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INTRODUCTION TO THE SPECIAL ISSUE "COGNITION AND TECHNOLOGY: A 4E PERSPECTIVE"

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ABSTRACT

In this paper, we present the main contributions that are part of the special issue "Cognition and technology: A 4E perspective" . 4E cognition or the embodied and embedded cognitive sciences aim to make sense of the mind as constituted by bodily and environmental aspects. This approach to the mind offers some challenges to our current understanding of technology, and this special issue includes an analysis of key epistemic, ontological, and methodological aspects of 4E cognition in relation to the use of technology. .
Key Words: cognitive science; technology; embodiment; situated cognition; affordances; 4E cognition.

The relation of cognition and technology is a significant one. Outside philosophy, the use of technology has been regarded as an example of cognitive development from an ontogenetic and a phylogenetic perspective (*e.g.*, Greenfield 1991, Meulman *et al*. 2013). Ethologists (in particular, primatologists) have extensively researched the use of tools in animals since the last century (*e.g.*, White, 1942). Within philosophy, theoreticians have discussed in a very detailed way about the intricacies of technology and its impact on cognition in order to understand the ontology of devices and artifacts, the new epistemic dimensions that are opened thanks to technological use, and the very nature of human and animal minds (Vega, 2009).

Thus, the relation of cognition and technology from a philosophical perspective goes in two directions: how the use of technology illuminates our views on the mind and also how our ways of conceiving the mind affect the way we understand and create technology for our lives. In this special issue, we focus on 4E cognition or the post-cognitivist approach to the mind as a framework for understanding cognitive skills. The four 'E's stand for embodied, embedded, enacted, and extended, four concepts that summarize the eclectic

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nature of this approach. What all the views within this approach share is the idea that understanding cognition in terms of brain states does not suffice to fully understand how the mind works. Thus, these views emphasize the essential contribution of the body and the environment in the shaping of cognitive abilities, which is conceptualized in the terms 'embodiment' and 'embeddedness' or 'situatedness', but there are multiple ways of understanding the nature of these contributions. Also, there are substantive differences regarding some theories within the approach: for example, some versions of the extended mind accept a minimal representationalism and information-processing, while some other theories don't (in particular, some varieties of enactivism[1] and ecological psychology). As we can see, there are both shared commitments and clear disagreements in what could be the most pluralistic philosophical approach to the mind nowadays (Fultot *et al*., 2016; Stapleton 2016; Di Paolo, 2016; Heras-Escribano, 2016; Loughlin & Zahidi, 2017; Heras-Escribano 2019a, b; and Heft, 2020).

This 4E approach has taken technology into account since its very beginning. In their influential paper on the extended mind hypothesis, the most famous example consists of a case in which someone replaced the function of memory storage of a brain with a notebook. How we extend the mind through tools, artifacts, and other technologies has been analyzed by a wide variety of authors in the philosophy of technology from a 4E perspective. For example, several authors claim that our minds are extended beyond the brain thanks to material engagement with technological devices (Malafouris, 2013), and that brain, body, environment, and tools could be correctly coupled to enhance performance through soft assembly (Favela, 2019). There has been also a special interest in analyzing the epistemic impact of technology within a 4E approach (Andrada, 2019). Other authors focus on different ethical implications of the 4E approach to technology (Carter & Palermos, 2016; Heersmink, 2017). The wide variety of theories within the 4E approach has problems of its own, such as the different understandings of cognitive integration of technological devices according to different approaches (Heersmink, 2015). Researchers have analyzed how to build a better technology from a 4E approach, such as in the fields of robotics and sensory substitution (Ibañez-Gijón *et al*. 2013, Lobo *et al*. 2018). Well-known technologies have also been analyzed as a technological resource from this perspective, as it happens to the internet (Smart, Heersmink, and Clowes, 2017).

Nevertheless, there is still a lot of work to do in this field from a 4E perspective, and this special issue aims to offer a humble contribution in that direction. In this issue, a total of six authors deal with different aspects on the relation of technology and cognition from a 4E perspective. First of all, Jesús Vega uses Ingold's notion of taskscape for making sense of how material artifactual culture relates materiality and cultural and bodily meaningfulness through affordances. Certainly, this is a great line of research that strengthens the relation between technology and affordances, emphasizing the importance of both of them for our mental lives, while offering a strong starting point for the analysis of the structure of experience. Gloria Andrada challenges the phenomenology derived from extended cognition by criticizing the idea that a technological object becomes transparent in use. This paper offers an insightful criticism of the notion of transparency in extended cognition, providing substantial development in the analysis of the epistemological consequences of the extended mind hypothesis. Gunnar Declerck offers an innovative transcendentalist approach to the human technological system, focusing on an understudied aspect of technology: its phenomenological conditions of existence. Then he contrasts his Heideggerian approach to the Gibsonian view on affordances arguing why affordances and equipments cannot be synonyms given that what an object allows to achieve for a human being has to be related to "a network of functional references" that exist within the social normativity of a community. This paper inaugurates a way of understanding the phenomenology of technology from a new perspective and deepens into the dialogue between cognitive science and phenomenology. Vicente Raja's paper offers a classification of the different theories within the 4E approach depending on their understanding of technology (either in an instrumental or in an embodied way) and draws some consequences. This paper is a wonderful contribution that develops some key ideas of the embodied understanding of technology, even for the realm of the political dimension of technology. Finally, Carlos de

Aldama describes how the extended mind has been discussed in previous literature. He claims that the use of technology in educational contexts has been considered as an asset to motivate students without the necessary reflection about the changes that it implies in our cognition. This paper aims to go further in illuminating cases in which the use of technological devices in these contexts can either diminish or enhance cognitive capacities. This paper develops important aspects of situated cognition as applied to educational contexts by providing examples from the literature that should be taken into account for having a virtuous use of technology in these contexts.

In conclusion, this special issue offers innovative and valuable contributions on several aspects of the relation between technology and cognition from an embodied and situated perspective with the hope that it will be valuable and illuminating for the 4E community.

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NOTE

1 Although orthodox views on enactivism reject mental representations tout court, some others don't. See, for example, Noë's (2004: 17) view on sensorimotor contingencies.