Art Education for the Development of Complex Thinking Metacompetence: A Theoretical Approach

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Abstract

This article proposes to explore the relationships between art education and the development of complex thinking (proposed as metacompetence in this study) from a theoretical perspective. This is an approach that arises from contemporary conceptions about art, which is an intrinsic relationship between the artwork and the creative and critical character towards representation systems. Emphasising the definition of complex thinking proposed by Mathew Lipman serves as a guiding axis to try to establish the cognitive processes that compose it. Among the main findings is that the development of complex thinking and cognition occurs through action and interaction with the environment, thus linking to the notions of 'situated competence' and the 'complex approach to competences'. By including cognitive and metacognitive processes, it allows us to postulate complex thinking as metacompetence. In addition, it is proposed that the use of learning methodologies (under a competence-based approach) could contribute to an art education where students produce artistic works that involve critical, creative processes or divergent results. It is also necessary that both the curriculum and the teachers encourage an expanded and interdisciplinary vision, understanding that art is not circumscribed to a specific discipline.

Introduction

Education in the twenty-first century faces great challenges, including adapting to the continuous changes introduced in daily life by the advances and proliferation of information technology and technological devices in general, as these do not

only modify our way of being, but also our forms of interaction with the social environment and the world. Morin (1999), in *Los Siete Saberes Necesarios para la Educación del Futuro* (The Seven Necessary Knowledge for Future Education), proposes that education should be aimed at making each individual aware of their complex and common identity to all other human beings. Education must teach mutual understanding, in every sense, and recognise our earthly identity as beings that live in the same community of destiny. Moreover, perhaps most importantly, education must teach and situate the human condition.

Teaching the human condition also involves teaching the skills and abilities that differentiate us from artificial intelligence. Education should not only focus on the development of logical thinking, but also on the development of dialogical or divergent thinking. For this, it is necessary to develop the skills or emotional competences of social, critical, creative and ethical interaction. Developing the skills and competencies that allow us to recognise an inherent complexity, therefore, becomes the need for complex thinking development.

Located in this context, there is a need to investigate and deepen knowledge towards a conceptualisation of complex thinking and try to discover the implicit cognitive processes. As a guiding axis, the notion proposed by Lipman (1997), which posits the relationship of complex thinking with critical and creative thinking, is fundamental. From contemporary conceptions regarding art, which establish an intrinsic relationship between the artwork and the critical or self-critical character towards its systems of representation, together with the creative component inherent in all artistic production, this article tries to explore the contribution of art education to the development of complex thinking from a theoretical perspective.

What is complex thinking?

The notion of complex thinking was coined by the french philosopher Edgar Morin (1995). From the perspective of this author, it refers to the capacity of thought to aspire to a multidimensional knowledge, which integrates the simplifying modes of cognition and rejects the reductionist, one-dimensionalising and blinding consequences. It implies the recognition of a principle of incompleteness and uncertainty. It also involves the recognition of the bonds between the entities that our thought must necessarily distinguish, animated by a permanent tension between the aspiration to a non-parceled knowledge and the recognition of the unfinished nature of all knowledge. It involves recognising realities: conflictive/harmonic; peaceful/aggressive; just/unfair; equitable/inequitable. That is to say, realities inherently carry contradiction, dialectic, dialogic, understood as a means of dialectical-conflictive communication between different forms.

> *Relevant knowledge must face complexity. Complexus means what is woven together; in effect, there is complexity when the different elements that constitute a whole are inseparable (such as economic, political, sociological, psychological, affective, mythological) and that there is an interdependent, interactive and interrelated fabric between the object of knowledge and its context, the parts and the whole, the whole and the parts, the parts between them. Therefore, complexity is the union between unity and multiplicity. The developments proper to our*

planetary age are confronting us more and more ineluctably with the challenges of complexity.   (Morin 1999, 17)

For Morin, the complex could not be defined simply to replace simplicity. Complexity is a problem word, not a solution word. It brings with it the principle of *unitas multiplex*, since 'understanding the human is to understand its unity in diversity, its diversity in unity. We must conceive the unity of the multiple, the multiplicity of the one' (Morin 1999, 28). Such understanding could not be approached from the fragmentation and disciplinary hyperspecialisation; the simplifying thought is incapable of conceiving the conjunction of the one and the multiple (*unitas multiplex*). This understanding could be possible from the integration and interrelation of the different knowledge generated between, through and beyond disciplines, from multidisciplinarity, interdisciplinarity and transdisciplinarity.

From the perspective of Lipman (1997, 222), complex thinking is a higher order thought that arises from the fusion between critical and creative thinking: 'There is no critical thinking or totally pure creative thinking, it is precisely higher order thinking that leads to criticism and creativity.' Critical thinking implies reasoning and critical judgment; creative thinking involves dexterity, art and creative judgment (see Figure 1). Critical thinking is basically guided by criteria that can be formulated in a discursive way, and creative thinking is guided by the non-discursive quality of the situations that are being generated by research or creative action. In any situation that requires the action or putting into practice of one of these thoughts, there is an interaction between the discursive and the non-discursive, therefore, between the critical and the creative.

Complex thinking is based on both rationality and creativity. Unlike lower-order thinking (simple, mechanical, routine, restrictive and using a discrete series of rationally sequenced skills), higher order or complex thinking is not reduced to the algorithmic; it is expansive; it demands tolerance of uncertainty and ambiguity; it is self-critical and synchronously coordinates various skills in problem solving or product creation. It combines the declarative with the procedural. It produces multiple solutions. It is multilogical and dialogical. It is multilogical, because it goes beyond a single frame of reference, which requires a dialogical thought that
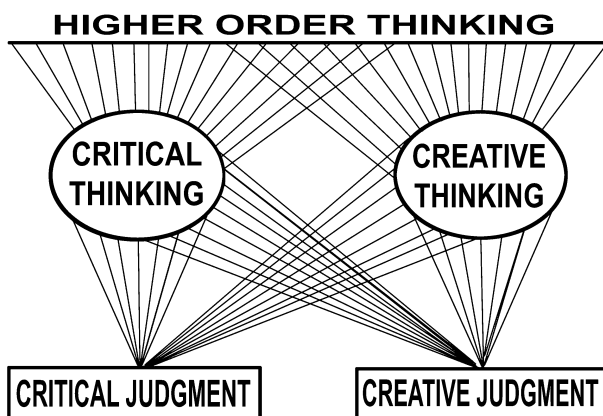

Figure 1
Scheme of complex thinking or higher order thinking Source: Lipman (1997)

represents the exchange between the different points of view or contradictions. It implies the use of multiple criteria that may conflict with each other; it also implies the use of metacriteria or megacriteria and the self-regulation of the thought process (metacognition).

Among other authors who establish the existence of complementarity between critical and creative thinking, we can point to De Bono, who agrees with Lipman when establishing dependence between creativity and critical judgment, arguing that 'only after obtaining a considerable number of lateral ideas can it proceed to formalise a critical judgment' (De Bono 2000, 118). For De Bono, unlike vertical thinking (where the logical correctness of ideas matters), lateral thinking is creative, seeks new perspectives and explores the multiple possibilities in solving problems.

Complex thinking from the cognitive sciences

In order to be able to approach the cognitive processes of complex thinking, following the argument advanced to this point, it is necessary to investigate from studies centred on critical and creative thinking. One of the investigations that allows extracting some evidence on the complementarity between both is the one developed by Saremi & Bahdori (2015). These authors, from the inferential analysis product of the application of the critical thinking skills test of California (form B) and the SIP Rend creativity questionnaire given to 47 primary school principals, concluded that there is a direct relationship between critical thinking and creativity. Among the results, they found that there is a significant positive relationship between both ($r = 0.047$, $P = 0.294$) and postulate that the increase of each of these processes (analysis, evaluation, inference, deductive and inductive reasoning) implies an increase in the creativity.

From the neuroscientific perspective, faced with the scarcity of research about critical thinking, we choose to investigate from the basis of creative thinking. From this approach, the results obtained are multiple and very heterogeneous, however, we focus on studies that establish some kind of relationship between both cognitive processes (critical - creative).

Recent studies (in neuroscience) highlight this relationship between sensory aspects, decision making and creativity. Beaty *et al.* (2018) found a positive correlation between the regions of the sensory-motor brain and borderline controllability, suggesting that a greater role of integration of brain sub-networks in the sensorimotor areas contributes to obtaining more creative responses in divergent thinking tasks or artistic production processes. In addition, they postulate that creative people have greater ability to co-activate neural networks that usually work separately (they observed a dense connection and coupling), such as default network (used when the brain is at rest or imagining), salience network (which is used to discern about the importance of objects) and central executive network (which is activated in decision making). The above coincides with the proposal of Goleman (2013), who points out that emotion has a direct influence on creative processes and thinking in general and, above all, in decision making, an important factor for the development of critical thinking.

Kenett *et al.* (2018) also agree that the integration of sensory-motor areas intervenes in the creative capacity, noting that this is consistent with the perspective of embodied cognition. This would take place through the sensory-motor

simulation, the perceptual recreation and the acquisition of the introspective state during experiences with the world, the body and the mind. Linking with the proposal of Beaty *et al.*, who also postulate that this mesh of networks (by default, executive control and salience) is consistent with the dynamic perspective of the brain.

For Smith (2005), in his proposal of cognition as a dynamic system, cognition is fundamentally linked to the corporal processes in real time through our actions in the physical world; in this way, knowledge is embedded in the processes of perception and action. The above also connects with the notions of 4E-Cognition Theory (embedded, extended, embodied, enactive). This theory postulates that cognition develops in a complex network system where the brain/body is embedded, extended and acts in the world (Parada & Rossi 2018; Hibbert 2016). From this perspective, both context and situationality constitute the very essence of cognition (Varela *et al.* 1991).

Some interesting aspects extracted from the conceptualisations reviewed so far allow us to establish links between the neural networks that govern our emotions and decision making. Keeping the idea that they are common systems that are part of these cognitive processes allow demonstrating the co-dependency between critical and creative thinking. Therefore, from the cognitive sciences there are indications that allow establishing the complementarity between both, approaching the existence of complex thinking from this perspective. It also allows us to establish that, like all cognitive processes, their development is not limited to brain functions, but that these functions extend to action, situation and context, opening the possibility to characterise it as a competence.

Complex thinking as metacompetence

Maidana (2011) argues that from the theory of complexity the cognitive is multidimensional, therefore complex thinking must be conceived as the ability to interconnect different dimensions of reality: it cannot be reduced to the intellectual, since it includes affective and psycho-social; nor to the individual, since it includes the collective and social interaction; nor to the psychological, since it includes the biological and the sociological; likewise, it includes the contextual and the situational. From this perspective, in addition to being linked to the notions of 'situated competence' or 'complex approach to competences' proposed by Jonnaert *et al.* (2008) and Tobón (2007), respectively, who agree when defining it as the capacity to mobilise internal and external resources in situations or contexts.

Jonnaert *et al.* propose the notion of 'situated competence', holding that 'competences can not be defined except in terms of situations; they are as situated as knowledge in a social and physical context. The concept of situation becomes the central element of learning' (Jonnaert *et al.* 2008, 3). It is in a situation where the student constructs, modifies or refutes knowledge. Being competent is not only applying a set of knowledge to a certain situation, but being able to organise your activity to adapt to the characteristics of each situation and context: 'The competence then becomes the dynamic organising structure of the activity, which allows the person to adapt to a type of situation based on their experience, their activity and their practice' (Jonnaert *et al.* 2008, 15).

From the above, the parallels are evident when compared with the notion proposed by Lipman (1997), when he postulates that among the essential conditions

of complex thinking are that it has to be sensitive to the context and applicable to different situations. This implies flexibility of thought to recognise different situations since each context demands different applications of rules and principles. It means recognising that there is not only one point of view, but that all knowledge and reflection is made from concrete perspectives or specific situations. Therefore complex thinking, as thought sensitive to context, implies the recognition of: exceptional or irregular circumstances; limitations, contingencies or special restrictions in which normally acceptable reasoning could be prohibited; general settings; the possibility that the evidence is atypical; and the possibility that some meanings cannot be transferred from one specific context to another.

> *Complex thinking is thought that is aware of its own assumptions and implications, as well as the reasons and evidence on which its conclusions are based. Complex thinking examines your methodology, your procedures, your perspective and your own point of view. Complex thinking is prepared to identify the factors that lead to bias, prejudice and self-deception. It involves thinking about the procedures themselves in the same way as thinking about the subject matter.*
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> (Lipman 1997, 67)

From the point raised by Lipman, in relation to the metacognitive characteristics implicit in complex thinking, by becoming aware of their own assumptions, their procedures and by being a cognitive process that integrates both critical and creative thinking, we can postulate that it belongs to a higher order of competences, and dare to call it a metacompetence.

For Gustav Bergmann (2006), a metacompetence is a competence of competences, understood as universal competence. A metacompetent actor would have the capacity to face any problem, possess supra-regional thinking abilities and act with a great scope of empathy and self-distance. For Hobohm *et al.* (2014) a metacompetence that not only includes the informative value of one's knowledge, but also one's experience, is critical thinking and acting. Metacompetence is based on competition itself and arises precisely in the interaction of self-reflection and external reflection. It is the ability to reflect and evaluate the competences of oneself and others. Referring to two distinct observations, one is the development and action itself in specific social situations and the second, in relation to the context, is a game of interdependence between subject of action and context. Based on the definition of metacompetence proposed by these authors, we can find some aspects that are shared with the notions of complex thinking reviewed so far, such as thinking and acting critically, the capacity for reflection and self-reflection, and the implicit evaluation and the relationship with the context. All these metacognitive processes are inherent in complex thinking.

Bergmann (2006) also proposes that metacompetences can be understood under four focuses: metasystemic competences as metacompetence; metacompetence as wisdom; metacompetence as development of other competences; and metacompetence as a universal ability to solve problems. Next, each of these approaches is reviewed and analysed in relation to the skills and characteristics that make up complex thinking.

Regarding the first approach, metasystemic competences as metacompetence is related to metacognitive aspects such as self-knowledge and self-determination. For example the motives of life are considered specific metamotivations of the personality because they act as essential components for decision and behaviour.

Metacompetent actors, in this sense, are capable of having greater capacity for decision making and rationality in their performance. From this perspective, complex thinking makes it possible for the process of thought to self-evaluate and optimise itself. For Lipman (1997), a metacompetent actor is also self-corrective and self-regulating, characterised by his interest in discovering his own weaknesses and rectifying errors in his own thought processes.

Regarding the second approach, metacompetence as wisdom is conceived as the possession of knowledge at the expert level, characterised by extensive knowledge about the course of life; procedures and solution strategies; the contexts of life and their temporal relationships; the relative indeterminacy and unpredictability of life; and the relativism of differences in values or priorities. Although, for this approach, the life experience for the acquisition of said knowledge and skills is determinant, at least for the majority of the characteristics it is possible to develop skills for solving problems through complex thinking. It is also possible that complex thinking contributes to having a consistent attitude to face the indeterminate, the unpredictable and the uncertainties of life.

Regarding the third approach, metacompetence as development of other competences is a level of competence development that serves to develop other competences. Through metacompetence the observation of the development of the competence can be described. It is closely related to learning to learn. In this regard, Lipman argues that complex thinking acts as a context in which cognitive skills are perfected.

Finally, regarding the fourth approach, metacompetence as a universal ability to solve problems is understood as a level of competence development of universal character that allows solving complex and diverse problems with the ability to use skills in any situation or specific context, related to the transfer capacity. It is also conceived as the ability to self-organise systems. Lipman proposes that complex thinking develops capacities for the solution of problems in any situation or context and is oriented by megacriteria, an example would be the search for truth. This can be understood as an attitude that can be transferable in any action. In this sense, it is also a meta-attitude because it serves life, as is the application of critical or creative judgment towards all kinds of questions or in the resolution of any problem.

Art, art education and the development of creative and critical thinking

For Eisner (1995), artistic education allows students to generate multiple responses to specific problems, which other areas of the school curriculum do not, encouraging the development of superior skills such as critical thinking and creativity. For Touriñán, it is necessary to understand artistic education in its entirety as a field of education. Its purpose is not only to train professionals in a specific area, but also to contribute to the general education of all students, that is, to develop common formative values to all education. These formative values are 'proper values of the meaning of education in the form of learning located in a specific time and physical-personal-socio-historical-cultural space' (Touriñán , 60) as well as skills, habits, attitudes and knowledge. It is important to develop the educational competences necessary for the current context, towards an integral development of the students, including the formation of critical and creative subjects.

To understand how the development of these types of thinking would take place through art education, it is necessary to begin by understanding what we refer to under the concept of 'art'. One of the great problems of art precisely concerns its lack of definition, because there is still no agreement. For some, the search for a definition could be classified as essentialism, whose work would be an impossible task. For others, the lack of definition of art is precisely its essence (Castro 2005; Martínez 2017). For Parselis (2008), the anti-essentialism influenced by Wittgenstein's thought and poststructuralism generated this movement that rejects the search for a definition of art in terms of essence. Although there is no consensus on a precise definition, if it is possible to delimit it, it is possible to determine its historical origin and establish the difference between what art is and what it is not.

Gadamer (1991) delimits referring to the historical origin of this concept, pointing out that the emergence of this sense of art is separate from the productive practice that coincided with the invention of aesthetics (in the eighteenth century). He argues that from the moment this concept adopted the tone that for us is our own, it was detached from any relationship with life since art did not want to be anything other than art, as is accentuated in modernity. Like Adorno (1970), Gadamer establishes correspondences between criticism and aesthetics. In this regard he points out:

> the 'critique', that is, differentiating the beautiful from the less beautiful, it is not, properly, a later trial, a trial that scientifically subsumes the beautiful under concepts, or that makes comparative appraisals about quality: the critic is the experience of the beautiful itself. (Gadamer 1991, 59)

In this way, both criticism and creativity are conditions inherent in art, artwork and aesthetics.

For Danto (1999), the essence of modernism rests on the use of the characteristic methods of a discipline for self-criticism and this is a characteristic attitude of avant-garde artistic manifestations, something that Bürger also raises in his *Theory of the Avant-Garde*. Bürger (2000, 103) postulates that with the avant-garde movements 'the artistic subsystem reaches the stage of self-criticism and with this, art itself becomes the content of art'. It analyses the development of the avant-garde in its attack on the status of art, on its autonomy and above all, on its attempt to overcome the separation of art with respect to vital praxis and its lack of social function. It would be a false overcoming since it has already reached the stage of self-criticism. The avant-garde artistic manifestations criticise rather than self-criticise the preceding tendencies. They criticise the institution of art, its production and distribution apparatus as well as the ideas of art that dominate in a determined time and that determine the reception of works.

This critical or self-critical character towards the systems of representation is a fundamental principle of contemporary art and it is what allows cataloging an artwork and differentiating it from any utilitarian object. From this perspective, it is important to point out that art and the artwork are not limited to a specific discipline or area. Art can arise from visual arts, musical arts, literature, theatre or dance, among others. For Wimmer (2002, 59), art 'always demands new answers to the question, in what way should the existing symbolic system be organized?'. He also maintains that, as an inexhaustible source to observe, perceive and think, art could help us overcome the traditional vision of education.

In an approach in tune with what Wimmer suggested, some authors such as Hernández (2013), Freedman (2006) and Duncum (2009) propose an expanded

vision of artistic education directed towards studies in visual culture. Freedman argues that in the context of a globalised culture, faced with the constant increase and proliferation of images (especially at the virtual level), these, through their symbolic and representative power, influence the conformation or deformation of reality. Therefore, it is necessary to educate the students so that they can look critically at these images. For Hernández (2013), this proposal does not only seek to expand the objects that are part of the study of art in education, but also involve new strategies and ways of learning, which would entail epistemological, methodological and political implications to favour students' change of position, a shift from the position of receptors to that of visualisers and critical authors.

Art education and its relation to the development of complex thinking

The possible contribution of art or art education to the cognitive development of students is something that has not yet been established with precision from scientific research. Winner *et al.* (2014, 11) point out that, although all associate art with creativity, 'research on multiartistic education has not clearly demonstrated that it exerts a causal influence on creativity and the ability to resolve student problems'. However, research from neuroscience developed by Beaty *et al.* (2016) reveal that this relationship could be established.

Beaty *et al.* (2016) investigated the role of the brain's control network regions in musical improvisations using functional connectivity analysis. A group of professional pianists were asked to: first, play the piano using only a specific set of keys; and then, they would create a musical improvisation expressing specific emotions. The results showed that improvising expressing emotions was associated with greater functional connectivity between the control network of the dorsolateral prefrontal cortex and the predetermined network. In another study, visual arts students were asked to design ideas for a book cover and then evaluate those ideas. Functional connectivity analyses revealed a greater coupling of the default and control network regions during the evaluation of the idea, consistent with the study described above. The experiments showed that the evaluation of the idea implies a greater functional coupling of the default and control networks.

These studies suggest that the generation of new ideas benefits from the self-generation of thoughts that originate in the default network. In addition, they are consistent with the subsequent studies on creativity carried out by the same authors, who postulate that the same functional coupling exists between the analysis of artistic performance and the analysis of divergent thinking tasks in highly creative people (Beaty *et al.* 2018).

Regarding the relationship between critical thinking and art, although there are no scientific studies to clearly establish their contribution, many authors posit the complementarity and dependence between critical and creative thinking (Lipman 1997; De Bono 2000; Águila 2014; Cernas *et al.* 2015; Saremi & Bahdori 2015). Therefore, this relationship could be established from studies on creativity such as those mentioned above. In artistic production, critical thinking occurs when questioning the representational aspects of objects or phenomena and implies, inherently, having thought of alternative solutions. Creative thinking occurs when proposing divergent results, new possibilities or meanings to problematic objects or situations and implies, inherently, having previously put into crisis its

representational or functional aspects. In this sense, and following Lipman, the relationship between artistic production and critical thinking + creative thinking becomes evident, that is, between artistic production and complex thinking. From this perspective, it is possible to postulate that the education of art contributes to the development of complex thinking, at least from a theoretical dimension.

To develop complex thinking (critical + creative) according to the conceptualisation proposed in this study it is necessary, paraphrasing Efland *et al.* (2003, 16), to abandon educational practices related to artistic-modern expressions of the self, since 'many of the practices used today by art teachers, if not most, are based on modern conceptions of art'. This is a problem that still persists in some places, as shown by a study conducted by Daniela Cobos. She found that most teachers (from schools in the Metropolitan Region in Chile) focus their classes from academic, productive and self-expressive models. She concluded that 'we cannot observe activities such as "group self-reflection" or construction of artistic knowledge through dialogue or critical reflection about personal aesthetic experiences' Cobos 2013, 6). Furthermore, she maintains that this would happen because there are notions of art linked to values such as free self-expression or linked to academic conceptions still circulating in the environment.

Conclusions

As conclusions we can emphasise that, from the revised conceptualisations about complex thinking, it is possible to distinguish the parallelisms between the notions proposed by Morin and Lipman; both notions are closely interrelated. Among the main convergent aspects are thoughts that: overcome a simple, reductive and fragmentary thought; explore the logical, multilogical and dialogical possibilities; recognise uncertainty and ambiguity; imply approaching knowledge from multidimensional aspects; utilise interdisciplinary, multidisciplinary or transdisciplinary methods; and examine in a critical or self-critical way their own procedures and methodologies, self-regulating their thought processes (metacognition). From the above, we can postulate that complex thinking not only promotes the construction of knowledge but also its deconstruction, especially if we consider that in the cognitive process both critical and creative thinking interact.

It is also important to note that, in current terms, cognitive processes are not limited to the human brain alone. The development of cognition occurs through action and interaction with their environment, thus linking to the notion of 'situated competence'. Therefore, complex thinking, as a cognitive and metacognitive process, thanks to the self-regulating components of thought and its practices, allows us to place it at a higher level of competence. In this sense, we can postulate that complex thinking is a metacompetence.

Another important conclusion thanks to Beaty *et al.* (2018) is that it has been established that creativity is a cognitive process that involves the functional coupling of three neural networks (default, executive control and salience), which usually work separately. They observed that highly creative people and artists, in divergent thinking tasks or artistic productions, showed the same capacity of coactivation and coupling between these networks. Another important aspect is that the integration of the sensorimotor system, emotions and decision making are common elements that had been theoretically-conceptually proposed for both critical thinking and creative thinking. Therefore, such correspondence is confirmed from the cognitive sciences.

We can propose that the contribution of art education to the development of complex thinking metacompetence could occur from the use of learning methodologies that encourage the participation of students through the production of artistic works (be it visual, musical, literary, among others) that involve critical and creative processes. This generates instances where students can suggest new forms or meanings for objects or everyday situations in the search for divergent results. For this, it is necessary that both the curriculum and teachers have a vision linked to critical or self-critical approaches to the systems of representation. There also needs to be an expanded and interdisciplinary vision, understanding that art is not circumscribed to a specific discipline, which would allow its transfer to other disciplines or subjects of the curriculum. So, education changes the traditional perspective through a more reflective and critical respect towards the representational systems of each discipline in particular, advocating an educational approach in tune with the inherent complexity of cognitive processes and knowledge in general.

As a future task in this line, we consider it necessary to carry out empirical studies that would allow us, through experimental investigations, to observe and determine if there really are correspondences between art education and the development of complex thinking in students. This would involve developing learning methodologies and assessment tools that include aspects that allow the observation of cognitive processes related to critical and creative thinking in an integrated manner. Extending the methodology towards a mixed methods study would allow us a greater understanding from the different dimensions linked to these cognitive processes, considering that studies of this type, including the systems of interaction and the social environment, are scarce. We should keep in mind that cognition is currently conceived under this perspective.

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