Ambiguity in the educational technology category

Ambigüedad en la categoría tecnología educativa

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Abstract

This article is theoretical and is developed from the perspective of epistemology and philosophy of education, focused on higher education. It is structured in three sections: the first shows some theoretical criteria regarding ambiguity; the second is an approach made to the course of the technology category and the imprecision in its theoretical use, and the third shows the educational technology category and the ambiguity that exists in it and in its use, as well as some of its causes. The aim is to analyze the ambiguity in the educational technology category. The methodology used is Documentary, consisting of the critical study of texts. The main results are conformation of general ideas around theoretical studies about ambiguity; theoretical elaboration, from an epistemological perspective based on the ambiguity in the categories technology and educational technology. It is concluded that a positive view has been displayed around ambiguity, but it has not eliminated its negative charge; ambiguity is not consubstantial to the technology category, it is due to the extraordinary expansion of its definition; In the educational technology category, the ambiguity typical of the technology category is present, in addition to that provided by the *educative* adjective.

Keywords

Ambiguity, category, knowledge, technology, educational technology, high education.

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Resumen

Este artículo es teórico y se desarrolla desde la perspectiva de la epistemología y la filosofía de la educación, centrándose en la educación superior. Está estructurado en tres epígrafes: el primero muestra algunos criterios teóricos en torno a la ambigüedad; el segundo es un acercamiento al decurso de la categoría tecnología y a la imprecisión en su empleo teórico; y el tercero aborda la categoría tecnología educativa y la ambigüedad que existe en ella y en su utilización, así como algunas de sus causas. El objetivo es analizar la ambigüedad en la categoría tecnología educativa. La metodología utilizada es la documental, consistente en el estudio crítico de textos. Los principales resultados son: conformación de ideas generales en torno a los estudios teóricos acerca de la ambigüedad; elaboración teórica, desde una perspectiva epistemológica, en torno a la ambigüedad en las categorías tecnología y tecnología educativa.

Se puede decir que en torno a la ambigüedad se ha desplegado una mirada positiva, pero no ha borrado su carga negativa; la ambigüedad no es consustancial a la categoría tecnología, se debe a la ampliación extraordinaria de su definición; en la categoría tecnología educativa está presente la ambigüedad propia de la categoría tecnología además de la que le aporta el adjetivo educativo.

Palabras clave

Ambigüedad, categoría, conocimiento, tecnología, tecnología educativa, educación superior.

240

Φ

Introduction

Interest in technology is increasing every day, with the attention given to its sustained development and refinement, to its wide and varied use and to its influence on society and culture in all respects and from the same roots, with benefits ranging from the simplification of historically complicated and difficult actions to the achievements of purposes that some years ago were chimeric. Every day, advances are more innovative, and the scope is more extended. In turn, it can arouse specific interests, with very specific aims and perspectives, including epistemological, which can be due to the essence of the category, the concepts and conceptions about it, the precision achieved in its formulation and use, and among many others, the emergence and development of other categories and concepts related to or with certain common relationships, such as educational technology.

Both categories are commonly used and are related to a variety of seemingly unrelated things. They can refer to tools, processes, components, methods, pathways, computer programs, or all of this, or even something else according to circumstances or individual reasoning. The use of a single word to refer to a variety of facts and objects is a saving of language, but it can also be an attack on precision. There is ambiguity in the use of the technology, as mentioned by Quintanilla (1998).

This term refers to the quality of ambiguous, i.e., when language can be understood in various ways and have different interpretations. In certain contexts, it may be valuable, as in some works of art, but this is

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not exactly the case in the construction of knowledge, where the desire to achieve the greatest possible precision prevails, because it can create doubts or confusion and although a positive role in cognition, since it stimulates ideas and theoretical debates, also, as Cupani (2018) emphasizes, it gives the impression of failure. It is worth noting that an interest in accuracy does not mean the ultimate in accuracy, because "exact knowledge not forced is a symptom of the true, and true knowledge does not always have an empirically accurate data as an example" (Martínez, 2010, p. 68). Moreover, this text is not permeated by the spirit of modernity condemned by Romero Moñivas (2016), as for "in the logical-mathematical, philosophical and scientific field the presence of ambiguities and contradictions is a black spot in research" (p. 38) but having a moderate or open position in the face of imprecision does not mean that order, since coherence and clarity in epistemological aspects are denied or neglected. It does not mean to go from one extreme to the other; it is not leaving the way to disorder, to vagueness.

241

On that basis, the aim of this paper is to analyze the ambiguity in the educational technological category. This purpose was based on the following scientific problem: Does ambiguity occur in the educational technological category as happens in the technology category? Consequently, ambiguity exists in the educational technological category, but with some specificities.

This topic is important from an epistemological perspective. One of the issues of epistemology is, as Maletta (2009) emphasizes, the transmission of knowledge, so that it may be known and used; for this reason, language is very important, as well as the precision that is transmitted through words.

The technological development and its multifaceted presence in human life are the defining characteristics of the era that has been making its way since the middle of the twentieth century. Thus, the importance of every scientific work, any theoretical elaboration or applied research that moves in this thematic universe, as happens with this article whose background aims to encourage debates on ambiguity, specifically that which takes place in the use of the categories of technology and educational technology. The latter is of great importance because it is directly present in the education of the new generations; however, its value is much greater when it comes to the university, because of the increasingly comprehensive scope of higher education in society and culture; the relations between the three are consolidated and raised to levels never seen before and with possibilities still unsuspected.

Over the last few decades, new technology, particularly information and communication, has motivated an increasing number of specialists in higher education to use them in this type of activity and, in turn, to carry out scientific research around them, from where numerous contributions to theory and practice have been obtained. Recent technology has become a path that, with a glaring acceleration, has been opening to the eyes of teachers and students, who have understood that its use is inevitable. It is increasingly less likely that educational spaces and their actors will be on the sidelines of technological resources, especially when their consequences include the fading of the boundaries between the outside and the inside of educational institutions, the modification of the configurations of the classrooms and classes, the alteration of the role of teachers and students, as well as the possibility of speaking of academic modalities where the assimilation and production of knowledge respond to a different logic; this is largely due to the possibility of establishing remote communication (synchronous and asynchronous) and the alteration of basic concepts, including space and time.

Advanced technology has been a constant in academic institutions because there have always been professors interested in perfecting their work and they have used many advances they have found promising for achieving their purpose; the presence of technology in this area is remarkable today, not only because it favors the processes of these institutions, but because it is an essential part of those involved in the process. However, although it would be very difficult, human beings could live again without the current technology and without it, it would also be possible to educate and teach.

The importance of the subject starts from the object of study, and its specificity is at the center of a task that humanity needs to know: To understand. One way to get closer to this ideal is to increase the accuracy of language, of communication, for a world as dynamic as the one that is opening up the way, the points that are added to concepts are not enough. Coherence does not have to disappear, nor does ambiguity subdue.

This article is totally theoretical, developed with the use of the documentary methodology, consisting of the critical study of texts and the analysis of written information. It is structured in three sections: the first shows some theoretical criteria about ambiguity; the second is an approach to the technology category and the imprecision in its theoretical use; and the third addresses the category of educational technology and the ambiguity that exists in it and its use, as well as some of its causes. The bibliography used is mostly recent and deals with the conceptual core

242

of the work; it is remarkable by its inciting character, the *Technique and culture* article by Miguel Angel Quintanilla.

A look at ambiguity and the studies about it

The word ambiguity comes from the Latin verb *ambigere*. Pera (2010) says that it is composed of *ambi*: on both sides and *agere*: to address. In the Spanish language it has three meanings, all very related to each other: as for language, which can be understood in various ways and give reason to doubts, uncertainty or confusion; as for a person, who, with his words or behavior, does not clearly define his attitudes or opinions; as for uncertain, doubtful. According to Aliaa Abd Al-Aziz Al-Sharif (2008), this phenomenon was called *αʹμφιβολιʹα* (amphibolia) in Greece and Rome, along with the Greek term *ambiguitas*.

243

Φ

Ambiguity is a linguistic situation typical of certain sentences that have various meanings. Something is ambiguous when it can be interpreted in more than one sense. From the point of view of language, Pera (2010) defined ambiguity as "the fact that a word may have several different meanings" (p. 6). In linguistics, it is associated with polysemy and the existence of more than one meaning in everyday speech, which is due to the interest of attention among other causes, a phenomenon that, according to Nerlich and Chamizo (1999), is called intentional ambiguity.

Two ways of ambiguity stand out in this specialty: polysemic and absolute. Aliaa Abd Al-Aziz Al-Sharif (2008) states that the former is observed when a form can be interpreted in different ways, because it is associated with more than one sense; it is the result of an insufficient context or a situation of unexplicit communication and occurs "when some concepts acquire a series of connotations over time, which vary with changing circumstances" (p. 334). The same asserts that the second mode takes place "when the linguistic context does not dissolve the ambiguity of a lexical element, and therefore, one has to resort to the intervention of the extralinguistic context, i.e., to the situation and the context" (p. 316).

Ambiguity has attracted attention not only in the context of linguistics. Although in some texts it is used with the common meaning and there are no reflections about it, for which the understanding around it must be obtained from the written context, as happens in the texts of Santibáñez and Vergara (2008), Alcalá Galán (2010), in other works, not always linguistic, there are broad and deep theoretical ideas, which are developed from two perspectives: negative and positive, which will be discussed below.

In studies of science, ambiguity is often seen as a negative quality, because precision and clarity prevail as inviolable principles. In this regard, Di Bitetti (2012) notes that "the ambiguous use of scientific and technical terms can create conflicts of understanding within the scientific community" (p. 137); thus, it is associated with confusion and is the result of the lack of an adequate operational definition of terms and concepts, which leads to a limited and weak theoretical basis. Similarly, it is the case in some studies on finance, for example, Corso (2015), relates it to the lack of information in certain operations.

There are economic studies, such as González Álvarez (2004), that use 'Causal Ambiguity' category to refer to the possibility within the reach of a company so that others do not imitate it. Although this result is positive, the category is associated with disability, uncertainty, ignorance. As can be seen in the text by González and Nieto (2007), it is intended that competitors perceive a high level of imprecision, guaranteeing protection against imitation and favoring results, showing the basic indetermination arising from the nature of the connections between actions and results.

The negative aspect is observed in some studies of bioethics; for example, Pardo Caballos (2010) understands it as lack of clarity and precision, as confusion; and refers to the inner ambiguity of the principles of bioethics, which is seen between the objectivity and subjectivity of what is wrong, and the external ambiguity, which takes place in the principles of bioethics as long as these principles are given meaning in accordance with hypocratic ethics; this author relates it to ethical relativism and skepticism. Similarly, Díaz Fúnez et al. (2016) develop a series of ideas about 'role ambiguity' such as the absence of clearly formulated information on performance expectations, goals, duties, authority, responsibilities, obligations and other working conditions related to the performance of the role; it occurs when employees perceive a lack of clarity in the activities needed to perform well; they ensure that performance is reduced and job satisfaction is altered in work contexts with high levels of role ambiguity.

The positive approach to the category, according to the texts consulted, is because the word ambiguity takes the meaning of uncertainty and hence relates to certainty. This perspective is mostly seen in certain socio-political and cultural studies.

The text of Rottenbacher and Molina (2013) is an example of sociopolitical studies, in criticizing the simplistic paradigm; they start from epistemic motivations and condemn the interest of possessing knowledge about the world that is simple, structured and unambiguous; their position is that they see this paradigm linked to dogmatism and intolerance

of imprecision and uncertainty, as well as to the cognitive needs of order, structure and closure, in turn, they associate it with political conservatism and cognitive rigidity, which, according to them words, are manifested, first and foremost, in the aforementioned intolerances; hence, they relate intolerance to ambiguity to diverse socio-cultural attitudes, such as heterosexism and political conservatism.

Similarly, Pera (2010) affirms that until the 20th century, ambiguity had been a pejorative and disqualifying concept in the West, but that the relations of culture with ambiguity are complex and sometimes positive, because culture implies ambiguity, both the concept of it, as well as the phenomenon that it alludes to and points to artistic language, because, in his view, the ambiguity that the author introduces in his work, is that "with his wealth in meanings, with his rupture of the dominant logical discourse, and with his capacity to stimulate diverse interpretations, the one that can be 'the unexpected' from the point of view of aesthetic values" (p. 76).

Pera (2010) affirms that to understand culture, it is needed to accept and analyze its intrinsic ambiguity, which reflects the infinite ambiguity of the world. He argues that this statement is basic to the point that it can be said that "we are now immersed in the age of cultural ambiguity, as a consequence of its growing complexity, as well as the multiplicity of speeches that try to interpret and dominate it" (p. 76) and that "new information technology is imposed in this type of culture, in which the infinite ambiguity of the interpretations demands the forceful and continuous application of critical thinking, so as not to be lost definitively in confusion and chaos" (p. 77).

Pera (2010), considers that it is different when it comes to the relation ambiguity-knowledge, although he considers that if ambiguity is denied, the foundations for education and scientific research in freedom are destroyed (of course, if ambiguity is understood as doubt and uncertainty, not as darkness or confusion). In turn, he argues that because accurate knowledge is not possible, one must prepare to live "with uncertainty and ambiguity. Because all knowledge derived from human models for world research—including reasoning—is necessarily, and in the strict sense, to a greater or lesser extent, ambiguous" (p. 77). Nevertheless, he assures that "in the field of human behavior and coexistence, in societies that are increasingly heterogeneous and conflictive, in which it is necessary to narrow down ambiguities and to have functional certainties" (p. 77).

López López and Vargas Hernández (2012), also explain their considerations whose framework is the organizational processes; based on

245
Φ

the theory of organized anarchies, they use the concept of ambiguity to express the complex relationships that occur around and within organizational processes. In the light of the theory of organized anarchies, the decision loses its linear character and is judged as a complex process of loosely coupled relationships between problems, solutions, and participants. Hence, their assertion that an organized anarchy "lacks clarity and coherence in the objectives it intends, and how it intends to achieve them, as well as who is or are the decision-makers, the latter called the constant flux of participants in the decision-making process" (p. 50).

In studies on religion, Gómez (2017) argues that religious ambiguity is part of reality, because it is interpreted in a religious and non-religious way, moreover, it promotes diverse and incompatible interpretations; thus, he differentiates intellectual and experiential ambiguity. In the first case, he argues that it is possible to defend rationally incompatible positions, because there are different types of evidence to appeal and different interpretations that can be legitimately adopted, and different positions are equally well justified. In the second case, he points out that this is due to the fact that reality allows the creation of different models of organization and conceptual schemes; there is a dynamic and relational process that never ends between the latter and reality, that reality is ambiguous, because it is not composed of objects ordered in a fixed structure, nor of unalterable concepts, since the systems of concepts and reality are mutually configured.

As seen, there is a diversity of criteria surrounding ambiguity, but it must be clear that opposing and, at the same time, wanting as much clarity and precision as possible does not mean seeking rigid thinking, neither closed or schematic and much less allied to political, social or cultural positions retrograde, exclusive or prone and contrary to humanism. Order, coherence, and many other categories associated with them are not harmful by essence; the dose of its consumption can alter its quality.

The technology category: Some considerations

Since the last three decades of the last century, humanity has been immersed in the development of technology, which although it covers the improvement of existing technology, it stands out for the creation of others, of the most diverse variety, with properties never achieved before. Their presence and action have been extended throughout life, first because of their ability to solve problems and their functionality. Its development

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encourages reinterpretation around various issues, including life and human beings, as well as the links between the natural and the artificial, the technological and other types of creation, and between all this and the human, which is difficult in a world where "Nature and culture are practically indiscernible" as mentioned by Tilleria Aqueveque (2020: 88) and which Casquier Ortiz points out (2018) "the life of the human being is so modified that the extraordinary is becoming ordinary" (p. 94). Additionally, the reflections, past and present, are also the subject of reassessments.

The word technology has a Greek origin and consists of the term *techne* (art, craft, technique, skill) and the element *logía*, which is usually translated into Spanish as a treaty or study; on this basis, it can be deduced that it literally means treatise or study of the techne, but the matter is not simple; as happens with many meanings, it carries with a theoretical meaning supported by philosophical foundations and the characteristics of the time that serves as a framework.

The word technology in Spanish is polysemic and complex because it has several meanings, among them, dealing with technical matters, set of theories and techniques that allow the practical exploitation of scientific knowledge, language proper to a science or art, set of instruments and industrial procedures.

When used in certain circumstances words such as in the context of science and cognition are often referred to as categories, as they are primarily a function of the development and acquisition of knowledge. The technology category, based on the characteristics of the word technology, previously stated, economizes language because it expresses various ideas, but the recipient must infer the transmission of the information to which it is alluding; therefore, it damages the accuracy of the message and makes it ambiguous.

The origins of the technology category are in the studies that were developed in Antiquity, especially the philosophical studies, where the texts of Plato and Aristotle are discovered. According to Medina (1995) *techne* was for both "true but contingent knowledge (…), which could never reach the category of theoretical knowledge, necessarily true and immutable (…)" (p. 181). According to Osorio (2011), with the category techne Plato refers to human activities that can be spoken or reasoned, which are based on simple experience and are a routine way of doing, although they are not spontaneous or unconscious. So, at least since Plato, *techne* is associated with material production that relates to the world in a practical way, and differs from episteme: abstract knowledge, result of deep reflections. As for Aristotle, Medina (1995) assures that he under-

247

stands it as a capacity for action based on practical knowledge; it depends on a perception or reasoning about what must be done and that separates the productive techniques and the human capacities that it considers superior: the discursive and theoretical ones. According to what can be understood of these two authors, the common thing between both philosophers is in the practical component, which should have been transmitted to the word technology.

As for that word, Osorio (2011) points out that the 18th century is very important because the dictionary "The new world of English words" is published in 1706, where technology is defined as "description of the arts, especially the mechanics" (p. 20). It maintains its relationship with practice, but in the scope of theory. At the end of this century, in Germany and France technology was understood in connection with technique, i.e., with the practical elaboration of little or no theoretical composition, but the relationship was not as empirical, but rather rational. It was used as a reference for engineering schools, technical journals, industry rationalization and, above all, because it connected science and technology. Moreover, he points out that until the 19th century it maintains this sense, precise and clear, which corresponds to the structure of the word, and it was in the 20th century that the precision changed, since it is defined as industrial science in the Webster dictionary of 1909, and as "the totality of the means employed by people to provide for the objects of material culture" in 1961 (p. 22). In turn, he assures that in 1970 the scholar of these subjects L. Winner defines technology in more than one sense, and includes the devices, the methods, skills and procedures used for the accomplishment of tasks, the varieties of social organization related to technical social devices and the rational-productive sphere. There are authors, such as Cueva Gaibor (2020), who consider that "technology corresponds to digital devices that can be connected with a computer or with the internet" (p. 341).

While the content of the Technology category is constantly changing and enriching, as can be the case with many other categories, it is also stabilized. Today, when used, it is often referred to as a whole, covering artifacts, tools, instruments, and procedures (industrial and those that allow practical use), as well as scientific knowledge about it. It refers to the whole process that goes from the production of a product to its consumption, because it includes packaging, transportation, storage, distribution, as well as knowledge (with the consequent theoretical elaboration) and the practice that made all this possible. Technology is universal comparable in extent and internal heterogeneity with another category: culture.

The technology category has been accompanied by diversity of criteria; if, for example, Agazzi (1996) conceives technology as "a way of living, of communicating, of thinking, a set of conditions by which man is widely dominated, much more than having them at his disposal" (p. 141), Quintanilla (1998) understands it as "a set of scientifically-based knowledge that makes it possible to describe, explain, design and apply technical solutions to practical problems in a systematic and rational way" (p. 50), and Foucault (1990) use it in a varied way that becomes inaccurate. Examples may be more recently disseminated considerations, such as those of Carvajal Villaplana (2017) who refers to it by mentioning three characteristics: a) solve a practical problem or satisfy a need, b) novelty and c) efficiency, while Freyre et al. (2019) by using the category support their reflections on types of technology, which can be understood to do so to give more precision and clarity to ideas.

Technology is not all that a human being uses to develop life, but a type of human creation to a higher degree. There is no need to attack its breadth and reduce it to any of its components to gain concreteness in the category and remove ambiguity, or at least mitigate it; this characteristic is valuable, as is its heterogeneity; it needs to be adjusted.

Technology is the scientific system composed of procedures (including organizational and skill variants), artifacts (instruments, tools) and considerations about the two components above, focused on the scientific optimization of human activity (practical, cognitive, valuative and communicative). In the category, its scientific condition is decisive. In this sense, I agree with Quintanilla (1998), but I do not limit technology to knowledge, it includes everything that has already been mentioned.

Conceived in this way, technology can find its own problems and can seek for solutions through procedures arising from its broad and dynamic premises. It does not mean that technologists do not turn to science, including social and humanistic sciences.

To study it more deeply and not to get lost in the ambiguity resulting from its breadth and heterogeneity, an effective way of doing it is through approaches, as suggested by Quintanilla (1998) or observing it, according to Eslava (2019). It can also be observed from a cultural perspective, as recommended by Peña and Otálora (2018), who emphasize their educational essence and conceive it in a universal, integrative, and complex way, giving rise to knowledge, interpretations, and senses, that take the name of technological knowledge. This idea is enriched if considering that "every technological novelty is a new way of reading, studying and writing reality" (Caéros, 2019: 9).

249

Φ

Regarding these ideas, it is worth considering the criterion of Rubio Barrios and Esparza Parga (2016) who claim that technology "cannot be assumed as a means, since it is possible to find its proof in itself" (p. 16), with it the human being can achieve greater satisfactions than those offered by nature.

The Educational Technology Category and Ambiguity: An Epistemological Look

The strong, varied, and dynamic links between knowledge and higher education are steadily growing; this characteristic propitiates the establishment and consolidation of multiple relationships between it and epistemology, a philosophical specialty dedicated to studying knowledge in general, although in not few occasions its object of study is framed in scientific knowledge and science. Since the end of the last century, this discipline has strengthened by the importance and timeliness of its content, its conclusions, and recommendations, all of which acquire a much greater meaning in universities. Institutions are great receivers and diffusers of knowledge, its use is continuous, but at the same time institutions stand out for their capacity and quality to store it, and they produce it in greater quantity and diversity.

The value of the relationships between epistemology and higher education is recognized by many scholars for various purposes. Hence, the existence of a considerable number of texts in this regard. Among those consulted for this article is Cardenas (1991), who argues the value of these studies and the need to increase them. He notes that one of the subjects least studied by teachers is the epistemological status of pedagogy; Perafán Echeverri (2004) and Aldana de Becerra (2008) insist on the urgency of giving more attention to the epistemological conceptions of teachers; Senior Martínez (2016), as well as González and Fernández Aquino (2018), emphasize that sciences generate philosophical-epistemological problems around which it is necessary to open spaces of critical debates on epistemology to be aware of the importance of assuming paradigms that incorporate social dimensions in the understanding of knowledge. The Cuban philosopher Guadarrama González (2018) calls for the teacher to differentiate results and methods in the process of knowledge-making, to enable it to pass on alternative attitudes to new generations; Artigue (2018) alludes to some aspects of the relationship between epistemology and didactics, and Martínez Sánchez and Galindo

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Albores (2019), emphasize the inclusion of epistemological discussions in educational programs of all branches.

As can be seen, the epistemological perspective is related with higher education and thus stands as a theoretical basis from which technology and specifically educational technology can be analyzed.

If the current technological changes and innovations have covered life in so many manifestations and the tendency to increase is apparent, it is inferred that the field of education is also in the same influence. In the educational framework, its use is significant accompanied by specificities given by the historical moment, the context, and the level. Such permanence is due to an essential reason: throughout the history of humanity, the intention of the professor has been to optimize work to obtain better results. For this reason, the tendency has prevailed to insert the human achievements that contribute to the performance of their objectives; as Aguilar Gordon (2011) asserts, it is not possible to categorically separate human being, education, and technology.

In education, especially since the most recent decades, when technology is mentioned it is often thought of as cutting-edge advances but without mentioning, at least to a fair extent, that its use has had stages and that its presence in the classrooms is not recent, since it has had space, for example, the radio receiver, the gramophone, the projector, the tape recorder, the television, almost since its emergence, even though its presence was not always intense, or massive.

The real concern in educational institutions is the use of cutting-edge technology, especially digital ones, and with it the task is no longer to decide whether or not to use them, but to think about how to use them, what the benefits are, what to discard and what to maintain, what to reconvert and how, which is not a simple work, because education meets many demands, ranging from the characteristics of each student to the politics of the country.

In education, the reference to technology continues and a lot is mentioned next to another very close category: 'Educational technology'; but this, although it has its specificities because it is educational, it is also technology and the ambiguity that has been explained must be present in it.

There is a peculiarity of the educational technology category, and it is because of the ambiguity of the word 'educational'. This adjective is often used with more than one meaning; one of them refers to what is related to or belongs to education and what it serves to educate; but in another sense it means 'what educates'. In the latter, imprecision is possible, because it can be thought that this technology has an educational

251

Φ

function, as happens with the categories of educational work and educational task, which are educational, i.e., they educate.

Presumably, teachers do not allow themselves to be caught by this ambiguity, but it has concerned more than one scholar, such as Liguori (2000), who stresses that "the problem of new technology in education (…) cannot be based solely on technical problems (…) the debate must also be centered on the ideological, political and ethical problems that it entails" (p. 127). Additionally, Salas Madriz (2002) and Sancho Gil et al. (2015), warn that educational technology cannot guarantee becoming an efficient tool in education, since it depends on several factors, including the conception that supports the educational task and the pedagogy that is employed.

For all the above, greater attention should be given to the existence of an educational project and a pedagogical approach, as Luján Ferrer and Salas Madriz (2009) asserted, it is not possible for technological equipment and tools to produce or promote meaningful learning processes since they are not a "mechanical know-how" (p. 27), or as Prendes and Serrano (2016) and Aguilar Gordón and Chamba Zarango (2019) claim, they are not the magic solution to the problems of education, although they act on the behavior of human beings, but their simple incorporation into educational processes does not guarantee their quality.

The above reflections should not be confused with technophobia: fear and rejection of technology, nor with technologatry, which indicates that the use of technology is "the most direct and effective way of achieving the solution of all the problems of education" (Litwin, 2005, p. 13). As Romero Monivas (2016a) points out, there must be clarity and precision regarding the knowledge, education, and society in which technology is framed. It is not superfluous to say that extreme positions are reductionist, and neither justifies the possibilities of technology, its scope, or limits.

The educational technology category began to be used in the United States in the 1960, according to Luján Ferrer and Salas Madriz (2009), although in the same text they say that the use of the media in educational tasks after the Second World War was already mentioned. This corresponds to the information provided by Salas Madriz (2002) who points out that it has its origin in the years 1950 as a field of education in that country, and he points out that the category 'educational technology' is in the relations between education and the media that developed significantly in the 1950. Thus, there is still no ambiguity in it, although this was present in the technology category since the beginning of the 20th century.

Educational technology was originally associated with advances in computer manufacturing and military self-teaching devices, as well as the

252
Φ

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development of individual differences in learning, which was supported by behaviorism, psychological current through which much attention is given to observable behavior and to the interaction of individuals with the surrounding environment, which since the decade of 1950 was led by the American psychologist Barrhus Frederic Skinner (1904-1990), who was very interested in the technofication of teaching and was known for his theoretical and methodological contributions to the use of the technologies that were emerging.

Although these theoretical positions have been strongly positioned for many years in the conception of education and its work, since the 1980 the influence of other theorists has increased, especially three psychologists: The American David Paul Ausubel, the Swiss Jean Piaget and the Soviet Liev Vigotsky (this order does not indicate importance or degree of influence), each one with its specificities and differences with the other two—which is not the subject of analysis this time. All three actively conceived the student and emphasized the teacher's guiding character.

The expansion and diversification of the theoretical framework contributed to the ambiguity of educational technology. Litwin (2005) points out that this theoretical framework had an impact on the ideas surrounding educational technology and began the deployment of its reconceptualization through different theoretical positions: In some they were associated with the technological means produced for education, others stressed the limitations of their origin or opposed artifactual conceptions and linked them to pedagogical projects that included sociopolitical criticism and awareness raising to achieve human emancipation. Thus, regarding the category, a huge number of ideas developed through diverse approaches and with different theoretical foundations were deployed, which enriched the theory around it, but increased its ambiguity.

The ambiguity in the educational technology category is due to the diversity of conceptions and definitions about it. Luján Ferrer and Salas Madriz (2009) show some of the ideas pertaining to the last four decades of the 20th century, reaching the following generalizations in this paper: in the decade of the 60 its conception as a body of technical knowledge related to the conduct of education to improve it stands out. Here is the opinion of Freyre Roach et al. (2019), who say that the category of hogs can be understood from the perspective of using something (technology) in a specific context (education) and that technology "is used to make the teaching-educational process or teaching and learning more efficient" (p. 257).

Following Luján Ferrer and Salas Madriz (2009), in the 70 and 80, the way to understand it is emphasized as the systematic application of

253

scientific knowledge to the solution of educational problems, as a set of techniques accompanied by practical knowledge at the service of education. In the 90 the integrative way of seeing it and the innovative pedagogical conception prevailed, according to which educational technology was understood as a complex process given by the connections between devices, procedures and a specific curriculum that encouraged the active participation of the student, led to the creation of differentiated learning environments, and promoted the development of skills, not only the traditional ones, but also those demanded by the new times.

Today, at the beginning of the third decade of the fast-paced century, when it comes to educational technology, the ideas and practices of Skinner and his followers usually do not come to mind first, but technology (with all the breadth mentioned above), as a system that serves as tools or instruments in education and that is based on philosophical, scientific, educational paradigms, on the characteristics of culture and society, as well as of the policy that governs in the latter, from where many of its traits, objectives and trends are determined.

But such a system has not come to be understood precisely, either it is seen as a whole or only some of its components are taken. It is on this basis that there is a variety of conceptions about it. Such a situation, while enriching the theory about educational technology and adding scientific polemics, also increases the ambiguity of the category. It is worth emphasizing that this reflection is not due to the purpose of achieving uniformity of criteria, or forming a single or uniform thought, or even reaching a consensus, let alone stating a unanimous opinion, what is being sought is the clarity and the concretion of the educational technology category.

The ambiguity in the use of the reference category can also be found with another nuance; a subject with a strong presence in the Hispanic world is named with it: Educational Technology, whose field of action, according to Cabero Almenara (2016), is "the design of learning situations, and more specifically of mediated situations" (p. 24). However, the problem is not in the name, but in the fact that this field of action is not always used fairly, because there are two variants with the same name which, when looked at carefully, constitute two similar subjects, because they have the technology-education relationship as their core and because they have strong community links to essential content; but it is in the latter that, in turn, the difference between the two takes place, because it is not perceived from the same angle, nor with the same purpose, so the distinction is given not only by the presence of one or the other matter, but also because of the priority given to them and the scope they achieve.

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254

The attention in one of these variants is on the technological aspect, while in the other is in the pedagogic and the philosophical-social, although in both, the technological aspect and the educational aspect are not absent. Likewise, Area Moreira (2009), says that the subject has evolved between two visions, one that equates to the means and instructional resources (fundamentally audiovisual), and the other that is considered a field of study to design and control scientifically the teaching processes.

An example of the variant that focuses on the technological aspects is the teaching program of Martín (2014), whose thematic axes are epistemological and political debates around educational technology; knowledge in networks and scientific social networks; technology in educational systems, high technological environments: classrooms and their new configurations: enlarged classrooms, mobile digital classrooms, personal learning environments; teaching with technology. It is worth mentioning two investigations; the first one is that of Javier Ballesta Pagán and Raúl Céspedes Ventura (2015) who carried out a scientific investigation in several Spanish universities to locate the presence of the basic and mandatory subjects of the area of Educational Technology in the courses of pedagogical formation; from the information they offer, it can be deduced that ICTs stand out in this teaching computer instruction and knowledge. The other research by Carlos E. George Reyes (2018), focused on the programs of the Master in Educational Technology, and after studying it he provides a series of data, among them, the tendency of training in the discipline of Educational Technology is to master digital applications and to abandon the pedagogical structures to use technology efficiently. This tendency can also be found in a text by Valverde Berrocoso (2015).

Regarding the variation where the pedagogic and philosophical-social aspects stand out, it should be mentioned the teaching program of Area Moreira (2009), formed by the following topics: the use of digital technology in educational institutions and the redefinition of the contents of the curriculum; the training of students as users of new technology and of the culture around them that is produced and disseminated; the basic goal of non-formal education should be to enhance democratic access and participation in the new communication networks of groups and communities, which in one way or another are at the margin of technological evolution; revision of occupational training in the light of the new social and occupational requirements driven by the new technologies.

The truth is that when only the subject is mentioned, i.e., its content is not exposed, even if it is minimal, there is no precision capable of showing which variant is present. The ambiguity is glaringly clear.

255

Causes of such a phenomenon can be found in the history of discipline. Area Moreira (2009) maintains that Educational Technology in its evolution as a discipline went through five stages, the first dating from the 1940s and 1950s and was linked to the US military formation, while the second is from the 1960s and was based on behaviorism and considered the audiovisual media as its center. At this time, in the words of García Valcárcel (2002), "it was related to the use of technological instruments for teaching (teaching machines and other devices)" (p. 70) and the efficiency of teaching was given priority. Trujillo Saínz (2012) says that at the end of the sixties, the pretense of overcoming the vision of this as the introduction of hardware in education took force and was seen with a renewing approach, with the intention of improving education, although García Valcárcel (2002) argues that "the technocratic perspective was the dominant paradigm in the 1960s and 1970s" (p. 71). As can be seen, the origin of the subject is centered on technology, although the attention extends to the use given in education.

The third stage referred to by Area Moreira (2009) coincides with the 1970s. The author stands out the prevalence of a technical-rational approach to the design and evaluation of teaching, although Trujillo Sainz (2012) says educational technology "is configured as the science of the design of teaching, as the operational application of a set of disciplines (psychological, curricular and philosophical) to improve and increase the effectiveness of teaching processes" (p. 4), which, according to him, is the result of the passage from a reductionist conception (which led the subject to focus on the means) toward a vision that turned it into a scientific discipline suitable to regulate instruction.

The fourth stage exposed by Area Moreira (2009) corresponds to the 1980s and 1990s. Among its characteristics the author emphasizes that the subject was given the incipient interest in the applications of digital technologies and the crisis of the technocratic perspective on teaching from previous years. Trujillo Sainz (2012) notes that such teaching was characterized by "self-recognition of the crisis within Educational Technology; the absence of defined signs of identity; the professional disorientation of educational technologists; the lack of application and incidence in schools of Educational Technology" (p. 6).

The fifth stage mentioned by Area Moreira (2009) begins with the 21st century and is characterized by theoretical eclectic and the influence of post-modern theses, to which Trujillo Saínz (2012) refers that today's great technological development has attracted the attention of researchers and teachers to technology and its effects on education and culture

as a whole, favoring that the subject has been "a focus of attention or program of research and teaching clearly identifiable in the international pedagogical community that brings together different areas of the Social Sciences" (p. 6); although, as he states in the cited text "they are the relationships or interactions between information and communication technologies and education in multiple levels and fields of action" (p. 6); therefore, "it should be considered as an educational intellectual space whose object of study would be the socio-cultural effects and implications for education that information and communication technologies possess" (p. 6).

Its prevalence from the technological component and the strength of the pedagogic to be imposed in its configuration and development originates from this subject. But it should not be forgotten that it is linked to technology from its origin and, as Torres Cañizález and Cobo Beltrán (2017) consider, nor should it be lost sight of the fact that the field of educational technology reaches the scope of the pedagogical (theoretical and practical) work through the use technology. On the other hand, as Correa Padilla (2017) assures, although this subject has advanced, it remains a long way to go, due to its complexity and extension.

In the last ten years, there are authors who say that Educational Technology is the discipline centered in the study of technological means and resources at the service of teaching and learning processes for formative purposes, where information and communication technologies (ICT) play a leading role; for example, Jimenez Saavedra (2014) believes that it deals with "the study of media and information and communication technologies" (p. 136). According to Torres Cañizález and Cobo Beltrán (2017), the number of technological tools has multiplied to dynamize school environments and promote the development of new competencies, and a few focus on technology and its effective use in the teaching-learning process. Likewise, George Reyes (2018) affirms that there prevails "the didactic and pedagogical strategies that allow to make the school settings more dynamic and to generate the digital skills necessary to incorporate the student in the knowledge society" (p. 31), while Cueva Gaibor (2020) points out that ICTs are not only tools in the service of education, but also part of its object of study.

In the first decade of the present century, Area Moreira (2009) assured that for years it was intended to reformulate Educational Technology so that it was a pedagogical intellectual space whose object of study were the media and the technologies of information and communication as forms of representation, dissemination and access to knowledge and

257

Φ

culture in the different educational contexts, and that the subject had a multidisciplinary theoretical basis, with diverse epistemological spaces. A few years later, some authors argue that when consolidating this characteristic, it was imperative that the discipline Educational Technology study the teaching and transmission processes of culture, technologically mediated, in different educational contexts and that it be conceived, as suggested by Ballesta Pagan and Céspedes Ventura (2015) as "the study and ethical practice of promoting learning and improving performance through the creation, use and organization of technological processes and resources" (p. 134) and that it was necessary to develop a critical vision regarding educational technology in the training of future educators, including, as recommended by Correa Gorospe et al. (2015), the development of a collective critical awareness of the control, privacy and manipulation of technological resources.

258

Although an approach to the articles dealing with the subject indicate that there are teachers who consider the subject Educational Technology as the presence of computer science in education. According to Cueva Gaibor (2020) content is less important than the mechanisms by which it is accessed, created, and collected for an increasing number of teachers, but for some teachers the distinctive thing in it are not only the digital resources in the school, but also the theoretical constructions regarding the study of teaching and learning in social contexts enriched with ICTs. It is worth mentioning a text from the beginning of this century by García Valcárcel (2002), specifically his statement: "Educational technology should not be combined with educational information technology, although it should occupy an important space in educational technology programs" (p. 72); he states it is dedicated not only to applied aspects, such as the design of means and materials, curricula and proposals to solve teachers' problems, but also to "reflect and theorize what the media represent for teaching from a communicative and social didactic point of view" (p. 84). According to his opinion, it was necessary to work on theoretical bases that integrated the contributions of the social sciences, especially regarding the relations between technology, society, culture, and education.

That criterion can be found more recently. According to Suárez Guerrero et al. (2016), the Pedagogical Vision of Educational Technology should not be reduced to responding to what to learn, as this is a change in the conception of the teaching-learning process and is inserted into formal and informal spaces of education through didactic materials. Hence, as recommended by Arteaga Paz and Basurto Vega (2017), the focus should always be in the quality of education.

The question of how to see the Educational Technology subject has a scientific meaning because it has been accompanied by an interesting debate that can be very helpful, but besides this meaning, the controversy shows ambiguity takes different and very specific nuances when it comes to the subject and the area of knowledge.

The topic continues to get the attention of scholars from various perspectives. Castañeda et al. (2020) refer to the "current identity crisis" of educational technology, highlighting "the need for a more current and nuanced concept of what technology is" (p. 240) because they consider that one of the main problem in this area of knowledge is "the poor conceptualization of technology" (p. 243), they also mention the need to redefine the field of study of Educational Technology (p. 240); although Mujica (2020) emphasizes as a positive quality that "the term educational technology is inclusive, living, polysemic and contradictory" (p. 20), there is ambiguity in the adjectives polysemic and contradictory. Castañeda (2021), on the basis of his recognition that educational technology "is a field of research and practice in which diverse actors and interests converge" (p. 2), states that "the processes of using technology in education or directly of educational digitization are tangled" (p. 4), indicating that some aspects of technology and of educational technology "in teaching practices have not yet been satisfactorily addressed" (p. 4).

Ambiguity is not something bad that should be removed, but if efficient work is to be carried out, it is advisable to understand the concepts used and, therefore, to eliminate or at least reduce it; if these purposes are impossible, for certain reasons, to be aware of their existence is a good step in optimizing any work. Technology will continue to develop, at least for a good time, perhaps longer than can be expected, and, at the same time, the fact and the concepts, definitions and ideas that are formed and developed in relation to the category will continue to be complex. In correspondence, the technology applied to education will be incorporated in such a way that it may be unnecessary to mention it separately, but in the meantime, it is necessary to be clear, which affects the richness of the language, and avoid a single word to refer to such a wide-ranging and varied phenomenon that can lead to avoidable confusion.

Conclusions

A positive view of ambiguity has now been developed based on one of the meanings of this word: uncertainty. From this point of view, ambiguity

is taken into account as an opposition to the purpose of achieving total certainty in the process of knowledge; however, the word has not lost the other part of its meaning: that it can be understood in various ways or admit different interpretations, reason for which it is viewed in a derogatory way in scientific work. This latter position maintains its validity and actuality as its dialectical opposite: precision, has not ceased to be one of the essential characteristics of scientific knowledge.

Ambiguity is not inherent in the category of technology, i.e., its structure, but depends on its concept. A wide variety of objects and facts have been incorporated into its definition, extending its meaning and thus its imprecision. In order to eradicate it or at least reduce it, it is essential to be aware that technology is a scientific system of elaboration, application and reasoning. Technology results must have their own names and, if they do, they should be used appropriately.

The educational technology category is basically linked to the formation of an area of knowledge and a subject. The ambiguity in it is because it took it directly from the category Technology, which is a component of its structure, but it is due not only to that, but also to the fact that the educational adjective provides a certain amount of imprecision. The ambiguity in the educational technology category is extended when it is used to name an area of knowledge and a subject, where it can have practical consequences, especially organizational.

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260

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261

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263
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