

MENDIVE



REVISTA DE EDUCACIÓN

Translated from the original in Spanish

Original article

From the art-science universe. Unity and divergences in the university environment

Del universo arte-ciencia. Unidad y divergencias en el ámbito universitario

Do universo da arte-ciência. Unidade e divergências no ambiente universitário

Mara Lioba Juan-Carvajal¹



<https://orcid.org/0000-0001-6968-3813>

¹ Universidad Autónoma de Zacatecas
"Francisco García Salinas", México



maralioba@hotmail.com

Received: January 04th, 2022.

Accepted: January 22nd, 2022.

ABSTRACT

The positions regarding the link between art and science are dissimilar; the points of view are fundamentally related to the area of knowledge which they are investigated from. A study combining analytical-synthetic methods, document analysis, discussion and review, and methodological triangulation, applied in 40 theses and 11 teachers, leads

Translated from the original in Spanish

to conclusions in which the "necessary" unity of art and science is appreciated, especially in an educational context, regardless of the contradictions that are manifested when the professional artist's training faces an external evaluation process seeking its institutional qualification. In this sense, an objective is formed: to present diverse positions on the art-science relationship, from a reflection in which this relationship is defended as universality in the educational context, based on the historical evolution and on the "identity of qualities", regardless its contradictory aspects in its manifestation. As a result, divergent and universal aspects are identified in the art-science relationship.

Keywords: art; science; quality; unit; divergences.

RESUMEN

Las posiciones respecto al vínculo entre el arte y la ciencia son disímiles. Los puntos de vista se relacionan, fundamentalmente, con el área del conocimiento desde la que se investiga. Un estudio en el que se combinan los métodos analítico-sintético, análisis de documentos, discusión y reseña, y triangulación metodológica, aplicados en 40 tesis y 11 docentes, lleva a conclusiones en las que se aprecia la "necesaria" unidad entre el arte y la ciencia, sobre todo en un contexto educativo, independientemente de las contradicciones que se manifiestan cuando la formación del artista profesional se enfrenta a procesos de evaluación externa con vistas a la acreditación de un programa. En tal sentido, se formula como objetivo: presentar posiciones diversas sobre la relación arte-ciencia, desde una reflexión en la que esta relación se defiende como una universalidad en el contexto educativo, basada en el devenir histórico y en la identidad de cualidades, no obstante existir aspectos contradictorios en su manifestación. Como resultado, se identifican aspectos divergentes y universales de la relación arte-

ciencia enmarcada en el contexto universitario.

Palabras clave: arte; ciencia; calidad; unidad; divergencias.

RESUMO

As posições sobre o vínculo entre arte e ciência são díspares. Os pontos de vista estão fundamentalmente relacionados à área do conhecimento a partir da qual é investigado. Um estudo em que se combinam métodos analítico-sintéticos, análise documental, discussão e revisão e triangulação metodológica, aplicados em 40 teses e 11 professores, leva a conclusões em que a unidade "necessária" entre arte e ciência, especialmente em contexto educacional, independentemente das contradições que surgem quando a formação do artista profissional enfrenta processos de avaliação externa com vistas ao credenciamento de um programa. Nesse sentido, formula-se como objetivo: apresentar posicionamentos diversos sobre a relação arte-ciência, a partir de uma reflexão em que essa relação seja defendida como uma universalidade no contexto educacional, a partir da evolução histórica e da identidade de qualidades, não No entanto, há aspectos contraditórios em sua manifestação. Como resultado, identificam-se aspectos divergentes e universais da relação arte-ciência enquadrada no contexto universitário.

Palavras-chave: arte; Ciência; qualidade; Unidade; divergências.

INTRODUCTION

The expression universe, due to its meaning, is used in countless phrases when you want to refer to something very comprehensive. It

is common to hear the term to name the cosmos, the infinite. However, when talking about a group of elements or people with one or more common characteristics, this word is also useful, and that is precisely the meaning with which the title is delimited, motivated by the current debate in which they bifurcate, as two independent branches of knowledge art and science.

The visibility of the debate in higher level institutions related to the training of the artist increased in the 20th century, basically, when the need to face an external evaluation for the accreditation of the processes, and of the entities themselves, became evident; all this with the encouragement of technological development, the increase in the use of computer and communications media, together with the presence of the internet in classrooms.

For external evaluation in the world, a diagnosis based on standards that make it possible to offer information on its quality is proposed. According to the evidence that is reviewed from variables, dimensions and indicators, a vision of the degree to which the requirements declared in the educational policies, programs, lines of research and projects defended by the entity are met. With this, the university's capacity to satisfy needs is specified and that related to social impact and improvement for the transition to a better state is compiled.

The variables, dimensions and indicators that allow the assessment of the processes in higher level educational institutions are conceived and applied in those that are related to training in areas of knowledge, such as Social and Humanistic Sciences, Techniques, Mathematics, Biology, Chemicals, among others. This has resulted in a certain rejection in the branches of art, since these standards are not applied in this area of knowledge, which increases the debate on the art-science universe. In

Translated from the original in Spanish

reality, such standards may be applicable to specific knowledge, considering its particularities and the link with other disciplines.

We focus on the academic universe, since it is sometimes unduly heard that the training of professionals and teachers in arts faculties is not scientific and that it only responds to the mode of action in any of the profiles of its various disciplines. Nothing is further from reality if you consider that its own conception is justified and based not only on practice, but also on the knowledge acquired and the theory established after centuries of evolution.

The conviction that art arises with the existence of man and has developed alongside humanity is indisputable. Dance, for example, had its first manifestations, very elementary, in the body movements that were performed for religious rituals, mating, war or celebrations, the start of harvests or planting; however, epistemological studies showed that "(...) the new epochal scenarios required new budgets and new ways of conceiving and interpreting this artistic manifestation (...)" (Chacón, 2019, p. 14), which marked its evolution until it reached to the great diversity that exists today.

Music accompanied man since his appearance. Some authors describe it as the primitive form of language (Rodríguez, 2007); its cosmopolitan manifestation is considered from its presence in all spheres of life "(...) if in fact music is a universal phenomenon, the idea that it has purely cultural origins would be difficult to justify and would instead suggest some kind of biologically based" (Leongómez, 2015, p. 79). In any case, its antiquity is manifest:

Most of the historical manuals, in search of a temporal fixation that refers us to the origins of music,

point to the Solutrean (21,000-15,000) and the Magdalenian (15,000-10,000) as determining periods or cultures, since from those stages From the Upper Paleolithic come most of the instrumental remains found and also the samples of cave painting that suggest a musical activity, primarily dance (González-Cobo, 2016, p. 25).

In museums and libraries of historical reliefs, there are collections of visual arts where you can study the way of life in ancient Egypt, Greece, Assyria, among many others. As a result, the impact that social development has had on the arts and the existence of various classifications can be seen. Martínez (2005) distinguishes, among others:

- Those that privilege the search for aesthetic values such as painting, sculpture, architecture, music, literature, dance, and theater, which are part of the Fine Arts.
- From the way they are perceived, they are classified within the visual arts: architecture, painting, sculpture and drawing; in those of the ear: music and poetry; and in the mixed: dance, theater and opera.
- According to the degree of reproduction of nature, as essentially imitators: sculpture and painting; as creators: architecture, music and poetry; and like those that they create and imitate: dance, theater and opera.
- Regarding the material with which their expression is developed, they are classified, within those that depend on a palpable material: painting, sculpture and architecture; and in the spiritual: music and literature.

It expresses that in times as remote as the 18th century, the existing conceptions began to be divided into techniques and aesthetics, which distinguished the tools from the fine arts.

What is known today as art was not so identified in ancient times; its etymological root is based on the Latin *ars* and the Greek *techné*, terms that refer to "(...) the human capacity to do and execute something skillfully" (Freitag, 2015, p.129), which in a certain way justifies the theory of its appearance with the existence of humans and the imprecision of its origins.

The layout of the museum tells us: the history of art is the history of its styles. The style arises from the contradiction between the integrity of the work (as a complete and perfect whole) and the autonomy (independence) of art. If we want to distinguish art from other spheres of human activity -from crafts or technology, for example-, we need something that, beyond the integrity of each particular work, links the others to it. That is precisely the style. In Italian we say "maniera" (way, "manière" or "manner"), a word that has also been used to designate manners, that is, the way a person behaves, their style (Schawanitz, 2004, p. 275).

On the other hand, scientific knowledge, as a result of the creative activity of man, evolved and developed various disciplines that describe and explain, with the help of categorical systems, processes and reality using experimentation, theoretical explanation and means of knowledge.

It is remarkable how the limits between art and science are lost when magnificent works of different styles and periods are appreciated, such as the Sistine Chapel by the sculptor, architect and painter Michelangelo (1475-1564). From the 20th century, it is worth mentioning the prolific and monumental work of the Brazilian architect Oscar Niemeyer (1907-2012), among which the following stand out: *Casa del Baile* (1943), which he conceived as "(...) the creation of a «new» architecture and «bolder», with the dimensions of Brazil" (Philippou, 2013, p.11), or others that today occupy a place among the classics of architecture such as the *Church of Pampulha* (1943), the *Cathedral of Brasilia* (1970), for which he was awarded the Pritzker Prize in 1988, and the Museum of Contemporary Art in the 1990s (Duque, 2017). In the 21st century, science, technology and art are combined with the aim of proposing, for example, an environmental message: "Sunflower-Climate Change Sentinel. It is a robotic solar flower that works like a weather station, measuring environmental variables and acting as an eyewitness through its cameras" (Fargas, 2020), among others.

In music, examples stand out where science and art have established principles in creation: Pythagoras (c. 570-c. 490 BC) established the numerical relationships and pitches of sounds, setting the tonal scale in mathematical terms; JS Bach (1685-1750), by composing *Das wohltemperierte Klavier* (The Well-Tempered Clavier) with which he gave impetus to the tuning of the tempered scale as an upper step that is still used, not only on keyboard instruments, constituting the harmonic foundation of the composition for several centuries.

In the contemporaneity of the beginning of the 20th century, it is enough to remember two important artists and theoreticians who have consciously changed the vision of art until today:

At the time I am referring to, two great new ideas are about to emerge simultaneously: atonal music and abstract painting; and both spring from the reflection of two great artists and thinkers - Schoenberg and Kandinsky - who give consistent form to the thousand suggestions that have been crystallizing for years and who naturally also contribute their own personality.

Recall that Kandinsky's book *On the Spiritual in Art* was written at the same time as Schoenberg's *Treatise on Harmony* and published only a few months later. Both works, despite great conceptual differences, point to the same goal, and their authors immediately realized this identity of intention. "Schoenberg's music - writes Kandinsky - makes us enter a new realm, where musical emotions are not totally auditory, but, above all, interior. Future music begins here." Very shortly after, in the magazine *Der blaue Rieter*, founded by Kandinsky and Franz Marc, an article by Schoenberg appeared, "The affinity with the text" (collected in the volume *The style and the idea*) in which the following is said: " With great joy I read Kandinsky's book, in which the hope is raised that those who question about the text, about the material argument, will soon ask no more questions. Both texts are from 1912 and show the clairvoyance of two great artists, not only regarding

their own work, but that of another artistic field (Barce, 1979, p. VI).

In the course of history, there are innumerable works of art that were based on pillars of scientific knowledge. León Battista Alberti (1404-1472) alluded to the scientific nature of the artist: "To achieve the ideal of beauty in nature, the artist depends on experience and the study of nature. It does not imitate nature itself, but rather reflects its principles or laws (...)" (Veciana, 2004, p. 27). In general, such knowledge does not emerge on a par with its celebrity, the previous exploration that a work of months or years entails does not appear in the result; however, close examination reveals the background of his greatness.

The analysis carried out so far justifies the objective of the article: to present diverse positions on the art-science relationship, from a reflection in which this interaction is defended as universality in the formation of the artist, based on the historical evolution and the identity of qualities; however, there are contradictory aspects in its manifestation.

MATERIALS AND METHODS

Based on a mixed investigative approach, methods, techniques and procedures were combined to reach conclusions on the aspects in which unity and divergence are visualized in the current debate on art and science in the university context. With the analytical-synthetic method, the conceptions of art and science were studied, which made it easier to identify common elements or with a sufficiently strong link between the two.

The use of document analysis made it possible to examine a sample of 40 research theses on various topics of art or related to them (table 1), at various educational levels

Translated from the original in Spanish

(bachelor's degree 28%, master's degree 15%, doctorate 58%). In it we identify the most used scientific research methods: general (those that are applicable in any branch of knowledge were grouped), specific (those that responded fundamentally to the qualitative approach and were characteristic of a scientific discipline) and mathematical-statistical (methods, procedures and statisticians); its results complemented the reflection on the meeting points in the exhibition of the unit.

analysis, graph processing, ethnography, life history, rokola.fm study, and image-based research.

Table 1- List by country of these reviewed

Country	Quantity	
	Of art	Related
Argentina	0	1
Colombia	2	0
Cuba	18	2
Ecuador	2	0
Spain	6	5
Mexico	0	2
Peru	1	1
Total	29	11

To establish the percentage relationship between the methods, techniques and procedures used in the different theses, the average was determined among the 41 classified as general (57%), specific (21%) and mathematical-statistical (22%), and it was found the standard deviation to set the limits within the data obtained. As a result, we worked with those methods whose repeated values were between 10 and 20. The existence of 5% of theses in which the methodological strategy used was not described was striking, so they were not useful.

Figure 1 shows the behavior of the use of general methods of scientific research in the theses reviewed. In order to simplify the analysis, all the interview variants were added to the survey. When setting the limits in the studied sample, the fact that most of the methods registered as belonging to the arts and those that, from the qualitative approach, are recognized as widely used in them, were discriminated against. These methods included case study, dramaturgical



Fig. 1- General methods and techniques used in research related to art

The analysis of documents also served to identify coincident aspects between art and science in the university context; for this, the exploration was carried out according to the categories: manifest contradictions between art and scientific research; approach to artistic research in Higher Education; alignment with indicators for an external evaluation.

With this method, it was also possible to determine the percentage of the publications of Fine Arts magazines with those of other areas of knowledge, through the catalog of the seal of quality for the Humanities and Social Sciences, of the Spanish Foundation for Science and Technology. Technology (FECYT, 2020). Its services include offering Spanish scientific journals "...a standard of good practices made up of editorial and scientific evaluation criteria accepted worldwide, and granting them recognition of their editorial and scientific quality, thus promoting their visibility and presence in international databases" (p. 4). Likewise, the percentage of the Ibero-American Network of Innovation and Scientific Knowledge (REDIB, 2020), and *Art, Individual and Society*, whose topics deal with "(...) about the visual arts and their relationships with the social, historical, political and cultural context from different scientific fields, especially creation

Translated from the original in Spanish

and artistic education" (Complutense University of Madrid, 2020).

For the analysis of the data, a methodological triangulation was carried out, in which the results of interviews, observation and analysis of documents were compared; those that were also considered for the workshop "Discussion and review" developed with the aim of identifying the contradictions and meeting points between art and science in the university context. For this, we worked with a group of 11 teachers (table 2), selected for their disposition, for having more than 10 years in Higher Education and more than three related to art. At the beginning of the workshop, an exhibition was held on scientific and artistic research, on the coincident aspects between both and their application in the training of the artist; subsequently, the meeting points and the divergent points were highlighted, and those in which there was no coincidence were discriminated under the criterion of concordance e" 81%.

Table 2- Characterization of the teachers participating in the workshop

Scientific degree or academic degree	Knowledge area	Quantity		
		Participants	Years	
			in teaching	in arts
Doctor of Science	Art	5	20-35	25 - 40
	Pedagogy	3	25-35	3-7
Master	Art	2	15	10 - 25
	Pedagogy	1	12	3

RESULTS

Regarding the debate on art and science, its historical character was evidenced, with a methodological, professional (facilitated by positioning in an area of knowledge) and evaluative approach, based on measurement standards. The qualitative assessment of the art-science relationship goes through the analysis of the historical development that, at different times, was transforming it according to the existing paradigms. The manipulation that man has made of nature in

order to ensure its survival, subjectively or objectively, was carried out at the same time as attributing a meaning to existence. In nineteenth-century discourse, this relationship manifested itself as rivals; According to the vision of who referred it, the role of one or the other was exalted. Without reaching the antagonism that this represents, such a position, with its nuances, is heard in the current debate.

It was possible to appreciate that, regardless of the apparent distance between art and science, they behave as a dialectical unit with a certain transference, where what happens in one positively or negatively influences the other.

It was found that the art-science relationship has also been permeated by technological development and its impact on education. The boom that media agents have taken in the academic scenario and the potential they offer to the pedagogical process based on the immensity and diversity of information sources, the almost immediate access to events, the possibility of exploring the different tendencies and what innovative in both areas of knowledge with the use of the internet, provide a new edge from the academic field. The need to know the possibilities of a program or a medium to optimize its exploitation and ensure the quality of the teaching activity is inserted, which proposes an interdisciplinary integration model applicable to the artist's training, despite its adaptability according to the particularities of the profile and the disciplines that it includes in the curriculum.

It was observed that, from the branches of art knowledge, there are still rejections of the demands on quantification, in order to demonstrate the validity of the results, an aspect that continues in the current debate on the art-science relationship in the educational setting. .

Translated from the original in Spanish

Likewise, from the standards established for an external evaluation of the academic processes in the formation of the artist, questions remain open in this debate regarding whether any research carried out during artistic creation can be considered scientific, or any artistic work can be an investigative product. The manifestation of logical and systematic schemes, as well as the possibility of demonstrating why, how, or what for, with the use of terms and methodologies related to the different profiles in the arts within the dynamic and creative activity, feed such questioning.

The existence of a unit was confirmed based on meeting points in the art-science relationship and, within it, contradictions that affected the quality of teaching, taking into account the standards identified for external evaluation.

In relation to said evaluation, as a quality evaluation process in the university, on the art-science relationship, the following contradictions were identified:

- The processes that in an organization precede the evaluation in which its quality is defended are periodic, based on institutional strategies, and favor the detection of anomalies and decision-making for their improvement, considering strengths and opportunities offered by the environment and the organization itself. However, its application in the field of artist training enters a predominantly subjective space that complicates its assessment, regardless of the fact that there are criteria for this purpose for competitions and the awarding of prizes.
- Evaluation as a collegiate process contrasts with the insufficient convergence of efforts. Facing an external assessment implies the need to reread documents, refine

procedures, introduce new dynamics to daily practice and, above all, reorganize evidence that, until then, constituted recognition. These changes encourage the general discontent of the faculty in its triple function -professor, artist and researcher-, in most cases world-renowned, and require dedication and time due to the complex network of documents and models to fill out. Although the teaching staff is aware that external evaluation with a view to accreditation of quality in the university is currently a necessity, in general the application of criteria in an inflexible manner based on the assumption of norms that guarantee the reliability and applicability of research results, or that distinguish the social relevance of a teaching activity.

- There is the purpose of improving educational quality; however, the evaluation is perceived as a control of the work from a perspective far from the arts. The rigor of the evaluation process brings with it the perception of control, especially due to the existence of standards that, as their name indicates, are not representative of the particularities of a specific area of knowledge. The work is valued from a different point of view and although it is in the line of desire, the lack of specific indicators for the arts makes it difficult to accept artistic creation as a scientific production.
- The recognized prestige of the cloister contradicts the insufficient credit given to artistic creation as a research practice. A particularity of the faculties and universities of arts is the inclusion of professional artists of national and international renown in their academy, which constitutes a model for the new generations; In contrast, his greatest effort is aimed at the training of the artist on other

Translated from the original in Spanish

ways of action present in his profiles and other processes typical of university work such as research. In this sense, the dichotomy and confrontation "science vs. arts" reappears; the time that the artist must dedicate to its preparation and creation reduces the possibility of other activities. However, in the academic field the need to carry out research increases, which again leads to questions regarding artistic creation as a result of this process.

- The amount of research in, from, for and about art compared to the poor visibility of scientific results through impact journals or indexed in databases recognized by evaluation systems. The problem in this sense lies in the quantity and infrequency of publication of magazines whose themes are directly related to the arts with respect to other areas of knowledge. The possibility of publication in other magazines demands a movement towards themes, for example: education, communication, or management. More important, as well as limiting, is that these journals usually have a structural scheme and rules in which the results of research are manifested, as if it were an exact science, which dismantles the freedom and originality of artistic-philosophical language, of the cadence and unsuspected eloquence of his constructive discourse and, above all, the feasibility of expressing the spontaneity implicit in creative processes.
- The demand for updated sources from the arbitration for publications before the authenticity of original sources. Currently there is a certain tendency in the referees, during the review of the articles, to veto references with more than 10 years as if what was written in another time was not valid today; this results in the repeated

paraphrasing of criteria that once established positions or described situations typical of the time. Regardless of the contextual vision that any scientific writing should have, it is important to review original sources whose artistic and scientific value is indisputable and enriching; especially when, from the history of art, criteria, aesthetic movements or conceptualizations are studied or analyzed that were coined by the artists themselves who devised a philosophy, a theory or an artistic style, such as: the surrealist art of the French André Bretón (1896-1966) or the *dripping* of the original American plastic artist Jackson Pollock (1912-1956). Nothing more interesting and authentic for reinterpretation than the original sources.

- The defense of an artistic identity against the intervention of other scientific or administrative actors, against the insufficient body of theoretical and methodological references that favor the scientific dimension in artistic practice. Ignorance or rejection of the normative brings as a consequence clinging to criteria of identity that, although not always unfounded, generally have not considered criteria other than their own within the dissimilar areas from which a study process can be carried out.
- The contrast between publications in high-impact journals and the amount of research results carried out in the educational context in, for and from art, whether undergraduate, specialties, master's degrees, doctorates, or as external demands or self-demands of the teachers. Figure 2 shows the minimum percentage of journals (2.9%), which have Art as their central axis compared to other areas of knowledge; the analysis was carried out based on the information

Translated from the original in Spanish

from the FECYT quality seal catalogue.

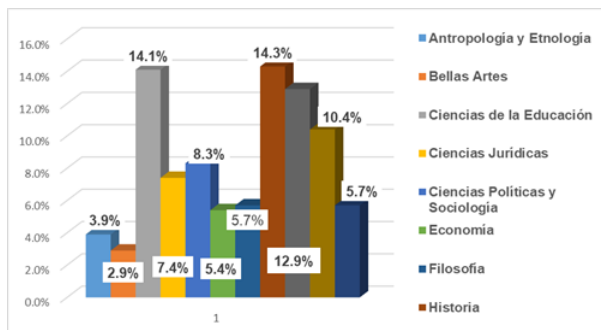


Fig. 2- Presence of Fine Arts in Spanish magazines with the FECYT seal of quality

In 2019, in the Ibero-American Network of Innovation and Scientific Knowledge [REDIB] (2020), a notable difference was observed in the impact and citations of art-related journals (minimum) compared to those that work on other topics. It is also significant that the percentage of articles cited is less than 3%, except in Art, Individual and Society.

The universal between art and science was revealed in its purpose, which manifests the production of new knowledge and its transforming function. It was also identified in the conditioning of the performance of the teacher-artist, given by the historical-social context and communication; the interdisciplinary nature of both branches of knowledge; the contributions during the interaction that occurs when they merge in a sociocultural process; taking reality as the starting point for research, its foundation based on a theoretical framework; the combination of general and specific methods; in the training of the researcher, its flexibility; and the potential of the sources at your fingertips. From this result, the unity and the meeting points between art and science derives:

- The production of new knowledge, different in its nature, but truthful in terms of the reflection of reality. In

art, the production of knowledge, even in this context, does not appear only as a result of work that has complied with an investigative protocol, or that had the purpose of being defended as such. In the quality of the work, regardless of the artistic manifestation, a background of years of study, exploration, systematization or revelations is perceived that, in addition to offering identity elements of the artist, make the receiver sprout a new approach, a new perspective, new knowledge.

- Communication as a process that favors the interaction between the researcher and the artist with the public to which the final product is directed. Art has traditionally contributed to the dissemination of advances in science, favoring its understanding. In the different activities carried out by human beings, both are conditioned by a historical-social context in which their own laws, codes, symbols, ways or methods are identified, for which it is essential to transfer the unknown to a known language for the community.
- The transformation of reality. Both art and science generate new relations of social interaction and dictate new rules in the evolution of language as a communicative medium.
- The interdisciplinary nature of science and art. At the present time it is difficult to find a scientific investigation, in which the performance of a multidisciplinary team is not manifested, or that does not refer to the interaction of various themes, methods, strategies or disciplines; there are even those that transcend this link and are integrated as one, giving way to the transdisciplinary. In art, this phenomenon is not new, artistic manifestations, for centuries, have been permeated by this nexus, either in their creative process or during

Translated from the original in Spanish

their exhibition. In a play or film, for example, music plays an important role in conveying the message; the same thing happens in dance, where the expression and meaning of body movements are also evident; this is also revealed during the performance of a musical work, where the language of mime and movement offers the public a complement of meanings.

- The combined use of general and specific methods. In the investigations carried out from, about and of art, the repeated use of general research methods and techniques is observed, for the collection and analysis of data, regardless of the methodological strategy designed for such purposes.
- The training of the artist and the researcher, conceived regularly, from a teaching institution. Its generative sources are framed in daily life, practice, experience, interaction, the difficulties experienced by the individual or the social group, and study. Its results are transferred towards improvements in human performance.
- The richness of sources, increased with technological development and the presence of computer and communication media, which favor access to information almost immediately, the contrast of different points of view, the management and review of data, the study of trends and methodologies, and the positions generated by various models in the artistic, teaching and research processes.
- Flexibility, present in both art and science. Based on the theoretical-practical tools, the artist has the possibility of reaching results from an exploration that facilitates the descriptive exposition or the understanding of what he wants to express. The result of artistic creation

and/or research demands, as in science, a previous and conscious study that reverts to the intentional handling of combined procedures, becoming, in a dynamic, lively and creative way, the investigative or artistic product.

DISCUSSION

In the qualitative analysis of the art-science relationship, the existence of divergent criteria was revealed. In the opinion of Moya (2018), the procedure of science, its methods and its results, have no comparison with the instant seizures of artistic production. From our point of view, the social division of labor, where economic interests prevailed, became a specialization, in which roles were identified for the different branches of knowledge. The arts were given entertainment; to the sciences, the explanation of processes or the solution of problems. Practice has satisfactorily shown that the arts are not only a means of entertainment for human beings; their own development presents them as an area of knowledge. We are, therefore, before two apparently distant areas; however, its essence manifests itself as dialectical unity.

When we think and take for granted a place or date in the birth of art, science indicates the need for an investigation and puts us before questions about it; In this sense, we agree with the researcher Deborah García Bello, who provokes reflection with questions whose starting point focuses on the art-science relationship and exposes criteria on the unequivocal link between both areas of knowledge; In this way, he describes how the use of advances in science and technology modifies art and vice versa: "(...) when a material that was outside of art begins to be used, it opens new fields to the imagination" (García, 2019).

Translated from the original in Spanish

Regarding the quality evaluation processes in art universities, criteria related to subjectivity and the difficulty of its evaluation prevail: "... can we think of an art valued by its citation index in publications or an art committed to fighting for assured knowledge?" (Veciana, 2004, p. 26). In a certain way, this process is difficult if the intention is to value artistic creation and not the process.

When carrying out the evaluation of the processes with a view to obtaining an accreditation that demonstrates their quality, fundamentally social, administrative and curricular aspects are emphasized through indicators that are constituted as standards on the basis of globally accepted regulations, such as ISO international standards, in which the quality management system is described and conceptualized so that any organization faces the challenges imposed by the context in which it develops (ISO General Secretariat, 2015).

However, artistic creation as a result can be considered as scientific production, although in some scenarios this recognition is difficult by not considering that it is developed and based on theoretical models whose starting point is reality. In this sense, we agree with Salgado & Dalagna (2020), who state that "The purpose should not be to turn artists into anthropologists, sociologists, philosophers or anything else, but rather to recognize their contributions, (...)" (p. 24).

Trying to settle these investigations on the basis of the canons established for other sciences is rejected on the one hand, and on the other, runs the risk of mutilating the creative richness that is evidenced taking into account the particularities of this production, generally descriptive or narrative, in which subjective, customary, and cultural elements prevail, both from the artist and from the public that is, ultimately, the recipient of the product, "(...) artistic research would produce a shared material

thought. But how can this knowledge, which is more felt than understood, more recreated than represented, be shared? (Salgado & Dalagna, 2020, p. 29), all of which highlights the need for a theoretical and methodological body, by nature flexible, that favors its standardization.

Since its inception, scientific and artistic research converges in the historical, cultural and social reality; the result, in both cases, is the production of new knowledge. "The knowledge produced by artistic researchers is not based on abstractions or intellectual propositions, (...) they allow us to expand our awareness of ourselves, of the world and of ourselves in the world" (Salgado & Dalagna, 2020, p. 53).

In the educational context, by nature, there is an increase in research and knowledge development. The result of a study carried out at the University of Girona, Spain, on the vision of teachers as researchers, which showed the link between both functions, is significant. There are manifestations that, in this context, both functions cannot be separated, they systematically interact, and that the research-teaching premise lies in sharing knowledge (Hirsch & Navia, 2019).

The vision of the unity between art and science, therefore, indicates the identification of common or intertwined aspects, which Hernández (2013) explicitly declares: "Artistic creation resonates and has communicating vessels with research and innovation. I am interested in expressing that the limits between them are fortunately diffuse and that instead of drawing boundaries to separate them when in reality they are not, I would like to make their connections visible" (p. 3).

Another aspect under debate is the interdisciplinary in both branches of knowledge. We agree with Hamann (2015), who argues such a position: "The contemporary artist works interdisciplinary

Translated from the original in Spanish

and integrates knowledge, methodologies, techniques and different instruments, and during his creative process he consults authors from various branches" (p. 11).

The relationship between art and science has been transformed with the historical evolution, in accordance with the existing canons in the different eras. In the references studied, various criteria can be found about the role occupied by one or the other, permeated by the vision of those who issued them; however, practice shows the indissoluble link between the two.

Regardless of the similarity that exists between science and art during the teaching-research practice of the artist in universities, discordant elements continue to be manifested, such as the look towards evaluation as a control of work from a perspective far from the arts; the insufficient credit to artistic creation as an investigative practice; or the poor visibility of scientific results through high-impact journals. These become more noticeable when they face an external evaluation, whose purpose is oriented towards the accreditation of one of the processes that are developed in them or of the institutions in general.

In the art-science universe, the divergent manifests itself as aspects that lead to the necessary unity between both branches of knowledge, based on the convergence in reality and in the production of knowledge. This unity is perceived, among others, from the capacity to produce new knowledge; the leading role given to communication to encourage interaction; the interdisciplinary character; the practice of the investigative process combining general methods with other specific ones, the richness of sources and flexibility.

The divergences found regarding the art-science relationship in the university context -with a casuistic analysis- had as their axis the evaluation of the quality in the

educational institutions of training of the professional artist. They focused on the evaluation as a collegiate process, the improvement of quality, the recognition of the cloister, scientific production, the defense of artistic identity and the lack of a theoretical body that supports artistic research.

Questions remain open regarding whether any research carried out during artistic creation can be considered scientific, or any artistic work can be a research product. Consequently, it is recommended to carry out research from whose results the theoretical and methodological body that favors such evaluations is derived.

BIBLIOGRAPHIC REFERENCES

- Barce, R. (1979). Prólogo. En: A. Shoenberg. *Tratado de Armonía* (pp. V-XXII). Traducción Barce. Madrid: Real Música.
- Chacón, L.Y. (2019). *Cuerpo y/en movimiento: una alternativa semioestética para su análisis dancístico*. Universidad de las Artes: Cuba.
- Duque, K. (2017), En perspectiva: Oscar Niemeyer. Chile: ArchDaily. <https://www.plataformaarquitectura.cl/cl/758954/oscar-niemeyer-en-perspectiva>
- Fargas, J. (2020). El encuentro del arte, la ciencia y la tecnología. *Razón y Palabra*, (65). <http://razonypalabra.org.mx/N/n65/actual/jfargas.html>
- Freitag, V. (2015). La invención del arte: Una historia cultural. *Alteridades*, 25(49), 129-133. Recuperado en

Translated from the original in Spanish

- 02 de febrero de 2022, de
http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0188-70172015000100012&lng=es&tlng=es
- Fundación Española para la Ciencia y la Tecnología [FECYT] (2020). *Metodología de clasificación de revistas de humanidades y ciencias sociales con sello de calidad*. FECYT. ISBN/NIPO: e-Nipo: 831200063.
<https://www.fecyt.es/es/publicacion/metodologia-de-clasificacion-de-revistas-de-humanidades-y-ciencias-sociales-con-sello-de>
- García, D. (abril 2019). La ciencia del arte. Conferencia llevada a cabo en el ciclo *Acerando la Ciencia*, Universidad de Burgos y Museo de la Evolución Humana, España.
- González-Cobo, R.A. (2016). *El mundo en el oído. El nacimiento de la música en la cultura*. Barcelona: Acantilado.
- Hamann, J. (2015). La problemática interdisciplinar en las artes. ¿Son disciplinas los distintos modos de hacer? Relaciones posibles con otros ámbitos disciplinares. *On the W@terfront*, 34(1), 5-15.
Retrieved from
<https://revistes.ub.edu/index.php/waterfront/article/view/18830>.
- Hernández, I. (2013). La creación artística y su relación con la investigación y la innovación. En: *La Investigación en la Pontificia Universidad Javeriana*. XII Congreso, Colombia.
- Hirsch, A., & Navia, C. (2019). Articulaciones diversas entre las labores de investigación y de docencia según los académicos de posgrado de la UNAM. *Perfiles Educativos*, 41 (163), 8-20.
http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0185-26982019000100011
- Leongómez, J.D. (2015). La música como objeto de estudio científico: consideraciones en torno a la musicalidad y el origen de la música. *Pensamiento, Palabra y Obra*, (13), 77-86.
<https://dialnet.unirioja.es/servlet/articulo?codigo=5271131>
- Martínez, O. (2005). La tradición en la enseñanza de las artes plásticas. *El Artista*, (2), 19-27.
<https://www.redalyc.org/articulo.oa?id=87400203>
- Moya, A. (2018). La ciencia y el arte desde la perspectiva de la transevolución. *Arbor*, 194(790).
<https://doi.org/10.3989/arbor.2018.790n4002>
- Philippou, S. (2013). El modernismo radical de Oscar Niemeyer. *Arquitectura y Urbanismo*, 34(2), 5-26.
http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1815-58982013000200002
- Red Iberoamericana de Innovación y Conocimiento Científico [REDIB] (2020). *Ranking de Revistas REDIB*.
<https://www.redib.org/Ranking/revistas>.
- Rodríguez, J.M. (2007). De musas y sirenas. Apuntes sobre música y psicoanálisis. *Revista Intercontinental de Psicología y Educación*, 9(2), 85-92.
<https://www.redalyc.org/pdf/802/80290206.pdf>

Translated from the original in Spanish

Salgado, J. & eDalagna, G. (2020). *Un modelo de investigación artística. Cahier de Investigación Artística 3*. Editorial UA, Editora Universidad de Aveiro.
https://ria.ua.pt/bustream/10773/28268/1/ESP_3er_Cahier_Un-modelo-de-investigacion-artistica.pdf

Schawanitz, D. (2004). *La cultura. Todo lo que hay que saber*. México: Taurus.

Secretaría General de ISO (2015). *Norma Internacional ISO 9000, 4*

edición,V1. Suiza.
<http://www.iso.org/obp/ui/es/#iso:std:iso:9000:ed-4:v1:es>

Veciana, S. (2004). *La intersección arte, ciencia y tecnología como campo de conocimiento y de acción*. Facultad de Bellas Artes, Universidad de Barcelona, España.
https://www.academia.edu/24929290/LA_INTERSECCI%C3%93N_ARTE_CIENCIA_Y_TECNOLOG%C3%8DA_COMO_CAMPO_DE_CONOCIMIENTO_Y_DE_ACCI%C3%93N

Conflict of interests:

The author declares that they have no conflicts of interest.

Authors' contribution:

The author has participated in the writing of the work and analysis of the documents.



This work is under a licencia de Creative Commons Reconocimiento-NoComercial 4.0 Internacional

Copyright (c) Mara Lioba Juan-Carvajal