https://doi.org/10.17163/soph.n31.2021.05

Reflections about problem of truth, science and technology and its implications in the educational field

Reflexiones sobre el problema de la verdad, la ciencia y la tecnología y sus implicaciones en el campo educativo

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Abstract

First, this research will be done a cartography about main streams of philosophy to understand present discussion about truth, knowledge and science considering a world marked by technology and the corresponding implications in education. In this sense, using the genealogical method I analyze the emergence of the technology concept to identify both the historical and conceptual conditions of possibility. This allows us to appreciate how the application and consolidation of modern science caused a break in the conception of technique to move to technology. In this way, the relationship between technology and the human being is analyzed under the confrontation of two opposite perspective, on the one hand, the reflections made by Martin Heidegger and on the other hand, the approaches made by Ortega y Gasset to make visible the dispute of the vision of technology. The results of this debate will allow us to appreciate the implications of the technological revolution in different fields of education, considering its limits and possibilities. Among the main findings is that modern science direct influences on the consolidation of technology as opposed to the traditional technique under positivist criteria that have monopolized the concept and knowledge about truth, set aside other spheres such as art, politics, or love. This has led to a growth of relativistic cultural positions. In addition, these aspects have marked the contemporary world, also affecting the educational field.

Keywords

Truth, science, knowledge, technology, education, genealogy.

Suggested citation: López, Luis (2021). Reflections about problem of truth, science and technology and its implications in the educational field *Sophia, colección de Filosofía de la Educación, 31*, pp. 129-154.

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Resumen

La presente investigación tiene como objetivo central realizar una cartografía del estado actual de la filosofía en función de comprender el debate vigente sobre la verdad, el conocimiento y la ciencia en un mundo signado por la tecnología y sus correspondientes implicaciones en la educación. En este sentido, usando el método genealógico, se analiza la emergencia del concepto 'tecnología' en función de identificar las condiciones de posibilidad tanto históricas como conceptuales que permiten apreciar cómo la aplicación y consolidación de la moderna ciencia motivaron una ruptura en lo que hasta entonces se conocerá como técnica para dar lugar a la denominada tecnología en la actualidad. De este modo, la relación de la tecnología y el ser humano es analizada bajo la confrontación de dos ópticas opuestas, por un lado, se tomarán las reflexiones realizadas por Heidegger y, por otro, las planteadas por Ortega y Gasset con el objeto de visibilizar la disputa de la visión de la tecnología. Los frutos de este debate permitirán apreciar las implicaciones de la revolución tecnológica y científica en la educación considerando sus límites y posibilidades. Entre los principales hallazgos se encuentra que la ciencia moderna impactó directamente en la consolidación de la tecnología frente a la tradicional técnica bajo criterios positivistas que han monopolizado el concepto y conocimiento de la verdad, dejando de lado otros ámbitos como el arte, la política o el amor. Esto ha desembocado en un crecimiento de posiciones relativistas culturales. Estos aspectos han marcado el mundo contemporáneo con un impacto radical en el campo educativo.

Palabras clave

Verdad, ciencia, conocimiento, tecnología, educación, genealogía.

Introduction

One of the most outstanding features of the 21st century is the great changes that have resulted from the so-called *Fourth Industrial Revolution* marked by technology that has radically changed the way of being and perceiving the world. For example, social networks, internet, influencers, computers, blogs, AI, virtual libraries, wikis and streaming services have altered the ways of working, learning, communicating and knowing.

In the face of these great changes, framed within a project of capitalist modernity, numerous questions are opened to debate. According to Medina (1989, p. 13), the need for systematic reflection on the relationship between knowledge, truth, technology and science is due to the great social, cultural and environmental impact, among other things, of the latest scientific and technological developments. New concepts such as the technoscience highlighted by Guzón (2020) show the profound impact of technology.

Education is one of the many fields where technology has impacted; it is only necessary to observe how so-called information and communication technologies (ICT) have increased in the didactic field along with virtual modalities, modifying certain traditional elements of school and access to knowledge.

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

In this sense, the main objective of the article is to map the current state of philosophy in order to understand the debate on the truth, knowledge and science in a world ruled by technology and its corresponding implications in education, using a genealogical methodology. The research is structured in three parts, the first addresses the problem of truth from contemporary philosophy, which, in turn, is directly linked to the current of thought. Thus, the lines of truth, science and knowledge are linked following the approaches of Alan Badiou and Markus Gabriel. In the second part, a brief historical and conceptual tracing of the term technology is carried out to take the contributions made by Heidegger and Ortega y Gasset, and to contrast both theoretical perspectives on this subject. Two visions are confronted that perceive technology as a potential danger to humanity, on the one hand, and an optimistic vision that sees on it a means to modify nature, making life easier for human beings. Finally, as a result of the application of the previous debate, the current role of technology in the formal educational field is studied in accordance with its limits and possibilities.

Regarding the concept of truth in philosophy

The problem about the concept of truth has been a recurring topic in philosophy that has been working it from various approaches and positions, often totally opposed. As every philosophical problem, it does not and surely will not have a definitive solution. However, its reflection continues and is embodied in one way or another in the current state of philosophy; thus, considering the approaches of Badiou (2010), there are three great marked currents of thought in contemporaneity that are necessary to visualize since they will allow to make a cartography of the possible ways of dealing with the problem of truth.

According to Badiou (2010) the three main philosophical currents are hermeneutics, analytical and postmodern. The first comes historically from German Romanticism and the most representative authors are Heidegger and Gadamer. The second emerges mainly from the influence of the Vienna Circle and the main philosophers that represent it are Carnap and Wittgenstein. As for its historical niche, although it appeared in Austria, it is now hegemonic in the English and American academy. The third takes elements from the two above and works actively in France, although it is also strongly taken in Spain, Italy and Latin America. Jacques Derrida or Lyotard are very influential names in this line of thought. It is impor-

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

tant to mention that these three lines respond to countless intersections, mixtures and circulation networks between these three points (Badiou, 2010, p. 52), however, from an overview they would be the keys.

The problem of truth is dealt differently in each of them. For the hermeneutical current, the objective of philosophy is to decode the sense of its existence in the world. As Badiou (2010) points out, its central concept is 'interpretation'. His concern is centered on the 'method' that could shed light on the darkness of reflections, as Gadamer (1977) says. From this point of view, interpretation allows to open from the immediate world, which is rather closed, hence his dispute between the world of philosophy and that of technique, where the latter would incarnate nihilism and the closed.

For Badiou (2010), the analytical current is very clear in trying to delimit the alleged borders between the statements that make sense and those that do not, and thus a demarcation between what can be said and what cannot be said, or in Wittgenstein's words (2016, p. 62) we must be silent on what cannot be spoken of. The key tool is the logical and grammatical analysis of sentences, although more accurately, the entire language. The central concept of this current is that of rule, since the mission of philosophy is only to find the rules of language that ensure agreement about meaning so as not to fall into illusion or discordance.

According to Badiou (2010), the postmodern line has as its main goal the deconstruction of those supposedly evident facts of modernity; particularly it focuses on the great theoretical buildings inherited from the 19th century that imprison the thought, such as: subject, progress, revolution, science, among others. Its position emphasizes the impossibility of applying these great constructions since multiplicity is what constitutes contemporary, and it is no longer possible to try great epics of thought by not being able to reduce its plurality; therefore, it is sought to deconstruct the same idea of philosophy as a whole. Among other areas, what is proposed is the mixture between the conceptual method of philosophy and artistic enterprise.

In spite of their great differences, there is something in common in all of them, and it is the topic of an end, of a realization which can be seen in this way: the ideal of truth, as postulated by classical philosophy, has come to an end as mentioned by Badiou (2010, p. 55). This implies that the three currents also hold the end of metaphysics in their classical perspective. For example, Heidegger (2012) shows the closing of the history of philosophy and, therefore, of an entire period dating back to, at least, Plato. Carnap (1988), diametrically opposed to Heidegger, also

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affirms the impossibility of all metaphysics for a totally different reason, especially because it would be built from unregulated and meaningless statements. For Lyotard (1987) it is well known that one of his most influential theses is what he calls the end of the 'great stories'. Here it is not necessary to mark the reference toward the end of metaphysics, as it is extremely explicit the intention to show the end of the great narratives that it embodies.

Therefore, truth, as a category, is judged by contemporary thought and the classical figure of philosophy. The center of reflection seems to have changed toward sense and language. In the view of Badiou (2010), there are two axioms common to the three main philosophical currents: the first states that the metaphysics of truth has become impossible and the second states that language is the crucial area of thought, because meaning takes place there. Then, the question of meaning replaces the classic question of truth.

However, as Markus Gabriel (2016) recalls, this picture seems to believe that everything around it responds to some kind of cultural construct and at best, natural sciences describe things themselves, and this undoubtedly brings the so-called spirit sciences to a complicated position (2016, p. 145). The problem is that if accepting that everything responds to a cultural construct, the distinction between the true and the false disappears completely, since ultimately everything is a matter of perception as mentioned by a certain absurd and naive constructivism.

Within this dilemma of truth, in the author's view, the proposals of the German philosopher Markus Gabriel and the French philosopher Alan Badiou (2010) succeed in basing a new vision of truth that shortens many of the previous problems. In the book *Being and Event* it is mentioned that truths are generic multiplicities, because no linguistic predicate allows them to be discerned, no explicit proposition can designate them. [In this same line it is legitimate] (…) to call subject to the local existence of the process that develop these generic multiplicities [defining subject as:] (…) a point of truth (2010, p. 117). This would allow a new metaphysics to be found within a new materialistic dialectics. Descartes (1644) had already intuited the existence of these truths: there are such a large number of truths that it would be very difficult to enumerate them. But, it is not necessary to list them because we could not ignore them when there is an opportunity to think about them (p. 47). Truth is therefore imposed by its own intrinsic force and of course has an ontological nature. At the same time, however, the way truth looks is unique. The

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

universality of truths is supported by subjective forms that cannot be either individual or collective (Badiou, 2010, p. 118).

For Badiou (2010) truths have seven fundamental characteristics. The first states that even though truth is produced in a measurable time, it is eternal in that, from any temporal point, it is always intelligible. The second expresses that, although inscribed within a particular language, it is translinguistically and, therefore, separable into each particular language. The third presupposes an organically closed set of material, therefore every truth is the trace of an event. The fourth recalls that these strokes are related to an operational figure called the new body. The fifth explains that truth articulates and evaluates what it understands on the basis of its consequences. The sixth property explains that truth establishes a new subjective form from the articulation of the consequences. Seventh, truth is both infinite and generic, i.e., that it is a radical exception as well as an elevation of anonymous existence at the level of the idea.

The relationship between thought and truth is also worked in an innovative and strongly influential way from the so-called new realism represented by Gabriel (2019). Any form of realism, according to the author, is more accurate than the hegemonic constructivism that is being lived, as follows:

> The argument I am thinking of can be called the argument of truth. Part of the observation is that we can express what we believe as real through statements. These statements, through which we claim to determine reality, can be called affirmations. Statements can be true or false (p. 76).

Simple affirmations such as 'people live in Ecuador' or 'cats are animals' express true affirmations which simply mean that the truth of the statements is only a connection between the affirmation and their content. Up to this point there is nothing innovative because Aristotle has already manifested it. And Gabriel (2019) rightly states that nothing is easier than the truth [while remembering] (…) sometimes it is difficult to discover what the truth is (p. 79). And it is here that constructivism confuses the truth with recognition by the institutions created by the human being. Without the existence of the truth, we could not even communicate, since it requires a set of common beliefs, since paradoxically any disagreement on an important issue presupposes that we share a common system of opinion (p. 88). Therefore, for Gabriel (2019):

> Therefore, the conclusion of the truth argument is, ultimately, that constructivism consists, more or less, of a series of well-disguised inconsistencies. The constructivist modifies the meaning of each statement.

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

> But this also changes the significance of their own affirmations, so that in the end we can no longer communicate with the constructivist in a common way. Normally, we do not consider our statements to change reality; rather, we assume that they refer to a reality that contains much of what is not an affirmation (p. 89).

Thought plays a fundamental role here, since thanks to it all sensory modalities are objective. The human being thinks, as animals do, however, the radical difference is that it possesses a logo that makes the human being a creature that directs his life around the fact of having it. Therefore, Gabriel says (2019) that human has the capacity to think about thought and this implies the fact that there are different and incompatible theories of thought that cannot be all true at once, they are explicitly mutually exclusive most of the time (p. 98).

Once this succinct cartography is made around the current state of philosophy regarding the problem of truth and knowledge, it is imperative to bring it together with the reflection on the nature of science strongly worked by contemporary epistemology. Next, an approach will be made to questions such as: What is meant by science? What are the criteria for determining a discipline as scientist? What are the implications of a discipline to be considered scientific?

About knowledge and science

In everyday life the question: what is a science? is recurrent, and it is certainly a key issue at present and not only in the epistemological field, as it has numerous implications in multiple dimensions. Before addressing the question of how the current conception of science arises, it is essential to remember with Chalmers (1990) that it implies scientific status in the contemporary world:

> Scientific knowledge is proven knowledge. Scientific theories derive, in some rigorous way, from the facts of experience acquired through observation and experimentation. Science is based on what we can see, hear, touch, etc. Personal opinions and preferences and speculative imaginations have no place in science: Science is objective. Scientific knowledge is reliable knowledge because it is objectively proven knowledge (p. 11).

According to Chalmers (1990) the view of science mentioned above is strongly influenced by the scientific revolution that took place fundamentally in the 17th century and which was carried out by pioneers

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of science as Galileo and Newton (p. 11). In this sense, it is no coincidence, as Artigas (1999) recalls, that the origin of modern experimental science coincided with that of modern philosophy that begins with Descartes (p. 67). As is well known, Cartesian dualism allowed science to advance almost without precedent. At the same time, however, it created a great deal of confidence in science and its method, which was meant to extrapolate the different ways of knowing. In fact, as López (2013) recalls, there was also an eagerness to find a method for the human sciences to equalize the status of experimental sciences, the one proposed was hermeneutics.

The scientific model that predominated was the one put forward by Isaac Newton in his famous work *Mathematical Principles of Natural Philosophy*, where the importance of mathematics and experience in the new science is emphasized (in Artigas, 1999, p. 66). On these approaches, a positive epistemology is created, as Artigas (1999) recalls, where science was reduced to relating observable phenomena, renouncing knowledge of causes (p. 68). However, this view suffers from numerous shortcomings and is mentioned by Chalmers (1990) as 'naive inductivism', which would basically consist of believing that science comes solely and exclusively from observation. Obviously, this reductionist view of science is wrong and dangerously misleading (Chalmers, 1990, p. 24). In the words of Gómez (2014) this, rather than absolute and objective truths, are values that govern in science and not exclusively, as some argue, social sciences (p. 15).

At this point, it is essential to be clear that science is not isolated, it is always related and seen from non-scientific premises. In this way, according to Gómez (2014), it is interesting to appreciate how the neopositivist current that argued a strong inclination to empiricism and the reverential dependence on logic [in turn it had a political intention as soon as] (…) was part of a political, emancipating and functional project (p. 18) and had as its central axis the alienation from metaphysics. In this context, it is known that the Vienna Circle drafted a manifesto called *the scientific conception of the world,* where besides mentioning the objectives and proposals for its project, the position on the non-valuative neutrality of scientific knowledge is evident (Gómez, 2014, p. 20). In fact, the project seeks a political objective, namely that of a better world on the basis of unity of science and action.

Thomas Kuhn will be the one who points out that science has a strong valuing burden and therefore an intrinsic social humanity. This author distances himself from positivist approaches through concepts such as paradigm. In fact, *the structure of scientific revolutions* is one of the key works in the field of science and philosophy in the 20th century: His

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book caused an authentic revolution, the effects of which still remains in the modern philosophy of science (in Artigas, 1999, p. 85). One of the main contributions made by this author is Gomez's judgment (2014) in the explicit recognition of the presence of values not only in scientific activity, but also in his unit of analysis (p. 69). With this historization of science, Kuhn makes a great change in the face of the prevailing positivist positions of his time.

The paradigm concept is undoubtedly the most transcended element of Kuhn's philosophy of science, defining it is an arduous task since it uses it, at least, in two ways. On the one hand, it can be understood as what members of a certain scientific community have in common, i.e., the set of techniques, models and values to which members of the community relate more or less consciously [and, in a second sense, they refer] (…) to a singular element of this set (2008, p.14), for example, the *Principia* of Newton or the *Almagesto* of Ptolemy, where they both have in common the ability to replace explicit rules and allow the definition of a particular and coherent research tradition.

Knowledge, in the words of Chalmers (1990), does not longer occur by a logic of order and progress, but would be explained by the abandonment of one theoretical structure and its replacement by another, which is incompatible with the previous one or in terms of Kuhn pre-science-normal science-crisis-revolution-new-normal-science-new-crisis (pp. 127-128). Change would be oriented toward and from new paradigms that establish the necessary norms to legitimize work within the governing science. In this sense, the requirement for a discipline to be scientific is a large part of modern sociology that lacks a paradigm and is therefore not described as science (p. 129).

Today, human sciences have evolved to adapt to these new demands, which are certainly more viable than those posed by positivism. However, it is important to say that Kuhn's approaches are far from absolute and for this reason he has received harsh criticism accusing him of being relativistic, because according to Chalmers (1990) the decisions and choices of scientists or groups of scientists shall be governed by the values of these individuals or groups (p. 145). Clearly there is no universal criterion that can be cataloged as purely rational. For Badiou (1999), along with other elements, thought devices, inspired by mathematics, logic, and the heritage of the Vienna circle, hold the figure of scientific rationality as a paradigm (p. 9).

Badiou's (1999) approaches to science are interesting, since for him mathematics constitutes nothing less than ontology, the being. And

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taking up the subject of truth, it can appear in four fields such as love, art, science and politics (p. 25). At this point it can be seen that the truth is not confined or monopolized to experimental science, indeed, even to human sciences. Fields like love and art are incorporated, which from a positivist approach are impossible to consider. The author calls these four places 'truth procedures' or generic procedures.

Badiou (1999) says that the excessive concern in which any discipline is considered scientific comes from the social imaginary extended by the success of experimental science and the approaches of positivism. For him, truth is not necessarily tied to science, it is not a unique and exclusive field of science, but it is in other places like art and even love. This opens up new questions about science: Do all disciplines need to be science? Perhaps this, rather than enriching them, impoverishes them?

Once the current state of philosophy has been recalled in the field of reflection on truth, knowledge and science, it is necessary to relate it with today´s element: technology. It is certainly impossible to understand the present if the technological component that signals contemporary times and which has radically changed the way we are in the world is omitted from reflection. To do this, first of all, it is necessary to reflect on what is meant by technology.

Technique or technology?

For Quintanilla (2017), the concept of technology is relatively recent as it should be sought in the Industrial Revolution of the 18th and 19th centuries. It is right in this period when there is a break in the way of understanding what is called technique, and from it a new name will emerge. In fact, as known, it was at this time that the production system of the different material goods was modified due to the progressive appearance of different machinery that would replace the traditional handmade tools, highlighting, among them, the famous steam machine.

Before these events, according to Ferrater Mora (2009), traces of the word *téchne* can already be found in the Greek, referring to an ability to transform a natural reality into an artificial reality. However, the technique is not any skill, but a very specific one that follows certain rules, in fact, that is why it can also be understood as work since the technique is all series of rules by which something is achieved. In this sense, there is one technique for hunting, one for the government and one for the navigator. For Aristotle, for example, *téchne* is superior to experience, but

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less than reasoning. Spengler, on his part, defines the technique as 'the tactic of life'. This definition is put on the basis of the idea of man as a 'prey animal'.

In any case, the emergence of the concept of technology cannot be understood without that of technique, since the latter, following Sarsanedas (2015), has a long philosophical tradition of reflection, which, as has already been mentioned, appeared in ancient Greece under the form of *téchne*, referring to an art, a practical skill or procedure that achieved a given outcome. This conception of Greek technique was modified in Latin to be transformed into art. However, it will not be until the Renaissance when these two concepts are clearly distinguished: on the one hand, art linked to dimensions of beauty and, on the other, technique related to efficiency and utility in a pragmatic framework.

At present, as Sarsanedas (2015) states, despite the different ways of defining the technique, a common line of thought can be found which understands it as manufacturing, production and construction from elements provided by nature to achieve certain objectives (p. 3). In fact, it will be in the 18th century when the concept of technique will go fully into the set of procedures that allow 'useful' things to be done. So, what is the relationship between technique and technology? According to Sarsanedas (2015), the latter would be the task of modern science and [...] it presupposes techniques as essential forms of human action (p. 4). In this way, it can be said that the technique precedes the technology within the historical field, being the latter the phenomena with more contemporary influence due to the increase of modern science, giving as a result information and communication technologies.

Therefore, Sarsanedas (2015) says that technology presupposes technique and is intrinsically related to modern science, in fact some define it as a simple application of science (p. 4). Therefore, he agrees with Quintanilla (2017) in tracing modern technology to two previous events, on the one hand, the Industrial Revolution, and on the other, the development of capitalist modernity. These two contextual elements are drawing a new era of civilization which constitutes a turning point with regard to the conception of pre-industrial technique. Therefore, reflections on technology in many authors are indistinct, as this latest name is very recent and responds to the enormous increase of modern science.

As referred by Sarsanedas (2015), technology can be understood simply as the application of science; it is easy to appreciate how both terms are so related today, becoming one. As Chalmers (1990) recalls, science has become a kind of guarantor of access to truth to the point that

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the adjective 'scientific' produces a sense of solidity due to the monopoly of knowledge possibilities. However, in the face of this mastery of technology and positive science, Badiou (1999) shows that there are other possible paths to truth such as art, politics and love.

In this context, the relationship between human beings, technology and science has been an issue where basically two opposing positions can be found. On the one hand, there would be thinkers, like Heidegger, who see technique as risky and even dangerous, something that humanity will not be able to control. On the other hand, authors such as Ortega y Gasset consider technique and human beings as intimately linked elements in an almost symbiotic way. It is therefore necessary to explore both classic perspectives on technology presented by these authors and their implications in education.

Heidegger and technique as a danger to humans

References to technique can be found in the German author Heidegger's magna *being and time* (2012) and more specifically in his writing *The Question for Technique* (1994). In the first text, the author refers to technique as the daily way in which man relates to technical objects, this is a daily vision in the field of practice. It will be in the second text where the author enters fully into a philosophical critique where technology is its central problem.

It is important to consider that, in Heidegger's Question for Technique, the core of the reflection is on the relationship of the technique with the Self and the human being from an ontological point of view.

Heidegger (1994) understands technique as an instrument that has two dimensions, the first as a means to fulfill certain ends and the second as a man's making. Both conceptions will be two sides of the same coin as establishing ends, creating and using means is also a man's making. Thus, an instrumental and anthropological conception of the technique is observed. Heidegger does not ignore the difference between technique and technology; however, he uses the same term to refer to both: the instrumental definition of modern technique, which is normally stated, that, compared with the traditional technique, is something completely different and therefore new (p. 10). For the author, both technique and technology are means to certain ends, however, without using this name he sees the most contemporary technology as something totally new.

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

According to Heidegger (1994), human beings seek to dominate the world through technique. The problem is that, by wanting to master the technique, it escapes from the domain of man. For authors like Linares (2003) what is hidden behind this intention is the human desire to conquer its power and appropriate it.

In this way, the main problem of the technique can be found as Patricia (2010) points out in its totalizing tendency, its pretension to cover the whole reality (p. 16). In general terms, there would be a domination of the human being who believes to be free. Zizek (2006) raises this issue as follows:

> Today, with the perspective of the biogenetic manipulation of human physical and psychic characteristics, the notion of danger inscribed in modern technology, elaborated by Heidegger, became a common currency. Heidegger stresses that the real danger is not the physical self-destruction of humanity, the threat that something will go terribly wrong with biogenetic interventions, but that nothing *will go wrong*, those genetic manipulations work perfectly; at this point, the circle will be somewhat closed and will abolish the specific opening that characterizes the human being. That is, is not the Heideggerian danger (Gefohr) precisely the danger that the ontic will surpass the ontological (with the reduction of man, the here of being to another object of science)? (p. 252).

Humanity, as such, should freely set certain limits in the function of renouncing certain 'progress'. In the case outlined by Zizek (2006) on biogenetics, Heidegger would say that the survival of human beings cannot depend on an ontic decision of humans (p. 252).

Heidegger advanced in time by reviving the risk that technology will become the predominant way of producing our life, not only in a material sense but also in a spiritual and cultural sense (Linares, 2003, p. 35). In this context, technical means are not controllable for humanity nor by nature and human life.

Zizek (2006) mentions that technology is originally conceived as a means for something, however, it seems that it is becoming in that something, the 'thing itself'. For example, computers were initially used by publishing houses as a mere tool for making prints more efficient. Thus, they were means for printing. However, the same virtual text began to be conceived as the 'thing in itself', i.e., printing was no longer necessary. The question that arises is what will happen to the 'thinking computers' that were originally created to facilitate human thought, then, 'will human beings who read be reduced to an esthetic complement, like the book printed in the digital age?' (p. 257).

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Therefore, for Linares (2003), it makes sense that the predominance of contemporary technological power in human life is played by the very being which is, in essence, creative (poietic) freedom before being; freedom to be (p. 36). Heidegger's alternative to this is not linked to a return to a supposed pre-technological natural life, but rather to find a genuine way to inhabit the world. On this road, Heidegger returns to the Greco-Roman origin of the *techné* that is more linked to its artistic dimension connected with beauty. For this author, the essence of the technique is nothing technical, but something that transcends it.

Heidegger's position (1994) on technology, and updating his thinking, also in the face of modern science or technoscience, certainly glimpses many of the problems facing modern day. However, it is necessary to analyze another, perhaps opposite, different position from Ortega y Gasset.

The substance of the technique in Ortega y Gasset

For Diéguez (2014) the reflections on the technique by Heidegger are well known to philosophers from all over the world and have been very influential in contemporary ecological thinking (p. 131). This is very different with the approaches made by Ortega y Gasset that have not received similar recognition or attention even among the scholars of his line of thought. This may in principle be due to different causes, among which the seemingly simple content of their *Meditation on Technique* (1982) stands out and the rescue of other more influential dimensions related to epistemological, political, social, ethical, esthetic issues, among others.

Ortega y Gasset's (1982) position on the technique seems to be totally opposite to Heidegger's, as was seen at the meeting they had at the conferences held in Darmstadt in 1951, where opposing approaches were held. Much of the philosophical historiography has not been particularly kind to Ortega y Gasset's approach to the technique (in Diéguez, 2014), as he has been accused of taking a naive and optimistic position; it is superficial if we compare it with others, especially Heidegger's (p. 134). However, it is important to rescue his vision of the technique open to new possibilities of making human life. Therefore, he separates himself from purely instrumentalist visions in order to give a radical importance to the role of the technique in the very existence of the human being, which also allows to address recent approaches such as those made by transhumanism.

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In the first view about the courses of technique taught by Gasset (1982) he begins by saying the role that writers should have: the writer's mission is to anticipate what the problem will be, to provide readers time, i.e., before the debate arises provide clear ideas on the issue (p. 4). It certainly fulfilled this mission, even in areas such as technology.

Ortega y Gasset (1982) is categorical in manifesting that without it, man would not exist and would never have existed. And he goes further by saying that it is the technique that allows us to be human; the technique allows us to meet the needs, because it is the energetic reaction against nature or circumstance (p. 8).

Ortega observes the hostility of nature to the human being, who through technique seeks his well-being in the world around him, how can it be said that nature does not try to destroy humans? To answer the question, it would be enough to spend a single night in wild nature to see how nature is capable of destroying humans. Then, as Diéguez (2014) says, the place where the human being feels truly comfortable is not nature, sometimes idealized, but in a world largely shaped by that thick and extensive overlay that has worked hard to create technology for him (p. 135).

This search for human well-being will be a constituent part of his being and is only possible thanks to technology. In fact, it is curious to observe that for Ortega y Gasset (1982) the needs covered by the techniques are not precisely those that are associated with animals, since the animal instinct is sufficient to cover the basic needs. In humans, on the contrary, only the objectively superfluous is necessary (p. 10).

These affirmations become more complex when questioning what is understood by welfare. In the case of Ortega y Gasset (1982) it is inferred that they are directly linked to a vital project; man, technique and well-being are ultimately synonymous (p. 10). In this sense, human nature is conceived as indefinite and constantly changing.

These reflections he makes can be perfectly related to the contemporary proposal of transhumanism, whose techno-philosophical approaches are based on the explicit search for a substantial transformation of our species, as mentioned by Diéguez (2014, p. 143), which could happen by an integration of the human being with the machine, originating a kind of cyborgs, or, perhaps, modifying human genes in the germline, in both cases leading to a new species other than human, a post-human species. Some years ago, these approaches might have seemed science fiction, but today they are increasingly near and real possibilities.

While it is true that the context in which Ortega y Gasset wrote (1982) made it difficult for him to imagine the transhumanist postulates,

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it is also true that his approaches can be used to reflect on the new issues of this position. In this sense, this movement seems to have found a source of defense in Ortega y Gasset's claims (1982) such as:

> Man is, therefore, first and foremost, something that has neither a reality nor a body nor a spirit; it is a program as such; therefore, what is not yet, but aspires to be. [o] (…) man, whether he wants or not, has to make himself (pp. 15-17).

Ortega y Gasset's (1982) approaches may share with transhumanism a rejection of the existence of a human nature or condition from an essentialist point of view. It is important to consider that for Ortega y Gasset (1982), human being is a being with a historical dimension, and technology is important to make him human and to improve his lives through technology. A rupture with transhumanist positions can be found here since, as referred by Diéguez (2014), instead of seeking an improvement of human life through technology, an improvement of human beings is sought (p. 144). Therefore, the limits of transhumanism for Ortega y Gasset might imply a dissolution of the human.

There is a big difference between Ortega y Gasset's approaches (1982) and those made by transhumanism. While the former seeks that technology modifies nature so humans adapt better to it, it sometimes almost eliminates the effort imposed by the circumstance achieved by reforming it, by reworking against it and forcing it to adopt new forms that favor man (p. 13), transhumanism seeks precisely the opposite, namely a modification of human beings for their adaptation to different hostile environments that they may face in the future.

In this sense, it has been observed how Heidegger and Ortega y Gasset present two opposing views on technology and science, while the first warns of their risks, the second shows their possibilities without reaching positions presented by transhumanism. Today these two positions have long marked the debate on technology and science, but relatively new approaches have also emerged, which are having a major impact on contemporary thinking. Thus, contemporary philosophers of technology, such as Feenberg (1991) have classified the debate on technology into two major groups, instrumental and substantive.

The debates on technology and science

The limits between technology and science have become extremely diffuse and it is almost impossible to differentiate them, especially when

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modern science is guided by positivist and pragmatic parameters such as practice, application and use. The main difference between science and technology was that the first was guided by the search for truth and the second by the search for utility. However, this affirmation is difficult to maintain when most of the scientific work is aimed at obtaining marketable goods within the framework of a world guided by liberal hegemonic market logic. In this context, reflections on technology are intrinsically linked to modern science.

For Andrew Feenberg (2000) philosophical reflection on technology can be grouped in two broad concepts, on the one hand, in the thinkers of instrumental theory and on the other, in the advocates of substantive theory. The first is characterized by considering technology as dependent on the values established in other areas, such as politics and culture. The second states that the use of technology implies significant consequences for

Feenberg's instrumental theory (2000) would be the hegemonic current of reflection on technology, based on the idea that these are tools for those who use them; in this way, technology is considered a neutral field with no valuable content. The idea of neutrality is problematic because it implies total indifference to the political field, which is really difficult to maintain in the contemporary world. On the contrary, the substantive theory, put forward by authors like Jacques Ellul and Heidegger, would state that technology is not and cannot be neutral, but it is characterized as a key element, namely a cultural system that restructures the entire social world into an object of control. Max Weber, in some areas close to these approaches, already spoke of an iron cage that implied the rationalization that ultimately was the cause of technology.

For Feenberg (2000), despite their radical opposition, both theoretical frameworks are related, since, for example, both share a certain radical attitude toward technology: take it or leave it. In both cases technology would be part of a supposed destiny of humanity. To respond to this situation, the only way that it can be maintained is to set certain limits for it, which would generally be moral and/or political in nature. In view of this situation, Feenberg (2000) raises a critical theory of technology that traces a difficult journey between resignation and utopia (p. 10) that originated by combining insights (instrumental and substantive) into a common framework called the theory of instrumentalization (2005, p. 112).

Feenberg's theory of instrumentalization (2005) states that technology can be analyzed at two levels. The first corresponds to the original functional relationship with reality while the second involves the level of design and implementation. The relationship with reality refers to the

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dehumanization processes by which objects are uprooted from their contexts and exposed to analysis and manipulation by positioning subjects in a remote control. On the other hand, the level of design and implementation involves the possibility of integrating these with other existing mechanisms and systems with various social constructions, such as ethical and esthetic principles. To illustrate this in simple terms, it can be said that the first level simplifies the objects for their incorporation into a mechanism, while the secondary level integrates these objects into the natural and social environment. This is precisely what Heidegger called unveiling a world.

In short, for Feenberg (2000) technology is not one thing, in the ordinary sense of the term, but an ambivalent process that implies distinction of supposed neutrality by the role attributed to social values in the design. Within this vision, technology is not a destination, on the contrary, it is a dispute scenario. It is a social battleground in which civilizational alternatives are debated and decided.

Finally, it is impossible not to mention Melvin Kranzberg's thesis (1986), who somehow manages to catch the main problems about technology:

- Technology is neither good, nor bad, nor neutral.
- Invention is the mother of necessity.
- Technology comes in big and small packages.
- Although technology can be a key element in many public issues, non-technical issues are the primary factor in technology policy decisions.
- The story is relevant, but the most relevant story is the history of technology.
- Technology is a human activity, as is the history of technology.

Whatever the position regarding technology and science, what is agreed is on its enormous impact on contemporary societies framed within a logic of capitalist modernity and development. Education is a small area that can be analyzed based on its link to technology.

Science, technology and education

The world, as it is known, has had a great impact of technology and science, however, the truth is that its presence has meant a reorganization of the material and symbolic forms of life production that has involved

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a profound crisis, from which different theoretical frameworks have emerged to explain the new reality. Marco Raúl Mejía (2020) systematizes some of the most representative attempts to conceptualize this era:

> The way of naming these changes emphasizes the most visible element that constitutes them, according to the author who states it: Knowledge Society (Drucker), Information Society (Adell, Sally), Third Wave (Toffler), Informational Society, Post-Industrial Society (Bell), Techno-Science Society (Latour), Post-Modern Society (Vatimo), Individualized Liquid Society (Bauman), Network Society (Castells), Entertainment Society (Debord), Power-society (Negri), Risk Society (Beck), Consumer Society (Baudrillard), Control Society (Monjardet), Biomolecular Society (Kaku), Quantum Society (Zohar), Aquarium Era (Fergusson), New Era (Heelas), Frugal Abundance Society (Latouche), Shortage Society (Caven), Post-Consumer Society (Eguizábal), artificial societies (Epstein), transhuman society (Kurzweil), posbiological society (Pijamasurf), among others (p. 23).

In all these attempts, it is also essential not to lose sight of the important role of questioning the assumptions on which the Euro-American power is based and its corresponding hegemony from epistemic, conceptual and technological centers (p. 24). In this way, the limits of growth-based theories are revealed by questioning: economy based on infinite growth, human-dominated nature, endless progress, universal epistemologies that deny difference, development understood as a fixed place denying the different, among others.

From the other side of the world, the reflections of Gabriel (2016) and Badiou (1999) have also highlighted the need to explore new paths of dominant scientific positivism and its opposite extreme, which has gained more ground, cultural relativism and the corresponding impossibility of access the truth. These contributions must be moved to the educational field where science and technology cannot be considered as dystopias. It is necessary that a path to new realisms be rebuilt to consider multiplicity and move away from the monopolies of knowledge and truth marked by purely instrumentalist and utilitarian logic under commercial logic.

Paradoxically, however, when talking about the twenty-first century, the first thing that comes to mind is the great technological, scientific transformations and their goodness in making lives easier and more comfortable. It is important to remember, as mentioned by Aguilar (2011), that technologies of a culture condition its form of organization, as well as the worldview of a culture conditions the technologies that it is willing to use (p. 155). The field of education is no exception, but the

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existence of a great educational transformation is far from reality. The hegemonic educational model begins to be shaped in the 16th century as Varela and Álvarez mention (1991), and has barely changed since then.

However, it is important to clarify that the current and precise model of public school, free and compulsory, has been instituted […] at the beginning of the 20th century, as Varela and Álvarez indicate (1991, p. 14). But, what has been the role of technology and science in recent times? If observing technology as an instrument, its equivalent in the educational field is undoubtedly didactic or more accurately the didactic resources. Regarding science, it is the foundation of what is taught in school, and the dominant mentality has made that the only thing that is worth teaching is what is useful, following pragmatic criteria that have privileged the teaching of exact sciences to the detriment of other kinds of disciplines that are not valuable from this purely utilitarian and commercial approach such as the arts and the human sciences.

One of the accusations to 'traditional school' in the field of education is the use and abuse of the word by the teacher, who is the owner of science and knowledge in the classroom, who sees the close-minded approach of the school where the exterior world rarely penetrates in the classrooms through some books, a few geometric bodies, some maps and posters, together with the tools for writing as Gimeno says (2012, p. 132). It will be technology that will expand this repertoire of instruments in the classroom. The problem, however, is that the limitations are not only focused on the absence of artifacts but on the institutionalized model, which has been historically and conceptually shaped. It is not only about incorporating more technology into the classroom, but also about changing the positive scientific vision under utilitarian and mercantile parameters that continues to dominate education in the twenty-first century.

In this context, it is impossible not to talk about the well-known information and communication technologies (ICTs). Like previous reflections on technology, ICTs are presented as encouraging and worrying elements. According to Gimeno (2012) it is based in the fact that recent use of technology into the classroom reflects not so much the use of technology in the service of education, but the usurpation of education in the service of technology (p. 133). It can also be added that ICTs can be very profitable for certain companies, without producing the promised results in the learning processes, and becoming uninhibited consumers of cheap devices of rapid expiration (p. 133). ICTs are new not simply because of their recent emergence, but because they present innovative

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

and novel possibilities. To get an idea of the pedagogical implications, as for Gimeno (2012), the following information can be highlighted:

First, it is necessary to bear in mind that ICT, to an even greater extent, integrates a large number of auditory, visual and kinesthetic stimulation that present a great challenge to traditional forms of communication in the classroom. In this way, there is the possibility of accessing to an uncomprehensive amount of differentiated and varied learning materials that are usually presented more attractively for learners.

Second, it can be observed how accumulation capacity increases exponentially, allowing teachers and students to find knowledge accessible in different media. It is also important to consider that disciplinary barriers begin to disappear as information is presented integrated.

Thirdly, access to the digitized cultural heritage is easier to access at anytime and anywhere, something that the school has not been able to achieve to this day.

Finally, it can be mentioned that ICTs can revolutionize the way for communication, as well as collaboration in group tasks, where it is now possible to exchange information and opinions in real time, allowing virtual cooperative work between students and teachers.

In this sense, it is interesting to see how ICTs have radically changed the way human beings have lived in recent years, and only by looking at the huge fields of application its impact on education starts to be considered. However, the case is that ICTs are already educating us, not in the field of formal education, of course, but in the informal field. As mentioned by Gimeno (2012), ICTs are already educating us because they change our lifestyle, the ways of working, our relationships with others, as well as references to our identity (p. 137).

At this point the most important thing is to consider that the revolution of technology and science has already directly impacted in the field of education, which is not reduced to formal processes taught in the classroom, but it covers all the ways of living. Now, having this clear, the main point of reflection is being able to read the possibilities of ICT and the change of scientific approach in the field of education within the spaces and school where very diverse pedagogic activities and tasks are carried out as didactics, evaluation, management, ongoing training processes, school assignments, teaching resources, among others.

There is no doubt that science and new technologies make it possible to speed up all the aforementioned processes, and this has been extensively and thoroughly documented in recent times. In fact, the information or knowledge society, if this differentiation is made as Gimeno

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

(2012) states, is one in which the generation, process, mastery and propagation of knowledge promoted by ICTs become sources of wealth and transformation of productive activities (p. 147). However, it is important to consider the large inequality gap even between groups of different ethnicities, taking into account gender and social class.

In this educational context emerged a new concept called Learning and Knowledge Technologies (LKT). Generally, when referring to ICTs, reference is made to computer or digital skills linked exclusively to information and communication technologies, however, in the educational field, the aim of the LKT is to orient ICT to specific and differentiated uses framed in the formative processes of students and teachers, whose aim is to learn more and better, Lozano (2011, p. 44).

In this sense, the interest is no longer so much on the fact that competences related to informatics are developed, but there is a more methodological application, i.e., to emphasize their uses and to know what can be done with technology (p. 46). Hence, the idea is to move from technology learning to learning using technology. This logic could be framed in approaches such as those made by learning to learn. This pedagogical motto is related to the so-called constructivism that, in a very synthetic way, following Martin (2011), refers that knowledge is a construction of the human being, which is conducted from the cognitive bases that he already has (p. 24). This causes several consequences at the didactic level, mentioning that the teacher is a guide or mediator in charge of providing the tools or inputs, so that students can generate their own learning in general terms.

However, according to Martin (2011), LKT are not reduced to a paradigm or pedagogical current, but rather they directly affect the different educational practices, called 'connectivism'. This tecno-educational interaction can be linked directly to the so-called Web 2.0, which reopens the educational debate in a complex and plural context.

Connectivism would suggest that learning is based on the desire to learn and is only achieved through learning on the network. In this sense, Web 2.0 especially values the Internet, blogs, wikis, educational virtual platforms, among others, as they reflect the intention to promote the collective recreation of knowledge through the integration of personal and collective intelligence into learning.

However, it is necessary to mention, in line with the approach of Philip Meirieu (2013), that:

> (…) The issues of self-evaluation, meta-evaluation, metacognition and self-regulation are far beyond technical issues. These are deeply

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> political issues that occupy the aims of the school and the democratic project (p. 49).

Thus, the dispute is not so much didactic, scientific or technological, but political. The author considers that the challenge is not only to teach with technology, but to turn them into tools that allow to improve the learning of all students by reducing inequalities; to promote their social development; to strengthen their moral autonomy and finally to educate socially capable individuals to integrate and learn in a plural and multicultural society, as mentioned by Diaz (2011, p. 160). If technology and scientific approaches do not contribute to these goals, its use in the educational field will be limited to that of a didactic resource that will allow to achieve some kind of functional and non-significant learning to a particular hegemonic order that constantly reproduces and strengthens inequalities. Therefore, a theory of technology mediation in the educational field and a broader view of science that even addresses other paths of access to knowledge and truth are chosen.

Conclusions

This article has made a brief review of the problem of truth, science and knowledge in a world marked by technology. To this end, the current state of philosophy has been observed in the light of the main currents of thought, from where these problems are analyzed, leading to the approaches of the French philosopher Alain Badiou and Markus Gabriel. Together with these authors, the hegemonic, constructionist and cultural relativism, whose fragility has been observed by showing its deep internal contradictions, has been examined. From this questioning, attempts have been made to rebuild the step toward a new realism.

With regard to technology, it has been possible to place its emergence in the historical rupture with the technique generated from the scientific revolution and its subsequent application in different fields that led to a radical change in the ways of understanding and inhabiting the world. Regarding the reflections on what is now called technology, there are two philosophers who were able to foresight the problems that are currently being experienced. In this way, Heidegger's views are opposed, on the one hand, because he sees technology as a potential danger to humans and, on the other hand, Ortega y Gasset's vision who considers technology as consubstantial to humans, i.e., a means that allows them to live fully in the world, modifying nature. These two antagonistic posi-

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.

tions have marked the present of the reflection on technology and science that has incorporated new elements into the debate resulted from the so-called fourth industrial revolution.

As a result of this debate, it has been observed that reflection on technology goes beyond political and social dimensions. As far as the educational field is concerned, its impact is undeniable as its potential to speed up certain processes and educational mechanics. At the same time, technology, without clear teleology, can become a barrier to achieving meaningful learning. In this regard, the proposal that is being made is that any type of technology should be framed in a socio-political aim of reducing inequalities and social justice, where education is a privileged field of action.

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Document reception date: December 15, 2020
Document review date: February 15, 2021
Document approval date: May 20, 2021
Document publication date: July 15, 2021

Sophia 31: 2021.

Print ISSN:1390-3861 / Electronic ISSN: 1390-8626, pp. 129-154.