Towards 'Onlife' Education. How Technology is Forcing Us to Rethink Pedagogy

Ángel García del Dujo and Judith Martín-Lucas

Abstract The objective of this chapter is twofold: on the one hand, to provide an explanation for the need we have today to rethink pedagogy based on new realities and the scenarios in which we live, also in education, generated by the technology of our time and, on the other hand, to point out the direction in which we can find a path that leads us to that reflection in the face of the inevitable convergence between technology and pedagogy in which we are today.

Keywords Fourth revolution · Onlife education · Rethinking pedagogy · b-learning

1 Introduction

In recent years, advances in technology have generated a considerable and extensive wave of changes and transformations in all areas of life, including forms of political, social, economic and cultural thought and action. These changes have been so important lately and affect our world and everyday activities in such a way that we are being forced, in almost all fields of knowledge, to examine and reformulate long-standing approaches, concepts, perspectives and theories about our ways of being, behaving and doing as individuals and citizens. Ubiquity, connectivity and easy accessibility, characteristics of the information of our time made real by digital technology, are drastically changing the ways in which individuals and society act and think about themselves.

In education, as we will see throughout this chapter, this technology is also making notable contributions to all aspects of the educational process, to the point of even generating new scenarios of action; in this regard, we want to believe that the creation of these new environments, based on the virtualisation of traditional spaces or the

Á. García del Dujo (✉) · J. Martín-Lucas
University of Salamanca, Paseo de Canalejas 169, 37008 Salamanca, Spain
e-mail: agd@usal.es

J. Martín-Lucas
e-mail: judithmartin@usal.es

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creation of new ones, is resulting in substantial changes to the educational scene that demand a step forward in pedagogical reflection on forms of knowledge construction, thus going beyond a merely instrumental interpretation of this technology in education, an interpretation that must now be definitively overcome.

Before translating and specifying this reflection on the question that can be found in the genesis and development of this chapter, and with the intention of avoiding certain confusions, we hasten to state that we embrace this conception that virtualisation construes as the process of migrating activity, including the space of the physical world, to a digital platform [1], and the virtual environment as a space of action and information, synchronised or not, housed in different situated contexts and which we access easily, flexibly and ubiquitously, a global space that can be shared and reformulated by subjects and informational entities and that, at the moment, undoubtedly constitutes the main source and place of information and knowledge construction.

With this interpretation of the virtual realm, which enables us to create digital technology, the questions that interest us here come immediately to mind: Does this virtual environment cause a change in the way we human beings learn? Is it likely that the technological characteristics and conditions of this environment will generate changes in forms of action and information processing in such a way that it is appropriate to rethink ad hoc pedagogy? To these and other questions, we will seek to find answers by using Luciano Floridi's interpretation of the world and informational life—onlife—which we take as a starting point with the intention of extracting—and also contributing to—a pedagogical interpretation that ends up explaining, and consequently affecting, ways of thinking and doing education today.

2 General Framework of Understanding: The Fourth Revolution

We are currently witnessing one of the fastest social transformations ever thanks precisely to the growth, development and impact of digital technology on all areas of society; no previous generation has ever experienced such a rapid technological (r)evolution with such wide transformative potential. In just a few decades, information and communication technology has changed our forms of relationship, communication, management, production, thought and action, to the point of becoming essential in a society whose dynamics pivot and revolve around information; it is responsible for the immediacy, speed and volatility characteristic of the state of hyperconnectivity in which we live and will live in the future. Information is now the raw material of all sectors of society, including the educational field, because it is here—although not only—where it is generated, transformed and transferred, where information is managed and knowledge is built, individually and collectively. It is not, therefore, out of place to believe that this informational habitat may be demanding a pedagogy that matches the potential of the technology that makes it possible, a pedagogy that has its correlation in ways of seeing—and doing education—more

in line with the reconfiguration being experienced by spaces and times of life, also those of school life, and is giving way to new educational scenarios.

All revolutions that have occurred to date—Copernican, Darwinian and Freudian—according to Floridi [2] have brought about deep changes in political, economic and social structures, which, in turn, have affected ways of doing education. In all of them, in addition, changes in the perception of the world bring about transformations in ways of seeing and understanding ourselves. In the reflection of the author of reference, this begs the question: Will information technologies be responsible for a fourth revolution? At this point in time, there is little doubt that these technologies are not only reformulating our perception of the outside world, but also doing so to our self-perception, which—we add—should have an impact not only on ways of educating but on the theoretical scaffold that we have so far obtained on educational processes; we are, in this regard, at an important time to clarify and understand if the technological artefacts of our time are demanding a reformulation of pedagogy.

Floridi understands [2, 3] that, since the 1950s and thanks to Turing's contributions to modern computer science and advances in the area, we could find ourselves again in a process of re-evaluation of our nature, beginning with a reconsideration of the artefacts that mediate our relations with the world, following that of our environment, by which we now mean natural and artificial, and ending in our own reconsideration, those, and their informational nature, ultimately being the promoters of the whole process. Until now, no society in the history of mankind has been so exposed and connected to such amounts of information in such a way that this technology makes us informational beings, surpassed only by the amount of physical devices responsible for the hyperconnectivity that characterises the contemporary world (Fig. 1).

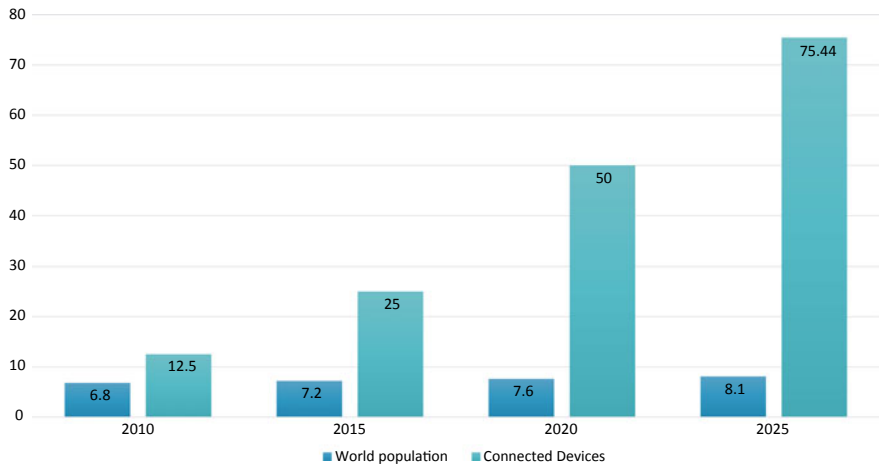

Fig. 1 Number of connected devices and population (in billions). *Source* Own elaboration based on Floridi [2], Evans [4], Khokhar [5], Statisa [6]

This new reality leads us to think that human beings are no longer unique and independent entities, but *infogs* [2, 7], informational bodies and entities connected by technology and with technology and information in such a way that we would have become informational bodies interconnected with—and between—other informational bodies and entities. Everything in our ecosystem—bodies and entities, individual and collective, natural and artificial—would be subject to a process of reconfiguration and resignification to the point that the changes and transformations that occur would also be of nature, fully reaching our *modus vivendi* and with the emergence of a new environment—*infosphere* in Floridi's terminology [2, 8–10]—which includes both analogue and digital. In a way, our author of reference goes on to say, we are witnessing a process of 're-ontologization' of our environment because this technology is not only redesigning or rebuilding our world, it is also transforming its intrinsic nature, whose first consequence is that we are increasingly 'inhabiting' more in the digital than in the analogue; the artefacts that at first, still close in time, were presented as instruments that purported to be useful to our way of being and acting would have ended up creating new realities, qualitatively different environments, and even educated us to live in them.

As a result of this re-ontologization, we live in an increasingly synchronised society, a society that also progressively relocates and is characterised by human experience being increasingly deterritorialised and social interaction more digital. Expressed in other words, the digital is merging with the analogue and, in the same way that many physical action spaces are migrating to the virtual world [1], new environments and action spaces are also being created and these have their correlation in the terminology used to talk about both that merger and the ways of living in the digital world. In more general terms, we would say that the progressive computerisation and digitisation generated by the artefacts and spaces that surround us are leading us to experience in crescendo an *onlife* life [2]; it is not surprising that new generations increasingly find it difficult to differentiate between online and offline activities.

And in this general framework of understanding, we situate the following reflection: it is true that the educational has also been influenced by the digital, but, although in recent decades we have introduced digital technology to the educational field, its inclusion in traditional day-to-day education is no longer enough, since, some time ago, it stopped being a mere complement, a simple facilitator of the teaching/learning processes, and became new action scenarios as real as the traditional. Pedagogy, therefore, is obliged to take this reality into account and to analyse carefully if in that new reality, made possible by the characteristics of a technology, new ways of finding, using and processing information are emerging which, we cannot forget, is the raw material in the construction of knowledge that takes place in teaching/learning processes.

2.1 The Impact of Technology on Teaching/Learning Processes

It would take considerable effort to implement teaching/learning processes without these technological artefacts; the changes brought by this technology are of such size and nature that some authors [11] do not hesitate to talk about a new learning ecology, in line with the re-ontologization of the world to which we referred to earlier, let us see:

In the *infosphere*, we have new mediums that allow us to free ourselves from certain cognitive tasks, which, in turn, leads us to think that ways of doing education can be affected, redirected or, at least, enriched. For example, if a few decades ago a person had to be responsible for selecting, organising, memorising, summarising, storing, creating and distributing information, nowadays, this technology facilitates and even frees us from some of those tasks, allowing us to focus on others that are more demanding and complex, such as analysis, design and creation of information. To illustrate the assertion that we have just made, we will compare the distribution of tasks in the information life cycle [7]; we can see graphically that, until the arrival of these technologies, analogue devices—books, graphic documents, etc.—basically focused on tasks of storage and distribution of information; it was there, in those activities and phases of the information life cycle, where they fulfilled their function and did so in a way that we could call static (Fig. 2).

By contrast, the digital devices of the moment are capable of carrying out several other activities/tasks in that life cycle, which previously only human beings performed, in addition to performing traditional tasks differently; they even participate in some way in those that seemed to remain the subject's own (Fig. 3).

We have transferred to technology the performance of a significant number of physical and mental tasks involved in the learning process, which should be taken

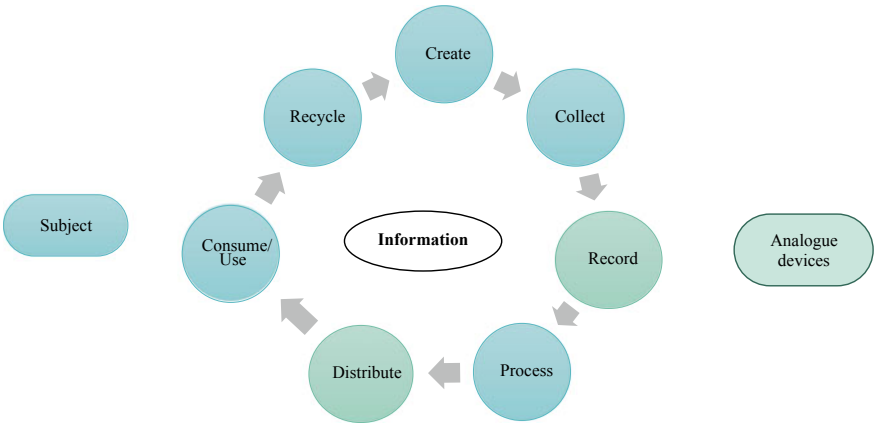

Fig. 2 Distribution of tasks in the information cycle in the offline environment. *Source* Own elaboration based on Floridi [7]

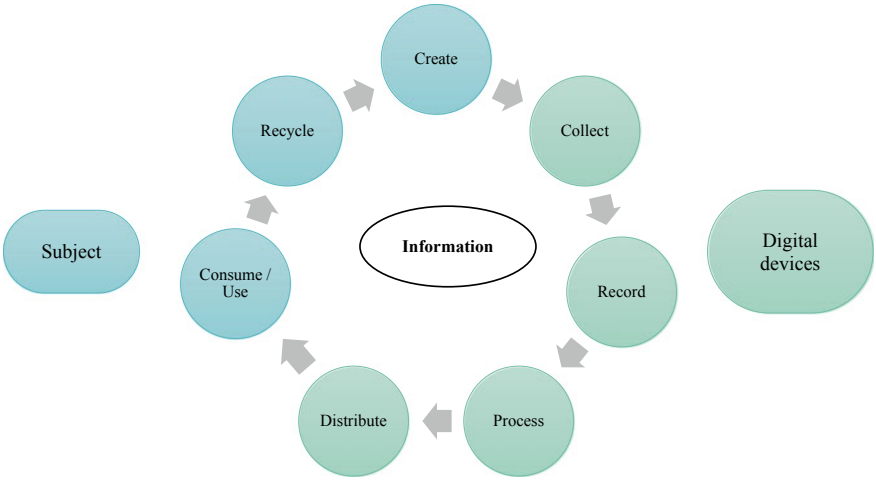

Fig. 3 Distribution of tasks in the information cycle in the online environment. *Source* Own elaboration based on Floridi [7]

into account in pedagogical reflection. At the same time, technology is recomposing, expanding and enriching educational environments and does so not only in terms of reconfiguration and creation of spaces or overabundance of information, but all of this, taken as a whole, is signifying a restructuring of the ecology of educational processes, also affecting its complexity, not only its diversity. In a way, Vygotsky [12] has already warned of this scenario of increased complexity when he speaks of double stimulation as that situation in which a subject faces a problem with the help of an auxiliary artefact; to some extent, this technology, and the scenarios it creates, would work like that second stimulus, or, to put it another way, it provides not only a second stimulus, but many and very diverse when it comes to dealing with a problem.

This phenomenon of double stimulation also forces us to question how to view and categorise this technology within learning processes. We are referring to the fact that, if until now this technology has been catalogued as merely an auxiliary, mediating artefact, highlighting its instrumental character, we should consider it as a secondary or even tertiary artefact due to its technical and pedagogical characteristics and potential in an informational world; we will pause here briefly for its implications in the field of education.

From the perspective of sociocultural theory, we understand by artefact any mental or physical object that mediates our actions towards the achievement of an objective [13]. With technology considered in this way, it is easy to verify the mediating nature that is implicit in its use, since any action we carry out as human beings is mediated by these mediating instruments. Based on this mediating property of artefacts then, and taking as a reference the contributions of Floridi [2], it is possible to talk about different types of artefacts, depending on the nature of the mediated components. A primary artefact would be one that mediates between a person and an object of natural nature; an example is a coat that mediates between a person and the cold of

winter, or a stick that mediates between an olive tree and olive picker in the collection of olives. Not all actions of the human being, however, are related to natural objects, as there are numerous occasions in which we relate to another type of technology that we ourselves have created; that is, secondary artefacts that mediate the relationship between a person and a primary artefact, for example, a pencil used for writing in a notebook or scissors that mediate between a tailor and cloth. While primary artefacts mediate the relationship between human beings and nature, secondary artefacts fulfil their mediating function between the person and another artefact. And there would still be tertiary artefacts, typical of the *onlife* world [14], which would be those that mediate the relationship between technology and technology, understanding that technology can act independently of the human being, for example, a credit card that communicates with a dataphone or mobile phone, which, in turn, does so with a bank's digital platform to confirm the availability of money; another example of easy understanding is found in our famous fitness trackers that communicate with our smartphone, which, in turn, synchronises with an application that connects it to the computer and tells us if we have met our weekly exercise goal, they even compare our activity with that of other users on the application. These tertiary artefacts, despite relating to us, keep us out of certain actions and communications, which seems to lead to the disappearance of boundaries between the human being and machine.

All of this seems to point to the fact then that, on the one hand, primary and secondary artefacts mediate, influence and shape our relationships with the environment, and, on the other, tertiary artefacts are responsible for creating completely new environments that demand a rethinking of the intrinsic nature of action spaces, in our case, of educational action, and this is the main issue that leads us to rethink the role of technology in teaching/learning processes.

It is true that the promoters and defenders of new ways of organising the teaching/learning process—by the way, with great acceptance in the educational field—such as the so-called *b-learning*, tacitly consider technology there implicitly as an artefact that goes beyond the mere mediating instrument [13, 15, 16], but they also fail to clarify the nature or pedagogical potential and demands derived from it. What at first glance seems to be something merely descriptive, categorising the technology used in education as a secondary or even tertiary artefact goes beyond simple adjectivation since it involves reconsidering technology, this digital technology, not only as a useful mediating artefact and even essential in human learning, but as an artefact that can even free the human from certain tasks in the teaching/learning process and redirect attention and activity towards others. By this, we are not saying that these technologies are capable of replacing the teacher—especially if we emphasise the educational function over the instructional or formative—but they can carry out important work as a complement to the teacher whenever—we also want to emphasise—they respond to pedagogical criteria in their use and design.

The informational nature of these technological artefacts in the educational field means that many activities can be carried out in a virtual environment. Moreover, as other authors point out [17], we can consider these technologies as technical actors in teaching/learning processes, since, in many educational activities, these technological artefacts are somewhat more than mediating instruments between the subject

and the learning activity, a kind of educational assistant that, if used properly and pedagogically, not only facilitate the teacher's work, but they can act with certain independence. For Generation Z, it is usual to view platforms such as YouTube to answer questions about subjects taught in the classroom, while there are increasing numbers of YouTuber teachers who create channels to explain their subjects. It is not even strange that more and more people in the educational community talk about the remarkable possibilities that virtual assistants such as Cortana, Siri, Alexa and Google Now can offer if they adapt some of their functions to the pedagogical field [18].

If the information revolution, together with computer technology, is 're-ontologizing' our world, it is appropriate in the pedagogy of our time to pay attention to the new configuration of the environment, also to the new environments generated from virtualisation and living in the digital realm. An environment or environments that, while still under construction, evolve rapidly and where future generations will spend most of their time. A context where a good part—if not all—of educational activities will be carried out. There is no shortage of authors who assert that a day will come when it will be so natural to live in that way, to be an *inforg*, that any interruption in the flow of information will cause significant deterioration in subjects and citizens' way of being and acting.

It is clear then that this technology in education has not only come to stay, but is opening a door to a different context and space, a space that goes far beyond the classroom walls, creating a new environment of learning that can be complementary to traditional settings, but that requires a thorough theoretical and methodological review of teaching/learning processes.

3 Learning Theories, in the Convergence Between the Technological and the Pedagogical

We have just seen that the fourth revolution, in which we find ourselves, has brought about a reconceptualisation of relations between the human being and his environment, with unquestionable implications for the ways of approaching education, some not even foreseen yet. This new reality is demanding reflection based on issues of major importance, if what we seek is to carry out quality educational practices adapted to our time; since the beginning of this chapter, we have pointed out these two: Is this technology causing a change in the way human beings learn? Do these technologies influence the ways we process information and build knowledge? Two powerful questions that we may not be able to answer today, although we are already recognising that it will be difficult to achieve quality education if we do not have a solid theoretical scaffold that explains the processes that take place in these new environments. And much less, education.

It is true that there have already been several attempts to explain how learning occurs in virtual environments and if this technology is transforming our ways of

learning or not, but it is nevertheless the conclusions and proposals that have been made throughout the last decade that do not seem robust enough to shape that theoretical scaffold that we are seeking, with the ultimate intention of understanding how we learn through this technology; moreover, some of these proposals have been greatly criticised for not rigorously considering theories but rather pedagogical approaches, as in Connectivism [19–21]. In any event, what is discerned from these criticisms is the need to reformulate the theoretical body that we have had about learning processes, including developing a new one that responds and gives pedagogical reason to the implications of a technology whose nature and potentiality still exceeds the limits of our minds; let us get to it.

We will begin by saying that, without forgetting the valuable theoretical contributions that have allowed us for a century to sufficiently understand how learning occurs, the question we are asking now is whether these contributions sufficiently explain how technology-mediated learning occurs in our time or if they need an update according to the potential of this technology, since it is of little use to integrate technology into educational processes and environments if we are not in a position to explain how learning occurs through these artefacts and in these new environments. This is the fastest way to reduce technology to its merely instrumental nature and to make pedagogy a very secondary and even useless discipline.

We have already mentioned that, throughout history, knowledge that seeks to explain learning has taken into account, in its social version, the technological development of the time. And in this regard, and thanks to the contributions of the pedagogical theories of social constructivism, which is concerned with understanding and studying the context of human activity within social systems and their environment [17], we can continue affirming that learning is a situated, contextual, distributed, interactive process, and the result of the participation of people in the community. That said, since we are not sure that these approaches are sufficient to understand technologically mediated learning in an informational world, we will conduct a conceptual review of these theories taking into account the changes and transformations that have occurred in recent decades, in case we find any clues or direction that leads us to a better understanding.

The current conception of learning continues to owe a debt to the original work of the school of thought led by Vygotsky and Leontiev, who are ultimately responsible for many successive approaches that, since the beginning of the last century, have tried to explain the ways in which learning occurs. In this regard, we are interested in mentioning that the main elements on which that original activity theory was based, in connection with the philosophy of Kant and Hegel [22], as well as Karl Marx [23–25] and developed throughout three generations [13, 26], continue to be protagonists in the approaches that continue to seek to explain learning over the centuries, despite having been raised for a long time and in a context outside virtual technology. Consequently, our intention now is not so much to analyse these theories, as contributions in this regard abound, but to dwell on those most representative aspects on which we can support our reflection on the ways in which learning takes place in this new ecology of education that we referenced in the previous section.

From the outset, we will recognise that Vygotsky's talent was to visualise the mediating component of social, historical and cultural factors within learning processes, granting a leading role in educational processes to the interpersonal versus the intrapersonal. Through the well-known triad of subject, object and mediating artefact, Vygotsky shows that the interaction between subjects and the environment does not occur directly, but as a mediated action, in such a way that the educational action will also be mediated by artefacts—understood as signals and tools—of a physical or mental nature [24, 27]. Artefacts that arise, develop and transform into concrete contexts throughout history and as part of cultural and cognitive development [19].

Vygotsky proposed the first triad scheme, extended by Leontiev [28] and illustrated by Engeström [26, 29], with the intention of overcoming the unit of analysis focused on the individual and considering collective action instead; therefore, in the learning process, the subject, object and mediating artefact should not just be taken into account, given that rules, norms and division of work also come into play in the individual's activity processes. It is appropriate at this time to identify the components of an activity system [13, 22, 24, 30]:

- The activity, considered as a hierarchy of actions that are aimed at transforming objects.
- The subject, individual or group that is part of the educational activity and, at the same time, the subject that mediates it.
- The physical or mental artefacts, which can be catalogued into primary, secondary or tertiary artefacts, and which mediate the process and through which the subject can reach an objective and accumulate and transmit knowledge; their use is what shapes the way we think and behave. Understanding of both the world and artefacts changes continuously as a result of their interaction.
- The object or objective, the mental or physical product that is requested (subject matter, skills, abilities, competences).
- The expected results, the problems we seek to solve or products we seek to achieve.
- The community, which defines both the social and cultural reference groups in which the activity is inserted and the subject that shares the same objective as the group of individuals who will carry out the learning activity.
- Certain norms or rules explicit or implicit in a behaviour that regulate the actions and interactions within the activity.
- The division of work as the set of actions, tasks and operations that are carried out.

What we have just shown supposes that learning requires the mediation of artefacts that allow a process of dialogue between the subject and the community, and that is where technology, as an artefact, currently plays a fundamental role in that mediation and communication—as we mentioned in the previous section. In this process of dialogue between artefact and subject, both the action and the mind of subjects and communities are shaped by cultural artefacts [31], which inevitably are also transformed as a result of the performance of the activity as a whole.

Expressed in other terms, learning is a process of self-social-construction of knowledge, an action or set of actions where the subject explores from what he

knows to where he arrives in a self-regulated way, together with the community, and in which all mental processes are influenced by culture [27, 32]. The action is always orientated towards an objective, being the result of the participation of the subject in his community; therefore, the activity will inevitably be situated in a specific context, at a specific time, and marked by the history and culture of the environment where it unfolds. In his attempt to understand the complexity that characterises our society, Engeström [26], in his theory of expansive learning, concludes that reaching the goal to which the action is directed sometimes involves going through several cycles of activity, that is to say, in order to acquire new knowledge, to obtain a culturally new result in a context marked by the complexity and overabundance of information, subjects go through several cycles of activity, acquiring knowledge through the construction of a new activity [33–36]. In other words, focusing on the topic at hand, it is no longer enough to develop new learning activities since the virtual environment generated with the help and support of technological artefacts promotes the development of new forms of activity. A student is no longer only a consumer of information, but also, even without intending to be, a creator of content, information and knowledge. The virtual environment, together with the technical actors that we mentioned in the previous section, is responsible, due to its technical characteristics, for learning happening in much wider, complex and chaotic spaces.

Parallel to the progress and development of activity theory, in 1991, Lave and Wenger [37] presented their theory of situated cognition in a context where digital technology begins to spread and integrate into human activity through technological artefacts. We consider this perspective as the worthy heir to the Russian school of thought because it addresses the issue of learning by taking the main elements of the Vygotskian approach, emphasising the space in which the educational action occurs and adapting the main contributions of that to its time. This theory places the spotlight on the fact that the learning activity cannot be understood outside the context in which it takes place; without taking into account the context, it is difficult to understand why subjects do what they do or why the results are what they are. Cognitive processes, thoughts and learning need to be located in physical and social contexts, since it is in the community setting that learning actions make sense [38–41]. This approach allows us to confirm what we already stated at the beginning of this section: that learning implies a complex network of relationships between the subject, the reality of its context, time, social interaction, culture and change [42, 43]. But not only that, because, to a certain extent, the impact of technology within educational processes began to be discerned; authors such as Salomon [40], among others, relying on the potential of technological artefacts and taking into account the social factor of learning, supported the notion of understanding learning as a distributed action, that is to say, although the subject retains his cognitive identity within the community of which he is part, knowledge is distributed. Even other authors, on the grounds that no person or device is in possession of all of the information necessary to complete a task or solve a problem, agree that it is not only knowledge that is distributed, but cognition is de-localized, it is situated beyond the limits of the brain. In this regard, cognition unfolds—not divides—between the mind, body and environment [44–46]. This conception explains the impact that technology began to have on

learning processes, as it began to be the main source of information storage. The rapid evolution and technological revolution seemed to demand new ways of understanding educational action and thus emerged an approach that sought to regenerate the theory of learning today, connectivism. Siemens [21] attempted to provide an answer to how learning occurs in an environment mediated and influenced by an overabundance of information and digital technology. This approach has been the most controversial. We remember that Siemens himself, who published his theory in his personal blog, ended up deleting the original document from his theoretical proposal and any trace of it in the wake of the considerable criticism he received [19, 20, 47–49].

However, even concurring with some of the authors cited that connectivism cannot be considered a theory because of its lack of consistency and empirical evidence, we agree that, considering this approach from a pedagogical perspective, it can offer us valuable contributions when it comes to creating a theoretical construct that allows us to clarify whether the digital environment, as a new habitable environment for the human being, together with technological artefacts, is changing ways of doing education. Siemens [21], in his reflections, given the ubiquity of the virtual environment, alluded to the fact that learning does not occur by following a taxonomy, or a series of stages, but chaotically in this new digital habitat, since ubiquity and the extent of this new environment in which to build knowledge make the learning process an unpredictable action.

At this point, and in order not to deviate from the objective we pursue, we consider that the theory of situated cognition, together with some of the contributions of connectivism, constitutes the most significant current trend for interpreting educational action, which would consequently be:

- interactive, because it is the result of a mediated process in which the subject's action begins in an activity of a collective nature, mediated by artefacts that allow him to achieve an objective. Knowledge cannot be understood outside of social interaction; the relationship between thought and the world is a living process because thought is inherent in conversations with ourselves, a collaboration of our inner world [32]. Therefore, and as Salomon states [40], knowledge is socially built. The processes of social interaction of the individual with his environment modify and transform his ideas and beliefs [50].
- contextual, the activity takes place within a unique context [51], a community. Knowledge is built within activity systems understood as spaces, both virtual and physical, where people acquire their own community patterns. The activity is carried out by individual and group actions and only makes sense when interpreted in relation to the activity systems that are related to each other in that space [52]. Wertsch, however, in 1988, pointed out that situational contexts are not determined by the physical context, but are created by the participants within the context itself, a key argument to support the explanation of that sense of decentralisation of learning in a society mediated by technology and the virtual environment. Virtual spaces allow us to physically relocate that sense of community, giving rise to the virtual community.

- distributed, at a time when information flows and changes with some speed; for knowledge to be useful it has to be shared by the community. No person or device is in possession of all of the necessary information to complete a task or solve a problem [45, 53]. The web environment allows access to a large amount of information, if not unlimited; ubiquity, characteristic of this type of environment, could also situate it as a community conducive to learning processes, where knowledge would pass from the social to the individual level, always in feedback processes.
- product of the analysis and summary of information that takes place in activity systems; therefore, conscious knowledge arises from actions related to certain types of activity and goes through the same stages as the activity as a whole [27]. At a time when advances in technological and information sciences facilitate and allow access to a large amount of information at any time, our learning largely depends on the analysis and summary of many more sources of information than we had available in the analogue world.
- creative, both individually and as a community. The construction of meanings is different in each of us, knowledge takes shape in the body and mind of the individual who builds it, which means that it will always be impregnated with the prior, contextual, social and cultural experiences of each individual. To the extent that knowledge is shared, it is dialogically constructed interdependently with others and acquires truthfulness through consensus with the community [45, 51]. Thanks to their characteristics, technologies allow us to transmit, share and distribute our thoughts, beliefs and ideas with some ease, which means that we can summarise information from numerous sources and generate a more creative, original summary of the new information we create.

The theory of situated cognition, endorsed by the socioconstructivist heritage and reinforced by pedagogical contributions made in recent times [19, 21], provides important arguments to justify the notion that educational activity cannot occur outside the context in which it takes place; in addition, and in relation to advances in the field of artificial intelligence and neuronal exploration, it warns that they will not be useful in the educational field if they are taken in an isolated, individualised way and outside the environments in which the action takes place, even more so if we take into account the complexity of the characteristic deterritorialisation of our digital habitation, which affects educational processes. The activity of learning and knowledge construction not only depends on our capabilities as human beings, but also on the time, place and situation in which educational action occurs.

Up to now, analyses and approaches that seek to justify the technological in relation to the pedagogical have done so, on the one hand, by differentiating these two areas as components and separating our ways of working and inhabiting the online and offline, and, on the other hand, by relying on innovative practices and methodologies such as b-learning; an example of this is the thinking of Fadli, Gordon and Ellison [13], which links the celebrated triad of activity theory with the b-learning model, separating the spaces and times in the convergence between the technological and the pedagogical. Perhaps this is the time to accept the *onlife* world and, returning

to the subject, object and mediating artefact triangle, grant technology a different category as a technical actor, which could well be situated at the level of the subject.

As can be seen in the following figure, although the theoretical scaffold remains at first sight the same, its updating allows us to situate both the subjects and the technical actors as protagonists of the educational process, given the versatility, ubiquity and even autonomy that they can acquire as tertiary artefacts. This approach leads us to face a more complex, even chaotic, scenario characteristic of this hyperconnected information society; hence, in the figure that follows, educational situations could be diverse, both in the beginning and in the result. A characteristic example of the moment in which we are now would be the fact that the activity can be started on the basis of a subject that, through physical or technological artefacts, seeks an object, for example, analysing data from research through a supercomputer; we are interacting with our computer which, in turn, is communicating with the supercomputer to which they give us access and is activating, through its internal rules, the protocols and steps necessary to analyse the data. Moreover, as we have already mentioned, the role of virtual assistants can even acquire great prominence in learning processes. In the not too distant future, we may not have to type into Google the search terms that interest us or refine keywords, we will simply have to entrust all of these tasks to virtual assistants; these types of assistant could even keep track of our academic progress and collaborate in improving our weaknesses (Fig. 4).

At this point, it is necessary to recover the two major changes that technology has generated and that are affecting the theoretical rethinking that we have been talking about in this chapter: on the one hand, one of the most important transformations that our digital habitation has facilitated is acquiring and generating knowledge because educational activity does not require a community that is physically present at the time of the educational action; although a subject is physically surrounded by other

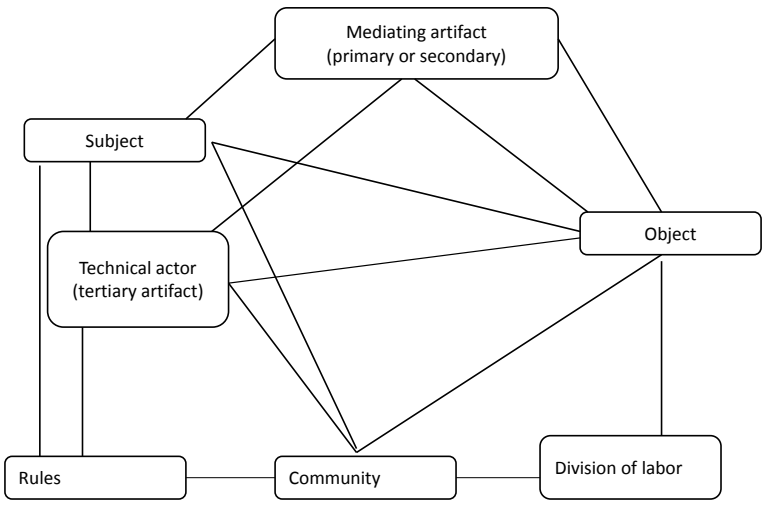

Fig. 4 Activity theory triangle adapted to *onlife* world

subjects, he can resort to the web environment in order to share, and extend his knowledge and thought to what Glassman and Burbidge [54] call other 'realms'; the information at his disposal has been created and shared by subjects, by the virtual community. Hence Uden's [55] noting of the importance of knowing and taking into account that individuals who participate in an activity are in turn part of the activity that is being carried out in other communities. Transferring this reflection to the educational environment, it is understood that a subject who participates in an educational activity in person in the classroom, can also do so online by being connected to the Web at that moment, where he can have access to other types of educational communities or resources that may well be part of that same activity by sharing the same goal.

And on the other hand, technological development is providing us with countless artefacts, instruments and digital devices that help us to not only inhabit a virtual environment, but also to perform everyday tasks. Artefacts that are also available to us to continue to evolve and generate greater technical and scientific development. This technology offers so much ease and comfort that it has become essential for the latest generations, such as Generation Z, which already considers it a necessity [56] and it is obvious that we are increasingly dependent on it to perform many of our daily tasks, whether work- or learning-related; today, technology not only allows us to mediate and facilitate educational work, it has also become an element that enables us to interact in our everyday activities.

All of this makes us think that we have a theoretical scaffold that allows us to explain how learning occurs, a scaffold whose origin and fundamental principles are found in activity theory, since that triad—subject, mediating artefact and object—would not need drastic transformations; however, these approaches need updating and reconfiguring in order to adapt them to the *infosphere*. This reconceptualisation may well come, on the one hand, from a way of cataloguing technology as a secondary or tertiary artefact and technical actor in learning processes, and, on the other, from recognition and acceptance that we increasingly live in the online realm, which, in education, has implications in two directions: the virtualisation process not only allows the transfer and even migration of physical spaces to the virtual environment, for example, virtual repositories and libraries hosted in the web environment, but this technology also allows the creation of other spaces that do not exist in physical reality, such as worlds created in online and multiplayer video games, such as Fortnite, World of Warcraft and League of Legends.

4 Conclusion: b-learning in the Onlife World

Given this convergence between one and the other, the *online* and the *offline*, the technological and the pedagogical, b-learning could very well present itself as the most representative methodological model of teaching/learning in these moments and the immediate future because it is the only one that so far has been able to integrate and accept the important role that technology and information have acquired in

educational processes, the only one that has sought, at least in theory, to overcome the flaws of poor integration of technology into the classroom, by which we mean the consideration of technology as a simple instrument of and/or complement to educational action. A model that is evolving and seeking to find and integrate resources and tools that allow teaching to adapt to the demands of today's society.

As Floridi astutely advanced [8], we are probably the last generation to differentiate between online and offline; anyone born around the turn of the century is growing up and developing in a wireless, hyperconnected and superinformed world, a world in major transformation when compared to the social changes of previous decades. In addition, changes in the information society are affecting the nature of reality, also of educational realities. Instant access to information means that we can transform and reformulate it in short periods of time, with implications for forms of transmission, acquisition, creation and dissemination of knowledge. We are faced with a different, complex and, to some extent, chaotic scenario, a scenario of change that is not only permanent, since societies are accustomed to permanent changes, but also accelerated, and even hurried, which demands more flexible structures in the educational sphere and ways of thinking and action in constant revision.

Education scenarios in the future will be—they are already becoming—multiple, diverse and very different to those that we are acquainted with, scenarios that are still presented to us today as uncertain for several reasons: not only is technology allowing the migration of existing educational spaces and creation of new ones, but the information and interactions it supports, which flow in different directions, can also be split and mediated by technical actors who, in turn, have autonomy to be able to communicate with other technological artefacts without taking into account the subject. Hence, learning processes increasingly give us the feeling of being more global and de-localized. This situates us in a scenario that demands methodologies that are capable of educating for the unpredictable and the complex so that the teaching subject can achieve his own orders [52]. In short, the technological revolution demands a pedagogy that—in the first or last instance, as it may be seen—is capable of educating people with the capacity for change.

The success of b-learning is down to the fact that it is able to listen to society, properly interpreting what the technology of our time is capable of providing us at the time it demands. Moreover, it is methodology, a way of organising the teaching/learning process that adapts to the demands of the *infosphere*, eschewing the classic epistemological culture of consumers and passive recipients of information; on the contrary, relying on technology as a liberating tool for certain basic cognitive tasks, it seeks to foster a culture of educating critical subjects, producers of information and proactive people who learn the new rules of the activity in an *onlife* world; in the end, information and knowledge have become both consumer goods and raw materials that we generate and transform.

Based on the theoretical legacy of the Russian school and, more specifically, on the theory of situated learning, b-learning is also going in that direction and aims to reach that non-differentiation between online and offline [57], which means a challenge not exactly for generations to come, but for us teachers who are currently straddling the classroom and virtual fields and making notable efforts to understand

and integrate technology into our teaching methodology, although we are often far from generating a class typical of an *onlife* world, as technological development advances much faster than the theoretical and practical capacity of our education to integrate these advances. Proof of this are the different research works and meta-analyses carried out that point to the fact that many of the teachers in higher education, despite viewing digital technologies as artefacts that mediate that subject-object relationship, have difficulty implementing a b-learning methodology in its totality, that is, making the leap towards the *onlife*, a leap that would be reflected in the moment in which technological artefacts are seen in another way [58, 59], for which thought, action and training in that direction are required.

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