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Vindication of Science Applied to Education: Story of a Meeting

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Abstract

The essay collects reflections on the historical and social development of two fields inherent to the human being: Science and Education. Science emerges as a new type of vision about perceptible reality, which transcends other types of possible explanations, among them, mythological or subjective ones derived from common sense, through a process that was perfected over the centuries. Education, seen at the beginning as a mechanical, instructional or indoctrinating activity (relegated to the abstract terrain of Philosophy), re-emerges in the middle of the 20th century, after the debacle of the Second World War, as a transforming process of man, for a new world. Therefore, the essay also analyzes the claim of the Social and Human Sciences, as a tool that enabled the construction of transformative consensus during the post-war period, to achieve the recovery of the human sense, which is common to peoples and nations as a social whole. Finally, the document addresses the need for research in Education, in order to understand and improve teaching and learning processes, being a field in which other related sciences, such as Psychology and Neurology, converge. The conclusions reinforce the analysis, showing the harmonious way in which knowledge and humanism are integrated through the processes of Science and Education, as a reflection of the human condition.

Keywords: Social sciences; Education; Human evolution; Human history

Introduction

Research as a human activity: early days and consolidation

At a general level, research activity has been linked to human development [1,2]. With the advent of Homo sapiens, the evolutionary process initiated, in the hominid and primate ancestors, continues. Several variants of the human being arise that, due to the effects of adaptation to the environment, prospered or disappeared. This "wise man" was characterized by a remarkable brain growth, walked in a bipedal form (Homo erectus), possessed the characteristic five fingers with opposable thumb in each hand and formed nomadic groups that spread throughout the continents, from Eurasia and Africa, in search of food and moderate climates [3]. This incomparable intelligence allowed him or her to use his or her hands to manufacture hunting or building materials (Homo habilis), perfect guttural growls to generate sounds close to language, learn to communicate by means of signs; his or her facial features moved away from those of the primal primate to adopt the features we now possess. Of these ancestors are dated remains so ancient that anthropologists agree that the so-called «prehistory» is one of the longest periods of humanity, which would comprise the appearance of man-hominid and the emergence of the first human

tribes, characterized by sedentary activities that have been traced through cultural vestiges, such as pictograms, pottery or writing [4]. Therefore, it is estimated that prehistory covers between the year 500.000 and the year 4.000 a.c [5]. The prehistoric ancestor laid the foundations of what would become the current human being, and has been the only species on the planet that took advantage of natural resources to improve its quality of life; a characteristic that prevails to this day [6]. It is not surprising, then, that in this first human being, other intrinsic qualities that accompany our species were born: curiosity, the use of imagination and the symbolic capacity to interpret reality. In this way, the first existential questions arose about the universe and the role of humans in the cosmos they would look at the stars in the night sky, the infinity of the sea or the inexhaustible horizon, wondering: what are they? and why are they there?, to become an even more disturbing question: who am I and what is my role in all this immensity? [7].

Exhausted mythological explanations, associated with higher divinities, a new kind of vision about perceptible reality was generated in the human being [6]. By the 5th century BC, a mode of thought based on obtaining true knowledge by cause was developed in Ancient Greece, which surpassed the archaic way of knowing exclusively by means of senses and simple empirical reasoning [doxa]-subjective and limited-, in favor of a conceptual approach to knowledge grounded in the logical structuring of cause and consequence [episteme] [8]. One of its greatest exponents was Aristotle (384 - 322 BC) who, in his Posterior Analytics, indicates (or rather teaches) that knowledge close to the truth [alêtheia] should set out its basic principles, on the basis of demonstrations, to draw concrete conclusions about them a procedure that, after being purified over the centuries, continues to this day. From Aristotle, the Greeks differentiate two types of knowledge: the ability to relate principles (episteme) and the superior ability to understand those principles, which they called "intelligence" [nous] [9]. Hence the word "science" comes from the Latin ‘scientia’: the equivalent of the Greek ‘episteme’. Aristotle based his model of knowledge acquisition on the geometric method, so widespread among the Greek sages and that would subsequently address Euclid, in which "mathematical precision" explains the universal order (cosmos), which is knowable by man through logical reason. Aristotle distanced himself from the inductive consideration of knowledge -raised by Plato- and promoted a deductive system of knowledge based on the verification of explanatory theses of reality that are general and universalist [10]. Nevertheless, not all human knowledge behaves with the precision of mathematics, and often obeys anarchic principles of conflicting forces [11]. For example, historical knowledge deals with human events that are not governed by verifiable and predictable general rules. For that reason, the Greeks considered that science could not be done with History, as well as with Biology, Chemistry and Physics, which do not allow to be generalized through postulates or axioms, but are based on a contrary -inductive- method, from which data are extracted experimentally [12]. Aristotle himself realized this, because observation and empirical experience are unique in that enable the classification of individuals in nature. Thus, since the emergence of Western philosophy in Greece -as epistemological foundation of knowledge- there has been a distinction between an experimental science (to differentiate it from experience), of an empirical nature, that intervenes and modifies the elements that it studies; and a science based on observation, which takes as object of study a part of reality, as it is given in sensitive knowledge, without any elaboration or manipulation [13]. Chemistry would be an example of experimental science, since it is based on the combination of elements or substances by the scientist and elementary astronomy, an example of «observational science», since it does not modify or originate anything, but is limited to observing the motion of the stars [14]. At the same time, both incorporate measuring and data collection elements, quantifiable and verifiable (which will later give rise to scientific positivism) [15]. The study related to human beings and their behavior was relegated to the abstract terrain of philosophy, along with ethics, politics, society... and education itself (Camacho Verdugo and Morales Paredes 2020), which originates from the Greek term paidagogós [pedagogy] which means paidos (child) and gogy ("lead" or "carry"), referring to the first pedagogues, who were slaves in charge of taking children to school [16]. This concept would remain imperturbable until the middle of the 20th century with the advent of anthropology, sociology and psychology. In this way, over the centuries, each science (experimental or observational) acquires its own status, characterized by principles and methodology that are particular to it, but still linked to a philosophical vision and sense.This is the case of the Middle Ages, in which coexisted the diversity of sciences and their methods in line with metaphysics as "first science", which gave reason to the others [17]. hat is, the Greek approach was retaken, which in Latin was defined as cognito certa per-causas [obtain certain knowledge by causes]. Faith and reason were linked and mutually validated [18]. With the Renaissance modern science began, closely linked to the rescue of the work of ancient thinkers such as Archimedes, Euclid and Pythagoras and the revitalization of Platonic philosophy as opposed to Aristotelian scholastics, worn in previous centuries [9]. Humanism will encompass all the expressions of the human being: art, philosophy and science, which will remain in force until today; in a wide period that spanned from the fourteenth century to the eighteenth century A.D., a series of changes occurred in Western thought, which meant an awakening to the wonders of nature and the role of the human being in the universe [1]. At this point, a renewing mentality occurred, for Western culture that was manifested in the separation of philosophy and science, faith and reason [19]. Galileo

worked on his scientific process based on simplicity - which challenges the doctrine of the church and its conception of the Cosmos- being prosecuted for it [20]. Kepler established the conditions of intelligibility of a scientific theory. Newton defined the notions of motion, space and time and their mechanical application; Leibniz offered the infinitesimal calculus attached to his theory of infinity. These and many other ideas, at the time "revolutionary", spread throughout Europe with the invention of the printing-press by Johannes Gutenberg. New inventions of measurement and calculation emerged, which gave man greater dominion over nature, overcoming mysticism which allowed, among other things, that in 1492 Christopher Columbus reached the American continent looking for an alternate route to China (the Indies). It was a period in which mathematics was conceived as a "divine language", a means of knowing the design and order of the universe, a whole [21]. The period of greatest peak for science happened between the seventeenth and eighteenth centuries, characterized by the search for a definitive method that would enable science to reach general results (theories and laws) that did not depend on or were attributed to verifications of philosophical postulates what would be called later as scientific method. This accumulation of contributions from thinkers and scientists (such as Francis Bacon, David Hume, William Whewell, among others), would lead to the widespread acceptance of the principles that would characterize, henceforth, science and its derivatives:

- Science does not represent reality, it interprets it, since the human mind is limited to understand the totality of the world.
- Science is based on logical and rational theories, on a continuous process of construction of knowledge and interpretations.
- The value of observations is relative, since they depend on the theory on which the observer is based; therefore, scientific theories must be refutable or falsifiable experimentally.
- Science always has to question itself leaving behind all dogma, which makes it the best tool to understand sensitive reality (knowledge).

Thus, the only valid knowledge is empirical, verifiable through logical reason and supported by numerical systems (positivism) [15].

The importance of the scientific method is such that without it science cannot develop: it is the strategy of scientific research that is applied through the quantitative methodology, focused on the object of study and statistical analysis to verify hypotheses from their explanation. Which is why the scientific method bases its results on the rigorous examination of numerical data from the field of statistics (variables, percentages, averages), which can be measured and quantified. Wherefore, the scientific character will be linked to the characteristics of the quantitative methodology: be rigorous, objective, verifiable, seeking to identify patterns and verify hypotheses, theories; with this, the operation of universal laws can be discovered [22]. From that moment on, it is considered that all disciplines that use the scientific method are science, for example, Biology and Physics; but, again, the disciplines that do not use it, such as Psychoanalysis, Geography or Anthropology, are relegated.

Social crisis of the positivist system: interwar period

In the 19th century, with the rise of the industrial revolution, the so-called theory of scientific modernization» gained momentum. This theory synthesized the belief that, after the process of industrialization, modern institutions would gradually develop societies in which the economic and social progress, that science provided through the improvement of the quality of life of individuals, would be implanted (use of electricity, innovation of steam and petrol engines, the locomotive). A process of development that every society would eventually reach, until achieving an orderly and stable world system [23]. This paradigm was founded on the idea of a rational, empirical and scientific «social science», possessed only by the great powers of that time: Germany, the British Empire, the Austro-Hungarian Empire, imperial Russia, France and the United States; which, with the exception of North America, were monarchical empires that conceived science as part of their progressive effort at civilizing transformation, which would encompass the entire world. However, this would not happen and, with the entry into the 20th century, humanity plunged into a series of conflicts and political instabilities that peaked with the outbreak of the so-called "Great War" in 1914 [24]. The debacle of World War I (1914-1918) had a catastrophic effect on the European belief system and the hegemony of positivist science as the only valid source of knowledge. Before industrialization, the number of deaths in battles did not exceed 15% (with few exceptions); but, from 1914, with the mass of rifles, machine guns and cannons, it would reach 70%. Before, the rear was shaken by invasions of enemy armies for looting and taking prisoners; with the First World War, the rear, where rest the wounded and displaced civilians, would be completely destroyed as war propaganda to demoralize warring nations or cause their political and social destabilization.

The First World War would end the romantic concept of war; of soldiers and officers in huge plume and lace hats; of uniforms with showy epaulets and glittering medals, to make way for the massive industrialization of homogeneous and expendable soldiers, in favour of pyrrhic victories; points on a map that perished by thousands, rotting in muddy and unhealthy trenches [25]. The "Great War" launched the use of science and machine in all its apogee: in the air, with airships and bombing planes; on the ground, with the appearance of tank, chemical weapons, and flamethrower;

at sea, with the submarine, to equally destroy enemy ships and convoys of food or supplies. The First World War was the midwife of the first socialist state: the Soviet Union, and destroyed the Europe that claimed itself as "civilized", rational and colonizing, to turn it into an example of savagery, causing more than 38 million casualties, among dead, missing and mutilated. This provoked waves of migrants of multiple nationalities, who fled, in terror, to North and South America, running away from famine, disease and death [26]. The impact and consequences of the First World War were apocalyptic on the European continent: secular monarchies would fall, millenary empires would disappear and consecutive periods of social and political instability would ensue throughout the continent that would have repercussions on the rest of the planet. Yet, devastating as it was, the First War was only the progenitor of an even more gritty and lethal war (World War II), characterized by the rise of totalitarian regimes, which culminated in the use of atomic bombs on Hiroshima and Nagasaki by the United States (indisputable victor) in 1945. Bombs that were the result of decades of research into atom division and electron behavior. Both wars -only twenty years apart- meant the perversion of science, which was focused on a single purpose: kill and destroy [27]. If the First War devastated Europe, the Second plunged it into ruin, not only material but moral. And, after the horrors of the concentration camps, the machinery and the numerical precision put at the service of massacre, came the questions that plunged science into a deep darkness: How was it possible for the nations that cradled the greatest civilizing ideals to reach such extremes of destruction? How could their inhabitants be capable of committing such atrocities in the name of a political party, a Fuehrer or an ideology? The answers were not found in mathematical perfection, but in the labyrinths of the human psyche: in psychology, sociology and the renewed Human Sciences. One of them, education.

Vindication of social sciences and qualitative research approach

The promises of reason and science fell into the unbelief of a skeptical world that saw them with contempt, because they engendered the monsters that devoured it during the first half of the twentieth century: the incarnate nightmare of reason, which could only be reconciled with the human species after man's arrival on the moon in 1969. As the planet readjusted itself to the polarization of the hegemonic socio-political blocks of the post-war era: communism and capitalism, the Social Sciences resurfaced as a sounding board of the human effort for reconciliation and historical shame. The Social Sciences evoked the lesson that nations, alienated by war, refused to attend: humanity is part of the same species, mediated only by elements of language and culture, but with the inherent possibility of building transformative social consensus. Therefore, human nature is constructive, not destructive; it is communicative, not isolationist; it finds strength in diversity and not in extermination [28]. Through Human Sciences, a call is made for the recovery of the meaning given to a system of values mediated by the family, the school, the city, the state. Because man becomes human in conversation, sharing and coexistence. There is no possibility of knowing but through communication with others, from participation in interconnected networks of knowledge; of reconnecting thought and action, myth and reason, mind and body. Therefore, the Social Sciences require a valid system of knowledge that is recognized as science, like the rest of human knowledge; bearing in mind that, from their point of view, knowledge is first and foremost an adaptive strategy to the environment; a continuity from the biophysical to the sociocultural, for the human being is both a biological and a social being, mediated by language and culture [29]. Consequently, after the Second World War, the surviving nations focused their efforts on facing the challenges in social and economic matters, without specifying the differences that involve the relationships between applied cognitive strategies and the social link, according to gender and generation, social groups, and local culture; seeking values such as universal acceptance of human rights, the rights of children, the right to life, food and education. That is, the rights inherent in the human condition. Terms thus emerged to distinguish this epoch of «postmodern society», such as: post-industrial, post-capitalist, post-cold war, post-national, among others. There was a search for the collective identity of a planet that was slowly coming out of the shock of past world wars and the uncertainty of falling into a third war, this time atomic and definitive [30]. The Social and Human Sciences had a common origin also in Greek philosophical thought, which was later taken up by the enlightened thought of the eighteenth century. Then, there was a current of social researchers who assimilated the quantitative methodology and the positivist paradigm while others, in contrast, used a methodology called «qualitative», derived from the data collection system adopted by Psychology and Anthropology, to comprehensively address social phenomena: case studies, participatory observation, in-depth interviews [31]. Since then, the use of both paradigms has been considered valid for the Social Sciences, since neither is intrinsically better than the other and they are only different approaches to study a phenomenon everything will depend on the objective of the researcher, who must approach the social reality found [32]. Qualitative analysis is based on hermeneutics and phenomenology; it focuses on the researcher, and uses tools such as the field journal and case studies in order to build hypotheses from understanding. The qualitative method will be used, as it currently is, when the aim of the research is to describe the qualities of a given social phenomenon. However, in the development of a research that uses qualitative methodologies, it will also be possible to make a positivist treatment of the information.

Research applied to education

Currently, a consensus has been reached that advocates complementarity between qualitative and quantitative approaches to education research. Whereby, both paradigms are used. Neither is better than the other, everything will depend on the objective of the research study; and even, it is possible that there are studies, called «mixed», that require the union of both methods. Thus, educational researchers use the most appropriate methods to the needs of their research, considering the possible combination of both from their criterion of validity. In other words, the two methods can be combined and add attributes, achieving the appropriate fusion to respond to the research problem posed. Considering education as a social science, epistemology (that is, the study of knowledge: how it is acquired, validated and what are its limits), allows a critical and integral analysis of the educational process as a whole, but it also serves as a foundation for science teaching; that is, from the understanding of concepts, methods and laws of scientific knowledge, improvements can be generated in teaching and learning processes [33]. Educational research allows to understand and improve the factors involved in the teaching and learning processes, so it represents a field of research for other related sciences such as psychology and neurology. Still, the educational researcher goes beyond understanding how the human mind works and how it processes knowledge data; he or she is also interested in the interaction and behavior of educational actors, the functioning of educational institutions, the effects of educational practice or how the results of educational processes can be improved, also through innovation. With a scientific look, educators, with their research, draw conclusions about reality, educational phenomena and observed phenomena; analyse the relationship between the elements that make up a given educational situation and decide how best to intervene in it to improve it. Therefore, the need to investigate in Education arises at the moment that you want to know better the functioning of a given educational situation -be a subject, a group of subjects, a program, a methodology, a resource, an observed change, an institution or an environmental context-, or you want to answer multiple questions that appear, about how to improve educational actions. The combination between the genesis of knowledge and its potential to transform reality through innovation and the improvement of everyday practices means that, sometimes, it is referred to as Research and Development (R&D): expression that is usually used to designate research actions linked to economic investment, either with public or private funds, to promote improvements in industrial and technological practices and in the products derived from them and, in short, to innovate. In the field of education this translates, among others, into the improvement of educational practices, learning, teaching, the dynamics of interaction within the family, classrooms, schools; the academic performance of students and the quality of education achieved in a given school or educational institution; or, with a policy or specific educational programs, improvement at a local, regional, national or international level [34].

Thanks to the benefits of research, it is necessary to disseminate the findings obtained, looking for the maximum number of beneficiaries. For it, after conducting research on procedures for improving educational practices and products, a report should be published which will be useful to other researchers in similar circumstances, taking into account that each educational context is different and therefore, its application will depend on the particularities of each case (adaptation). The research teacher can be a tutor, facilitator, advisor, mentor and mediator of learning; a learning that leads to the integral and articulated formation of students, based on critical thinking and proposing solutions to problems in the educational environment [27] Likewise, the actions of the research teacher should foster a research culture, characterized by a process of social action and transformation, based on the understanding and articulation of scientific research with pedagogical practice [35]. Thus, this contributes to the integral training of qualified, competitive, but also ethical, critical, purposeful, socially committed and innovative professionals; a formative work evidenced through research projects with scientific publication and in the generation of new knowledge [2].

Discussion and Conclusions

Research activity has always been linked to human development and, with Homo sapiens, the evolutionary process initiated with the hominid and primate ancestors continues. From this primitive being, intrinsic qualities of the human species were born: its insatiable curiosity, the use of imagination and its symbolic capacity to interpret reality. This raised the first human questions about the universe and the role of human beings in the cosmos. In the 5th century BC, a mode of thought developed in Ancient Greece, based on "obtaining certain knowledge for causes", which surpassed the subjective and limited way of knowing through the senses and empirical reasoning, where a conceptual criterion of knowledge was sought, grounded in the logical structuring of cause and consequences, called «episteme»; word that would later be adapted to Latin as scientia. For the ancient Greeks, mathematical precision explained the universal order that is knowable by the human being through logical reason, which can be accessed inductively or deductively, which originated a distinction between an "experimental" type of science, empirical, which modifies the elements it studies (such as chemistry); and a science based on "observation", which studies a part of reality, without any manipulation (such as astronomy). The study of human beings and their behavior came under the sphere of philosophy, along with ethics, politics, and society. The Greeks took great care in cultivating thought through the mentoring of philosophers and

mathematicians, who used to describe education as the way to acquire knowledge for practical life. The evolution of science during the Middle Ages and the Renaissance had its climax between the seventeenth and eighteenth centuries, characterized by the search for a definitive method that would enable science to reach general results (theories and laws) that did not depend on or were attributed to tests of philosophical postulates; which would be called «scientific method», derived from positivism. From that moment on, all disciplines that use the scientific method are considered to be science, for example, Biology and Physics; but, again, the ones that do not use it, such as Psychoanalysis, Anthropology or... Education, are relegated. The horrors of the two world wars plunged Europe into material and moral ruin. Explanations were sought to understand how the nations that cradled the highest civilizing ideals reached such extremes of destruction, yet, the answers were not found in mathematical perfection, but in the labyrinths of the human psyche: in Psychology, Sociology and the renewed «Human Sciences» such as Education, where there is no possibility of knowing but through communication with others, from participation in interconnected networks of knowledge. For which, the Social Sciences require a valid system of knowledge that is recognized as science, like the rest of human knowledge; bearing in mind that, from their point of view, knowledge is, above all, an adaptive strategy to the environment [36-42]. Hence, there was a current of social researchers who assimilated the quantitative methodology and the positivist paradigm against others, who used a methodology called qualitative, derived from the data collection system adopted by Psychology and Anthropology, to comprehensively address social phenomena through case studies, participatory observation, in-depth interviews, among others. Education, as part of the Social Sciences, uses both paradigms (quantitative and qualitative), depending on the object of research and according to the studied social reality. Currently a consensus, called mixed, has been reached that advocates complementarity between qualitative and quantitative approaches, for research in education. Science applied to education allows a critical and integral analysis of the educational process as a whole, but also serves as a basis for science teaching; that is, based on the understanding of concepts, methods and laws of scientific knowledge, improvements can be made in teaching and learning processes. Educational research allows us to understand and improve the factors involved in teaching and learning processes; therefore, the educational researcher is interested in the interaction and behavior of educational actors, the functioning of educational institutions, the effects of educational practice, or how the results of pedagogical processes can be improved, also through innovation. Thanks to the benefits of research, it is necessary to disseminate the findings obtained, looking for the maximum possible number of beneficiaries to improve educational practices and products, taking into account that each educational context is different and, thus, their application will depend on the particular characteristics of each case (adaptation). The actions of the research teacher should promote the research culture of the students, characterized by a process of social action and transformation based on the understanding and articulation of scientific research with pedagogical practice, so as to contribute to the integral training of qualified, competitive, but also ethical, critical, proactive, socially committed and innovative professionals. Actions that are, in short, the contribution of Education to the sustainable social development of peoples and all humanity, through the reunion of Science, Research and Education.

References

1. Alexander J. Cultural sociology: forms of classification in complex societies. Barcelona, Anthropos. 2000.
2. Carvajal Tapia AE, Carvajal Rodriguez E. The importance of the teaching role in teaching and research. J Psychological Res. 2019; 21: 107-114.
3. Cadena Monroy LA. From the first hominids to Homo sapiens. Colombian J Bioethics. 2013; 8: 49-63.
4. Alvarez Farfan MP, Companioni Albrisa V, Perez Fonseca LJ. La prehistoria. Dilema conceptual. Debates through History. 2022; 10: 17- 44.
5. Brunet M. Origin and evolution of hominids: Toumai, a striking confirmation of Darwin's prediction. S. R. Palevol. 2009.
6. Rodriguez E, Quintanilla AL. Human-nature relationship: Development, adaptability and positioning towards the search for subjective well-being. Advances in Agricultural Res. 2019; 23: 7-22.
7. Estrada JA. El hombre, el Universo y la pregunta por Dios. Pensamiento, 2009: 65: 593-621.
8. Flexner A. The usefulness of useless knowledge. J Institutional Econ. Santibanez Guerrero; 22: 49-63.
9. Torres K, Lamenta P. Epistemology and research within current complex organizational systems. Orbis Scientific Magazine Human Sciences. 2015; 11: 59-75.
10. Mares Manrique E. Induction as a method of knowing ethical principles in Aristotle's Nicomachean Ethics. Dianoia. 2015; 60:
11. Carpintero Roman G. An anarchist theory of knowledge. Clarities. Philosophy Magazine. 2010; 2: 24-35.
12. Bermudez, Gonzalo M.A. The origins of Biology as a science. The impact of evolutionary theories and the problems associated with their teaching and learning. Eureka Magazine on Science Teaching and Dissemination. 2015; 12: 66-90.
13. Esquivel JC, Carbonelli M, Irrazabal G. Introduction to scientific knowledge and methodology of social research. Florencio Varela: Arturo Jauretche National University. 2014.
14. Ciccio JF. The importance of chemistry. Concept of matter according to the Greeks of the archaic era InterSedes: Magazine of the Regional Headquarters, XIV. 2013; 28: 167-191.
15. Perez Villamar J. Positivism and Scientific Research. ICE-FEE-UCSG Business Magazine. 2015; 9: 29-34.

16. Ramos JS, Rhea B, Pla RV, Abreu O. Pedagogy as a Science for the Treatment of the General Contents of the Educational Process and the Formation of Values. University education. 2017; 10: 77-86.
17. Perez A. Metaphysics as the science of essence: E. J. Lowe and Thomas Aquinas. Civilize. Social and Human Sciences. 2013; 13: 177-188.
18. Morales Hidalgo PDLA, Bermudez Garcia JA, García Zacarias JC. The phenomenon of knowledge as a problem in educational research Sophia, Philosophy of Education Collection. 2018; 25, 157-182.
19. Acosta Munoz M. Critical thinking and religious beliefs. Sophia, Philosophy of Education Collection. 2018; 24: 209-237.
20. Schmidt HL. Fe, ciencia y bioética. Revista Latinoamericana de Bioetica. 2011; 11: 22-41.
21. Minayo MCS. Origen de los argumentos científicos que fundamentan la investigación cualitativa. Salud colectiva. 2017; 13: 561-575.
22. Hernandez Solano IY. Epistemology and education. Research Magazine of the Tamaulipeca University. 2014; 1.
23. Vera Lugo JP, Jaramillo Marin J. Social theory, qualitative methods and ethnography: the problem of representation and reflexivity in Universalist social sciences. Huanistic. 2007; 64: 237-255.
24. Wallerstein I. Open the Social Sciences. Report of the Gulbenkian Commission for the restructuring of 2011the social sciences. Mexico: Century XXI. 2003.
25. Sagredo BR. 1914: from greatwar to tragedy of humanity. Some books and sources. History (Santiago). 2014; 47: 189-205.
26. Sarewitz D. Salvar la ciencia. Revista de Economia Institutional. 2017; 19: 31-65.
27. Flores E, Loaiza A, Rojas de Ricardo G. Role of the teacher-researcher from his social practice. Scientific Magazine. 2020; 5: 106-128.
28. Bartra R. Dilemmas in the social sciences. Latin American Profiles, Latin American Faculty of Social Sciences. Federal District, Mexico. 2013; 41: 7-17.
29. Beuchot M. The semiotics. Theories of sign and language in history. Mexico: FCE Economic Culture Fund. 2004.
30. Plata CJJ. Confianza: el reto para las Ciencias Sociales. Revista de Derecho 2009; 259-279.
31. Cook T, Reichardt C. Qualitative and quantitative methods. In A. Guzman Jorquera. Epistemology. National University of San Marcos. Lima Peru. 2007.
32. Hernandez Sampieri R, Fernandez Collado C, Baptista Lucio P. Research methodology (6th ed.). Mexico City: McGraw-Hill. 2014.
33. Aravena M, Kimelman E, Micheli B, Torrealba R, Zuniga J. Educational Research I. Arcis University (Chile); Afece (Ecuador). 2006.
34. Martinez Gonzalez RA. Research in educational practice: research methodological guide for diagnosis and evaluation in educational centers. Educational Research and Documentation Center (CIDE). We Investigate Collection 5. Ministry of Education and Science. Ed. Fareso. Spain
35. Saby JE. The role of the teacher-researcher in the framework of formative research. Papers Magazine, 2012; 4: 23-30.
36. Marin Escobar JC, Maury Mena SC, Marin Benitez AC. Administration and management in educational organizations. Social network, 2016; 2.
37. Aristotle. Metaphysics. Book Ninth. Θ. 1045b-1052a. X: Of the true and the false.
38. Camacho Verdugo LR, Morales Paredes H. Philosophy of Education and teaching pedagogy in teacher training. Case study, student perception. Education Magazine. 44: 1-30.
39. De Micheli A, Iturralde Torres P. Around the evolution of scientific thought. Arch Cardiol. 2015; 85.
40. Gershenson C. Scientific thought. Online course. UNAM. Mexico. 2013.
41. Jaffe K. What is science? An evolutionary vision. Saarbrucken, Germany. Spanish Academic Publishing House. 2012.
42. Santibanez Guerrero DGP. On the emergence of science in Greece: Greek transmission and assimilation of technical knowledge from the Eastern world. Orbis Terrarum Stories Magazine. 2016; 16: 91-97.