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Felipe de Matos Müller; Márcio Vieira de Souza

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Keyword: network education; knowledge communication; knowledge media; knowledge dialogue.

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Abstract

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Keywords: network education; knowledge communication; knowledge media; knowledge dialogue.

1. Introduction

An efficient model of education is always closely related to a vision of society. The concept of a network society (Castells, 2010) places a model of network education as a priority. Networks can take many forms represented in a basic typology such as centralized, decentralized, and distributed. Network education can initially take any of these forms. Network education is not the same as democratic education, although they may coincide, depending on the structure of the educational network. Therefore, it is necessary to abandon an ideological or idealized view of network education so that it can reach its full educational potential. If a distributed and democratic network education is desirable (Uys, 2002), then it needs to be planned and built.

A democratic network education requires network literacy. There is the need for a network literacy in a network society (Cramer, Porter, Sayama, Sheetz, & Uzzo, 2015). If you want to understand your educational process in a network, it is necessary to advance in the understanding of nature, structure, and possibilities of this educational network. Someone can understand educational connections and interactions at various fractal levels through network literacy. If network education has as one of its characteristics the flexibility of connection and interaction patterns, understanding these patterns become students able to

informed change them. Network literacy seeks to raise awareness of the value of network science in education and offers a new lens for seeing the world: the lens of connectivity (Cramer, Porter, Sayama, Sheetz, & Uzzo, 2018).

Network education emerges strongly associated with knowledge media. Daniel (1996, p. 2) identifies “knowledge media” with the new generation of technologies that emerged at the end of the 20th century. Knowledge media emerged with the third generation of distance education. With the advancement of the internet and the virtualization of the world, new trends in distance education have been emerging and updating the understanding of knowledge media. However, network education is not reduced to Distance Education, but broadens it, bringing the science of networks to the media of knowledge. There are several types of knowledge media and several ways to use them, so the use of knowledge media does not imply that it must take any particular educational perspective (Inglis, Ling, & Joosten, 2003, p. 166). A democratic network education aims to increase the autonomy and educational, technical and contextual skills of teachers and students. In this perspective, knowledge media can offer the opportunity to emphasize the educational process on the person and learning (Lynch, 2004, p. 16).

Network education can favor the improvement of technical skills such as the use of devices and applications to carry out educational tasks (Lin, Lin, Jiang, & Lee, 2007). Network sciences and knowledge media become the educational process without limit of time or space (Lin, Lin, Jiang, & Lee, 2007; Guan, 2012). Democratic network education offering to students greater flexibility and promoting lifelong learning (Lin, Lin, Jiang, & Lee, 2007). The beginning of the 21st century is depicted by an immense volume of information that is offered to people. Along with this immense volume of information is Fake News. Democratic network education aims to provide the development of the competence to manage this information, fostering research, the selection, and organization of documents and making informed decisions (Lin, Lin, Jiang, & Lee, 2007). Network education in times of fake news should promote information literacy and ethics of information (Müller & Souza, 2018). Democratic network education should favor more personalized learning that enables the student to understand the relationship between regional and global problems.

Some of the challenges of network education are the unfamiliarity with network sciences (Cramer, Porter, Sayama, Sheetz, & Uzzo, 2018), the lack of knowledge and misuse of technology, the lack of adequate equipment for students, the lack of self-discipline on the part of students (Lin, Lin, Jiang, & Lee, 2007) and the lack of preparation of teachers. New skills for this educational modality need to be massively developed. A much larger number of students have been reached than traditional universities would ever be able to through information and communication technologies (Burke, 2012).

There seems to be a process of the mediatization in the society that is facing the COVID-19 pandemic. The mediatization of society which is the result of the interaction process between the media and human relations and social practices (Hjarvard, 2013). The dependence on the media increases during the mediation process and as a result of this chronic and acute interaction, many of the social practices are redefined. This may be the result of the intensive interaction with the media (traditional, social, or digital) that is being experienced during the COVID-19 pandemic in 2020. Mediation is interfering with the way human relations occur. Mediatization is not characterized by the use of the media or the power of influence of the media, but by human interaction which becomes mediated (Hjarvard, 2013). Mediatization arises

from the relational space between the media and human relations and social practices. The phenomenon can be found almost everywhere because of the ubiquity of the media in many forms of devices. This leads to the question: what is the impact of the knowledge media in this intense mediation process?

The general objective of this article is to understand the nature of the relationship between network education and knowledge media. The article intends to answer the following question: what is the locus of network education?

In the first section, the foundations of network education, based on the vision of network society, will be established, and their difference from distance education models, based on the use of information and communication technologies. In the second section, the concepts of “knowledge media” will be analysed and discussed. In the third section, the relationship between network education and knowledge media will be addressed. In the fourth section, the possibilities and limits of network education within the scope of knowledge communication will be established. The result of the theoretical reflection points to a model of network education in the digital age based on the network society, within the scope of knowledge communication, aiming to establish the knowledge dialogue through the knowledge media.

1. From Distance Education to Network Education

A fundamental characteristic of distance education is that teachers, tutors, and students are, at least in part, separated in time and space, physically and geographically, and, being in this condition, the use of Information and Communication Technologies (ICT) is necessary (Diana, 2019, p. 27). The foundation of distance education is precisely the use of ICT to fill the space-time gap between those involved in didactic-pedagogical mediation. The technology-mediated connection between student and teacher is a necessary condition of distance education (Diana, 2019, p. 34). Teaching necessarily takes place, at least in part, at a different time and/or place from learning, through ICT and some special institutional infrastructure (Moore & Kearsley, 2013, p. 2). Although several active methodologies are used today in distance education, it is not based on the pedagogical approach. Although the teacher's skills as a mediator of knowledge have been growing within the distance education scenario (Alarcon & Spanhol, 2015), it is not based on the teacher's dialogical mediation. Although one can speak of a new generation of distance education, such as network learning (Silva & Spanhol, 2018), placing networks and their structures at the service of distance education, the mediation of digital information and communication tools play a necessary role. In distance education modality, online social networks are essential.

The term "network education" is driven by the works of Margarita Gómez based on the conjunction of Paulo Freire's pedagogical proposal, aiming at a liberating education, and the development of the expression of networked, rhizomatic and creative thinking in a globalized world (Gómez, 2005). Margarita Gómez (1999) develops the model of liberating education (freireana) to the network scenario and uses the term “network education” to indicate the “point of intersection of the educational activity”. The term “network education”, used by Gomez, appears motivated by an application of Freire's pedagogy to telematic networks (Gómez, 1999).

Margarita Gomes offers a clear and well-founded view of the nature of network education in her book, *Educación en red*, published in 2005. According to Gómez (2005) Network education (a) requires

connectivity, communication and solidarity, placing the educational focus on the learning process (p. 16); (b) it makes it possible to open the school to the world, involving the entire school community, promoting transculturality (p. 17-26); (c) it has its foundation and purpose in line with the educational thought of Paulo Freire, which proposes an education for human solidarity (p. 27); (d) it promotes human relations in its context, both local and global, as well as the relationship with other areas of knowledge, especially epistemology, which could help in reaching a more accurate understanding of the process of acquiring knowledge in learning networks (p. 165); (e) it is characterized by the relationship of solidarity between the human, epistemological and technological dimensions, making it possible for the educator to find in the virtual sphere a space for speech, deliberation and realization (p. 189) and for the transdisciplinary relationship (p. 198).

Therefore, Margarita Gomez's vision of Network Education (2005) assumes a liberating and solidary education as a starting point and an ending point, using Information and Communication Technologies (ICT) as an aid given an emancipatory appropriation of knowledge (Nunes, Rosa, Souza, & Spanhol, 2016). In this perspective, the use of ICT in network education is neither necessary nor sufficient. It is just convenient and instrumental to achieve that liberating and rhizomatic way of thinking in a globalized world. ICT can expand and enhance network education. However, network education is based on qualified human relationality as solidarity. It focuses on learning, aiming at an integral education of the human being integrated into his community. With ICT, open-access materials and tools and the possibility of building collaborative networks, network education can expand its reach, making education much more inclusive. Another perspective on network education has been developed by the research group Media and Knowledge from the Federal University of Santa Catarina (Brazil), in which the foundation is in a model of a network society. There is no way to think about a non-network education within a network society. The network society changes the productive, cultural, and educational processes (Castells, 2010; Souza M. V., 2015, p. 37; Nunes, Rosa, Souza, & Spanhol, 2016).

On the other hand, "network education emerges in a knowledge society, whose reach is expanded by digital technologies" (Rosa, Silva, Müller, Spanhol, & Souza, 2018). In this perspective, network education is an education extended across the entire network, being this physical and/or virtual, using for this purpose the resources of interactive digital media (Souza M. V., 2015, p. 23). Network education is a "comprehensive, holistic, complex education" that involves seeking to promote a space (physical or virtual) for dialogue and interactivity (Souza M. V., 2015, p. 26). In this model of network education, pedagogical views, methodologies, technologies, and agents involved in the educational process work on the network to promote a knowledge dialogue, inclusive education, and improvement of the cognitive, technical and contextual skills necessary to achieve a qualified education (Spanhol, Farias, & Souza, 2018, p. 20).

Network education is a process of socialization and development for autonomy that aims at social integration and involves the acquisition of knowledge, skills, and values. Education is a broad process, aimed at social inclusion and integration. Network education is deeply related to a complex and network society. In a globalized, networked, and ever-changing society, network education will use all the means offered by ICT to expand its power of inclusion, integration, and updating, serving as an effective means to accompany cultural changes both in small communities and the global community.

Considering the fundamental characteristic features of distance education and network education in their

two perspectives, a comparative framework can be established between these two types of education on four aspects. The first aspect is the foundation and distinctive feature of each modality. It was considered that the distinctive feature of Distance Education is the necessary use, at least in part, of ICT for didactic-pedagogical mediation, due to its foundation being in the space-time gap between teacher and student, and between teaching and learning. On the other hand, the distinctive feature of Network Education is precisely the relationship in offline and/or online networks, given that the foundation of the first perspective is liberating education, based on the pedagogical vision of Paulo Freire and the foundation of the second perspective is the network society model.

The second aspect to consider is the purpose. The mode of distance education aims to give access to education to those people who are, at least partially, prevented from participating in person in the educational institution, being deprived of carrying out or completing their studies on time. On the other hand, the Network Education modality aims at a participative, dialogued, and inclusive education.

The third aspect to consider is the network relationship. In the distance education modality, the online network structure mediated by ICT is a necessary condition. Usually, both online and offline networks are contemplated. However, there is no distance education without the presence of online networks at least part of the time. On the other hand, the network education modality can only take place through offline network structures, since ICT is not necessary, although useful and convenient. Generally, the two modalities are considered, online and offline.

The fourth aspect to consider is the use of digital information and communication tools. Both modalities, distance education, and network education make use of the great technological potential of these tools, aiming to enhance the quality and decrease the time of the teaching-learning process.

For these reasons, it can be inferred that distance education and network education are not the same phenomenon or reducible to each other, since they share only the technological means, distinguishing themselves in their foundations, their purpose, and their structure.

2. Knowledge Media

The term “knowledge media” was used for the first time by Mark Stefik (1986) to depict consequences of linking Artificial Intelligence to the internet (Eisenstadt & Vincent, 1998/2000, p. 4). The knowledge media emerges as a new discipline (Eisenstadt & Vincent, 1998/2000, p. 4), from the convergence between computing, telecommunications, cognitive sciences or learning sciences (Eisenstadt, 1995; Daniel, 1996, p. 2; 101; Lynch, 2004, p. 15). The emergence of knowledge media offers a new vision in the area of education connecting the rise of ICT to social and educational contexts.

There are three major projects that follow from the proposal of Stefik (1986). They were based at (1) Stanford University (USA), (2) University of Toronto (CAN), and (3) Open University (UK).

Mark Stefik's knowledge media proposal (1986) was first implemented, around the 1990s, at Stanford University (USA), through The Knowledge Sharing Effort of DARPA (Defense Advanced Research Projects Agency) which was a consortium with aim to “sharing and reusing knowledge bases and knowledge-based systems”, underpinning the knowledge media on ontologies (common vocabularies) (Grütter, 2002, p. viii). The purpose of The Knowledge Sharing Effort was “the development of techniques,

methodologies and software tools for sharing and reusing knowledge” (Stanoevska-Slabeva, 2002, p. 6) “providing the basis for the next evolution of the web - the web semantics” (Hendler & McGuinness, 2000). Grütter (2002, p. viii) comments that the approaches to knowledge media at the (i) Knowledge Media Design Institute of the University of Toronto (CAN) and (ii) Knowledge Media Institute at the Open University (UK) are not directly based on Stefik's (1986) original view, but reflect some basic features of that view.

The Knowledge Media Design Institute, from the University of Toronto (CAN), conceived of the knowledge media as “building blocks of a learning society” (Stanoevska-Slabeva, 2002, p. 10).

On the other hand, the project based at the Knowledge Media Institute, of the Open University (UK), idealized that the knowledge media capture, store, transmit, share, access and create knowledge (see Eisenstadt, 1995), to continue education (lifelong learning) (Stanoevska-Slabeva, 2002, p. 11). At the KMI (Knowledge Media Institute) the scope of knowledge media encompasses “enhanced collaboration media on the Internet, multimedia environments for students with disabilities, intelligent agents, organizational memories, digital documents, scientific visualization and simulation tools, informal and formal representations of the knowledge” (Eisenstadt & Vincent, 1998/2000, p. 9).

The term “knowledge media” has an origin and history. However, There is neither space nor purpose of this article to develop the history of knowledge media. However, it is of fundamental importance for the arguments offered here to understand the origin and nature of the term. There is no hegemonic definition of the term "knowledge media" or a common understanding of the nature of knowledge media. In the following, the definitions found in the literature will be presented in chronological order.

First, it is necessary to warn of the use of the term in the singular “Knowledge medium” and in the plural “knowledge media”. Second, to signal that the term was coined by Mark Stefik, in his article “The Next Knowledge Medium” published in 1986 (Baecker, 1997; Grütter, 2002, p. viii). Stefik (1986) defines the term for the first time, in the singular, “knowledge medium” as “as an information network with semi-automated services for the generation, distribution, and consumption of knowledge”. Stanoevska-Slabeva (2002, p. 11) notes that Stefik's (1986) concept of knowledge media is characterized by the standardized language of communication and by the representation of knowledge in an interactive digital media.

In the 1990s, with the emergence of major projects for the development of knowledge media, a more intense reflection emerges in the academic community, generating some new definition proposals for the term. Among them is the proposal by Gruber, Tenenbaum and Weber (1992), defining the term, also in the singular, as "a computational environment in which explicitly represented knowledge serves as a communication medium among people and their program"; the proposal de Eisenstadt (1995) summarized by Lynch (2004, p. 15), defining the term, in the plural, “knowledge media” as “capturing, storing, imparting, sharing, accessing and creating of knowledge” (Lynch also comments that Eisenstadt coined the term “knowledge media” to describe the convergence between telecommunications, computing and cognitive or learning sciences), the proposal by Baecker (1997), defining the term, already in the plural, “knowledge media” as “documents, artifacts, technologies, and systems intended to enhance human creativity, learning, and knowledge building”; Schmid's proposal (1997), summarized here by Stanoevska-Slabeva (2002, p. 8), defining the term “knowledge media” as “as a platform providing a sphere for the management and exchange of knowledge within a confined community of human and artificial agents”; in

close relationship with the previous one, is the proposal of Schmid and Stanoevska-Slabeva (1998), defining the term “knowledge media” as “information spaces, which based on innovative ICT support information exchange within a community consisting of human and artificial agents” (and signaling in his article that the concept of knowledge media is instantiated from the generic concept of computational media, which provides a basis for the development of interactive and multi-agent ICT); Eisenstadt and Vincent's proposal (1998/2000, p. 4), defining the term “knowledge media” as “the process of generating, understanding and sharing knowledge using several different media, as well as understanding how the use of different media shape these processes”; and the proposal of Eppler, Seifried and Röpneck (1999), defining "knowledge media" as "as a technical and organizational platform of a community for the purpose of knowledge exchange between its agents".

From the 2000s, three definitions for the term were found. Among them is the proposal by Stanoevska-Slabeva (2002, p. 3), defining “knowledge media” in a broad sense as “as extensions of ourselves capable of storing and transmitting explicit knowledge over space and time”, but explains that in restricted the term should be understood as “spaces of communication for the exchange of knowledge (“ Ba ”) that arise with digital media”; Eppler's proposal (2011, p. 525), defining "knowledge media" as " Information technology-based infrastructures that enable knowledge codification and transfer"; and Souza's proposal (2019, p. 107), defining “knowledge media” as “any mediating system: mechanical, electrical, electronic and electronic-digital, with some autonomy, which produces new information and simulates the knowledge process”, emphasizing (p. 15) the “procedural autonomy in the production of knowledge” and “its destination to the user in the context of social action” as distinctive conditions. Following, table 1 with the respective definitions follows:

Table 1. Definitions of the term “knowledge media”

Author/Date	Definition
(Stefik, 1986)	“as an information network with semi-automated services for the generation, distribution, and consumption of knowledge”.
(Gruber, Tenenbaum, & Weber, 1992)	“a computational environment in which explicitly represented knowledge serves as a communication medium among people and their program”.
(Eisenstadt, 1995)	summarized by (Lynch, 2004, p. 15) “capturing, storing, imparting, sharing, accessing and creating of knowledge”.
(Baecker, 1997)	“documents, artifacts, technologies, and systems intended to enhance human creativity, learning, and knowledge building”.
(Schmid, 1997) summarized by (Stanoevska-Slabeva, 2002, p. 8)	“as a platform providing a sphere for the management and exchange of knowledge within a confined community of human and artificial agents”.
(Schmid & Stanoevska-Slabeva, 1998)	“as information spaces, which based on innovative ICT support information exchange within a community

	consisting of human and artificial agents”.
(Eisenstadt & Vincent, 1998/2000, p. 4)	“the process of generating, understanding and sharing knowledge using several different media, as well as understanding how the use of different media shape these processes”.
(Eppler, Seifried, & Röpn, 1999)	“as a technical and organizational platform of a community for the purpose of knowledge exchange between its agents”.
(Stanoevska-Slabeva, 2002, p. 3)	“as extensions of ourselves capable of storing and transmitting explicit knowledge over space and time”.
(Eppler, 2011, p. 525)	“Information technology-based infrastructures that enable knowledge codification and transfer”.
(Souza R. P., 2019, p. 107)	“any mediating system: mechanical, electrical, electronic and electronic-digital, with some autonomy, which produces added information and simulates the knowledge process”.

Source: Authors

Knowledge media have the potential to capture, store, transmit, share, access, and create knowledge (Eisenstadt & Vincent, 1998/2000, p. 5). However, terminology in the field of knowledge media is still being established (Inglis, Ling, & Joosten, 2003, p. xiii). Knowledge media “can be differentiated in terms of its target community, such as scientific knowledge media, public knowledge media, professional knowledge media, and so on” (Eppler, 2011, p. 516).

However, not all digital media are knowledge media (Baecker, 1997). The knowledge media can arrange the incoming information in order to offer new arrangements of information (Baecker, 1997), characterized by “autonomy in carrying out processes”, since “they alter information and produce knowledge”, resulting in “informative syntheses” (Souza R. P., 2019, p. 10).

Stefik's knowledge media concept (1986) is grounded in the “interactive and *intelligent* digital medium” (Stanoevska-Slabeva, 2002, p. 11). In this perspective, knowledge media can be understood as autonomous non-biological mediating systems (Souza R. P., 2019, p. 10). However, the most interesting and relevant knowledge media are those that “incorporate interactive computing and communication technologies” (Baecker, 1997). Knowledge media are the integration of “human and artificial agents connected through a semantic space” that facilitates the production, conservation, offer or exchange of knowledge (Schmid & Stanoevska-Slabeva, 1998; Souza R. P., 2019, pp. 10-11).

Knowledge media enable the exchange of ideas, experiences, and methods (Eppler, 2011, p. 525) and transfer and aggregation of knowledge through information and communication technologies (Eppler, 2011, p. 516). We can think, communicate, and learn using knowledge media (Baecker, 1997).

In broad sense, we are following the definition of knowledge media from Stanoevska-Slabeva (2002), but we understand “as extensions of ourselves” as extended mind. The extended mind thesis explains that some cognitive processes extend beyond the organism's mind/brain (Clark & Chalmers, 1998). Tools and instruments assimilated by the organism can function as an extension of the capacity of some perceptual,

mnemonic, inferential, communicative or even social cognitive process (Carvalho, 2018). Tools and instruments are no longer understood as objects and are assimilated as an extension of the person's cognitive abilities in their knowledge acquisition, retention and sharing processes. Knowledge media express above all the integration of the organism with tools and instruments, expanding the potential of epistemic-communicative functions.

In narrow sense, we assume a disjunctive view about the structural nature of knowledge media which include understand that knowledge media is more than “information network”, “computational environment”, “systems”, “platforms”, or “information technology-based infrastructures” Knowledge media is primarily a system or network based on Information and Communication Technologies (ICT). Knowledge media can be as a system as a network. If it was a system based on ICT, it will underline the interdependence between ICT and agents. If it was a network based on ICT, it will highlight the various possible relational structures between ICT and agents.

In broad and narrow sense, we assume that knowledge media generate, distribute, and feed on knowledge through the integration of human and artificial agents. We disagree that knowledge media just produce added information and simulates the knowledge process. Luciano Floridi (2019, p. 71) explains the distinction between information and knowledge: “information is well-formed, meaningful, and truthful data” and knowledge is correctly accounted information. Knowledge requires “the capacity for answering relevant questions about p” (Floridi, 2019, p. 74). In this meaning, “scientific textbook or a website like Wikipedia” contains knowledge (Floridi, 2011, p. 286), not just information. The analysis informational of knowledge depict a pragmatic trait of knowledge by connecting propositional knowledge to practical knowledge (Floridi, 2011, p. 287). Therefore, knowledge media produce genuine knowledge in its process. In broad and narrow sense, we assume that knowledge media is typically characterized by integration of human and artificial agents. The key feature of the production of knowledge by a group composed of human and artificial agents is that the task is beat-up into small components and distributed to different members of the group (Bird, 2014, p. 45). The distributed cognition approach can be characterized as a system that producing knowledge in which each member of the group has a particular function within the overall system (Hutchins, 1995). Consequently, knowledge media requires distributed cognition between human and artificial agents or between human agents and technological devices.

We define knowledge Media as a system or network based on Information and Communication Technologies (ICT) that generate, distribute, and feed on knowledge through the integration of human and artificial agents. As a result knowledge media change the fundamentals of the relationship between person and knowledge by integrating technologies and agents (Eisenstadt, 1995; Daniel, 1996, p. 2; Lynch, 2004, p. 16). Qualifying a media as knowledge means that it will be different not only in degree but in kind (Daniel, 1996, p. 101) because it puts “knowledge first” (Eisenstadt & Vincent, 1998/2000, p. 8).

3. Knowledge Media and Network Education

In this section, it will approach the relation between Knowledge Media and Network Education. Initially knowledge media can contribute to various segments of the knowledge society (Eisenstadt & Vincent, 1998/2000, p. 1). Its potential lies in the productive use of technology (Daniel, 1996, p. 2), promoting the

continuous improvement of the user experience in the learning process (Eisenstadt & Vincent, 1998/2000, p. 13).

Knowledge media add new perspectives and tools to the process of knowledge dissemination and sharing (Eisenstadt & Vincent, 1998/2000, p. 13) to meet the demands and cognitive tasks of its users (Baecker, 1997). Knowledge media foster potential for aggregation and collaboration in the network, through knowledge sharing and reuse (Eisenstadt & Vincent, 1998/2000, p. 13). Accessibility, the degree of interactivity, and the use of the interface with knowledge media (Lynch, 2004, p. 16) will drive a faster and more effective learning process. However, this effectiveness will also depend on how it is used (Inglis, Ling, & Joosten, 2003, p. 51), since poorly executed applications of knowledge media can create obstacles to learning and may even be inferior to education. paper-based traditional (Eisenstadt & Vincent, 1998/2000, p. 12).

Eisenstadt and Vincent (1998/2000, p. 7) signal that the knowledge society leads to four fundamental changes in the area of education: (i) 'knowing how' to do something will be more important than 'knowing that' something is like this; (ii) the knowledge shared between people will be worth more than someone's personal library; (iii) people will choose what content and information they want to consider and consume; and (iv) presentations and lectures will take the form of shared experience (Eisenstadt & Vincent, 1998/2000, p. 7).

However, neither the definitions of knowledge media listed above nor the purposes of the foundational projects of the three universities (Stanford University, University of Toronto, and Open University) seem to identify with the foundation of distance education or even have such a limited purpose and nature.

There are several types of knowledge media and several ways of using them, so “the use of knowledge media to facilitate learning does not imply that it takes any particular form” (Inglis, Ling, & Joosten, 2003, p. 166). According to Lynch (2004, p. 16), knowledge media “offer the opportunity to shift the emphasis from the classroom and teaching to the individual and learning”.

Knowledge media should not be seen only addressing learning based on explicit knowledge, but also and above all addressing learning based on associated practice and implicit knowledge in order for the proposed courses to be effective (Inglis, Ling, & Joosten, 2003, p. 51). Based on this characterization, knowledge media can be modeled to be used for broader educational purposes such as Network Education.

If knowledge media can also promote implicit and tacit knowledge, then they can be used in offline educational networks, favoring the qualitative development of socio-emotional competences and more efficient educational interactions.

However, the nature of network education goes beyond technology, aiming to promote open, creative, and network education through the dialogue of knowledge. From this perspective, it can be said that the nature and purpose of network education are broader than those of knowledge media. Network Education does not belong to the conceptual and theoretical framework of knowledge media, but the opposite. It has a broader scope in which knowledge media find space to develop and collaborate.

Network education highlights educational connections. A theory of learning that could offer support by educational processes in a network society is connectivism (Siemens, 2004). Connectivism aims to respond to the influence that technology has on socio-cognitive processes underlining the importance of the characteristics of the social environment in which cognitive interactions are established (Silva, Müller,

Souza, & Spanhol, 2019, p. 94). Connectivism may offer a base to socio-cognitive adaptation in a world in constant change and technological influence. Although network education is not committed to any specific learning theory, connectivism appears as another useful theoretical resource for network education in the era of digital transformation in which knowledge media play an crucial role.

On the one hand, if there is a strong process of digital transformation in the early 21st century and the popularization of ICT, accelerated by the effects of the Covid-19 pandemic, on the other hand, there is a need to enhance the horizontalization of digital literacy due to the great interest in digital media and great expansion of online learning (Mendes, Spanhol, & Souza, 2018, p. 37). Digital literacy presents itself as an ethical-political horizon that calls for social inclusion and the development of the subject's autonomy in relation to the learning path throughout his life. An analysis of education based on the relationship between social networks and knowledge media points not only towards digital literacy, but also towards informational and network literacy.

A democratic network education requires the strengthening of cyber citizenship, using digital and knowledge media in a transformative and critical way, aiming at the social good (Souza M. V., 2015, p. 16). It is characterized by the effort of social inclusion, development of autonomy and exercise of cyber citizenship. A democratic network education should be understood as a space for dialogue, interactivity, re-elaboration of information, transforming knowledge into an instrument of cyber citizenship (Souza M. V., 2015, p. 40). On the other hand, we must be aware of other network education projects that can assume any form of distribution between nodes, highlighting other connections and expressing more or less hierarchy, etc. In a broad sense, network education is looking at education through networks. In this way, the use of knowledge media can take on any role within network education from the most central to the most peripheral. Therefore, the value of knowledge media is directly related to the network education projects being developed.

Social networks occupy a significant space within the network education scenario. Social networks enable various forms of human organization and articulation between groups and institutions. Network education is also driven by the various forms of relationship allowed by social networks (Giglio, Souza, & Spanhol, 2015, p. 110). In this way, network education can make education much more interactive. Network education can use the best of both worlds, face-to-face and virtual empowering individuals and groups (Giglio, Souza, & Spanhol, 2015, p. 116). However, it is necessary to investigate how ICT and the digital transformation process can better contribute to a more qualified and inclusive network education.

4. The locus of Network Education

In this section, it will approach possibilities and limits of network education within the scope of knowledge communication. One proposal is to align network education with the scope of knowledge communication. Martin J. Eppler (2011, p. 525) defines knowledge communication as “the (deliberate) activity of transmitting and interactively building ideas, assessments, experiences, or skills by verbal and non-verbal means”. Knowledge communication has a large scope involving human and technological, informational and communicational, and epistemological and social factors. Eppler (2011, p. 525) explains that knowledge communication “designates the successful transfer of know-how (e.g., how to perform a task),

know-why (e.g., the cause-effect relationships of a complex phenomenon), know-what (for example, the results of a test) and know-who (e.g., experiences with others) through face-to-face (co-located) or media-based (virtual) interactions”.

According to Eppler (2011, p. 516), knowledge communication can occur in two ways: (a) knowledge dialogue and (b) knowledge media. The knowledge dialogue is synchronous, and the knowledge media is asynchronous. The scope of knowledge communication is quite broad, covering the most varied items and knowledge processes, it can take place both face-to-face and virtual and both synchronously and asynchronously. In addition, it expresses in a qualified way its two aspects: the knowledge dialog and the knowledge media. If network education is characterized by a communication network, which must express and enhance the generation, sharing and retention of knowledge items and processes, offline and/or online, aiming at establishing knowledge dialogues throughout the network, using the media of knowledge, then the communication of knowledge is the comprehensive locus and compatible with network education, capable of offering you a new scope of research and better-defined practice. Network education can, therefore, be a strong expression of knowledge communication.

One of the most legitimate expressions of Network Education is dialogue, more precisely, the dialogue of knowledge. The dialogues of knowledge vary according to their objectives and according to different patterns of behavior, interaction, and support measures (Eppler, 2011, p. 516). Knowledge dialogues can be divided into four types, given their interactive and collaborative style: (a) *Crealogues* - aimed at creating new ideas and knowledge; (b) *Sharealogues* - aimed at transferring and sharing knowledge; (c) *Assessalogues* - aimed at evaluating new ideas and knowledge; and (d) *Doalogues* - which aim to transform understanding into committed action, using knowledge (Eppler, 2011, p. 516). The participants in the knowledge dialogues are in a process of knowledge mediation, which occurs when agents cooperate in a communicative process, combining knowledge (Sterling, 2011, p. 16).

Network education should interconnect distance education, face-to-face education and hybrid education in the network knowledge society” (Nunes, Rosa, Souza, & Spanhol, 2016). A democratic network education can follow through a dialogical education (Socratic-Freirean) with the purpose of building a teaching-learning process through dialogue and the exchange of experiences between the agents involved in the educational process (Nunes, Rosa, Souza, & Spanhol, 2016). Network knowledge communication in an educational environment will only fulfill its epistemological role insofar as it uses its two strategic resources, the knowledge media and the knowledge dialogue.

As a trend, network education has engaged ICT and active methodologies in an educational innovation process. However, the articulation between them will depend on the type of network education project that will be developed. Innovative educational methodologies are described as challenging and active methodologies in which they harmonize processes for the acquisition of theoretical and practical knowledge (Rosa, Spanhol, & Souza, 2018, p. 188). ICTs can be explored in a collaborative way for network education, enabling the mediation of knowledge (Rosa, Spanhol, & Souza, 2018, p. 187).

Democratic network education tends to be innovative and responsible, promoting transdisciplinary relationships of interdependence and social inclusion. Educational innovation should promote improvements in the teaching-learning process, taking into account the following measurement criteria: impact, contextualization, efficiency, applicability, engagement, intentionality (Souza, Teixeira, & Souza,

2018, p. 22). In an educational network, all agents involved, not just teachers, are challenged to be agents of innovation. In addition, knowledge communication is an essential ingredient to disseminate and share innovation processes and products and problem-solving in network education.

Responsible Research and Innovation (RRI) aims to expand and deepen the dialogue between the scientific community and civil society by establishing forums for cooperative dialogue between scientists and citizens (Okada & Rodrigues, 2018, p. 44). Scientists and citizens collaborate throughout the research and innovation process, seeking to reconcile values and expectations. In this way, “open education with open science and open schooling are essential to prepare individuals and communities for critical-collaborative participation with knowledge, skills and attitudes” (Okada & Rodrigues, 2018, p. 49). Networked open education based on the dialogue of knowledge can offer a new horizon of knowledge and skills to face changing social, political and economic scenarios. Besides, an open science based on RRI can offer promising future scenarios to the challenges posed by the Covid-19 pandemic.

5. Conclusion

After considering the fundamental characteristics of distance education and network education, it was understood that the fundamentals and the main characteristic of these two modalities are different; that the purpose of network education is much broader than the purpose of distance education; that the vision of network learning is different between them; and that both use knowledge media for their purposes. Thus, it was inferred that distance education and network education are not reducible to each other.

It was understood that there is no hegemonic definition of knowledge media. However, its impact, especially on education, is large, indicating developments that are relevant to several areas. Concerning the relationship between Network Education and Knowledge Media it was understood that the nature and purpose of Network Education are broader than those of Knowledge Media. Network education does not belong to the conceptual and theoretical framework of knowledge media.

Finally, knowledge communication and network education seem to have a broad and compatible scope. Knowledge communication can be the locus of network education, capable of offering a new scope of research and practice based on knowledge media and knowledge dialogues. Network education can therefore be a strong expression of knowledge communication.

The theoretical reflection pointed to a model of network education in the digital age based on the network society, within the scope of knowledge communication, aiming to establish the dialogue of knowledge using the knowledge media. Network Education finds a new locus, no longer in the wake of Distance Education, subjugated by the Knowledge Media, but open to dialogue under the aegis of knowledge communication.

6. References

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