THE DIGITAL TECHNOLOGIES: AN ANALYSIS FROM THE THEORY OF DISTRIBUTED COGNITION

AS TECNOLOGIAS DIGITAIS: UMA ANÁLISE A PARTIR DA TEORIA DA COGNIÇÃO DISTRIBUÍDA

LAS TECNOLOGÍAS DIGITALES: UN ANÁLISIS A PARTIR DE LA TEORÍA DE LA COGNICIÓN DISTRIBUIDA

Diene Eire de MELLO[1]
Simone Aparecida de Andrade VALLINI[2]
Vanessa Dantas VIEIRA[3]

ABSTRACT: The main objective of this text is to analyze researches in the scope of education that deal with digital technologies from the Theory of Distributed Cognition and verify how these are presented in the literature. The specific objectives seek to: contextualize the concept of Distributed Cognition; identify research in the field of education that deal with digital technologies from the theory of distributed cognition and characterize whether the research found is theoretical or experimental in nature. This bibliographical study was carried out by searching for articles in the academic google database between the years of 2015 to 2021. Based on the findings, it is possible to affirm that there are few studies in the scope of the Distributed Cognition Theory and its interrelationship with digital technologies in education, thus developing for the need for more studies at other levels and modalities of education. It was observed that technologies assume the role of providing experiences to students. Thus, they contribute not only to carrying out activities, but to ways of thinking, creating, elaborating and actively participating in the process.

KEYWORDS: Distributed cognition theory. Digital technologies. Education.

RESUMO: *O objetivo central do presente texto é analisar pesquisas no âmbito da educação que tratam das tecnologias digitais a partir da Teoria da Cognição Distribuída e verificar como estas se apresentam na literatura. Os objetivos específicos buscam: contextualizar o conceito de Cognição Distribuída; identificar pesquisas no âmbito da educação que tratam das tecnologias digitais a partir da teoria da cognição distribuída e caracterizar se as pesquisas encontradas são de natureza teórica ou experimental. O presente estudo de caráter bibliográfico foi realizado por meio da busca de artigos no banco de dados do Google Acadêmico entre os anos de 2015 e 2021. A partir dos achados, é possível afirmar que são poucos os estudos no âmbito da Teoria da Cognição Distribuída e sua inter-relação com as*

[1] University of Londrina (UEL), Londrina – PR – Brazil. Professor at the Department of Education. Post-Doctorate in Education with a focus on e-learning from the Open University of Portugal (2015). ORCID: https://orcid.org/0000-0001-6048-8130. E-mail: diene.eire@uel.br
[2] University of Londrina (UEL), Londrina – PR – Brazil. Master's student at the Graduate Program in Education (PPEdu). ORCID: https://orcid.org/ 0000-0002-8530-7911. E-mail: simone.andrade.valini@uel.br
[3] University of Londrina (UEL), Londrina – PR – Brazil. Master's student at the Graduate Program in Education (PPEdu). ORCID: https://orcid.org/0000-0002-0696-0729. E-mail: vanessa.dantas@uel.br

tecnologias digitais na educação, apontando assim para a necessidade de mais estudos em outros níveis e modalidades de ensino. Observou-se que as tecnologias assumem papel de propiciadoras de experiências aos estudantes. Assim, elas contribuem não só para fazer atividades, mas formas de pensar, criar, elaborar e participar ativamente do processo.

***PALAVRAS-CHAVE**: Teoria da cognição distribuída. Tecnologias digitais. Educação.*

***RESUMEN**: El objetivo general del presente texto es analizar las investigaciones del ámbito de la educación que tratan de las tecnologías digitales a partir de la Teoría de la Cognición Distribuida y verificar cómo estas se presentan en la literatura. Los objetivos específicos buscan: contextualizar el concepto de Cognición Distribuida; identificar investigaciones en el ámbito de la educación que tratan de las tecnologías digitales a partir de la teoría de la cognición distribuida y caracterizar si las investigaciones encontradas son técnicas o experimentales. El presente estudio de carácter bibliográfico fue realizado por medio de la búsqueda de artículos en la base de datos Google Académico entre los años de 2015 a 2021. A partir de los hallazgos, es posible afirmar que son pocos los estudios en el ámbito de la Teoría de la Cognición Distribuida y su interrelación con las tecnologías digitales, señalando la necesidad de más estudios en otros niveles y modalidades de enseñanza. Se observó que las tecnologías asumen la función de propiciadoras de experiencias a los estudiantes. Por lo tanto, ellas contribuyen en la realización de actividades, además de contribuir en las formas de pensar, crear, elaborar y participar activamente del proceso.*

***PALABRAS CLAVE**: Teoría de la cognición distribuida. Tecnologías digitales. Educación.*

Introduction

The contemporary world is marked by great changes in society, among which we can say that digital technologies assume a prominent role. In the context of systematized education, digital technologies have been the subject of extensive reflections. The discourses about education attribute a central place to ICT (Information and Communication Technologies), but such centrality has been based on so different justifications and foundations that it is not possible to make a singular reading of this picture (PEIXOTO, 2012). Many are the visions that support the pedagogical uses of digital technologies, whether they are deterministic, instrumentalist, or more critical. Feenberg's major criticism of the instrumentalist view is that technology is a tool or instrument of the human species with which we satisfy our needs (FEENBERG, 2003).

The instrumentalist view treats technology as subjected to the social sphere and its values, thus being a neutral tool controlled by man, and having efficiency as its norm. It can be said that this perspective has been present in the discourses about the uses of technology. Notably, and sometimes in a romanticized way or supported by common sense, technologies

are associated with innovation in teaching and learning processes, as if the simple use of them would trigger new methodologies, new ways of teaching, learning and thinking. In other words, the tool itself is already imbued with values, disregarding its uses, the social and human aspects involved. The big question is: what are the technologies really for? How can they contribute to the learning of studies in a critical way? What theories can support the use of technologies that take into account the relations of the subjects in their use? Although these questions are not exactly the questions to be answered in this study, we seek here to deepen our reflections about the Theory of Distributed Cognition, because we understand that it presents important contributions regarding the uses of technologies in teaching practices. Based on these questions, in this text we have tried to analyze research within the scope of the Theory of Distributed Cognition as a way to deepen aspects that can, in fact, contribute to the reflection about the uses of technologies in the teaching and learning process in a critical way, taking into account the subjects in an individual and collective way and the historical and social context. The principles of the theory of distributed cognition consider that knowledge does not happen in an individualized way, but is the result of the interaction of the subject with cultural and social factors, with the environment and with objects or artifacts (SALOMOM, 1993).

Thus, this research is justified by the importance of the use of digital technologies as mediating tools capable of enhancing and triggering significant learning. "However, considering the contemporary uses of digital technologies demands the understanding that there are ongoing changes in the ways of relating, communicating and knowing" (SILVA; LIMA, 2018, p. 246).

The present research presents as a guiding question: how have the researches in the field of education that deal with digital technologies based on the Theory of Distributed Cognition been presented? To this end, the general objective of this work is to analyze educational research that deals with digital technologies based on the theory of distributed cognition and to verify how these are presented in the literature.

In this paper, we intend to: contextualize the concept of distributed cognition and its relationship with the cultural-historical theory, as well as address digital technologies in education and analyze research in education that deal with digital technologies from the theory of distributed cognition, in the period 2015 to 2021.

Distributed Cognition Theory as a theoretical foundation for thinking about practices with digital Technologies

Vygotsky's historical-cultural theory (1998), according to Mello (2012), considers culture, mediation and activity, as part of the humanization process, the construction of the social being and the development of the human psyche. Thus, Martins (2015) also discusses the development of man as a historical and social product, as he builds and is built by the social world and by his relationship with nature. Thus, it is understood that the appropriation of culture occurs throughout history, through production, work, and relationships with other human beings. Therefore, the human psyche develops according to his experiences, his relationships with other social beings, and his vital activity.

For Leontiev (1978), in the process of appropriation of culture, the human being formed his motor sphere, that is, the human being is constituted through this process and the experiences lived through social relations. For the author, this is repeated several times, until the previous knowledge is overcome. From the biological point of view, this new way of thinking was a determining factor in the emergence of human qualities, such as personality and intelligence.

The Distributed Cognition Theory dialogues with the Historical - Cultural Theory, based on the assumptions of classical theorists such as Vygotsky (1998) and Leontiev (1978). In this sense, the former is conceived by many researchers as the second generation of Leontiev's activity theory.

The main theorists of distributed cognition theory are Salomon (1993), Cole and Engestron (1993), and Hutchins (2000). For Salomon (1993) and Hutchins (2000), distributed cognition occurs when cognitions are shared among the subjects involved in the same situation/life. The relations between subject and object consider cognitive processes beyond biological aspects, in which shared experiences reorganize human mental processes through interactions with subject, object, culture, and environment.

For Moraes and Lima (2018, p. 57), "[...] cognitions will be considered as distributed when interactions become mediators of mental activity." Such fact occurs in a spiral way between the mental processes of each subject, with social interaction or even with technological digital tools (SALOMON, 1993). The author also points out that these interactions occur in situations where cognitions are shared collaboratively between subjects.

As mentioned earlier, the theory of distributed cognition considers the relationships between subjects, objects, environment, and artifacts as mediators of cognitive processes.

According to Moraes and Lima (2019, p. 246), "artifacts are the physical tools/instruments, signs, and symbols that mediate the actions of human beings in their different forms, constituting culture."

In this context, we can consider digital technologies or digital artifacts as mediators of cognitive processes. About the relationship between human beings and technologies, Hollan, Hutchins and Kirsh (2000, p. 175) state

> [...] we think that distributed cognition theory has a special role to play in understanding interactions between people and technologies, because its focus has always been on environments entirely: what we actually do in them and how we coordinate our activities in them. Distributed cognition provides a radical reorientation of how to think about designing and supporting human-computer interaction. As a theory, it is specifically tailored to understand the interactions between people and technologies.

According to Hutchins (2000, p. 175), distributed cognition theory seeks to understand the organization of the cognitive system and its processes, wherever they may occur. For the author, a process is not simply cognitive because it happens within the brain, nor is a process non-cognitive because it happens in the interactions between many brains or through artifacts.

In summary, the assumptions of the cultural-historical theory bring the understanding of man in a dialectical process as a social being, who through the appropriation of culture and the activity of work modifies his way of thinking and existing. The theory of distributed cognition emphasizes that the subject does not learn alone, but mediated by processes that involve other subjects, culture, the environment, and objects.

In this regard, according to Hutchins (2000), the theory of distributed cognition provides a basis for understanding that information and communication technologies can enhance cognitive processes through the interaction between human beings and digital artifacts, reorganizing mental processes, in short, generating new knowledge.

According to Salomom (1993) and Hutchins (2000), the construction of knowledge and the use of information and communication technologies can foster the distribution of cognitive processes between people and artifacts.

Moraes and Mello (2020), based on Salomon's (1993) assumptions, point out that the use of certain artifacts assists in the accomplishment of the cognitive task. Thus, not only artifacts can be understood as mediators, but all other actions, such as interaction, collaboration, partnership, negotiation and the context itself are mediating resources of cognitive activities, from the relationships that are established

That said, we start from the idea that such assumptions can contribute to think the uses of technologies in teaching practices beyond neutral or technicist visions, understanding that technologies are produced by and for human beings in a certain social context. The assumptions of the theory of distributed cognition, anchored in an interactionist perspective, take into account that technologies are products of culture. In this way, technologies should not be used as fads or simple task optimization, but should enhance the ways of doing, thinking, analyzing, creating, reflecting, and creating.

From these ideas we present the study path of the present study in order to get to know and analyze research on the uses of technologies in teaching and learning processes that are based on the theory of distributed cognition.

Method and procedures

The present study, of qualitative approach and exploratory nature, is framed as bibliographical, from a systematic literature review. It was carried out by searching for articles in the *Google Scholar* database between the years 2015 and 2021, using the following words as descriptors: "Theory of Distributed Cognition". In total, twenty-seven articles (27) were found. After applying inclusion criteria, such as: research in education that dealt with digital technologies from the theory of distributed cognition; and exclusion criteria, such as: theses, Final Papers, dissertations, articles that were not in Portuguese and articles that did not deal with digital technologies in education, we were left with 09 articles, which were read and analyzed to compose the study.

Results and discussion

As already informed, we were left with only 09 academic articles that presented the theory of distributed cognition as a theoretical basis for studies on the uses of technology in teaching and learning processes. The table below shows the studies analyzed.

Chart 1 – Characterization of the articles found in the Google Scholar database

TITLE	AUTHOR	YEAR	TYPE OF RESEARCH
1) The student and his relationship with digital technologies: Representations in his learning	MORAES, Dirce A. F; LIMA, Cláudia. M.	2018	Qualitative with exploratory-explanatory design.
2) Contemporary uses of digital technologies by adolescents: pedagogical practices and teacher training	SILVA, Analigia M.; LIMA, Cláudia. M.	2018	
3) Young people's learning from their perspective and interrelation with digital artifacts: indicators for thinking about formative processes in the university	MORAES, Dirce A. F.; LIMA, Cláudia. M.	2018	Qualitative with a descriptive-explanatory design
4) Appropriations of digital media in conceptual formation and joint construction of meanings at university	MORAES, Dirce A. F.; LIMA, Cláudia. M.	2021	Exploratory-explanatory
5) Digital artifacts in conceptual learning: possibilities for cyberculture	MORAES, Dirce A. F.; LIMA, Cláudia. M.	2020	Qualitative, of exploratory nature and with characteristics of research-intervention.
6) The reconstruction of teaching practice: reflections of the intervention in a didactic experience	MORAES, Dirce A. F.; LIMA, Cláudia. M.	2017	Descriptive
7) Teaching concepts at university: facebook as a collaborative didactic mediation tool	MORAES, Dirce A. F.; MELLO, Diene. E.	2020	Research-intervention
8) Digital artifacts as mediating tools of students' cognitive activities: possibilities for new learning scenarios	MORAES, Dirce A. F.; LIMA, Cláudia. M.	2019	
09) Reflections on the context of virtual environments, their theoretical approaches and the pedagogical use of interaction in online courses: scenario of different languages	GODO, Eliamar.	2016	Qualitative, exploratory-explanatory approach

Source: Organized by the authors from Google Scholar data

When selecting the studies that dealt with the Theory of Distributed Cognition and its relations with technologies in education, one aspect draws attention: of the 09 studies, 07 were by the same authors: Moraes and Lima, who present several studies that are the result of a doctoral research in Education at UNESP (São Paulo State University Júlio de Mesquita Filho). The articles are apparently fragments of the thesis defended in 2017. In article 1, Moraes and Lima (2018) investigate the representations that young adult students have about their relationship with digital technologies in their conceptual learning through an exploratory-exploratory research. The authors point out that the nature of adult cognitive processes is not the same everywhere, as it differs according to the historical and cultural changes that occur in

a given society. Based on authors such as Salomon; Perkins; Globerson (1991), Moraes and Lima (2017), state that the potential of technologies is not in what they offer, nor in the tool itself, but in the nature of the activity to be developed.

Text 2, by Silva and Lima (2018a), the second author being the same as text 1, aimed to identify and analyze teaching practices in the use of digital technologies and their relationships with student learning. The authors point out that the interaction between the different elements - subjects and artifacts - results in knowledge that cannot be attributed to a specific element, but in the symbolic exchange between them. In this way, intelligence becomes collective, that is, a product of individual and collective mental structures (SILVA; LIMA, 2018, p. 249).

Text 3, by Moraes and Lima (2018b), investigates young adults' learning from their perspective and interrelationship with digital artifacts, and constitutes an exploratory-exploratory study, whose target audience was a class of young participants at a university. The data collected by the authors in this study indicate an ambiguity between what students point out regarding the way they learn and what they actually experience in academic spaces, since this is not the reality we have in educational institutions.

Text 4, also by Moraes and Lima (2021), takes the Theory of Distributed Cognition as the unit of analysis of the data collected through participant observation, dialogues on social networks and documentary analysis of productions in collaborative environments and treated from the perspective of content analysis. The data reveal that young people appropriated digital media in different ways and for different purposes. With this, two main categories became evident: as mediators in conceptual formation, through dialogue, cognitive confrontations, and sharing; and as an instrument for the joint construction of meanings, through intellectual partnership, participation, collaboration, and mutual help.

Text 5, also by Moraes and Lima (2020), sought to investigate the contributions of the use of digital artifacts in concept learning with a group of first-year students in the Pedagogy course of a public institution in the interior of Paraná. The research is of the descriptive type, and was carried out in the light of the theory of distributed cognition. The results elucidate interaction, differentiated learning and collaboration as contributions to learning in the context of cyberculture, and reveal that the opportunity to experiment with new didactic experiences with digital artifacts in learning and concept formation occurs when these act as mediating instruments.

Text 6, by Moraes and Lima (2017), from the same research, points out results regarding changes in teaching conceptions and practices, understood as changes in the role of the student

and the teacher. The authors also emphasize that teaching practice should be guided by a theory that can support its goals and actions.

Regarding text 7, by Moraes and Mello (2020), the authors seek to analyze the possibilities of using the social network Facebook as a collaborative didactic mediation tool in teaching concepts. The results show that Facebook has great potential as a mediation tool based on the interactions evidenced through dialogue, cognitive confrontation and joint construction of meanings, and also based on collaborative participation, which expressed the contributions of students to achieve collective goals through intellectual partnership in search of conceptual understanding.

In text 8, by Moraes and Lima (2019), it was sought to investigate to what extent digital artifacts, used by young people in their daily practices, are consolidated as mediators of cognitive activities in academic practices. Given the data presented, the authors state that the didactic sequence provided new learning scenarios, which the linear and face-to-face format is not able to offer, emphasizing collaborative, procedural, hypertextual, real and interactive work.

The work developed in Text 9 is a bibliographic study through theoretical research, different from the previous ones, which analyze experiences with the use of digital technologies. The study raises interesting aspects concerning the conceptions of teachers about technologies and their uses, pointing out the need for more studies about interaction between: the teacher, the student, the content and the digital tools, and Instructional Design.

In general, the texts present a vision of non-neutrality of technologies, at the same time that conceives them as elements of culture. For this, it is not enough just to use such tools to consume content, but the student needs to have the opportunity to live didactic experiences that allow him to make the most of the potentialities that such tools offer, so that he can learn or expand his abilities to explore, analyze, synthesize and problematize, and thus develop himself.

With the data collected and analyzed, we can see that the texts point to digital technologies as a potentially active space for learning, and indicate the need for significant experiences. In their relationship with digital technologies, adolescents have changed the way their activities and cognitive processes are required and/or mobilized, and this promotes intellectual development (SILVA; LIMA, 2018, p. 246).

According to Silva and Lima (2018, p. 247):

> The intertwining between the use of digital technologies and cognition is an important discussion when we think about school processes. We understand that the teaching and learning process, under the Vygotskian perspective, presupposes digital technologies as psychological instruments with mediating

> capacity in the promotion of inter/intramental processes, promoters of cognitive development.

Salomon (1993) points out that interactions with technological artifacts mediate the mental activity of each subject, enabling the construction of knowledge, collaboration and learning.

It seems that the texts emphasize collaborative processes in learning, understanding digital technologies as mediating tools for learning, through the relationships between subject, object, culture, and environment. According to Cole and Engestrom (1993) and Moraes and Lima (2018), knowledge does not occur individually, but rather through a process of interaction with social and cultural environments, the experiences lived, the context of the students, and the technologies used. It is these media that alter the nature of human activity, transforming it, thus distributing cognition: as a result, new knowledge is built.

Moraes and Lima (2018, p. 58), point to GCT as a theory "suitable to underpin formative practices" of students and or teachers. Also according to the authors, this theory "aims at assumptions that value interaction, acting in partnership with the other and with artifacts, exchanges and negotiations that may result in changes. That said, we reiterate that the theory of distributed cognition can support formative processes, because it values the interaction of subjects with the environment, culture and object, it is based on collaboration and the use of digital artifacts with specific planning and purposes.

> The study elucidated that young people trust technologies as a potentially active space for learning because they offer a diversity of options for doing so and constitute a source of information available to their needs (MORAES; LIMA, 2018, p. 311).

The authors point out that technologies are understood as essential tools and mediators of learning. However, in this regard, Silva and Lima point out:

> The teacher must act as a mediating element between the students' individual cognition and the environment, proposing activities that enhance specific skills, that lead the student to develop learning strategies, that culminate in the construction of scientific concepts, taking advantage of collective intelligence (SILVA; LIMA, 2018, p. 263).

For the authors, the pedagogical practices must focus on the implementation of situations and conditions that take advantage of the students' ways of learning. The teacher is responsible for teaching and monitoring the students' learning, promoting situations in which he/she can mediate the processes so that the student can reflect both on his/her own learning and on the collective learning.

> We could realize that it is not enough to make the technologies available so that people can use them, but to provide conditions so that actions can be carried out both with regard to teaching and learning (GODOI; LIMA, 2016, p. 11).

Through the reading of the texts, we also noticed that it is the teacher's role to seek quality education, to promote interaction and interlocution among everyone, as well as to create alternatives for the construction of knowledge, enabling paths for learning autonomy.

Final considerations

Returning to the guiding question of this study: how has the research in the field of education that deals with digital technologies from the distributed cognition theory been presented? we can consider that the analyzed articles highlight that digital technologies can enhance learning processes, collaboration and socialization, fundamental principles of the distributed cognition theory. However, it is not the technologies themselves that play this role, but it is the organization of teaching and the nature of the activities that can actually enhance learning.

We also ponder, about the construction of new knowledge, that the subject does not learn alone, but through processes of interaction. In this perspective, distributed cognition is inseparable from interaction, from action with the world, subject, objects, and culture. It is important to emphasize that technologies without planning and pedagogical organization with a specific purpose, can contribute nothing to meaningful learning and consequently to these interaction processes.

Through the reading and analysis of the texts, it was observed that technologies assume the role of providing experiences to students. Thus, they contribute not only to perform activities, but in the ways of thinking, creating, elaborating, and actively participating in the process.

Based on the findings, it is possible to affirm that there are few studies in the scope of the Theory of Distributed Cognition and its interrelation with digital technologies in education, thus pointing to the need for more studies in other levels and modalities of education.

REFERENCES

COLE, M.; ENGESTRÖM, Y. A cultural-historical approach to distributed cognition. *In*: SALOMON, G. **Distributed cognitions**: psychological and educational considerations. Cambridge: CUP, 1993. p. 01-46.

DE MORAES, D. A. F.; DE LIMA, C. M. A reconstrução da prática docente: reflexos da intervenção em uma experiência didática. **Revista Profissão Docente**, v. 17, n. 36, 2017.

DE MORAES, D. A. F.; DE LIMA, C. M. O estudante e sua relação com as tecnologias digitais: Representações em sua aprendizagem. **Revista Teias**, v. 19, n. 53, p. 299-313, 2018a.

DE MORAES, D. A. F.; DE LIMA, C. M. A aprendizagem do jovem adulto a partir da sua perspectiva e inter-relação com os artefatos digitais: indicadores para pensar os processos formativos na universidade. **Educação em Perspectiva**, v. 9, n. 3, p. 632-649, 2018b.

DE MORAES, D. A. F.; DE LIMA, C. M. Os artefatos digitais como ferramentas mediadoras das atividades cognitivas dos estudantes: possibilidades para novos cenários de aprendizagem. **Educar em Revista**, n. 78, p. 243-262, 2019.

DE MORAES, D. A. F.; DE LIMA, C. M. Apropriações das mídias digitais na formação conceitual e na construção conjunta de significados na universidade. **Educação em Foco**, v. 24, n. 42, p. 259-278, 2021.

GODOI, E. Reflexões sobre o contexto dos ambientes virtuais, suas abordagens teóricas e o uso pedagógico da interação em cursos on-line: cenário de diferentes linguagens. *In*: SIED - SIMPÓSIO INTERNACIONAL DE EDUCAÇÃO A DISTÂNCIA; ENPED - ENCONTRO DE PESQUISADORES EM EDUCAÇÃO A DISTÂNCIA, 2016, São Carlos. **Anais** [...]. São Carlos, SP: UFSCAR, 2016.

LEONTIEV, A. O homem e a cultura. *In*: **O desenvolvimento do psiquismo**. Lisboa: Horizonte, 1978.

MARTINS, L. M. Psicologia Histórico-Cultural, Pedagogia Histórico Crítica e desenvolvimento humano. *In*: MARTINS, Lígia Márcia. *et al*. **Periodização histórico-cultural do desenvolvimento psíquico**: do nascimento à velhice. Campinas, SP: Autores Associados, 2016. p. 13- 34.

MELLO, S. A. A escola de Vygotsky. *In*: CARRARA, K. (org.). **Introdução à psicologia da educação**: seis abordagens. São Paulo: Avercamp, 2004.

MELLO, S. A. Cultura, mediação e atividade. *In*: MENDONÇA, S. G. de L.; SILVA, V. P.; MILLER, S. (org.). **Marx, Gramsci e Vigotski**: aproximações. Araraquara, SP: Junqueira; Martin; Marília, SP: Cultura Acadêmica, 2009.

MORAES, D. A.; DE LIMA, C. M. Artefatos digitais na aprendizagem de conceitos: possibilidades para a cibercultura. **Revista Teias**, v. 21, n. 60, p. 242-254, 2020.

MORAES, D. F.; MELLO, D. E. O ensino de conceitos na universidade: o Facebook como instrumento de mediação didática colaborativa. **Revista Ibero-Americana de Estudos em Educação**, p. 361-384, 2020.

SALOMON, G. **Distributed cognitions**: psychological and educational considerations. Edited by Gavriel Salomon of University of Hayfa, Israel. United Kingdom: Cambridge University Press, 1993. Available at: https://web.stanford.edu/~roypea/RoyPDF%20folder/A67_Pea_93_DI_CUP.pdf. Access on: 19 Sept. 2021.

SILVA, A. M.; LIMA, C. M. Usos contemporâneos das tecnologias digitais por adolescentes: práticas pedagógicas e formação docente. **Plures Humanidades**, v. 19, n. 2, 2018.

VIGOTSKI, L. S. **A formação social da mente**: o desenvolvimento dos processos psicológicos superiores. São Paulo: Martins Fontes, 1998.

How to reference this article

MELLO, D. E.; VALLINI, S. A. A.; VIEIRA, V. D. The digital Technologies: An analysis from the theory of distributed cognition. **Revista Ibero-Americana de Estudos em Educação**, Araraquara, v. 17, n. esp. 1, p. 0768-0780, Mar. 2022. e-ISSN: 1982-5587. DOI: https://doi.org/10.21723/riaee.v17iesp.1.16327

Submitted: 24/11/2021
Revisions required: 19/02/2022
Approved: 28/02/2022
Published: 01/03/2022

Management of translations and versions: Editora Ibero-Americana de Educação
Translator: Thiago Faquim Bittencourt
Translation reviewer: Alexander Vinícius Leite da Silva