



Mathematical experiences in the art of Almada Negreiros: Some reflections

Experiências matemáticas na arte de Almada Negreiros: Algumas reflexões

Iran Abreu Mendes

Cristina Lúcia Dias Vaz

Edilson dos Passos Neri Junior

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1 INTRODUCTION

We often use the word experience in various contexts, but we do not reflect on the variety of meanings that this word acquires. Let's take for example the following sentences: "the teacher carried out a chemical experiment in the laboratory", "that gentleman has lived a lot, he is very experienced", "that doctor has a lot of experience in performing a certain procedure", "the cook tried putting pepper in chocolate to see if they matched". Depending on the context in which it is used, the word experience can denote the performance of a test, learning from practice, a scientific test, among others. This polysemic variety is also verified when we take the word experience from common and popular use to technical use in various areas of knowledge, such as Education, Art, Philosophy, Mathematics, Natural Sciences, etc.

This article aims to present some reflections on the use of the concept of experience in two areas of knowledge, in Art and Mathematics, from the work¹ of Almada Negreiros, which emerge from a broader research, under development. These reflections began from an intense observation of drawings and paintings by the modernist Almada Negreiros (1893-1970), who gathered in several works geometric elements that, in addition to aesthetics, provided us with an understanding of the message behind the work, as well as enabling us to develop a process of meaning from all previous knowledge, both of Art and Mathematics.

¹ In this text, when we use the word "work" or the term "work of art", we refer specifically to the visual arts: painting or drawing.



We will examine the meaning of the word "experience" from its etymology, its use in the Portuguese language, in Mathematics and in Art, to finally enter Dewey's concept of experience in the context of Art. This article is divided into three sections: an itinerary on the concepts of experience, the experience in art according to Dewey and the mathematical experience in the art of Almada Negreiros.

2 EXPERIENCE: ETYMOLOGY AND MEANINGS

The word "experience" derives from the Latin *experientia*, which means proof, trial, attempt. Its etymology comes from the preposition "ex" and from *peritus* (translated into Portuguese as expert, skillful, experienced), past participle of the Latin verb *depoente periri*. Thus, this term acquires two meanings: an objective and direct one, associated with something that is done, an attempt, a test or a trial; a subjective one, associated with learning from various tests and trials in the course of one's life. The following words derive from *experientia*: *experimentum*, meaning proof or proof by facts; *expertus*, meaning experienced or the person who has proven knowledge (specialist in Portuguese, *expert* in English), as Amatuzzi (2007) states. Therefore, from the etymology of experience, it can be observed that the meaning of this word is associated with what has been obtained from a test, a test or a sequence of attempts.

The Houaiss Online Dictionary of the Portuguese Language² conceptualizes experience as the act or effect of experimenting (-se) and is related to 1) experimentation, experiment (scientific method); 2) any knowledge obtained through the senses; 3) form of comprehensive, unorganized knowledge, or wisdom, acquired spontaneously during life, practice; 4) form of specific knowledge, or expertise, which, acquired through systematic learning, improves over time, practice; 5) attempt, rehearsal, proof.

For Japiassú and Marcondes (2006), in philosophy, experience is distinguished in two senses: general and technical. In the general sense, experience is a spontaneous or lived knowledge, in which the individual acquires throughout life. In the technical sense, experience is the action of observing or experimenting for the purpose of formulating or controlling a hypothesis. For Abbagnano (2007), the term "experience" has two meanings: personal participation in repeatable situations and recourse to the possibility of repeating certain situations as a means of verifying the solutions they allow.

² Available at: https://houaiss.uol.com.br/corporativo/apps/uol_www/v6-0/html/index.php#0



In Mathematics, Silva and Idem (2021) state, experience is related to aesthetics, which is a way of analyzing its objects and processes, in a dimension whose thoughts are permeated by symbolic and intuitive processes, that is, they involve reason, logic, language, imagination and sensitivity.

3 EXPERIENCE IN ART

John Dewey (1859-1952), an important American philosopher of the early 1990s, is considered alongside Charles Peirce (1839-1914) and William James (1842-1910), one of the precursors of pragmatism and sought to bring the production of knowledge closer to the individual's experience (PERUCHIN; 2019). In 1934, Dewey published the work *Art as Experience*, which presents artistic work from a philosophical perspective, transversing the human organism, from reverie to the production of imagination.

In his writings, Dewey states that "artistic objects", when separated from the conditions that allow the individual to develop an experience, an opaque barrier is built around them, hindering the production of meanings, that is, the understanding of the meaning (s) of artistic objects emerges when the individual "forgets for a while" elements considered aesthetic and proposes to dive into the bowels of artistic objects, in their raw form. As a metaphor, Dewey (2010) states that the Parthenon is considered a great work of art, but it only acquires the status of aesthetic when it becomes an experience for the individual, which occurs from the moment the subject moves from the Parthenon *as a work of art* to the Parthenon *as a civic commemorative symbol of the Athenian people*. It is, therefore, to turn to this context to reaffirm that it was human beings, with specific needs, who led to the construction of the Parthenon. In the words of Dewey (2010, p.61),

Whoever proposes to theorize about the aesthetic experience embodied in the Parthenon needs to discover, in thought, what those people into whose lives time entered, as creators and as those who delighted in it, had in common with the people in our own homes and streets. (DEWEY, 2010; p.61).

In this way, Dewey (2010) proposes the non-distancing (or isolation) of art and its appreciation of the different forms of experimentation, that is, when we understand a work of art as human production, we establish an approximation of art with the people around us, contributing to make them more attractive to the popular sense.

Essentially for Dewey (2010), the nature of experience is directly linked to the perception of life, immersed in an environment and in constant interaction, which



generates sensitivity, emotion, feeling of harmony and balance. Therefore, "experience, insofar as it is experience, consists in the accentuation of vitality" (DEWEY, 2010; p.83).

Based on this idea that experience accentuates the vital feeling, we ask ourselves: how can we actually have a meaningful experience that highlights our sense of feeling alive? The answer to this question begins with Dewey's assertion that life is subdivided into boxes (or compartments) that generate classifications such as superior/inferior, profane/spiritual, material/immaterial. This kind of classification arising from the compartmentalization of life also entails the separation of "doing" from "imagining", of "meaningful purpose" from "work", of "emotion" from "thought and action". In addition to this argument, Dewey states that the individual lives mechanically, that is,

(...) we see without feeling; we hear, but only as a second-hand account - second-hand because it is not reinforced by sight. We touch, but the contact remains tangential, because it does not merge with the qualities of the senses that sink below the surface. We use the senses to arouse passion, but not to serve the interest of insight, not because that interest is not potentially present in the exercise of the sensory, but because we yield to conditions of life that force the senses to remain as superficial excitations. (DEWEY; 2010, p.87).

Still on the experience, Dewey (2010) also relates to the senses, which are the organs by which the individual connects to the world and participates directly in what occurs around him, that is, the experience is the product of the interaction between the individual and the environment, transforming this interaction into communication and participation.

Experience is, therefore, the perception of life, of being alive, of vitality, which emerges from the interaction of the individual with the environment and this only occurs when we establish a new way of relating to the world, improving the senses and distancing ourselves from the compartments imposed by the way of life today. But can art be considered a life experience? Yes, because it is the "living and concrete proof" that the human being can consciously reestablish the meeting between meaning, need, impulse and practical action, characteristics proper to the living being. In the words of Wosniak and Lampert (2016, p.268),

Experience for Dewey is a process of living that relates intensely and continuously between the world and the subject. From this relationship arise conflicts, resistances, impressions. From these elements, in turn, experiences emerge, wrapped in ideas and emotions (Wosniak; Lampert; 2016, p.268).



Dewey (2010) in his work distinguishes the "fine arts" and the "useful or technological art" fundamentally by the existing social conditions of the historical context, however, regardless of this, a work of art is only considered as such because the artist lived and had full experiences during the production / creation process. Dewey (2010, p.96) states, "it is this degree of completeness of living, in the experience of doing and perceiving, that establishes the difference between what is beautiful or aesthetic in art and what is not". But how to have an experience?

The answer to this question is given by Dewey from the premise that the experience occurs continuously, because the interaction of the individual with the environment is intrinsically linked to the process of living. However, depending on the context in which one lives, interactions with the environment end up modifying the experience, which can make it incipient, that is, things are experienced, but they are not configured as "singular experiences". On the other hand, there is what Dewey calls "singular experience", which occurs when what is being experienced follows the path until it reaches the goal, that is, the singular experience is a sequence of other experiences in such a way that its conclusion is not an end, but a culmination, with a satisfactory emotional character, that is, a singular experience occurs when the individual experiences an experience in an integral way until it materializes in a specific, particular object.

Materialization in a particular object is the key to the experience we wish to produce when we attentively observe a work of art and continuously interact with it. In fact, Dewey (2010) states that the artwork emerges from an impulse, from a will, at the same time that it denotes a process of making or creating, that is, a work of art to produce an experience has to be shaped so that the reception of those who observe it is pleasurable. Dewey (2010) defines this type of experience as aesthetic experience.

Aesthetic experience, for Dewey (2010), does not come from the outside in, but is the conscious and intensified development of several strokes that belong to every complete experience. For example, every brushstroke a painter makes on a canvas must be experienced consciously, knowing what he is doing and where his work is destined, realizing the various connections involved in this process. Therefore, the "aesthetic experience - in its strict sense - is seen as inherently linked to the experience of creating". (DEWEY, 2010; p. 129). When discussing the aesthetic experience, Silva and Cunha (2021) point out that the "creating" of the aesthetic experience refers not only to art objects, as is usually understood, but is related to creating solutions to everyday problematic situations.

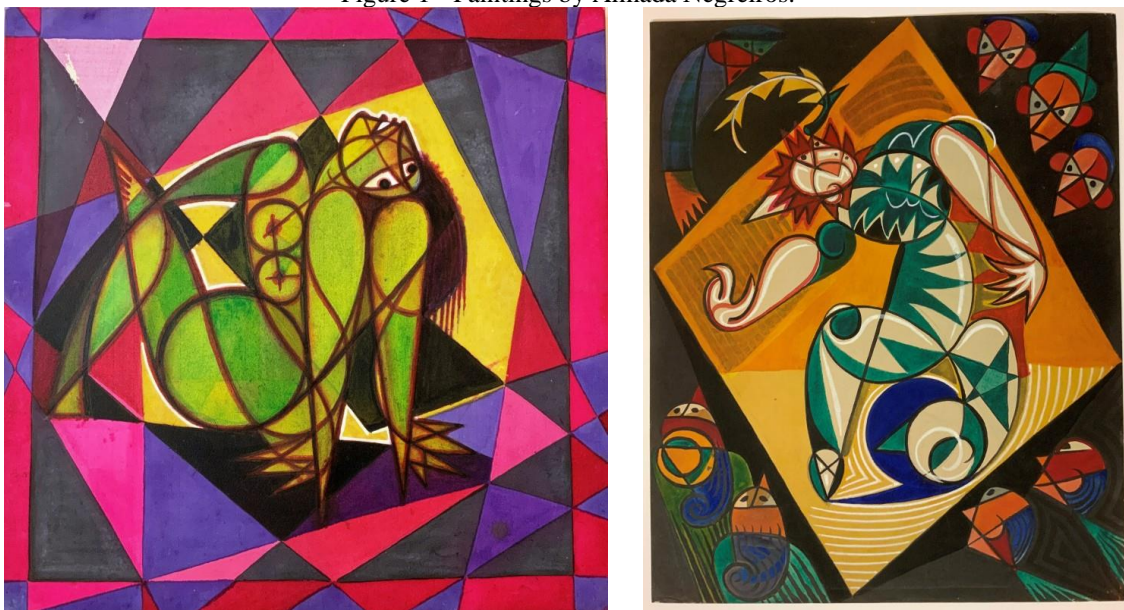


In this process of creation, between the artist and the work, a relationship is established, triggered by the act of creating, under constant influence of the environment, which advances in a progressive way that, when it reaches the end, the result experienced is evaluated as good, not from an intellectual and external judgment, but as a direct perception. Thus, for a work of art to be aesthetic, it is necessary for the artist to place his individual experience in it, so that from it, those who observe it can share their experience.

4 ALMADA NEGREIROS AND THE MATHEMATICAL EXPERIENCE IN ART

Almada Negreiros was an artist of Portuguese modernism, in the early twentieth century, who worked, among other languages, in painting, having a wide production and with strong geometric characteristics. Although self-taught, Almada developed studies on geometry and numbers, transposing this knowledge to his paintings and drawings (figure 1).

Figure 1 - Paintings by Almada Negreiros.

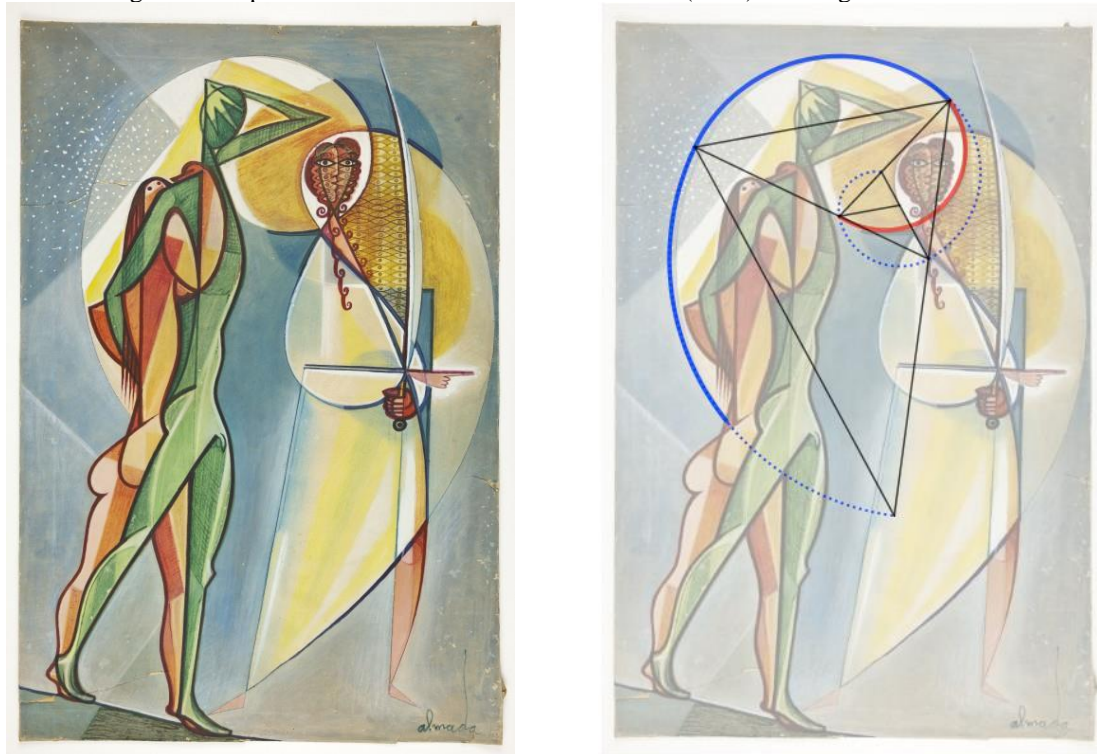


Source: <https://modernismo.pt>

The large volume of drawings and paintings, as well as the diversity of themes and representations, makes Almada Negreiros' work admired not only as art, but as a good mathematical work, as Freitas and Costa (2014, p.1) state, "although the author's primary intention was to produce works of art, much of his work can be appreciated mathematically". With this, we understand that we can have a mathematical experience in Almada Negreiros' art, an experience understood as Dewey (2010), which culminates in a creation.

In figure 2, we have the drawing *Expulsion of Adam and Eve from Paradise*, an iconographic work, which portrays a biblical narrative, which interact with it, we perceive the characteristic features of the artist himself, as well as mathematics itself as the background of the representations.

Figure 2 - *Expulsion of Adam and Eve from Paradise* (1952) and its geometrization.



Source: <https://modernismo.pt/index.php/arquivo-almada-negreiros/details/33/3065>

The process of studying and analyzing the work led us to identify the geometric elements used by the artist, based on a broad investigation of the manuscripts, available in the Modern!smo virtual database - Virtual Archive of the Orpheu Generation³, which culminated not only in the iconographic understanding of the work, but also in the creation of a virtual animation, which shows the mathematical procedure for identifying the geometric elements that make up the work.

For the geometric elements, in the context of the we take the golden spiral, a curve that is associated with the golden number and is obtained geometrically from a sequence of golden rectangles, this curve being a bridge between art and mathematics in the work *Expulsion of Adam and Eve from Paradise*.

³ Available at: <https://modernismo.pt>



In addition, we understand that beyond the creation of this virtual animation⁴, the mathematical experience in Almada's art occurred from the moment we established relationships between the elements of the work, its production context, the mathematics involved and the influences of the artist, in a process of continuous interaction between these elements.

In fact, the aesthetic experience lived in this process, as Dewey (2010) states, began with an impulse arising from an attentive and pleasurable observation, which allowed us to identify that this work had an inspiring potential and motivated us to immerse ourselves in the universe of the artist and the work.

5 FINAL CONSIDERATIONS

A work of art is not just a commodity or simple and finished object, on the contrary, it is an inducer of experience, which occurs when the individual allows himself to look closely, interact with the work and understand it. Being open to all this is the first step to having an experience, which culminates in a process of creation. This creation, we believe, contributes to art coming to life, gaining meaning and dialoguing with the individual himself, his references and his own potential.

Specifically in Almada Negreiros' work, this aesthetic experience allowed us to highlight mathematics itself, culminating in a broad and deep study of the mathematical knowledge that is present there. The product of this process can be extended to other areas, especially education, a door that opens to make the process of teaching and learning mathematics more meaningful.

⁴ Available at: <https://www.geogebra.org/m/ycmf9qeu>



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