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Qualitative Analysis of Digital Technology Research and Practice in the Field of Social and Human Sciences

Beatrice Bonami[a,1], Mariella Nocenzi[b], Brasilina Passarelli [c]

[a]*University of São Paulo, Department of Communication Sciences – São Paulo (Brazil)*

[b]*University of Rome La Sapienza, Department of Social Research – Rome (Italy)*

[c]*University of São Paulo, Department of Communication Sciences – São Paulo (Brazil)*

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Abstract

This paper aims to present how the topic of digital technology has been discussed in the field of sciences, especially education. At first, presents 10 theoretical categories dedicated to the study of education in interface with digital technology, extracted from the systematic review of, approximately, 2,300 scientific papers collected in two portals: CAPES and ERIC. Following, the paper presents a topical research carried out in the Department of Social Sciences of the University of Rome La Sapienza, in particular on the Sostenibilia Research Center which integrates transdisciplinary research in the interface of social sciences, digital technologies, education and sustainability. In the scope of the research, Professors and Researchers were interviewed about which categories they identify as the main trend of study about digital technologies. After selecting the category of "The Study of Technology as a New Paradigm of Post-Modern Societies" two groups of possible answers were elaborated: the first one about why that category was chosen; and the second about what are the challenges in the study of digital technologies in the field of humanities. We offer some discussion and remarks about the characteristics of digital technologies' study among Education and Social Sciences' field underlighting the role of Open Educational Resources (OER) to consider a new paradigm for educational technology. Nevertheless, we present the concept of OER that connects education, its diverse skills and digital technologies.

KEYWORDS: Digital Technology, Social Change, Social Sciences, Humanities, Sostenibilia International Research Centre, Open Educational Resources (OER)

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1. Introduction

This position paper investigates how do the knowledge areas of Education Sciences and Digital Technologies interact within the academic sphere. The goal is to stablish 10 categories under which digital technologies are currently being studied inside university departments and how do the professors interact with the topic and connect different theoretical backgrounds to understand this contemporary phenomenon. As a result, alongside presenting the 10 categories this paper stablishes 10 reasons why digital technology is or isn´t a new paradigm in Education and 15 problems concerning digital technology studies among social sciences. After carefully data synthetization, it offers a discussion of how Open Educational Resources (OER) can help to foresee future *e*-ducation.

In the early 20th Century, studies regarding the concept of connectivity tried to understand how the system between man-message-technology was driven to comprehend what kind of materiality was present within the communication process. Many theoretical references have discussed communication materiality, arguing the human's emergence from a physical world to a symbolic one where everything (including messages and therefore algorithms) has a material

[1] corresponding author - email: beatrice.br@usp.br – address: Prof. Lucio Martins St, 383, São Paulo (Brazil)

content. According to Floridi (2014) there are three ages of human knowledge development: Pre-History, History and Hyper history.

In his work, he defines the Pre-History as the knowledge processes from the Bronze Age (stated by the development of writing in Mesopotamia and other world regions) until the Information Age (when begins the history period). Floridi suggests that both History and hyper history may appear as adverbs: they say how people live, but not when or where. Hence, the human development crossed those three periods as "Modes of Existence" (in a direct reference to the work of Etienne Souriau - Modes d´Existence, 2010, Presses Universitaire France).

Hyper history's dependence on ICTs created the Information Cycle, as follows in Figure 1. Information is the nucleus (in direct reference to cells and molecules) orbited by procedures and stages, developing the idea of an information as a living organism that is not autonomous but can be recycled and managed.

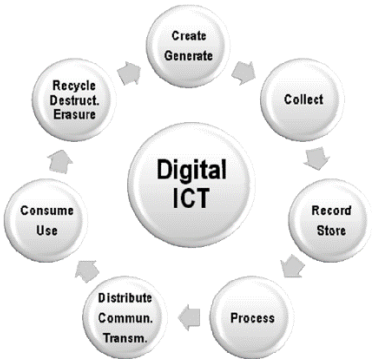

Figure 1 - The typical cycle of information in Digital ICT (Floridi, 2014, p. 5).

The idea of information as a living process encompasses the concept of Complexity supported by Morin (2015) as a term that refers to the incapacity to define simplicity and totality. Complex Thinking can be described as multidimensional with heterogeneous associations within the surrounding phenomena. It is the reintegration, or aggregation as Bruno Latour would argue (2005), between anthropocentric and exosystemic thinking highlighting the unbalanced dynamic as a power source to action. These procedures are, according to Morin (2015), the living being's logic (the variation between order and disorder) which is what the author calls auto-eco-organized organism. In other words, an organism is capable of following existing associations and creating new ones (a direct reference to Aristotle's conception of "autopoiesis").

Insofar as Morin clarifies the concept of Complexity, he introduces his perspective over the expression of "systemic", defining it as several integrated parts that creates clusters or groups, highlighting the frontiers and boundaries between those clusters. However, he states that the overall being is larger than the sum of its parts. Here, what is important in a systemic environment are not the entities alone but their connections, so the simple number of stakeholders does not reveal much if they are not connected in an integrated system.

In Human Computer Interaction (HCI) ICTs create and facilitate the communication between users and computational systems. To mention ICT is possibly to reconsider that computers do not compute, and telephones do not make calls. Humans do all these actions, or at least until autonomous algorithms begin. Those systems deal with data and we humans trust in their capacity to assess them, as we are not able to do so due to the high quantities involved (or Big Data and Network Dynamics).

To be in a network is, according to Latour (2005), to be an active entity playing a role. What does not move or make any actions does not exist in a network, which confounds some of the attempts to describe a network as a complex photography. A network could not be a steady image as it changes on a moment-by-moment basis. Plus, the network represents controversial dynamics in which the number of stakeholder's associations are increased requiring high performance equipment to track its agency (Venturini, 2010). In other words: to understand technology, the first step is to consider that networks are not steady and linear, but complex and highly dynamic.

Discourse surrounding network dynamics in Communication is so complex that it is often necessary to borrow terminology from other fields to explain the subject in a more coherent manner. Theorists regularly use the concept of Ecology to describe the Communication field (as "Communication Ecology") due to a possible unavailability of terms to describe the process regarding digital technologies.

Within Ecology is possible to analyze new forms of action that we cannot define as social or as a result of communicative and technological conditioning (Bonami & Nemorin, 2020). Their protagonists are not only humans, also other stakeholders who contribute to build a complex network: the action, then, is the result of synergistic interactions of individuals, information circuit, devices, digital social networks, sensors, data, platforms (Accoto, 2017, 2018). Ecology sets up a concept from the Greek *oikos*- space (Di Felice, 2017), and *logos*- word, which does not define a contrast, but rather a connective net-like structure, representative of society and of the assumed social action.

2. Material and Methods

Sostenibilia is an International Transdisciplinary Research Centre found within the Communication and

Social Research Department at Sapienza University, Rome. Its origin was motivated by the demand for integration between the Communication, Social Sciences, Environmental Sciences and Digital Technology fields.

Sostenibilia has as a goal to search for interpretations and theories that may contribute to the expansion of societal ideas, thus stimulating the international debate around climate, education and technology prospects of the 21st Century. It is considered an interesting case study as there are a growing number of institutions, research groups and academic networks acknowledging a social perspective in the phenomena of digitalization analysis. Their specificity is in promoting a methodology that makes use of sociological analysis that can ease the transdisciplinary examination of ecology complexity.

To begin, the present research aims to understand which theoretical references are being used to study technology. Through this perspective, academics were interviewed and their answers to two questions were studied: "*Why is technology a new paradigm of postmodern societies*?" and "*What are the main problems concerning digital technology studies within the Social Science and Humanities fields*?". Those questions were built on a theoretical background, to be presented next.

We tried to analyze the conceptions, opinions and references concerning the study of digital technology in the social sciences field. For this, interviews were conducted with scholars and researchers from four different theoretical areas: Media and Technology, Education and Technology, Technology Epistemology and new trends in the study of Technology. The eligibility criteria for interviews were based on the prominence of their work inside the Department of Communication and Social Research at Sapienza University of Rome.

This article considers that digital technology can be studied under ten categories. These categories were extracted from database research concerning the reading of 53 articles regarding the themes of Social Sciences, Education and Technology from 2016 to 2018 (the "relevant period"). We explored the procedures of search and selection, followed by the papers' systematic review. Each of the 53 articles were placed in one of the categories in the following table. It is important to note that these categories are common topics presented by papers and express a theoretical background to embed the present discussion.

The first database accessed was the Scientific Papers Portal by Coordenação de Aperfeiçoamento de Ensino Superior - CAPES (by Ministry of Science and Technology in Brazil). The keywords (in Portuguese and Spanish) used (in intersection) were: "superior education", "digital technology", "transliteracy", "literacy", "information", and "network". There were 1,530 results, of which 763 had been peer reviewed and 279 of these published within the relevant period. Following reviewing the abstracts of each of the 279, 23 articles were selected as part of the systematic review. The second database was the Education Resources Information Centre (ERIC) sponsored by the Ministry of Education in the United States. The keywords (in English and in intersection) were "superior education", "digital technology", "transliteracy", "literacy", "information", and "network". As a result, 44,788 articles, of which 24,947 had been peer reviewed and of these 5,936 had been published after 2015. Of these 5,936, 1,971 had the text available for download. Following reading the abstracts of each of the 1,971, 30 articles were selected as part of the systematic review.

Methodological procedures are consisted of the following stages: (i) scientific database research; (ii) systematic review of database findings; (iii) scientific overview of topics and categories; (iv) selection of academics; (v) semi-structured interviews; and (vi) coding interview findings (coding here refers to extract, analyze and categorize theoretical elements from the paper collection).

Polanin, Maynard and Dellsaint (2017) characterizes the overview as a close form to systematic review, but the information extracted is often quite different, as the content of revision can reach theoretical levels. The overview codes and reports pertinent information regarding the systematic review in addition to information on its reports about the primary studies. As a conclusion in this paper, the overview offers ten theoretical categories and the ten main problems within Digital Technology studies in the Applied Social Sciences field.

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) which consists of an evidence-based set of items extracted from a large set of references collected from relevant literature. PRISMA is predominantly used in healthcare sciences but can be applied in this research as an effective way to evaluate the data collection through theoretical review and interviews. It has contributed to the systemic reviews sciences and can be transferred to any theoretical ground as long as it meets the criteria to apply the procedure.

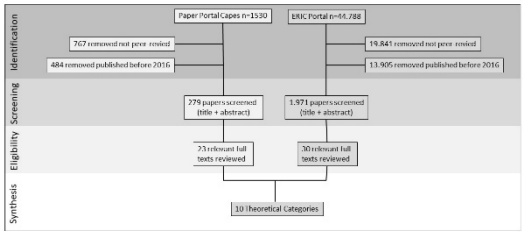

Figure 2 - PRISMA model appliance.

The first criterion was chronological: theoretical research (database collection) was restricted to production between 2016 and 2018 while the interviews were collected in 2019 (following the requirements of peer-reviewed materials and credited sources). Regarding the data base research, the criteria are as follows:

- have a significant contribution to the discussion of Education and Digital Technology;
- provide different perspectives and practical reports of initiatives occurring in cross national reports; and
- engage in a discussion about media, information literacy and digital literacy in a specific period considering the level of development of the digital technologies applied in Education (this criterion was considered desirable, but was not required).

The selected studies were coded comprising the following sections: (a) bibliographic information; (b) overview of characteristics and methods; (c) thematic synthesis; and (d) main questions asked and answered by the study.

Regarding the interviews, the eligibility criteria are listed as follows:

- be an Associate Professor or Research Collaborator at Sapienza University of Rome within the Department of Communication and Social Research;
- have a scientific production about digital technology or transmedia in the Social Research Department; and
- engage in a theoretical discussion about media, information literacy and digital literacy (this criterion was considered desirable, but was not required).

For that matter, it was elaborated an interview script to guide the data collection. The script considered to investigate theoretical references and opinions.

3. Results

The choice of categories was directed by the systematic review. Their goal is to understand how the selected papers studied and dealt with Education and Social Sciences Fields interfacing with Digital Technologies. Some important considerations:

Categories were extracted following current topics discussed during the systematic review and can be found on Table 2.

After elaborating them, each analyzed paper was fit under one or more categories; and Table 3 summarizes the categories and defines them according to the systematic review.

#	Interview Script
1	How would you define digital technology? What are the main theoretical references you use to study and teach about the subject?
2	Why do you consider digital technology as a new paradigm in the knowledge society?
3	What are the main problems when considering technology studies and practices?

Table 1 - Interview script.

Conceptual categories extracted from the systematic review of 53 scientific papers selected among ERIC and CAPES databases
The Study of Technology as a Potentially Empowerment to Solve Problems
The Study of Technology as a Logical Operation
The Study of Technology as a Tool
The Study of Technology as a New Paradigm of Post-Modern Societies
The Study of Technology as a New Paradigm of Education
The Study of Technology as a Human Perceptive Extension
The Study of Technic regarded as an autonomous entity (Big Data, AI, Blockchain, IoT)
The Study of Technology under an ecological approach
Technology under a Distributed Narrative
Technology under a Humancentric Narrative

Table 2 - Theoretical categories extracted from the systematic review of 53 scientific papers.

Exploring the theoretical categories	
Theoretical Category	*Description*
The Study of Technology as a Potentially Empowerment to Solve Problems	Presents digital technology as the students' and educators' empowerment accelerator, enabling improvement in digital skills. The word "potentially" is followed by the word "possibility", as digital technology provides new opportunities.
The Study of Technology as a Logical Operation	Deals with digital technology as logical skills and knowledge groups, next to language learning, empowering the individual to develop this ability.
The Study of Technology as a Tool	Interprets digital technology as a tool, instrument or as a means to an end. Deals therefore with technology as an object to be demanded by a human to reach personal, professional and cultural goals.
The Study of Technology as a New Paradigm of Post-Modern Societies	Offers digital technology's interpretation as a new society paradigm, promoting: • the dissolution of the industrial economic background; • the age of platform society (Dijck, Poell & Waal, 2018); • the urban gentrification with new arrangements brought by platforms; and • the data culture suggested by Hyperhistory.
The Study of Technology as a New Paradigm of Education	Interprets digital technology as a new educational paradigm, promoting the hybrid learning between: • the classic teaching (instruction); • the analogical knowledge dissemination (like books); • personalized learning; • open educational resources; • project based learning; and • knowledge shared production.
The Study of Technology as a Human Perceptive Extension	Presents digital technology based on Marshall McLuhan (1964) studies about the extension of a human, which cannot define its use as a means to an end as the human alters himself when in contact with it.
The Study of Technic regarded as an autonomous entity (Big Data, AI, Blockchain, IoT)	Interprets the technic as an autonomous entity capable of creating and reproducing knowledge and information, arguing against the human as the only entity capable of intelligence.
Study of digital technology under an ecological approach	Considers technology as far more involving than its aspects surrounding the human context taking into consideration the life history, environment and sustainability narrative, based on the ecology as an entropy concept.
Technology under a Distributed Narrative	Describes the interactions between humans and non-humans under a flat ontology (based on the Network-Actor Theory by Bruno Latour (2005) where the human is not the only one to dominate the technic. As a matter of fact, the agent's nature is not important, but its actions and how they aggregate with other agents are.
Technology under a Humancentric Narrative	Describes the interactions between humans and the technic underlying the human relevance in digital manipulation. This entitles the human to create, alter, transform and share the technical phenomena. Expands the technic as something demanded to reach a goal. The resource manipulation comes from an industrial (or historic) perspective while the globe has reached Hyperhistory.

Table 3 - Exploring theoretical categories to study digital technology and education.

Based on data base research, category design, and conducted interviews, we were able to elaborate two main outcome groups by answering two questions: "why technology is a new paradigm of postmodern societies?" and "what are the main problems related to digital technology studies among the Social Sciences and Humanities Field?".

These two groups are a collection of answers retrieved from the interviews and are organized in following Tables 4 and 5.

Group of answers 1	
#	**Why technology is a new paradigm of postmodern societies?**
1	Reshapes the economic regulation and background
2	Empowers people in a symbolic and cognitive way
3	Information (especially personal) becomes a powerful asset
4	There is a new perception of what kind of government people need
5	Remodels the way people populate cities, build the cultural background and product knowledge
6	Industry dissolution provides new ways to know and learn as a distributive intelligence
7	It isn't yet a new paradigm, as it doesn't have all the elements to build and evaluate a new paradigm. However, digital technology is bringing the need for a new paradigm in education and OER seems to be the key to this.
8	Technology is a powerful actor/stakeholder not a passive tool. Its own will also became autonomous. Like a doll or a toy that comes to life.
9	The basic dimensions of digital technology suggest considering them as strategic tools for the constructions of new forms of social spaces and relations and not directly a new paradigm.
10	Thanks to the new temporal, spatial, and network forms enabled by digital technologies, the morphology of society is changing and, thus its own composition: you can just think that nonhuman subjects have a growing social position and role.

Table 4 - First group of answers.

Group of answers 2	
#	**What are the main problems concerning digital technology studies among the Social Sciences and Humanities Field?**
1	TIMING: the timing of technological transformation is much faster than the time taken to adapt to it. This delay is related to mediation, as citizens begin to enter the Platform Society rethinking social standards.
2	PARADOX: the time required to understand technology is too long COMPARED to the short time taken to adapt to it.
3	GENERATION: how youth use technology, how they understand and perform their activities.
4	MACRO & MICRO: [macro] to capacitate teachers with soft and not only digital skills; [micro] how to connect and encourage professors to be interested?
5	MENTALITY: educators and institutions that stands in the way of digital technology promotion.
6	HUMANS & NON-HUMANS: the social created by technology is composed of humans and non-human entities.
7	BLACK-BOX: technology is a black-box in education where professionals may feel harmed or unprepared to deal with it.
8	"AND" & "AS": why technology AND education AND social? Why not technology AS education or AS social?
9	PUBLIC ENGAGEMENT: lack of connection between the academic context and civil society. University projects are important but not enough.
10	MATERIALITY: people have a hard time understanding what technology is because they cannot see its materiality (can't touch it).
11	DYSTOPIAN: technology should not be viewed as a dystopian and abstract background that may or may not come true (this is a futuristic narrative from the 1950s).
12	METHODOLOGICAL: technology is no longer a tool or method that was created to meet human demands (this is a functionalist narrative from the 1980s)
13	LEGITIMACY: the social sciences still use traditional paradigm to interpret current social processes. The information can be produced by everyone, thanks to handhelds such as smartphone. The authority of a journalist, as well as that of a scientist in regard to the result of scientific research, is no longer important for the legitimation of the truth.
14	TRANSFORMATION: these cases, which are both daily practices and objects of social studies, show that, considering a problem, the result of the transformation of society is the result of the interpretation of the current processes with past models: innovation always produces its own analytical tools, as well as lifestyle.
15	PRODUCTION: today, the consumer is increasingly a prosumer: humans don't need to buy a song (e.g.). They can produce with an app or a software and achieve their goals with many software and hardware operations.

Table 5 - Second group of answers.

4. Discussion and Conclusions

This paper brings two groups of answers for the questions: "why technology is a new paradigm of postmodern societies?" and "what are the main problems concerning digital technology studies among the Social Sciences and Humanities Field?". About the findings, it offers 10 reasons why digital technology is (or isn't) a new paradigm in postmodern society and 15 problems of digital technology studies in the social field. Regarding the results, there are at least two possible paths for discussion: social and educational.

In the first path, Nocenzi and Sannella (2018) explains that the sociological scenario, in terms of methodologies and theories' reformulation and for social research, shows some transformations promoted by digital technologies. The uncertainty of science has strengthened this process while its authority as a source of knowledge has been delegitimized. Even what could seem like a paradox in the face of the growing specialization of technological knowledge, a popular wisdom prevails as a result of statements, thoughts, proposals that users can express using social media and a worldwide connection.

These changes are challenging for the social sciences as they must re-formulate their own basic concepts, methodologies and even theories. However, the adoption of technologies in everyday life requires an analytical function that social sciences can provide as a structured field. Education is one of the strategy fields of Social Sciences and structural changes we foresee are challenging for educators and students. One of them, is the process of legitimizing knowledge and the growing dispute between knowledge itself and wisdom (Puech, 2016).

In the current interpretation it is risky to define who can verify the outcomes of this common debate, avoiding falsification and mistakes, both in good and in bad faith. Thus, education as technology and information should guide its activities in order to promote logical learning and citizenship empowerment, viewing digital as an extension of the human being. Nevertheless, educational approaches often consider the digital technology approach vis a vis an instrumentalist bias, a factor that this research intents to refute (at least the Aristotle-based instrumentalist perspective). On the path of logical learning, the concept of Media and Information Literacy offers an overview that understands the needs of 21st century's students and educators (Passarelli & Angeluci, 2018).

One of the applications of educational technology is through neuroscience. The usefulness of its findings for research in education is an ongoing debate. Ng & Ong (2018) talks about a gap between what you know about the human brain and what makes it able to be bridged by these neuroscience findings. However, research results normally found in small dimensions cannot be generalized. In addition, there is a demand for neuroscientific research in schools and universities, but it is not very clear how neuroscience can connect theory and practice.

First, neuroscience research has explored the representation and processing of syntactic categories. Some procedures such as MRI are used to observe how the brain moves and reacts to the learning of some items. Reading some research findings, we learned that some results on students' brain observation using digital technology reveal the activation of regions of the cortex that are equivalent to areas of language learning. A similar cortex indicator is perceived when producing and accessing materials, reason why Ng & Ong (2018) bring the importance of OER to further discussions related to neuroscience.

Just as Ng & Ong (2018) addresses the applicability of neuroscience in teaching, providing free access materials can be substantial to bridge the gap between theory and practice. OER have a particular role in that since not only enables the access but the broad production of materials that can highlight both educator and student activities.

In 2002, the term Open Educational Resources was coined by UNESCO (2017, 2019) to refer to educational resources generated for the provision of digital access through Information and Communication Technologies (ICT), to be used for non-profit purposes, following the Open Access guidelines. The OER theme has broad similarity with the concept of Open Courses (Open Course Ware - OCW) defined as an open and free high-quality digital publication for higher education. The William and Flora Hewlett Foundation defines OER as resources for teaching, learning and research that reside in the public domain or have been made available under a license that protects intellectual property and allows its use as free, shared and generative. OER has more than the potential of its devices and content: it has a transformative power based on network and sharing dynamics.

Importantly, UNESCO (2017) recognizes that continued refinement of an emerging set of indicators and survey items is necessary, and requires that they be pilot tested in several countries and scrutinized against a set of core criteria that address:

1. Data availability, in terms of a government's ability to gather reliable data on the indicator; and
2. Global comparability, in terms of the usefulness of the indicators for making global comparisons.

Key indicators can be listed to assess the OER development in cross-country and regional analysis and should be considered in the discussion of OER driving endeavors to a new paradigm of education:

1. Proportion of countries that have OER and how they report their contribution;

2. Ways and reasons why the country is engaged in OER by type of initiative;
3. Types of barriers to mainstreaming OER: language, digital access and cultural barriers;
4. Skills required to improve OER use by educators and learners;
5. Barriers to engaging educators in the production of OER;
6. Types of OER content produced by educators and license used for resources produced by educators;
7. Perceived impact and benefits of OER on teachers, instructors and for students;
8. Inter-institutional activities around OER; and
9. Co-operation with other educational institutions for exchanging OER.

Yet, indicators could foresee the digital transformation among societies or at least understand how OER is being applied. Important to consider that technology has at least four influences on education: methods transformation; content reshaping; institutional structure transformation; and relationship redefinition. Premature digital developments in the 1990s had an influence on one, two or three of these areas. However, for a paradigm shift to occur, the four topics need to be transformed. Paradigmatic transition involves changing basic concepts that underpin a discipline or field of knowledge and unless the four influences are combined, OER won´t bridge that transition.

The new logics of knowledge production at the interface with a range of hybrid methodological procedures give rise to the third paradigm of education. The first paradigm existed for thousands of years and operated in a pre-technology era. It was the one-to-one tutoring and mentoring format. The second emerged with the advent of analog media, especially with books printed in the Middle Ages. It is a one-to-many teaching model. This model is less effective than direct mentoring because the pupils' response process was more subjective. On the other hand, the paradigm shift to one-to-many enabled education to develop as common good to society until the 20th century when was considered a human right by the Human Rights Universal Declaration in 1948.

One may argue that education is at the dawn of its third paradigm. This affirmation is defined by the connection between students and teachers and the characteristics of many-to-many and multi-directional mentoring. The teacher no longer holds the role of the great master of knowledge. Furthermore, they are mentors or guides and students are involved in a process of sharing knowledge and exploring discovery. This paradigm represents the decline of the teaching hierarchy, the end of courses, when teaching becomes barrier-free and disciplines communicate (Passarelli & Gomes, 2020). OER is an important connector in this scenario, since encourages a horizontal relationship between educators, learners and resources.

The arrival of the third paradigm does not condemn the end of the other two, just as the arrival of the second did not expel the first. However, they are set aside, although they are still considered important. In this way, hybrid teaching assumes a certain role in which hybrid courses combine traditional instructional models and online learning. For example, the COVID-19 pandemic brought a new perspective on education with the compulsory measure of social isolation in many countries to avoid the virus spread and contamination. Reports from United Nations, OECD, World Bank drive the discussion if, after the pandemic is contained, education will go back to be completely presential or if it will incorporate novel methodologies learned through the past four months.

Some underpinnings for educational innovation based on this emerging paradigm could include the following: first, educators could build and incorporate digital resources into teaching at any level and field of knowledge, while combining methods with digital and connective media creating a communicative sphere in the learning community. Second, students can become lifelong learners and, eventually, teachers. The line between teacher and student is tenuous and can be dissolved, where teachers are guides and students are participants. Third, ethics must be the common compass that guides teaching in the Digital Information Age. Experienced educators can play vital roles in fueling the development of this moral compass in students. Fourth, it is important to avoid falling into technological determinism. Technology, no matter how advanced, does not guarantee a better education, just as it is not the solution for everything. Still, it is worth noting the promise of an engaged community of apprentices for life, an objective which requires a collective effort.

On this subject, Floridi points out that *e*-ducation (as he calls it) is coupled with knowledge and, as the information society testify the challenging growth of data, there is a demanding to understand which structures underlie learning processes. According to him, the learning mind architectures is pretty similar to the logic of algorithms, reason why these processes should have a better dialogue between their fields. Education basic structure should be so the join architecture of knowledge, insipience, uncertainty and ignorance and the real question is not “how” to teach the next generation, but “what”.

Future *e*-ducation must cross the mind’s categories borders and follow a transdisciplinary path to realize a complex understanding of surrounding world. As Floridi mentions, the “science changes our understanding in two fundamental ways: about the world and about ourselves” (2014, p. 87). Science compiled with education may be the key to understand how OER is developed within digital prospects.

Today, thinking about teaching is not only considering the interface between teacher and student: it is to understand that the words assigned in this process carry meanings that can mask technology and the collective construction of knowledge. Just as the prefix "post" is used to revoke categories of humanism, or the term "hybridism" to address the controversial aggregations of indistinct entities, the expressions "literacy" and "education" lack a "post"-look at their meanings. Their rigid senses lead to the denotation of instrumental processes of world apprehension, leaving the connective extension of the subject as a subjective factor and not the main objective.

OER is built within transdisciplinary and we refer the "trans" prefix according to Latour's "translation" definition, recognizing Education as an informative architecture (cohort of structures, references and conceptions that support a knowledge field – Edgar Morin, 2015) that favors the multiplication of hybrids, presenting itself as the basis of knowledge.

"What is called 'knowledge' cannot be defined without understanding what knowledge acquisition means. In other words, 'knowledge' is not something that can be described by itself or as opposed to 'ignorance' or 'belief', but only by examining an entire cycle of accumulation" (LATOUR, 2011, p. 343)

The challenge of pursuing research in this course of thought is to align academic elaborations with the pragmatical context (primary schools, high schools and other educational levels) and empower both population and government to understand the implications of what appear to be a new possibility for the philosophy of knowledge and, if not yet a new paradigm, a vision of a changing reality.

List of abbreviation

Abbreviations	Definitions
ICT	Information and Communication Technologies
AI	Artificial Intelligence
HCI	Human Computer Interaction
IOT	Internet of Things
CAPES	Coordenação de Aperfeiçoamento de Ensino Superior
ERIC	Education Resources Information Centre
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
MIL	Media and Information Literacy
MRI	Magnetic Resonance Imaging
OCW	Open Course Ware
OER	Open Educational Resources
UNESCO	United Nations for Educational, Scientific and Cultural Organization

Datasets and reproducibility

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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