Culture of Embodied Skills in Human Computer Interaction

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Summary

The role of the computer in the world has evolved from specialised computing machines to information devices that pervade our daily lives. As research in Artificial Intelligence attempts to make computers more human, some approaches to human-computer interaction are becoming analogous to human-human interaction. In our attempts to integrate computers into our daily lives in the world, we take into account the embodied nature of our interactions with each other and object we manipulate. Phenomenological views on language and communication emphasise actions associated with our speech, which are ignored by pure natural language systems. Hubert Dreyfus divides our embodiment into three modes as described by Merleau-Ponty: innate structures, basic general skills, and cultural skills. In this paper, I will demonstrate how integrating a multiplicity of input channels leads to benefits in interactive efficiency and robustness, and I will also show that multimodal systems should take into account not only the user's thoughts but also the user's emotions. In this way, computers can hope to share some of the phenomenological experience of humans, bringing us closer together in a more intimate form of interaction. To deal with these issues, I apply the philosophy of technology approaches of North American philosophers Don Ihde and Robert Rosenberger to develop a phenomenology of relations between humans, computers and the world where technologies are seen as inherently non-neutral. This account of phenomenology is useful to highlight the importance of the habitual aspects and embodied skills of our everyday experience of the technologies.

Keywords: body, computer technology, human-computer interaction, Ihde, Rosenberger

I. Introduction

Computer technology provides a new way of understanding the world in terms of "embodiment," which we can think of as a uniquely sensitive and manifold interface (includes seeing, touching and hearing). The role of the computer in the world has evolved from specialised computing machines to information devices that pervade our daily lives. As research in Artificial Intelligence attempts to make computers more human, some approaches to human-computer interaction are becoming analogous to

human-human interaction. By attempting to emulate human conversation, natural language technologies are poised to replace traditional graphical interfaces as a more natural means of interaction. This approach, however, overlooks the embodied nature of communication, leading to serious difficulties in usability and implementation.

In this paper, I will demonstrate how integrating a multiplicity of input channels leads to benefits in interactive efficiency and robustness, and I will also show that multimodal systems should take into account not only the user's thoughts but also the user's emotions (i.e., through affective computing, cf. Rosalind Picard Affective Computing, MIT, 2000; Picard has argued that emotion is a crucial element in our experience of and interaction with the world, and has gone on to demonstrate the role that it can play in interaction with information systems. Picard model of "affective computing" is a broad one, encompassing not only computational responses to, but also computational influences upon the emotions of a system's users: Cf. Cognitive and Cultural Views of Emotions, DePaula & Dourish). In this way, computers can hope to share some of the phenomenological experience of humans, bringing us closer together in a more intimate form of interaction.

In our attempts to integrate computers into our daily lives in the world, we take into account the embodied nature of our interactions with each other and object we manipulate. Hubert Dreyfus divides our embodiment into three modes as described by Merleau-Ponty: innate structures, basic general skills, and cultural skills (Cf. "Merleau-Ponty and recent cognitive science" in The Cambridge Companion to Merleau-Ponty, eds. Taylor Carman and Mark Hansen, CUP, 2004). Innate structures describe the way our body is built, and basic general skills are skills we learn through our bodies (Cf. Irrgang Der Leib des Menschen, the Body of Humans, Steiner Publisher, 2009: The embodied being is the situation of human beings. See the Chapter three on "emotionality, mindedness, and creativity as a network of competence, which tells us about the ternary structure of embodied subjectivity). Cultural skills[1] describe our learned interactions not directly tied to the way our bodies are built. In order to understand users and interact with them as ready-to-hand participants and tools, computers should view them as embodied agents in the world with communicative and cultural skills[2] specific to their embodiment. Natural language technologies capture a part of those communicative skills, but fail to take into account the embodied aspects of communication. We acknowledge that the natural body gives us extraordinary means of interacting with each other and with the world. It is a phenomenology of how we come to find our way about in the world, whether it be the world of jazz, discourse, typing, tennis, or getting on or off the bus. (Cf. Hubert Dreyfus, Foreword to 'David Sudnow: Ways of the Hand', MIT PRESS, 2002). In "Ways of the Hand", Sudnow engages the question by analysing the

phenomenology of hand with Jazz and Piano how our bodies gain their grasp of the world; and at the same time it explicates important implications for those who want to understand the nature of skillful performance, including the limits of cognitivism.

Phenomenological views on language and communication emphasise actions associated with our speech, which are ignored by pure natural language systems. Dourish describes Wittgenstein's view of language as socially shared practices "consisting of language and the actions into which it is woven" (Dourish, 2001). These actions into which language is woven are inseparable from communicative meaning. Thus, language has an extra dimension associated with social conventions and actions, such as gestures, pointing and body language. Winograd and Flores describe language whereby "words correspond to our intuition about 'reality' because our purposes in using them are closely aligned with our physical existence in a world and our actions within" (Winograd & Flores, 1986). Thus, natural language systems' attempt to strip spoken language from its phenomenological correlates and actions is somewhat misguided, yielding an incomplete means of human-computer interaction. "We inhabit conversations as embodied phenomena in the everyday world."

As human beings in the world, we utilise our entire bodies for the purpose of communication (rather than simply our voices or our writing), thus motivating a multimodal approach to human-computer interfaces. The tone of our voice, our body language, our gaze all constitute communicative meaning, either consciously or subconsciously. Our inclination to communicate with all our bodily facilities, either for efficiency or greater expressiveness, is captured by Bunt's "Multimax Concept," which states that people do not leave modalities unused that are available and useful in a given communication situation (Bunt & Beun, 1998). Computers that monitor and measure the affect of students in the classroom can give helpful feedback to teachers. Recognizing other peoples' emotions and feeling or being affected by them are two different things, however. How an affective computer may induce the emotional context of a certain environment is an important problem to solve: "The emotions of the game (with the players) change how a player sees the field and those aren't things that one can get a feel from the film" (Dreyfus, 2001). The computer's intentional arc, with the addition of multimodal and affective computing, is still incomplete. Phenomenologist Hubert Dreyfus takes the issues of how human bodies in the world function in understanding the world and comments, "We have got bodies, and we move around in this world, and the way that world is organized is in terms of our implicit understanding of things like we move forward more easily than backward, and we have to move toward a goal, and we have to overcome obstacles." Those aren't facts that we understand. We understand them just by the way we are in the world, such as we understand that

insults make us angry and such as we have pains, frustrations and pleasures and such as we understand the agony and joy of other human beings. People state those as facts. I agree with Hubert Dreyfus that there is a whole underlying domain of what we are as emotional embodied beings which we can't completely articulate as facts, a domain that underlies our ability to make sense of facts and to find any relevant facts at all. Dreyfus emphasizes that, for a human being the experience of the world as a whole precedes the experience of independently distinguishable elements. Thus a depressed person experiences the world as "grey" and "meaningless" before specific elements stand out in it, and one may experience a new environment as "safe" or "threatening" before distinguishing discrete objects; it is the situation as a whole that draws out the experience. **(**Cf. Brey, (2001b). 'Hubert Dreyfus - Human versus Machine'. In: Achterhuis (ed.), *American Philosophy of Technology: The Empirical Turn*, Indiana University Press, pp. 37-63.)

Human-Computer Interaction (HCI) is concerned with the design, implementation and evaluation of interactive computer-based systems, as well as with the multi-disciplinary study of various issues affecting this interaction. The aim of HCI is to ensure the safety, utility, effectiveness, efficiency, accessibility and usability of such systems. In recent years, HCI has attracted considerable attention by the academic and research communities, as well as by the Information Society Technologies industry. The on-going paradigm shift towards a knowledge-intensive Information Society has brought about radical changes in the way people work and interact with each other and with information. Computer-mediated human activities undergo fundamental changes and new ones appear continuously, as new, intelligent, distributed, and highly interactive technological environments emerge, making available concurrent access to heterogeneous information sources and interpersonal communication. The progressive fusion of existing and emerging technologies is transforming the computer from a specialist's device into an information appliance. This dynamic evolution is characterized by several dimensions of diversity that are intrinsic to the Information Society. These become evident when considering the broad range of user characteristics, the changing nature of human activities, the variety of contexts of use, the increasing availability and diversification of information, knowledge sources and services, the proliferation of diverse technological platforms, etc. HCI plays a critical role in the context of the emerging Information Society, as citizens experience technology through their contact with the user interfaces of interactive products, applications and services. Therefore, it is important to ensure that user interfaces provide access and quality in use to all potential users, in all possible of contexts of use, and through a variety of technological platforms. The field of HCI is now experiencing new challenges. New perspectives, trends and

insights enrich the design, implementation and evaluation of interactive software, necessitating new multidisciplinary and collaborative efforts.

II. Phenomenology of Human Computer Interaction

One of the most important purposes of technology is to produce and use certain instruments to free ourselves from various kinds of work. However, it is also well known that the meaning of technology cannot be reduced to the role of instrumentality. For example, during the process of the production and use of technology unintended consequences sometimes arise, which are considered to be not only the source of creativity but also the origin of failures and accidents. This aspect of technology could be called the "otherness" of technology, as it demonstrates the unpredictable and unmanageable character of technology. Japanese philosopher of technology Junichi Murata tells us that the kind of philosophy of technology we have depends on how we characterize this "otherness" of technology, or on which facet of the "otherness" of technology we focus. A number of philosophers of technology conceptualize technology as a *mediator* of human experience. In these views, a technology comes between a user and the world and significantly alters the relationships between them (e.g. Ihde, 1990; Rosenberger, 2008; Verbeek, 2005). According to these theorists, the use of a technology is always non-neutral; a technology changes how the world is approached, understood, perceived, and acted on by its user (Rosenberger, 2008).

Drawing from the traditions of phenomenology and hermeneutical philosophy, the first program of Don Ihde (1990) analyzes the diversity of human-technology relations and shows the extent to which technology is nonneutral. The second program takes up the issue of technology as a cultural instrument, in part through a discussion of indigenous technologies, technology transfer, and neo-colonialism (Ihde, 1990). The philosophical tradition of phenomenology provides a perspective through which technological mediation can be productively explored. "Phenomenology" refers to an effort in philosophy to describe the nature of human experience, in all its bodily, perceptive, and conceptual (or preconceptual) facets (Ihde, 1990; Rosenberger, 2008). Canonical figures in this tradition, such as Martin Heidegger and Maurice Merleau-Ponty, have reflected on human experience of the use of tools and other objects. Building on this work, contemporary phenomenologists Don Ihde and Robert Rosenberger develop a perspective for understanding the experience of technological mediation. Sometimes Ihde's and Verbeek's work, and the work of others (including Rosenberger and Selinger) that build on his ideas, is referred to as *postphenomenology*. The Chapter II "Technoscience and Postphenomenology" (published in the Ihde, Don.

"Postphenomenology and Technoscience: The Peking University Lectures", SUNY, 2009) gives the illustration about inter-relational ontology; "As can be seen, in each set of human-technology relations, the model is that of an inter-relational ontology. This style of ontology carries with it a number of implications, including ones which imply that there is a co-constitution of, for example, humans and their technologies. Technologies transform our experience of the world and our perceptions and interpretations of our world, and we, in turn, become transformed in this process. Transformations are non-neutral."

According to Don Ihde and Robert Rosenberger, everyday users of computers come to embody their devices in significant ways; "These embodiment relations often become deeply transparent and deeply sedimented. When a person uses the computer to perform everyday tasks such as typing, reading emails, or surfing the Internet (of course which tasks qualify as "everyday" depends on the individual), she or he may grow barely aware of bodily interactions with the device. The bodily, conceptual, and perceptual habits this person has developed enable conscious attention to be directed to the tasks being performed with the computer, rather than on the technological mediation that makes those tasks possible" (Rosenberger, 2008).

According to Rosenberger's model, the high degree of sedimentation of the typical relation to a computer is exemplified by the experience of the keyboard. Rosenberger elaborates "As a user types, she or he has a deep bodily understanding of the placement of the keys. The transparency of this relation is so high that the user's conscious thoughts are occupied with the content of what is being written, rather than how typing is done. The user thinks in whole words and ideas as her or his fingers tap out the spellings of those words on the keyboard. However, imagine turning the keyboard upside down; this user would not be able to apply the same bodily habits to this new context of interface. When the keyboard is oriented in the normal way, it can be engaged with considerable skill. Oriented differently, these habits of relation become less relevant, if not an obstacle. The user must actively search for each key—thinking about what is written in terms of letters rather than simply meanings and whole words. The transparency and sedimentation of the relation must be slowly regained in terms of the upside down keyboard orientation" (Rosenberger, 2008). Sedimentation is therefore related to the orientation of a human being with computer and technologies use. Sedimentation is habituated in an orientation in the technologically mediated world.

Rosenberger explains the affective role of sedimentation in computing world; "The everyday user also shares a hermeneutic relation to many aspects of the computer. Onscreen icons, buttons, and cursors appear as symbols that convey information. The

cursor itself as it is used, controlled by the mouse and keys, changes into different shapes, such as arrows, pointing fingers, swirls, and hour glasses. The user must be familiar with the meanings of these different symbols—the language of onscreen interface. If accustomed to interpreting these symbols, a high level of transparency develops and interacting with these encoded icons, buttons, and ever-morphing cursors comes as second nature. Their meanings are conveyed in perceptual gestalts. Refined habits of perception and interpretation enable the user to attend more to what she or he is doing than to interpreting symbols" (Rosenberger, 2008).

On the issue of *interaction with computers in a human-centered architecture* Rosenberger (2008 & 2009) provides us a solution on how do we interact effectively with information on a multiplicity of devices in a variety of places. Rosenberger (2009) argues for the interactions to be made understandable and usable for a wide spectrum of users, ranging from information specialists to novice users.

Human–computer interaction or **HCI** is the study of interaction between people (users) and computers. It is often regarded as the intersection of computer science, behavioral sciences, design and several other fields of study. Interaction between users and computers occurs at the user interface (or simply *interface*), which includes both software and hardware, for example, general-purpose computer peripherals and large-scale mechanical systems, such as aircraft and power plants. The following definition is given by the Association for Computing Machinery:

> *"Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them."*

Because human-computer interaction studies a human and a machine in conjunction, it draws from supporting knowledge on both the machine and the human side. On the machine side, techniques in computer graphics, operating systems, programming languages, and development environments are relevant. On the human side, communication theory, graphic and industrial design disciplines, linguistics, social sciences, cognitive psychology, and human performance are relevant. Engineering and design methods are also relevant. Due to the multidisciplinary nature of HCI, people with different backgrounds contribute to its success. However, due to the different value systems of its diverse members, the collaboration can be challenging. Human Computer Interaction is also sometimes referred to as the combination of **man–machine interaction (MMI)** or **computer–human interaction (CHI)**.

III. Human Technology Inter-relations is sedimented in the World

North American phenomenologist philosopher of technology, Don Ihde deals with non-neutrality of technologies. Don Ihde asks us to consider the technology (i.e., microcomputers) as part of the field of our experience and to pay close attention to what aspects of experience are selected, amplified, and reduced through interaction with various forms of technology. Technologies are subject to the philosophical reflection. Classical philosophy of technology, as told by Peter-Paul Verbeek and Don Ihde, tended to reify technology, treating it as a monolithic force, "Technology." Contrast to this, in his work nearly over the past 3 decades Ihde has demonstrated that technologies play a key role in our culture and in people's everyday lives; technologies are embedded in our societies. Considering the role of technologies, in the mid-1970s, together his colleagues at Stony Brook, Ihde developed an intentionally eclectic school of experienced-based "experimental phenomenology" with bridges to pragmatism, which has concentrated on elaborating the ways that instrumentation mediates between human beings and the world.

Don Ihde characterizes technological mediation is in terms of three different categories of human relations to technology: embodiment relations, hermeneutic relations, and alterity relations. These three kinds of relations point out different manners in which technologies figure in human experience. In the rest of this section I apply these kinds of relations to human-computer interaction, what Ihde calls "transparency," and what Rosenberger refers to as "sedimentation."

The first kind of relation that Ihde identifies is called an *embodiment relation*. When one shares an embodiment relation to a technology, one experiences the world *through* that technology (Ihde, 1990, p. 72). Though using a technology may significantly alter a person's perceptions or abilities, the user may become accustomed to the technology's presence. The user may actively move the glass to achieve better focus or greater magnification, yet at the same time she or he may remain largely enthralled with the object of investigation. In Ihde's language, this person *embodies* the technology (Rosenberger, 2008).

The second kind of relation to technology is called a *hermeneutic relation*. The term "hermeneutics" refers to a tradition in philosophy concerned with the nature of textual interpretation. A hermeneutic relation is one in which the user interfaces with the technology by reading off it and interpreting that readout (Ihde, 1990, p. 80). An example is a wall clock. To learn the time of day, one looks at the device and interprets its current physical composition. For example, experts may actively debate the meaning

of an instrumental readout, such as doctors considering the implications of a medical image, or meteorologists interpreting satellite data (Rosenberger, 2008).

The third kind of relation to technology is called an *alterity relation*. The term "alterity," borrowed from the philosophy of Emmanuel Levinas, refers to the special experience of the presence of another person. According to Ihde (1990) and Rosenberger (2008) some of our relations to technology partially resemble the experience of interacting with a person. Ihde says we relate to these devices as "quasi-other" (Ihde, 1990, p. 97 & Rosenberger, 2008).

A second variable is what Rosenberger calls *sedimentation*. This refers to the level of habituation that accompanies an individual's relationship with a technology. On the issue of "Sedimentation" in his paper *Habitual body and memory in Merleau-Ponty* (in Man and World 17, pp. 279-297(1984)) Edward Casey has described the phenomenological importance of sedimentation and habitual body. Sedimentation is a phenomenological term, first it was founded in Austrain born German phenomenologist Edmund Husserl (in Experience and Judgment). Husserl called it in German language as "Niederschlaege." In the book "Phenomenology of Perception", French phenomenologist Merleau-Ponty has analyzed the term sedimentation at some length. The notion of sedimentation is a central part of Husserl's view on intentionality. One's present experience of the world depends on one's past experience and activities through a process of sedimentation. Sedimentation is a crucial in the genesis of intentionality and functions as a horizon for all present experience of the world. It becomes reawakened in the individual acts, and it is revisable. The human body is playing a keyrole in the sedimentation.

Casey writes "Sedimentation is implied by my very being-in-the world, which must be as continually resumptive of acquired experience as it is pro-sumptive of experience still to come. In fact, sedimentation is the necessary complement of spontaneity, since these form the two essential stages of all "world-structure" for Merleau-Ponty. It is revealing that in discussing sedimentation Merleau-Ponty mentions character as a leading example and describes in some detail the experience of knowing your way around a house. Both are aspects of "acquired worlds" which precipitate themselves into my ongoing experience. Even if sedimentation typically begins with a particular person or place, its main tendency is toward depersonalization and generalization (cf. Phenomenology of Perception, 137, p. 142)."

Sedimentation is directly related with experience, which has a common point with Pragmatism. Casey further elaborates "What sedimentation teaches us, therefore, is that even at a moment of human experience when we might be most tempted to employ

terms connoting sheer passivity - e.g., as in the locked-in formation of sedimentary rocks, where depth signifies merely greater age or mass - an element of agency is at work, a factor of what Husserl would call "activity in passivity." And if habit memory is a main means of effecting sedimentation, and thus of giving a depth that is not objectively determinable, it cannot be through the working of the strictly habitual in the sense of the routinized: a routine is nothing but an inert pattern of behavior."

It seems to me the sedimentation has something to do with habituation (of body) here takes its most concrete form in the body's inhabitation of the world, its active insertion into space and time: "we must therefore avoid saying that our body is in space or in time. It inhabits space and time" (PP, p. 139).

In fact, the habituation which such inhabitation accomplishes involves a delicate dialectic between the implied passivity of enclosure (for space and time undeniably act to contain us) and the activity of getting to know our way around in a given circumstance. This is why it is true to say both that "I belong to [space and time]" and that in turn "my body combines with them and includes them" (PP, 140). Inhabiting, taken as a paradigm of the bodily expression of habit memory, is at once "wholly active and wholly passive" (PP, 428), in the world and of it. It is made possible by sedimentation even as it carries sedimentation itself to new depths.

It is always composed of motoric and perceptual elements in an inextricable mixture, Casey argues. Whereas its temporality is most adequately exhibited in the process of sedimentation, its spatiality is best construed in terms of an intuitive incorporation of the space in which it is enacted. Thus a typist employs, Casey says, certain bodily habits (in this case they are skills) so as to modulate manual space in a maximally dextrous manner. Not only is there an intuitive gauging of the positions of the keys on his or her typewriter, but the keys become part of the typist's total intentional arc (Casey acknowledges Merleau-Ponty's phenomenology of embodiment on sedimentation):

> *"When the typist performs the necessary movements on the typewriter, these movements are governed by an intention, but the intention does not posit the keys as objective locations. It is literally true that the subject who learns to type incorporates the keybank into his bodily space. (PP, 145)"*

Therefore, in having a habit (and we should keep in mind that habits are pre-eminently things we have as the origin of "habit" in habere, reminds us, Casey argues), we possess a world at once sedimented and open to free variation. Beyond the typist there is the organist, who provides Merleau-Ponty with a paradigm case of the creatively

habituating: for the organist can adapt himself or herself within an hour to an organ he or she has never played before and differing markedly in structure from one's customary instrument.

In the words of Rosenberger, sedimentation is also the level of force of one's "force of habit." If a person encounters a familiar technology and is strongly inclined to experience it in a particular way, this person's relation to the device is deeply sedimented, says Rosenberger. To explain this phenomenon of sedimentation, Robert Rosenberger (2008) illustrates the phenomenology of human relations to technology (which can be significantly applied to the educational aspects of human-computer interaction) as "the experience of driving provides helpful examples. If a person is accustomed to driving a manually shifted car and suddenly finds her or himself in an automatic, this person may continue to experience some of the habitual relations to the car in terms of driving a manual. This driver may feel inclined at times to reach down toward a stick shift or step down on the clutch. Hermeneutic relations also can be more or less sedimented. Our relations to wall clocks are deeply sedimented in terms of the clock's right-side-up orientation. While one could possibly read an upside down clock, this relation would not bear the typical level of transparency" (Rosenberger, 2008).

IV. Phenomenology applied to Computer Use in Everyday Life

The application of the phenomenological concepts to the experience of computer use draws out particular features of our interactions with these devices such as human-computer interaction; As described by Rosenberger (2008) "this 'phenomenological' account is useful is that it highlights the importance of the habitual aspects of our everyday experience of this technology *use*." Ihde and Rosenberger (2008) suggest that "these kinds of observations can be helpful to projects such as (1) thinking about how the rapid advance of computer technology is experienced, (2) determining the roles that our habits of experience play in problems related to computer use, and (3) addressing those problems."

To explain the sufficient use of technology use and to overcome the occluded problems in human-computer interaction, Rosenberger elaborates "The speediness of technological advance is a feature of computer use that is impossible to ignore. Once one has become accustomed to a kind of computer, program, or mode of interface, it is already on the way to becoming obsolete and replaced. One goal of those who study human-computer interaction is designing modes of interface into which new users can smoothly transfer. Often, this project is approached in terms of making interface more "natural" and "ergonomic." Or researchers attempt to design interface that is "obvious" and "intuitive" (Rosenberger, 2008). For example, Rosenberger comments that "part of the hype over

the current generation of hand held devices that access the Internet, such as the iPhone, is that their use is notably intuitive and smooth" (Rosenberger, 2008). The phenomenological concepts explored here are useful for articulating a further feature of this goal: "the identification and development of the bodily, conceptual, and perceptual habits that enable a user to engage ever-advancing modes of interface. This sort of investigation could attempt to discern the kinds of habits that training methods should actively develop in new users" (Rosenberger, 2008).

It can be seemed that some users have found some of their interactions with the computer to be unbeneficial or even unhealthy (Rosenberger, 2008). Some spend time using the computer or Internet when it might be better for them to engage in other activities (for example, fulfilling work obligations or getting exercise and co-curriculum activities, for example engaged in craft works and sports). College campuses offer support groups to aid students and school children that are addicted to the Internet, spending too much time on the computer. Bowers (2003, 2000a & 2000b) has done some good works on how the computers can be used effectively in learning and education by school children in schools and colleges. Bowers (1988a, 1988b) argues in the terms of Don Ihde (1990) to consider how experience is mediated by the technologies we use. Bowers (1998a) asks us to consider the microcomputers as part of the field of our experience and to pay close attention to what aspects of experience are selected, amplified, and reduced through interaction with various forms of technology. How the use of a particular technology mediates and transforms the nature of experience can be understood, to start with the simplest example, by looking at what aspects of experience are amplified and reduced when we use a pencil; "Use of a pencil amplifies the ability to express our thoughts in written form, and because of the characteristics of this technology we have the time to reformulate our thoughts in the process of writing them down" (Bowers 1988a). By facilitating written expression, Bowers says, the pencil amplifies a whole series of characteristics that have social, cultural, and political consequences: "a privatized form of communication, a decontextualized form of thought, creation of a text that takes on an independent existence thus allowing for critical analysis, and communication with an anonymous public." (Bowers 1988b, p. 42)

To take another example, Bowers says, we can ask what the use of the telephone amplifies and what it reduces. It is a powerful technology for communicating voice over great distances, and as it reduces other aspects of the communication process it sharpens our tendency to listen carefully. But it reduces our ability to use context, body language (including facial expression) as part of the message system. In learning to think of how different technologies -automobile, fork, book, calculator, flute, etc. -

amplify certain aspects of experience while reducing others, it becomes less strange to ask what a microcomputer, given the current state of software, amplifies and reduces (Bowers 1998b). But in order to understand the educational significance of this line of questioning, Bowers comments "we need to put in focus a more complex view of experience -one that takes account of the cultural aspects. Thus before we can examine what the use of microcomputers amplifies and reduces we need to situate this technology in terms of how culture is transmitted and experienced in the classroom. This will enable us to see what is being amplified and reduced and how this selection process (which involves the microcomputer acting on the student) reinforces a nineteenth-century mode of thought" (Bowers 1998a & 1998b).

As explained in *Section III*, Don Ihde notes that humans have three fundamental ways of experiencing technology: as background in a field of relationships (technologies that control temperature, sound, light in a room, etc.); as an interaction with a technology (switches, gear levers, keyboards, etc.); and as a mediated experience in which the nature of the technology amplifies certain aspects of individual or cultural experience while reducing or eliminating others (Bowers 2000b). For example, the way in which the characteristics of a technology select certain aspects of experience for amplification and reduction can be seen in how the nature of the stick amplifies a person's ability to reach into a tree's higher branches while marginalizing the other aspects of embodied experience-smell, taste, sound, and so forth. A second example can be seen in how the nature of the telephone projects voice over vast distances while eliminating the visual aspects of interpersonal communication. Similarly, it is the nature of the computer that determines which patterns of thinking, communicating, or experiencing will be reinforced as well as which patterns will be marginalized or represented as nonexistent (Bowers, 2000a, 2000b & 1998b).

One of the characteristics of the computer that contributes to its existential and cultural amplification characteristics is that it carries forward the culture patterns associated with print-which many scholars have associated with a modern form of consciousness. The spoken word cannot be recovered with the same accuracy as the printed word and thus does not lend itself as easily to critical analysis which, along with the act of reading, is an individualized activity (Bowers 2000b): "In effect the printed word (which is always separated from context) has been represented by Western thinkers as a more accurate representation of reality than the spoken word-which is dependent upon context and interpersonal accountability." This privileging of print over the living reality of the spoken word has been an important source of Euroamerican oppression of Native peoples in the past, as explained by Chet Bowers in (2000b). Computer-mediated thinking and communication further exaggerates the cultural patterns inherent in print technology. It

does this partly by the way in which advocates of computers treat oral and print-based communication as identical, and by their emphasis on associating computer-mediated communication and thought with participation in global networks-as though the participants share an identical cultural epistemology (Bowers, 2000b).

While based on Ihde and Rosenberger, I would not suggest that the explanations for these kinds of problems are wholly captured by the phenomenological perspective explained here. Rosenberger explains "If there are problematic aspects to a person's habitual interactions with a computer, it may be helpful to render these interactions less transparent and less sedimented—that is, make the user more conspicuously aware of these interactions, and, if possible, draw down the level of force associated with the habits of these interactions. Effort could be placed into developing practices that selectively draw out otherwise habitually transparent features of computer use" (Rosenberger 2008).

Students must also be taught "non-cyber logic," to research in an old-fashioned library, with all the social and high level thinking skills that go along with it. They need to have their fingers "walk through" school with pen and pencil as well as with a mouse. Teachers should motivate and facilitate learning on all levels. Higher level thinking skills can only be honed, if one has something to relate to personal experience. The "what if" (if / then) expression is a necessary component of life, as well as a program. The Internet makes it possible to locate information in seconds, but it does not provide the human connection a simple smile from a teacher brings to the face of a struggling student. The social skills gained from a simple spelling bee last a lifetime. The human connection is a crucial element of the learning process. If not, then why is it mimicked in programs with question responses and module completion comments with motivating expressions. As described in „Teachers and Machine: The Classroom Use of Technology Since 1920" (Teachers College Press, 1986) Larry Cuban defined instructional technology as "any device available to teachers for use in instructing students in a more efficient and stimulating manner than the sole use of the teacher's voice. Hardware and software, the tool itself and the information the tool conveys, define the technology. " Every time new technologies were introduced, claims were made that revolutionary changes would occur in teaching and learning.

Just as books changed the way we stored and retrieved information and enabled us to invent the modern schoolhouse, Internet will change the way we think of learning and teaching. Digital technologies will change the way we store, use and retrieve information. It is because of these changes that digital technologies are very different from others in education. I also caution against thinking that the technologies alone will bring about the

change. The technologies only allows us to think of new ways of learning. Just as books require good authors, the new technology will require new kinds of learning design engineers. Professionals will evolve who can take the research from learning theories and blend it with the technologies. It is not a simple or inexpensive task, but we already see some glimpses of what the future may bring (Tripathi, 2001).

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presentation and interaction. At the GMD Institute for Applied Information Technology, prototypes and services are currently being developed in the framework of two projects: 'Crumpet', a European project with five partners, focuses on localisation of the user and personalisation of information; 'SAiMotion', a co-operation between GMD and Fraunhofer Gesellschaft, concentrates on context modelling and Human-Computer Interaction, at http://www.ercim.org/publication/Ercim_News/enw46/oppermann.html (Accessed on December 22, 2009)

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Notes

[1] Prof. Hubert Dreyfus gave a Presidential Address on "Overcoming the Myth of the

Mental: How Philosophers Can Profit from the Phenomenology of Everyday Expertise" at the APA Pacific Division Meeting, 2005 the Presidential Address (In his Presidential Address, Prof. Dreyfus convincingly discuss the question; how philosophers who want to understand knowledge and action can profit from a phenomenological analysis of nonceptual embodied coping skills we share with animals and infants). The texts of the lecture is located at
http://ist-socrates.berkeley.edu/~hdreyfus/pdf/Dreyfus%20APA%20Address%20%2010.22.05%20.pdf

[2] Reviewer Jack Reynolds argues in the review of *Taylor Carman and Mark Hansen, eds., The Cambridge Companion to Merleau-Ponty, Cambridge University Press, 2005* (Notre Dame Philosophical Reviews) "...Hubert Dreyfus (Merleau-Ponty and Recent Cognitive Science) and Sean Kelly (Seeing Things in Merleau-Ponty) continue their inquiries into the normative importance of developing skills and maintaining an equilibrium for Merleau-Ponty..." -For a complete reading of the review, please see at: http://ndpr.nd.edu/review.cfm?id=3881 (Mark Wrathall also refers about skills and embodied coping in the chapter "Motives, Reasons, and Causes"-where he writes *What the phenomenology of lived experience teaches us, Merleau-Ponty believes, is that our primary way of being in the world is a bodily existence that, for its part, is experienced neither as mental model of comportment, with determinate conceptual contents, nor as a merely physical interaction with physical objects.* And *our way of being in the world is one in which we are ready for objects to be situated at varying depths.* (pp. 115-118).