variety of semiotic resources to collaboratively create observable cognitive processes that enable them to identify meaningful entities […] We analyze how representations of messy experimental data become organized meaningful phenomena through the extensive use of gesture, language and material structure distributed across spaces of practice*

The example representative for a series of other studies of distributed cognition: in airplane cockpits (Hutchins 1995, Hutchins & Holder 2001, Hutchins, Holder, & Alejandro

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\(^{3}\) fMRI – functional Magnetic Resonance Imaging
Pérez 2002) and ship navigation: (Hutchins 2002, Hutchins 1995). The interpretive approach is spread out on multiple supplemental approaches, i.e. cognitive field notes, videotaping the interactions from a fixed noninvasive point, interviews, and participation-based observation. The analysis following the documentation focuses the use of gestures, semiotic resources of the actors, use of primary artifacts or culturally shaped and appropriated tools. At a micro-level of analysis, Hutchins describes the detailed coordination of representational states across media that take place for the, often relatively simple but critical, coordination of the activity at hand. At a macro level of analysis, Hutchins also describes how these coordinated activities structure a meaningful experience for the people engaged, enabling individual learning of procedures and cultural practices (Hutchins 1995). Yet the crucial point is that the analysis to a large extent is focused around face to face interactions and the intra-systemic coordinations of the people involved in the activity, focusing the way in which various representational states are conveyed across media.

In doing so Hutchins shows how “the properties of this computational system are as much determined by the nature of the representational media and the pattern of interconnection among representations as they are by the cognitive properties of the individual actors." (Hutchins 1992:2). Over the years specially the use and digitalization of video has come to play a crucial role: “Recent advances in recording technology have made inexpensive digital video available to researchers. The flexibility of viewing digital video makes it easy to see new phenomena. This presents challenges to the theory, which then guides us to look for new things. And [...] the way scientist imagine their phenomena are critical." (Hutchins, unpublished manuscript 2005: 7) – a method that has somewhat of an resemblance with the circular notion of the phenomenological investigation; “phe-

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4 for discussion see: Wartofsky 1979:188ff.
nomenological reduction means leading phenomenological vision back from the apprehension of a being, whatever may be the character of that apprehension, to the understanding of the being of this being (projecting upon the way it is unconcealed).” (Heidegger 1975:22) – or in other words, the challenges posed to the subject by the material nature of the object structures the theoretical artifacts for the questioning itself. The being of this new, unexplained object becomes evidence for one's own presumptions and leads the investigator back to revise the theory that shaped the conceptual view of the being and now, once again, return and see the being of the object as constructed in a new way.

**Method and strategy II:**

**Engeström and the community.**

In these presentations of the approaches to cognitive systems we find crucial evidence for a methodological linkage between the two theoreticians; in the methodological section of *Learning by Expanding* (1987), Engeström stresses that the first step of an unrestrained developmental research consists of, on the one hand, a grounding phenomenological insight into the nature of the discourse and problems as they are practiced and experienced by the subjects, and on the other hand it consists of a delineation of the activity system under investigation (1995: chp5). As we have seen, the cognitive system (Hutchins) and the activity system (Engeström) may, under certain conditions, be treated as synonymous – and even more so in this shared view on the reciprocal relationship between the theoretician and his subject material. The notion of phenomenological insight refers to the identity of any activity as primarily determined by its object (Leontiev 1978). The object must be understood in relation to the preconceptions carried into the analysis, and vice versa, the presumptions must be readjusted to the properties of the in-
vestigated material. Thus, the analysis begins at a reaching of an understanding or agreement on the qualitative conversions of the subject material which in itself is seen as a separate system of activity. However, “the system of object-activity cannot be regarded as external to the central activity, to be only 'connected' with it. To the contrary, the object is to be analyzed above all as an integral component of the central activity while simultaneously acknowledging it as a relatively independent activity system of its own. This procedure, moving 'from within' the central activity out to the object-activity and back into the central activity, is essential if the researcher is to preserve his grasp of the self-movement, the self-organizational dynamics of the activity under investigation” (1995).

On the practical level there seem to be relative agreement between the applied methods: The analysis of activity systems relies on the researcher to understand the “need state and primary contradiction beneath the surface of the problems, doubts and uncertainties experienced among the participants of the activity. This may be accomplished through comprehensive reading of the internal and public discussion concerning the activity, through participant on-site observations, discussions with people involved in the activity or having expertise about it, and the like’.

Yet the overall achievement of Engeström's work seems to be an theoretical development and analysis that is less concerned with the meaning of micro-communication, e.g. gesture, voice level, turn taking, but is oriented towards the whole of a community as he approaches the problem field with the nomenclature that borrows from the organizational sciences (see Engeström 2005; Virkkunen, Engeström, Helle, Pihlaja, & Poikela 1997; Engeström & Middleton (Eds) 1996).
The role and understanding of artifacts in the two theories

As it should be evident by now, the idea of artifacts as both mediators and modes of thought plays a crucial role in both theories, calling for a closer look at how these are conceptualized and centered in the two approaches; In brief Hutchins states that “cognitive artifacts are involved in a process of organizing functional skills into cognitive functional systems” (2000), where Engeström draws the Vygotskian influence forth and remarks “In my interpretation, we may actually distinguish between two levels of mediation: the primary level of mediation by tools and gestures dissociated from one another […], and the secondary level of mediation by tools combined with corresponding signs or other psychological tools.” (1995). Again we see how Hutchins draws from a line of thinking where the artifacts are understood primarily as the concrete instruments playing its role in the activity or computation (Clark 2001). Yet he seems meets the Vygotskian notion of language as an artifact, as he, when discussing joined artifact mediated problem solving points out that “the structure of language will affect the properties of the group even if they do not affect the cognitive properties of the individual in the group” (1995: 232), meaning that the situated discourse that allows for addressing a problem at hand might be natural to the individuals and function as their everyday mode of thought but is never the less crucial for the performance of the group in that they rely on the existence of this shared cognitive tool in order to reach a collective understanding of the nature of the problem. The existence of the joint cognitive properties displayed in the world is thus crucial to the development of consciousness in the first place. A notion that is clearly expressed by Vygotsky when he says 'The use of artificial means, the transition

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5 See: Vygotsky 1979; Wartofsky 1979
to mediated activity, fundamentally changes all psychological operations just as the use of tools limitlessly broadens the range of activities within which the new psychological functions may operate. In this context, we can use the term higher psychological function, or higher behavior as referring to the combination of tool and sign in psychological activity." (Vygotsky 1979: 55 in Engeström 1995).

Wartofsky, with basis in Vygotskian thinking, goes further into the debate and suggest a hierarchical model of the artifacts, allowing for a specified discussion about these. Primary artifacts, says Wartofsky, “are those directly used in [the] production;” (1979:202), and the main concern in the writings of Hutchins; the concrete artifacts with embodied function that visibly modulates the interaction. The next level, the secondary artifacts "are those used in the preservation and transmission of the acquired skills or modes of action or praxis by which this production is carried out. Secondary artifacts are therefore representations of such modes of action, and in this sense are mimetic, not simply of the objects of an environment, which are of interest or use in this production, but of these objects as they are acted upon, or of the mode of operation or action involving such objects" (1979: 202). The propositions of the second level is somewhat abstract but never the less allows one to view the interactions between the subjects in any activity system, regardless of scale, as being acculturated to a specific thought style, allowing room for analysis that stretches over time in order to understand the dialectic relationship between the concrete tool and its translation into the symbol which shapes the interactions by its representational nature.
Never the less the general discourse on artifacts in Hutchins work implies that even though he would certainly agree to the tradition based on Vygotsky and Wartofsky, the project he is engrossed in is directed towards concretization of problems raised by traditional cognitive science. As pointed out, Hutchins is concerned with the use of the concrete tool in concrete situations, not as much with the internalization of it as a culture-historical symbol and on the other hand with language as a mediating mode of communication or a cognitive operation, without regarding the abstract implications of its constitution as an actual artifact by itself.

The legacy of Vygotsky:

Towards a unified theory of distributed learning.

When addressing the prior raised question regarding whether the two theories are compatible or not Hutchins has the following to say:

“One way to make that argument is to say that the activity theory and distributed cognition approaches share a unit of analysis (which is the correct one for understanding distributed learning), they share the understanding that this unit of analysis contains many elements (some social, some material, all historically contingent), they share the assumption that these elements are richly interconnected (when one changes, others change too), and they share the assumption that learning must be understood as a processes that happens in the interactions of these elements, not simply in terms of what happens inside individual learners. There are, of

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6 A deeper discussion of the role of Vygotskian pedagogy in Hutchins work will follow. Hutchins credits the Russian tradition for many of his inspirations – yet his praxis is derived from and addressed back to the field of cognitive science and therefore not concerned with that particular course of abstraction.
course, differences of emphasis among the members of our team, but those differences reflect a healthy diversity of approaches in our community.

That is a strength, not a weakness”.

When this might serve as a conclusion in itself the question of how this common understanding of learning as a distributed phenomenon will manifest itself in the actual research on the learning processes. A remaining task is to ask how the two theories conceptualize learning within the respective systems. As we shall see, it is in the discussion concerned with learning, it is here that we find the most unambiguous commonalities: influence from the Vygotskian tradition regarding learning in the zone of proximal development is especially apparent in both stances. The zone of proximal development is defined as "the distance between the actual developmental 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: 86). Compare this to Hutchins when he engages in a discussion about a specific training situation on a ship: “[...] if L did not share the work space with S and C or if there was a strict division of labor such that individuals did not monitor and participate in the actions of their fellows, this opportunity for L to have even peripheral involvement in the task that will someday be his would be lost” (1995: 270) – the learning that takes place and the discussion that frames it clearly carries the hallmark of the zone of proximal development, yet Hutchins only later refers directly to Vygotsky and the pedagogical insights of the Russian tradition in later chapters. However, much of the discussion regarding learning practices in centered around a term coined by Hutchins, namely the Ho-
rizon of Observation⁷, an elegant notion that, at the one hand takes the principal's zone of proximal development into consideration but also points towards how the constraints to what might be learned by the individual is exercised by the spatial and temporal position in relation to others. With this notion of an observational limit to potential learning Hutchins’ is drawing attention to two things; firstly that the milieu in itself must be regarded as just as important an influence in the constructing the zone of proximal development as any intentional action might, and secondly that his is a theory of learning that discusses the learning of adults in their work environment where the formal instruction often is replaced by participation. The horizon of observation is the boundary that decides what can be seen and heard – and thus participated in – by each member (1995:268ff), as opposed to the zone of proximal development, which is mainly concerned with the direct transfer in a spatially and temporally delimited mediated interaction.

Engeström on the other hand engages in a critique – or expansion – of the theory with what he calls a provisional reformulation of the zone of proximal development; it is in his line of thought constructed as “the distance between the present everyday actions of the individuals and the historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions. (1995). This means that, contrary to Hutchins horizontal constraint, training and knowledge appropriation is only taking place within the zone of proximal development when the activity is directed at developing new forms of action, not just at letting the learners acquire the societal existing or dominant forms as something individually new. Never the less the two theories seems to reach each other again when we understand that these new activities “aim at developing historically new forms of activity implies an i-

⁷ A poetic notion that obviously has its origins in the maritime milieu in which it originated
structional practice which follows the learners into their life activities outside the classroom” (ibid), a point which could just as well be put forth by Hutchins. It also implies the necessity of forming true expansive learning activity in and between the learners. The instructional task is thus twofold: to develop learning activity and to develop historically new forms of the central activity - work, for example.

**Reaching agreement and setting aside differences**

Thus, as we have seen, the two theories are in agreement on a number of crucial points, superseding a discussion of a basic coherence. Never the less it seems to be the case that the clearest agreement is, much to the benefit of the SDLC, in the approach to the question of learning, in that both draw from and expand on some degree of explicit inspiration from the Vygotskian pedagogical strategies and discourses. As pointed out, the unit of analysis in the two theories is characterized by a shared understanding of the structuring of the human mind as originated in the this-sidedness, moving from the social world to the shaping of the subject on a basis of cultural experience, but never the less differs in their application of this common view – a point that may easily be exploited to the benefit of the SDLC by allowing detailed analysis revolving around how humans learn to learn, how information gets distributed through networks of any scale, constructed around mediating artifacts with basis in a shared understanding of the implications of information distribution, but directed at multiple levels in the activity system.

**The science of distributed learning – what is it?**

The discussion could – and most likely it will – continue without an end. Never the less, if one where to bring forth a conclusion on the previous discussion that aims to-
wards the science of distributed learning, the words of Jim Levin seems to summarize it perfectly: “Just like Ed Hutchins sees all cognition as distributed cognition and not just as an additional part of the cognitive science field, so do we see distributed learning: it is not just a kind of learning – all learning is distributed” (Personal communication 11.28.05).

When all differences and similarities are taken into consideration it becomes evident that the two theories are characterized mainly by a number of commonalities, making them highly compatible – yet it is crucial to treat them as separate theories in order to maintain the two differentiated perspectives and utilize their diversity rather than strive towards a merge. We have now seen how the two theories can be applied as the natural extension of each other with the help of a distributed community of researchers; one theory expands where the other narrows and the other broadens where the first contracts. With the correct implementation - letting the two fight back to back – an analysis that considers both the micro-interactions in a community of learners as well as the community in its whole is within reach and the concept of distributed learning will – as a consequence of its utilization in a community of distributed learners, teachers, peripheral participants, old-timers and newcomers – be able to fulfill the proposed goal of the center, namely to “advance the science of distributed learning, which will lead to powerful new ways to understand and to improve learning” (Project summary 2005).
References


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