REVISTA ESPACIOS

Education as a body-oriented cognitive practice (digital dimension)

La educación como práctica cognitiva orientada al cuerpo (dimensión digital)

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Contents

ABSTRACT:

Within the confines of this paper, the topical issues of application of the theory of embodied cognition in cognitive and educational practices in the context of digital subject-environment interaction are being considered. The widespread of the Internet and, as a consequence, drastic changes in the ways of information searching and obtaining have had a significant impact upon the transformation of cognitive processes and necessitated the formation of the new educational models.

Keywords: Embodied cognition theory, cognitive ethology, body extensions, online education.

RESUMEN:

Dentro de los límites de este documento, se están considerando los temas de aplicación de la teoría de la cognición incorporada en las prácticas cognitivas y educativas en el contexto de la interacción digital sujeto-ambiente. La amplia difusión de Internet y, como consecuencia, los cambios drásticos en las formas de búsqueda y obtención de información han tenido un impacto significativo en la transformación de los procesos cognitivos y han requerido la formación de nuevos modelos educativos.

Palabras clave: Teoría de la cognición incorporada, etología cognitiva, extensiones corporales, educación en línea.

1. Introduction

The authors of this paper proceed on the basis of the idea of bodily determinism of cognition, in this context, the processes of cognition and educational practices are considered as emergent phenomena arising due to the interaction of the body, brain, consciousness and the environment. Because of the rapid development of the Internet technologies and the formation of digital educational space (Schelkunov, Nikolaeva & Kotliar, 2019), there is a need of giving a good serious thought to the new dimension of physicality, which is mediated by the influence of the digital environment.

Discussions on the role of corporeality in the process of cognition originate together with philosophy and remain one of its structural blocks throughout its development. Studies within the cognitive science, which appear in the nineties of the 20th century, submit the novel and completely non-trivial approaches to the consideration of cognition: they insist on the dynamic interconnection of the brain, body and the 'habitat' of a human being. In the modern post-non-classical epistemology, the theory of embodied cognition has been developed on the basis of various disciplinary fields: on the basis of neurophysiology (Damasio, 1994), neurobiology and

cognitive science (Maturana&Varela,1980), neurophenomenology (Varela, Tompson&Rosch, 1991; Gallagher, 2005) psychology (Wilson, 2002), linguistics (Lakoff&Johnson, 1999), literary studies (Gumbrecht, 2003). This research program happens to be the methodological basis of our research.

The common basis for various research areas within the framework of this theory is the assertion that the co-determination of the human body and the environment has a meaningful impact upon the formation of higher psychological functions of a person. This allows a wide range of variability of the embodiment from the assumption that the purpose of perception is action and cognitive processes depend on the work of sensory-motor systems of the body to the assertion that the environment is part of the cognition mechanism.

2. Methodology and results

The theory of embodied cognition happens to be a theoretical and methodological basis of our study. Taking a reflexive position on this theory, we assume that one of the major problems of the theory of embodied cognition is that there is not at least to a certain extent a generally accepted, conventional point of view on the question of what we imply when we refer to corporeality, and where the demarcation line between the seemingly close concepts of body and corporeality is. The most consistent and complete version of the description of physicality was presented by the American cognitive philosopher Mark Johnson (2008). He identifies five of its components (biological, phenomenological, environmental, social, and cultural) noting that this is only a minimal basic set, because there are many currently unarticulated elements beyond it.

Developing the research position of M. Johnson and pursuing the aim of obtaining a more comprehensive and thorough perception of corporeality, we question the occurrence of the new – digital dimension of corporeality in the modern society. In order to detect the essence of digital corporeality as an object of investigation and further conceptualization we make use of the method of ascent from the abstract to the concrete. Let us try conceptualizing the Internet as a source of a new kind of cognitive ecology, consider the cognitive and epistemological consequences of its influence on the formation of corporeality in the framework of the theory of embodied knowledge, and, as a consequence, on educational practices. We as well follow the norms of the dialectical method, which allows marking digital corporeality as an emerging, continuously changing controversial phenomenon.

The concept of five dimensions of physicality was introduced by mark Johnson in 2008. A decade later, we are living in a world which is on the brink of the fourth industrial revolution, and we are seriously pondering ethical issues on robot rights. Rapid changes have significantly affected the course of our cognitive processes and educational practices, for example, today the modern University is undergoing fundamental pedagogical transformations, as it becomes obvious that the understanding of education has changed. In higher education at the present stage, it is possible to distinguish the tendency to turn to some subject integrativity, the formation of new navigational skills in the search for information. Conceptually, this situation can be defined as the attitude of the subject to his cognitive choice, which is determined by the digital environment. Are there any irreversible changes, observed in this regard today? Of course, the direct proof of this is the new generation A or generation alpha whose representatives were born and live in an ever-expanding digital environment. Therefore, it is important to raise the question of the emergence of a new digital dimension of physicality. Of course, it can be argued that GoogleGlass refers to the biological, and the Wikipedia platform to the social dimension. However, in our opinion, this new digital layer by its appearance and rapid occupation of people's lives has earned the right to be referred to as and to become the sixth dimension of physicality.

What comes to mind first when we talk about the digital revolution and its impact on cognitive processes? Of course, this is the Internet. Not only has it changed the way we search for and transmit information, providing almost unlimited access to data and materials, but also it has significantly transformed the process of cognition itself. The digital expansion of consciousness is the defining characteristic of the modern civilization. According to the United Nations (2019, September), 4.5 billion people, almost 59% of the world's population, have access to the Internet (Internet World Stats: Usage and population statistics, 2019, September). The Internet does not require a high level of technological and technical training from its users. Most of us carry it in our pocket. There are no age restrictions on its use: a two-year-old child, even without formed speech skills, is quite independent in finding the content he needs.

The Internet offers a wide scope of possibilities, ranging from online education through the Coursera platform to a smart fridge, capable of reminding about the need of buying milk. But what

does it want in return? How much does our dependence on online resources affect upon the course of cognitive processes? Of course, one cannot immediately find a simple and subtle answer to this question that would be accepted by a wide range of interested parties: the academic community, the media and industrial corporations. The only way out is to move forward patiently, asking more specific questions.

The Internet is a 'Wild, Wild West': a combination of boundless expanses and innovative approach, but the main thing is that everyone lives here by their own rules, and there is no place for centralized editing. For example, the online encyclopedia 'Wikipedia'. Here are some statistics: more than 6 million articles, more than 3 million registered users and a billion edits since the creation, the average number of edits per page is 16.4 (Wikidata.Statistics, 2019, September). Any user of the network can become an author or editor, whether it is a holder of a doctoral degree or a student of the average school.

It is believed that the first steps of the Internet can be compared with the advent of book printing; at least to the extent that it concerns the expansion of our memory (Spaulding, 2014). Perhaps we could have agreed with this statement 10 or 15 years ago. But today the Internet has an impact not only on memory, it is globally changing the way people live, their physicality.

The Internet is a gigantic amount of resources. At the same time, there are no restrictions on the type of information that is available through the World Wide Web. According to the website https://www.worldwidewebsize.com for September 2019, there are at least 5.7 billion web pages on the Internet, and that's excluding DeepWeb and DarkWeb. The Internet is the new universal expert. Tables of derivatives and integrals, routes of urban transport, the capital of St. Kitts and Nevis – is it worth remembering this information or is it more advisable to make it the part of the 'cognitive offloading' (cognitive relief, or the use of the environment by performing certain physical actions to reduce cognitive load)? Since people are limited in the ability of information processing (there are limits to attention and working memory), part of the cognitive load is shifted to the Internet. There is no need to spend time memorizing and encoding new information, because it can be easily obtained at any time, with minimum efforts taken (a couple of clicks).

On the one hand, it can be argued that we similarly shift part of the work of consciousness to the books to which we turn while searching for the information, to a notebook in which we write down the information about meetings and events, to a cookery book which we consult to cook dinner or even to the cross we draw on the hand as a reminder. Do these actions lead to any negative consequences? Perhaps not. Therefore, the problem here is not down to the emergence of the Internet as such, but in the amount of cognitive load that we shift to it.

Perhaps we all intuitively assume that having constant access to information eliminates the need to develop the ability to think and memorizing skills, without being aware of the fact that it hides serious problems and hazards. This was reaffirmed when a few years ago, the journal Science (Sparrow, Lita, &Wagner, 2011) published an article on the impact of free Internet access upon the state of memory. In the course of a comparative experiment, it was proved that students of the 'ancient era of paper textbooks' exceed those of the 'era of gadgets' in terms of the volume of memorized information. That is, in a relatively short period of time (from the point of view of anthropogenesis), the human brain has changed. And there is no clear answer to the question: 'What appears to be an appendage here, whether a brain or a gadget?'

There are absolutely opposite points of view: some researchers (Dossey, 2013) talk about the emergence of the phenomenon of digital dementia. These are serious negative changes in mental state, behavior and cognitive processes under the influence of the new technologies. Others, (Cheremshina, 2013) on the contrary, claim, that the Internet contributes to an increase in the speed of mental processes, and therefore, children who use the Internet have a higher level of IQ and greater social intelligence.

We argue that cognitive unloading of the brain will lead to pathological, negative consequences, which are commensurate in volume to the refusal of motor exercises in early childhood development. Memory is not an ephemeral notion; it has very specific physiological characteristics, because the brain remains plastic throughout a person's life. Indicative here may be a textbook study by Eleanor Maguire (2006), Professor of cognitive science at the University of London, about the brain of London taxi drivers. She demonstrated that the brain of taxi drivers undergoes certain modifications, namely the increase in the rear hippocampus by reducing the front, because of the huge amount of information about the routes and detours, which they are trained for four years and pass the most difficult exam on the results of this training. Thus, everything that we remember, and in the case of the Internet do not remember, has a direct

impact on the formation of our neural connections and on the course of our cognitive processes in general.

For instance, today one can observe the loss of the ability to concentrate, the phenomenon of dispersion of attention. This, for example, is the habit (or need) to simultaneously read a book, listen to music and communicate in messengers. Changing the structure of the texts that students have to work with – hyperlinked texts that encourage the cursory study of information and web surfing also contributes to the dispersion of attention. In addition, digital content is a combination of necessary and desired information and advertising images that are not always relevant. Is this not the root of the total fascination with various meditative practices and the culture of slowing down the rhythm of life (Slow Movement), which today has more than 10 directions (including slow art, slow education, slow city), and the motto of the movement is the expression of one of its ideologists Carl Honore (2014): 'you only need to hurry, when it is necessary, the goal is to find your right pace" (p.21).

There are also certain negative consequences of the various forms of large-scale social involvement that the Internet provides today (for example, the Wikipedia platform). The main one is the probability of obtaining and, therefore, assimilating inaccurate information. Therefore, today the task is to change the structure of education, the focus should move from memorization to understanding. It is not enough to have a minimum set of technical skills to find out information on the Internet. New technologies require critical thinking, careful selection and evaluation, structuring and classification skills. Today there is a huge gap between the level of availability of information and the ability to process and assimilate it. Hence there is a very important consequence – devaluation of the information cost, growing distrust towards it.

At the first glance, interaction with the Internet seems to be far from such typical situations for embodied cognition as eye movement or gestures. However, the emergence of mobile and portable devices is changing the way we interact with the online environment. If earlier the Internet access was mediated by a computer monitor and a browser interface, today smartphones offer a wide range of opportunities to blur the line between the offline and online content.

In our bodily lexicon, the new gestures, related to performing web pages flipping and image zooming operations, are emerging. In addition, there are more explicit forms of embodiment, appearing due to the new forms of interaction with physical environments. One of the first innovative developments in this segment was presented in 2008. Two students from Japan, M. Takashi and H. Sho (2008) presented the Pileus gadget. It is a modified rain umbrella, the main task of which is to make walking on rainy days more comfortable and enjoyable. Pileus is equipped with a large screen on the inside, a GPS Navigator and a camera. The prototype has two basic functions – photo sharing and navigation. In this case, to use this device, for example, to scroll through the photos, traditional bodily movements of interaction with the umbrella are used – twists and turns. This product is aimed at the formation of augmented reality, as well as the synchronization of information in the real world and on the Internet. Thus, the authors speak of an attempt to create an 'embodied network'.

Various extensions of the body, a new type of 'prostheses' based on the Internet technologies, for instance, wearable devices – can also be attributed to the method of bodily embodiment in the digital environment. Are they a genuine part of the human body? From the point of view of biology and anatomy, the unequivocal answer is no. But if we take the position of a function-oriented concept, which states that the body mediates sensorimotor interaction with the world, then the answer is definitely affirmative. If our hands are considered as a part of our body, because with them we can feel, grab and turn, then why portable exoskeleton (Leeatal., 2017) is not part of our new body? Various prosthetic extensions (smartphones or smartwatches) undoubtedly happen to be part of our embodied cognitive processes. This position opens a wide path to potential forms of cognitive-bodily incorporation with various non-biological artifacts. Recent trends in technology development are largely consistent with what virtual and augmented reality researcher F. Biocca (1997) calls 'progressive incarnation'. His idea is that technological progress entails the immersion of sensorimotor channels into computer interfaces through closer communication, through the penetration of various sensors and displays into the body.

Thus, whether or not we acknowledge that the boundaries of the human mind are moving outwards, it is undeniable that new technologies are gradually moving inwards, trying to establish ever closer connections with the elements of the biological body.

Some studies show that users often view their mobile phones as extensions of their self, their bodies (Oksman & Rautianen, 2003). The smartphone is an indispensable tool that allows a person to solve various social and cognitive problems that he faces in his daily life. This is often expressed

in the form of a deep emotional attachment that people feel for their mobile devices. For some people, their gadget becomes almost an extension of their body: they hold, touch, stroke the device even when it is not being used.

Within the framework of Salerno experiment, (Salerno et al., 2012) the subjects were presented with four types of images: 1) the subject's own hand, 2) the other person's hand, 3) the subject's own mobile phone, or 4) the other person's mobile phone. Interestingly, similar neurological reactions were observed when subjects were shown images of their hands and images of their mobile phones. Although the psychological significance of these results is currently unclear, we suggest that the mental image of the body may include inanimate objects that were or are in contact with or in close proximity to it. These results can also be interpreted as proof of the concept of an extended body schema in which non-body objects become a part of neural processes and mediate the body's sensation and ability to act.

New technologies are changing, and even expanding, the capabilities we use to track and record our bodily states and actions. Portable devices, therefore, are not only the means of transforming the contact with the online environment, they also affect relationships with our own bodies.

For example, the 'quantifiedself' technologies (QS-lifelogging), which allow you recording and tracking physiological characteristics (body weight, sleep quality, heart rate). Thanks to the Internet connection, these devices allow you accumulating, storing and analyzing huge amounts of personal information, as well as to subject it to the large-scale forms of statistical analysis, which helps while conducting epidemiological and clinical studies that contribute to the analysis of factors associated with the onset and progression of the disease.

One of the consequences of lifelogging is that it provides a greater degree of awareness of one's bodily states and processes. Thus, self-monitoring technologies are sometimes seen as a means of creating a digital dashboard for the biological body, allowing people to use a variety of the previously inaccessible data. The individual body becomes more open to interpretation, cognizable, computable, and manageable object.

But the main factor that already has a certain impact today, and is likely to drastically change our perception in the making is the immersive technology and mixed reality. The concept of mixed reality involves combining a real environment with digital objects generated by a computer. In mixed reality systems, users perceive both the physical environment and the digital elements simultaneously.

Currently, there is a conspicuous shift in this concept. It is caused by the appearance of Microsoft Hololens (holographic lens): a headset, more like sunglasses, allows you layering holograms of virtual worlds on the objects of our environment. This gamification of reality will drastically change the processes of perception and cognition, and altogether the way we look at the world and interact with it. Marshall McLuhan, the founder of media theory, has the idea that first we shape our tools and then they shape us (Naughton, 2011). Man seems to be something like an octopus, which is constantly expanding its body, whether it is the invention of the wheel or the microscope. But these extensions are not neutral and independent random variables, they form the context in which we know. Another question arises, will this world, existing at extreme speeds, remain man-sized? How soon will the boundary between the real and the virtual be blurred? Will mixed reality become our new cognitive ecology in the next 10 or 20 years? How to differentiate between realities and whether it is necessary?

And if presently gadgets can fix the geographical location and adapt the processes of information retrieval on the basis of this, tomorrow devices will allow you tracking emotions or cognitive processes (memory, attention). It is also possible that future technologies will play an important role in determining the extent to which bodily states and signals influence our thoughts and actions, both individually and socially. But this, is of course, another unanswered question that underlies current research in embodied cognitive science.

3. Conclusions

At the moment, there are many countervailing views on the adequacy and adaptability of embodied research programs in cognitive science to the new scientific data (for example, the discovery of mirror neurons). In our opinion, the introduction and adoption of the concept of 'digital physicality' will open up a whole range of research moves in the study of cognitive processes in their coevolutionary connection with the new emerging cognitive environments.

Digitalization and digital expansion of consciousness is a defining feature of the modern civilization. Due to the appearance and wide spread of the Internet, not only the way of searching

and transmitting information, the volume of access to data and materials has changed, but the processes of cognition and education have also changed significantly. In addition, today we are talking about the 'choice at the tip of the fingers', and, therefore, about the construction of a new subjectivity, which is loaded with the experience of a new corporeality in the digital space.

Considering the Internet from the point of view of ecological perspective, we come to the conclusion that it is an important (perhaps defining) part of the socio-technological environment in which the brain is located, as a biological organ and the mechanism of human cognition is realized. And the direction of its further development largely depends on how in the future we will learn and implement educational practices.

Acknowledgements

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