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Writing and the Mind

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Bridging the gap between writing and cognition: materiality of written vehicles reconsidered

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ABSTRACT:

A part of the criticism formulated against Literacy Theory results from the vagueness of the concept of mind it employs. The need for reconsideration of the concept of mind used within Literacy Theory can be clearly observed in the case of debates regarding technological determinism. In these debates, the classical Cartesian model of mind is usually employed. Such an internalistic framework leaves unexplored the cognitive consequences of the material dimension of writing. Therefore, in order to dismiss the accusations of technological determinism, the model of mind and cognition needs to be reconsidered. The paper demonstrates how the framework of situated cognition helps to account for the cognitive consequences of written artifacts themselves. Material characteristics of written vehicles such as spatial and temporal stability of the content, fixity of information with reference to page boundaries, lightness and small size of paper sheets, spatial layout of documents make up the most relevant material factors enabling the distribution of cognitive work.

KEY WORDS: Literacy Theory, technological determinism, situated cognition, extended mind, written vehicles, consequences of writing, materiality of writing, cognitive technology

1. INTRODUCTION

In the final parts of his "Orality and Literacy" Ong (2002) concluded: "Philosophical thinking cannot be carried on by the unaided human mind but only by the human mind that has familiarized itself with and deeply interiorized the technology of writing (…) **What does this precisely intellectual need for technology have to say about the relationship of consciousness to the external universe**? " (p.170). [emphasis MT]. The question asked by Ong can be understood in various ways. It can be interpreted as a special case of a mind – body problem, as a problem of boundaries of cognition and cognitive access to the external world, or as a problem of intersubjectivity and cognition of other selves. This quotation can also be understood as a question regarding the problem: what concept of the mind could accommodate such a role for technology in our thinking? The answer to this question would make explicit the relation between mind and its tools and therefore explain the cognitive consequences of writing as characterised in Literacy Theory (McLuhan 1994; Ong 2002; Goody and Watt 1975; Olson 1994).

Reflecting upon the concept of mind in the context of Literacy Theory is of particular importance due to the fact that part of the criticism formulated against Literacy Theory results from the vagueness of the notion of mind it employs. Olson (1994) argued that: "major assumptions regarding the significance of literacy are currently under dispute (...) What is required is a theory or set of theories of just how literacy relates to language, mind and culture. No such theory currently exists perhaps because the concepts of both literacy and thinking are too general and too vague to bear such theoretical burdens" (p. 13). It seems fair to assume that difficulties regarding recognition of the cognitive consequences of writing and literacy are to be overcome by reflecting upon the notion of mind. I will claim that the need for a relatively coherent theory of mind, language, writing and literacy can be satisfied by theories developed within the situated cognition framework (Aydede and Robbins 2009; Clark 2008; Theiner 2011; Menary 2007).

The need for reconsideration of the notion of mind within Literacy Theory can be directly observed in the case of debates regarding technological determinism (Finnegan 1988; Williams 1992). The classical Cartesian distinction between mind and body created an unbridgeable rift between mind and its material environment. Furthermore, a preoccupation with the symbolic, representational and intentional dimensions of writing and literacy observed in theories of communication and media studies (McQuail 2002; Meyrowitz 1985)

has left the link between the material dimension of writing and cognition unexplored. The framework of situated cognition may help to elucidate the relation between material dimension of writing and cognitive processing. By showing how the written artefacts are actually used to distribute aspects of cognitive processes (such as attention, memory and perception) into the external environment (Theiner 2011; Menary 2007; O'Hara et al. 2002) it may become possible to dismiss the Cartesian presuppositions of the critics who accuse Literacy Theory of technological determinism[i].

I advance my argument in four stages. Firstly, I use the classification of cognitive technologies provided by Dascal (2002) in order to delimit the scope of phenomena taken into consideration. Secondly, I argue that accusations of technological determinism hinge upon the sharp Cartesian distinction between mind and world that creates the explanatory gap between the material world and mental acts. Thirdly, drawing on the investigations of Theiner (2011) and Menary (2007), I sketch the alternative framework for analyzing relations between mind and writing and defend that framework by appeal to a detailed empirical study conducted by O'Hara et al. (2002). Finally, I summarise the arguments showing that the internalistic approach is in principle unable to contribute to the understanding of the materiality of writing.

2. THREE DIMENSIONS OF WRITING

I intend to show how the framework of extended mind is used to overcome duality between internal and external factors influencing cognition, and how this approach can contribute to a more detailed picture of the consequences of the material dimension of writing. In order to do so, the notion of material dimension of writing needs some elucidation.

The concept of writing (not to mention literacy) is extremely complex and multidimensional (Olson 1994; Barton 2001; Street 1999), therefore I do not maintain that the only way to think of writing is as a material medium of communication and representation. I do claim, however, that Literacy Theory advanced in the works of Goody (1975), Ong (2002) and Olson (1988; 1994) consider writing as primarily a material medium that possesses particular objective characteristics (such as spatial and temporal stability) that make

particularly appropriate for certain purposes. That is why it is in principle possible to consider writing as an independent factor influencing cognition.

I understand writing as a particular case of "cognitive technology" in the sense applied by Dascal (2002). He defines cognitive technology as "every systematic means – material or mental – created by humans that is significantly and routinely used for performance of cognitive aims" (p.36). He identifies three levels of cognitive technologies distinguished in terms of the level of intentional involvement. Cognitive technology understood as environment affects cognition independently of intentions of its users (their will or awareness). Cognitive resources are those aspects of cognitive technologies that are consciously and intentionally applied in order to perform the task. Finally, cognitive tools refer to those aspects of cognitive technologies which are systematically and deliberately developed and rebuilt in order to complete cognitive tasks. All of these levels dynamically interact with each other. Writing may be examined as a cognitive resource or as a cognitive tool but I focus here on the material aspect of writing understood as cognitive environment. This level of analysis is particularly problematic since it is writing itself that is supposed to produce cognitive consequences and accusations of technological determinism appear precisely at this level.

One reservation needs to be made here. The extended mind model of the relation between writing and cognition possesses an important limitation as applied to Literacy Theory and technological determinism. The heuristic value of the extended mind is limited to the analysis of material aspects of writing understood as cognitive environment. The cases I discuss below (Menary 2006; O'Hara et al. 2002) assume that the effect of writing requires that the tool is in the user's hand here and now. However, in the debate on Literacy Theory and technological determinism writing is in fact also understood as a cognitive resource and cognitive tool producing domain-general cognitive changes displayed when relevant tools are unavailable. The problem of technological determinism emerge at each of mentioned levels: at the level of cognitive environment, cognitive resources, cognitive tools. This paper however, addresses the problem of technological determinism exclusively at the level of cognitive environment. I intend to show that the extended mind framework is particularly useful at this basic level when writing is considered as material vehicle for information.

3. TECHNOLOGICAL DETERMINISM: EXPLAINING THE CONCEPTUAL GAP

Accusations of technological determinism voiced against Literacy Theory concentrate upon the problem of autonomous technology. According to the critics, classical investigations regarding literacy and writing take writing as an independent factor of cognitive and social change. Autonomy of writing means that it posses its own intrinsic characteristics independent of the intentions of individuals and the social context. Therefore, the consequences of writing can be in part derived from its intrinsic features (Meyrowitz 1994; Street 1999). Goody (1977) explicitly refers to the material and intrinsic characteristics of written artefacts claiming that: "Words assume different relationship to action and object when they are on paper than when they are spoken. They are no longer bound up directly with 'reality'; the written word becomes a separate thing, abstracted to some extent from the flow of speech, shedding its close entailment to action" (p.46). Street (1984) accused Goody and Watt (1975) of assuming the model of autonomous writing in maintaining that by virtue of being spatially fixed and temporally stable, writing "establishes a different kind of relationship between the word and its referent" (p. 44), and that this in turn contributed to the development of logic, Western rationality, bureaucracy, science and finally modern societies.

Why is the model of autonomous technology of writing inappropriate? Some researchers claim that it is empirically false since writing yields different consequences in different cultures (Finnegan 1988; Street 1984). Others maintain that it is empirically impossible to draw a clear distinction between consequences of writing itself as opposed to consequences of the social practice of using it (McQuail 2002). However, the most general argument against the notion of autonomous technology is that it remains in conflict with basic theoretical assumptions of social sciences and humanities. As Finnegan (1988) maintains: "The medium in itself cannot give rise to social consequences – it must be used by people and developed through social institutions. (...) What counts is its use, who uses it, who controls it, what it is used for, how it fits into the power structure, how widely it is distributed – it is these social and political factors that shape the consequences" (pp. 41-42). The intention of Finnegan is not simply to demonstrate that writing has actually different consequences than technology-oriented theories maintain. Rather, her aim is to develop the general argument against the assumption that technology in principle can be understood "as autonomous, that is

as itself self-standing and independent of social shaping" (Finnegan 1988, p. 10). The very assumption that it is possible to sensibly account for the consequences of writing itself, is called into question. According to Finnegan, what matters most in studying the consequences of technology and media is the intentions of individuals and socially defined aims and meanings because those are the only phenomena which can be in principle credited with agency and autonomy. Finnegan's considerations seem to be grounded in a completely reasonable belief that agency can be ascribed only to individuals and social groups, and not to inanimate tools. Therefore, the proper unit of analysis in studying consequences of writing are the intentions of individuals and the aims of social actors (Finnegan 1988; Williams 1992).

Haas (1996) called the tendency toward explaining writing solely in terms of intentions and aims the "transparent technology myth". In this framework, the performance of cognitive tasks is conceived as uninfluenced and independent of the tools used to complete the task. This tendency hinges upon a sharp distinction between the sphere of autonomous internal intentions and the sphere of material and external tools that are subjected to the governance by intentions and aims. By relying on these assumptions, it is only possible to view cognitive tasks as entirely guided by internal mental representations and plans. This approach, she claims, neglects the role of material tools in shaping cognitive actions and processes.

The debate on technological determinism takes for granted the dichotomies between internal thoughts – external tools, mental representations – material artifacts, and independent minds – dependent instruments, thereby hindering the proper understanding of the dual nature of writing. Writing understood as either a human act or as its product assumes a hybrid nature; it is material and mental at the same time (Kroes 2010). In this light the discussion about technological determinism can be interpreted as emerging directly from the fundamental philosophical dilemma regarding the relation between mind and matter[ii]. In this context the question emerges: How can one say something sensible about the interactions between the outer world and the inner mind?

A proper understanding of writing needs to account for its dual nature. If written artifacts are conceived purely in terms of material substrate, the problem emerges as to how the consequences of writing are connected with the intentions and aims of the individuals who use it. On the other hand, however, if consequences of writing are limited to results of its

intentional use, as Finnegan suggested, the materiality of writing becomes neglected and any relation to its physicality is lost. Finnegan is right in claiming that written artifacts conceived as purely physical objects could no longer be conceptualized as writing. On the other hand, the intentional account of written artifacts ignores its material dimension and in consequence is insensitive to distinctions between various media of communication and representation[iii].

In the classic individualistic perspective on mind, the limits of cognitive realm are identified with the limits of an organism. Therefore, the body or mind alone creates a sufficient source of cognitive actions and the external props and tools are silently assumed as irrelevant for cognition (Hutchins 1995; Menary 2006; Clark 2008). In this way, a metaphysical rift opens between the internal mind and its external objective environment and to a methodological gap between one-sided mentalistic and materialistic explanations. Neither can tell the whole story.

The philosophical dimension of the discussion on technological determinism is aptly summarized by Roepstorff (2008) in his considerations regarding the role of material artifacts in cognition: "A critical issue here is how to mediate between inside and outside, between things in a pure form, and 'mind'" (p. 2050). A possible way to avoid simplistic interpretations of the relations between "inside" and "outside" is to adopt Clark's (2008) claim that "our cognitive relation to our own words and language (…) defies any simple logic of inner versus outer" (p. 59). His analysis regarding the relation between language and mind may be applied to the case of the cognitive consequences of writing. The theories of situated cognition promise to show that the classic opposition between active mental reality and reactive external tools fails when it comes to understanding the hybrid nature of cognitive acts involving writing.

4. WRITING AS DISTRIBUTED COGNITIVE ACTIVITY

In order to go beyond the discussion on technological determinism, the classic dichotomies between internal thoughts and external actions need to be overcame. In fact, it is possible to find in the work of literacy theorists some hints to this effect. For example when

describing the basic aim and scope of his approach, Goody (1986) explicitly claims that in his shifting the attention from the means of production to the means of communication:

"There has been no intention of confining analysis either to 'materialist' or to 'ideological' factors, a categorization which smacks of by-gone debates, long since by-passed. **Who nowadays would think of the intellectual products of the human hand and mind, such as writing, as being purely internal or external, as relating only to matter or to ideas**?" (p. 176) [emphasis MT].

This clearly suggests that the basic notion of situated cognition is deeply rooted in Literacy Theory. Similarly, the approach of Olson (1977; 1994), grounded in the socio-cultural psychology, uses the Vygotskian distinctions between oral, inner, egocentric and written speech (Vygotsky 1987). The central assumption made by Vygotsky and his followers is that thinking is not a solitary and "in the head" activity but rather the outcome of the dynamic relations between mental structures and cognitive tools in a cultural context. In this perspective, mind is distributed across persons, tools and practices. Moreover, recent research on literacy and writing, for example New Literacy Studies explicitly refer to situated cognition (Gee 2000). Although NLS are concerned with culturally situated literacy, there are still unresolved questions concerning the notion of practice and the notion of context (cf. Barton 2001; Gee 2000). Moreover, it is not clear how exactly cognition is situated, i.e. what the scope of extended literate mind is and what aspects of mental activity are actually distributed.

Two explicit attempts have been recently made to develop the understanding of the cognitive consequences of writing from the perspective of extended mind. The most recent is Theiner's (2011, pp. 143-175) argument that in order to properly understood the consequences of writing we need to abandon the assumption that "representational re-description of information in a different format does not deeply alter our cognitive abilities" (p.146) . Drawing upon the role of cognitive artifacts and language he presents a rich body of empirical research (esp. in the field of mathematical reasoning) to support the claim that cognition is distributed across people and external artifacts. Theiner suggests that writing by virtue of its spatially and temporarily stable character, contributes to the development of meatacognitive and metalinguistic knowledge. Moreover, the use of writing transforms cognitive tasks by reducing their complexity and therefore making it easier or even possible to

perform advanced cognitive processing including mathematical reasoning. Theiner's work shows that the two approaches of the extended mind and Literacy Theory shed light on each other. His main attempt however, is to outline the argument against cognitivist and internalistic frameworks using the data from the field of literacy theory.

Menary (2007) focuses explicitly on the relation between writing and thinking. He identifies three levels of writing: writing as a semiotic system such as phonetic or ideographic writing, writing as a process aimed at the creation or construction of a text, and, writing as a stable product of the above process i.e. written vehicles or written artifacts. Menary limits his analysis to the role of written vehicles in the act of writing. In particular, he claims that situated cognition helps to answer the question of "what it is about the nature of these vehicles that allows us to do cognitive things in a novel way" (Menary 2007, p. 622). Menary stresses that written vehicles are incorporated into the cognitive processes not solely as meaningful and intentional representations, but also by virtue of their mere physical characteristics. This second aspect of written vehicles is of special importance here. Menary (2007) explicitly declares that a "Cognitive integrationist does not think of sentences as abstractions, but as material vehicles" (pp. 631-632). Written vehicles are good example of writing considered as a cognitive environment, as defined by Dascal (2002). Menary's cognitive integrationist approach is primarily concerned with cognitive functions of the material dimension of writing, therefore it is particularly convergent with the aim of this paper.

Menary analyses the act of writing an academic paper as a fine example of a hybrid cognitive task. In this context the physical manipulation of written representations is in fact an integral part of cognitive processing itself. Menary claims that in the case of complex cognitive systems, there is no sharp distinction between internal cognitive acts, external material artifacts and bodily actions. In fact, the dynamic co-ordination between those elements enables such a system to complete the task. As perceived by Clark and Chalmers (1998), a cognitive system emerges in the process of writing if its elements meet the requirements of the parity principle: "If, as we confront some task, a part of the world functions as a process which, were it to go on in the head, we would have no hesitation in accepting as part of the cognitive process, then that part of the world is (for that time) part of the cognitive process." (p. 8). What follows from the principle is that all the elements of the cognitive system need to play active causal roles, jointly governing the behavior of the system

in analogous ways to the roles played by traditionally understood internal cognitive representations. Furthermore, removing the external component from the system will lead to a significant decrease in the performance of the system, as if a part of the persons brain were to be removed (Menary 2007; Clark and Chalmers 1998). Therefore, in case of writing an academic paper, the external written vehicles are not merely inputs stimulating the cognitive processes subsequently developing in the head. Information stored in the written vehicles need not be explicitly represented in the mind in order to alter its cognitive performance. The crucial issue here is the manipulation of written artifact itself. Written vehicles restructure the nature of the cognitive tasks limiting or inviting certain types of action (Zhang and Patel 2006). At this basic level we may observe how the materiality of writing directly contributes to cognitive practices.

In order to elucidate how exactly the physical manipulations of written vehicles enhance his cognitive performance Menary observed his own behavior. Writing, rewriting, erasing, restructuring written sentences, rereading them and moving to other paragraphs etc. are all manipulations inviting new forms of cognitive actions by enhancing the emergence of new ideas, relating them to information already stored in written artifacts and extending the working memory. Manipulations of written artifacts, such as revising and re-drafting, enable the cognitive processes that cannot be accomplished by an unaided mind.

A particular strength of Menary's analysis is that it creates a model of a cognitive system performing a hybrid cognitive task. Performance of at least some cognitive tasks is not a simple manifestation of the intentions and aims of the individuals or their internal operations on representations. Quite the contrary, material vehicles by virtue of their affordances play a fundamental role in completing cognitive acts. The model suggests that the boundaries between internal processes and external tools are solely a matter of convention. The distinction between cognitive and non-cognitive processes does not always overlap with the distinction between the internal and external or the mental and material. Menary therefore demonstrates that we need to abandon the sharp distinction between internal and external factors influencing cognition. His analysis, however, is limited to his personal experience and as such is of somewhat limited value as a confirmation of the general model.

4.1 PAPERWORK ZOOMED IN

O'Hara et al. (2002) deliver a more detailed analysis of the material dimension of writing and its cognitive consequences. Drawing on the situated cognition framework they conducted an empirical study of how multiple source materials supported the composition process. Their study highlighted:

"how cognitive processes are distributed across both internal and external representations (…). Cognitive processes such as noticing, evoking, organizing and translating have all been seen to be highly dependent upon the way that people can manipulate and interact with external representations, which in turn is dependent upon a particular representation's material characteristics." (O'Hara et al. 2002, 296).

O'Hara at al. (2002) found that written vehicles, by providing new objects for selective attention and new resources for working memory affected reasoning, planning and paraphrasing. Multiple display surfaces, concurrent and closely spaced visualizations afford quick and frequent shifts of attention and a comparison between different source documents, allowing new information to be integrated with knowledge already possessed. Tangibility of paper documents invites the simple practice of juxtaposing papers in space and physically pointing to relevant parts of different documents. Those simple manipulations reduce perceptual complexity of the documents enable instant shifts of attention and offload working memory. Spatial and temporal stability of written vehicles allows such arrangement of the source materials in the physical space so as to reflect the plan of the composition originally created in the head. Therefore, the spatial layout of the sources maintains the structure of the plan while the writer is busy paraphrasing, composing and linking information. Moreover, the spatial layout of documents allows for concurrent visual availability of particular information and direct visibility of the structure of the composition, which contributes to the awareness of the role of specific information in the context of the whole argument. Access to relevant information is possible by quickly scanning the spatial layout of documents. Accordingly, the cognitive costs of the access to relevant information is reduced and this in turn reduces the need for explicit inferences. Spatial fixity of information in reference to page boundaries and annotations guide the attention, offload working memory and reduce the perceptual complexity of the source material. Moreover, it makes for a fine example of how information is actually distributed across the mind and written vehicles. O'Hara et al. (2002) demonstrate

that annotations, in order to fulfill their function of offloading working memory, need to be taken in quickly and effortlessly without disrupting the ongoing cognitive subtasks (i.e. reading, paraphrasing etc.). That is why annotations are informal, personal, tacit and incomplete. Information is distributed between notes, the knowledge in the head of the individual, and the spatial juxtaposition of the parts of text associated with said annotations. Moreover, annotations are used as perceptual cues for navigating between various texts and the information they convey is rarely explicitly represented. Application of this cognitive strategy releases working memory from the demands of maintaining diverse ideas, liberating cognitive powers otherwise unavailable (O'Hara et al. 2002). The study shows how cognitive work is offloaded onto the external structures in the sense proposed by Kirsh and Maglio (1994) to aid working memory and reduce the complexity of inferences.

The role played by the spatial layout is an example of cognitive outsourcing described by Clark and Chalmers (1998) as delegating cognitive work to bodily manipulations of external tools and representations. Annotations, markings and fixity of information in reference to the page boundaries are used as prompts for guiding the attention while performing the complex task of composing an argument. This exemplifies the practice of cognitive scaffolding (Clark 2008), where markings and notes afford for new forms of selective attention by reducing the perceptual complexity of the document and enabling a concentration on relevant but otherwise elusive information. Frequent shifts of attention reflect the interaction between internal processing and external manipulations of written vehicles. Since the information embedded in written vehicles is functionally equivalent to internal representations the interplay between internal and external resources meets the requirements of the "parity principle" (Clark and Chalmers 1998). Therefore, the cognitive system described by O'Hara et al. (2002) meets the requirements of causal coupling as proposed by Clark and Chalmers (1998).

5. DRAWBACKS OF THE INTERNALISTIC APPROACH TO WRITING

As indicated above (Theiner 2011; Menary 2007), the distributed cognition approach makes for a useful interpretational framework for understanding the cognitive functions of

material artifacts such as written vehicles. What remains, however, is the question of why exactly the internalistic approach fails to account for the material dimension of writing.

The Cartesian internalistic framework, also known as the "sandwich model of mind" (Anderson 2003), assumes that the internal structures (i.e. brain or mind) constitute a sufficient basis for cognitive procesing, while all sensations and actions are considered as the marginal subsystems of an agent. According to this model of mind, the original domains of interaction with the external world and tools are clearly separated from the proper high-level cognitive processing (Clark 2001). This model of mind assumes that the role played by written vehicles is reduced to mere inputs for or outputs of full-blooded cognitive processes unfolding in the head. Furthermore, all the manipulations of written vehicles, as described by O'Hara, can be dubbed as cognitive only in a metaphorical sense. In the literal sense, writing as material cognitive environment is considered a mere addition (input or output) to genuinely internal cognitive processing. Therefore, the internalistic model of mind downplays the material context within which cognition takes place. However, as we have seen, explanations relying exclusively on internal representations fail to account for the observed dynamic interaction between written vehicles and the person. Conceiving written vehicles as mere input for internal processing, "misinterprets what writers actually do with source documents" (O'Hara et al. 2002, p.288). For example, the meaning of annotations is often distributed between a person and various external resources without being explicitly represented in the head. Annotations and markings function more as cues, mentally reconstructed and represented only when it is necessary. As Clark (2006) noted: "symbolic environment (…) can sometimes impact thought and learning not by some process of full-translation (…) but by something closer to coordination. On the coordination model the symbolic environment impacts thought by (…) using (…) the objects themselves" (p. 300). Finally, in the light of the internally oriented theories of mind, many uniquely human cognitive feats are inexplicable. We owe the ability to perform many complex cognitive tasks to skilled manipulation of external tools.

6. SYNOPSIS

Contrary to the common approach to the debates on technological determinism, I have argued that at the heart of the discussion lies a philosophical problem regarding the relation between mind and matter. Critics have approached Literacy Theory with Cartesian interpretational presuppositions and consequently they depict the relation between the material dimension of writing and cognition in terms of two essentially distinct and unrelated domains: material and mental. The critics of Literacy Theory reached the conclusion that the intentions and aims are decisive in determining the consequences of writing, therefore the influence of writing considered as a mere material tool can be ignored. This conclusion is in fact a special case of the general Cartesian conviction that external material reality is to be categorically distinguished from mind and cognition. To answer the critics I have adopted the framework of situated cognition to argue that writing as cognitive environment contribute to cognition by way of bodily manipulations.

A part of the problem in research on the consequences of writing is the fact that conventional models of mind fail to take into account the distributed nature of cognition. The internalistic approach to mind neglects the material dimension of writing due to the fact that it interprets written vehicles as mere inputs for real high level cognition unfolding fully in the head. Within this internalistic framework it is in principle impossible to account for the consequences of writing itself. When writing is analyzed at the level of cognitive environment situated cognition delivers a useful theoretical framework for understanding the material dimension of writing. It helps to account for the cognitive consequences of written artifacts themselves without the danger of being accused of technological determinism. Written vehicles directly influence cognition by virtue of their material characteristics.

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[i] Situated cognition is in fact an extremely diverse and dynamically developing field of research. In order to account for the interpretational advantages of this framework, I will use the already classic approach developed mainly by Clark (Clark and Chalmers 1998; Clark 2008)

[ii] In this section I apply the argumentation developed byKroes in order to explain the dual nature of technical artifacts. I assume that there is an analogy between technical artifacts and written artifacts as far as their dual nature is concerned, therefore, The argument made by Kroes can stand for both cases: the case of technology of writing and the case of technical artifacts.

[iii] One of the outcomes of this attitude is philosophy's blindness to the distinction between speaking and writing and between oral and literate forms of thought (Theiner 2011). In this context Dennet (1996) commented that philosophers "tend to run the two phenomena together, especially when theorizing about the brain or mind. Most of what has been written about the possibilities of a "language of thought" as a medium of cognitive

operations presupposes that we're thinking of a written language of thought – 'brain writing' and mind reading'" (p. 147).

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