CSCanada
Higher Education of Social Science
Vol. 16, No. 2, 2019, pp. 31-37
DOI:10.3968/10946

ISSN 1927-0232 [Print]
ISSN 1927-0240 [Online]
www.cscanada.net
www.cscanada.org

Visual Thinking: An Attempt at Dissecting Visual Aesthetics

Hanibal Charles Srouji[a],*

[a]Department of Art and Design, Lebanese American University, Beirut, Lebanon.
*Corresponding author.

Received 23 April 2019; accepted 19 June 2019
Published online 26 June 2019

Abstract

In Art Education, reading and understanding artworks and designs through a direct process of structural analysis improve visual thinking and performance, especially at the foundation level. This paper examines ways in which the learning process takes place. It argues that mathematical relations and geometry are underlying constitutes in artworks. The analytical process enhances the learners' cognition, perception, and their acquisition of visual and iterative skills that can significantly affect their development. Accordingly, it considers the mechanisms of the analysis and their educational value, as these may solicit novel rereadings of the artworks and their aesthetics.

Key words: Visual thinking; Reading artworks; Perception; Art; Design; Teaching methodology; Visual analysis; Education; Mathematics; Geometry

Srouji, H. C. (2019). Visual Thinking: An Attempt at Dissecting Visual Aesthetics. *Higher Education of Social Science*, *16*(2), 31-37. Available from: URL: http://www.cscanada.net/index.php/hess/article/view/10946
DOI: http://dx.doi.org/10.3968/10946

ANALYTICAL READING

Visual perception occurs in different ways and at different stages, and leads to altered appreciations, thus embodying novel ways of seeing and thinking. This paper is a contribution to general thought involving the reading of artworks and the transmission of such knowledge through teaching. It calls attention to how analytical drawing, as a perceptual tool, can help learners gain insight and skill in the fine arts and design fields. More specifically, when accessing the general compositional aspects of a work of art or a design, this kind of analysis can certainly lead to a better understanding that requires higher levels of cognitive skills and therefore leads to a deeper learning and the transfer of knowledge and skills to a greater variety of tasks and contexts. (Adams, 2015, pp.152-153)

Significant artworks, in their complexity, are based, whether intuitively (visually) or intentionally (rationally / mathematically), on relative and proportional relations among the *parts* that constitute the *whole*. When examined, the compositions demonstrate an inherent structural complexity comparable to a mathematical relativity among their visual constituents. They are integral constituents of the artworks and generate expressions and aesthetics.

In studio art and design education in general, addressing through artwork analysis the notions of geometry, relativity and proportional relations of structural components in compositions can advance visual thinking and enhance the learners' creativity. The geometric aspect of the analysis' outcomes calls on mathematics, which is of practical value when applied to addressing problems related to elementary geometry in two or three dimensions. (Grunbaum and Shephard, 1985, p.V)

ANALYTICAL METHODOLOGY IN READING ARTWORKS

This research is based on knowledge and data accumulated over the past years of teaching undergraduates who have entered the art and design fields with little art background. I have developed a teaching methodology based on the analysis of artworks for the foundation course at the School of Architecture, Art and Design. The course, grounded with a study of artworks by major artists, intends a reading from *within*. The outcomes were registered in the form of analytical drawings and schematic layouts.

The initial records of underlying primary axes, inter-relations and geometry become schematic guiding tools for further development and creation. The simplicity in these representations conveys the necessary information more effectively than detailed depictions. (Washburn, 1983, p.3)

Learners acquire a global comprehension of what it was in the original artwork that had interested them consciously or unconsciously. This wealth of information can be reinvested in a variety of exercises where students create their own compositions, designs, and models. They will adapt and exploit the outcomes and concepts of their findings in their own compositions. This teaching methodology in a studio class was primarily developed as a general plan for the course. I was motivated by the students' enthusiasm, discovering underlying formal relations. They succeeded in seeing artworks as intelligent structures with mathematical relations throughout the compositions: inner frameworks, relative proportions, and relative geometrical structures. These relations became evident once they were made visible; having clarified the interrelated interactions between sections and composites within the artworks. (Figure 1)

RECIPROCITY BETWEEN THEORY AND PRACTICE

In *Painting and Experience in the Fifteen Century*, Michael Baxandall writes "An old picture is a record of visual activity. One has to learn to read it, just as one has to learn to read a text from a different culture." Paintings are "a distinct kind of fact: what they offer is an insight into what it was like, intellectually and sensibly, to be a Quattrocento person." (Baxandall, 1972, p.152) Baxandall's analogy between the reading of a text and that of a picture highlights analysis as a way to understand, among other things, the artist's intention and the culture. This kind of reading is thus very productive in studio-art teaching. It becomes essential to practice visual thinking through processes and techniques that open up ways for learners to conceive and create their own.

Learning to read the records of visual activity in artworks is an asset in studio-art teaching. Pamela Smith, in *The Body of the Artisan: Art and Experience in the Scientific Revolution*, extends such observations to note that artworks are also the product of *artisanal activity*. As such, they are not just records of visual activity, but also records of beliefs, cognition, and categories of thought embedded in the process of production and creation. The intertwining relationship between theory and practice is clarified in P.H. Smith who argues in favor of practitioners who understand matter and have articulated their *process of cognition* through it. (Smith, 2004, p.22)

The development of reciprocity between applied processes of cognition and scholarly visions of aesthetics has become today instrumental in art and design teaching. The accepted knowledge that artworks are cognitive constructs in the physical world implies that they reflect the visual thinking that went into their creation as much as they reflect on the culture and technology of their times. The reading of artworks that is their *deconstruction* through an analysis process allows the examination of their imbedded structures. This consequently leads to their *raison d'être*, meaning, and aesthetics.

During the Renaissance, Natural laws were studied and applied to give rise to new forms of thought and aesthetics. (Baxandall, 1972, p.153) The reciprocity between an applied analysis of artworks and their critical academic review incorporated in art and design studio teaching brings learners to experience the nature of artmaking and design through the experiences of other creators. The adaptation and application of such assimilated knowledge, in addition to the visual *deconstruction / reconstruction* processes, lead inevitably to higher learning through *transfers of knowledge and technique*. It opens paths to development in the visual field where analysis becomes a powerful and direct learning tool of transmission and application of knowledge: *doing / un-doing / redoing*.

THE ROLE OF MATHEMATICS

Work from the individual student's own interest.

Make the mathematics important mathematics.

Learning mathematics should empower the students, not overwhelm them.

All students have expertise.

> Have the students share their course projects with each other in class.
>
> Judith V. Grabiner

What Judith Grabiner in *How to Teach Your Own Liberal Arts Mathematics Course* recognizes as essential practical instructions to teaching mathematics is very similar to organizing teaching in an art or design studio class. When learners can choose the artworks that interest them, they show a greater engagement / commitment and concentration. Mathematics helps clarifying the inter-relations between elements in the analysis outcome. It empowers learners through their new acquired knowledge of the relations between the various components in compositions. A knowledge created by relative visual associations through Geometry, re-creating relevant ratios between the composites (lines, shapes, colors etc.) whereby they become measurable and rational visual guiding tools.

The challenge of communicating basic underlying mathematical notions, geometry, and composition to the generally 'math-unfriendly' art and design students is always a challenge. Doris Schattschneider, in *Mathematics and Art - So Many Connections*, points out to many interconnections between mathematics and art. She highlights the fact that there are inner and direct mathematical correlations between the dimensions of

the parts, their underlying geometric structures, and the apparent surface divisions in artworks. "Voluntary mathematical constraints can serve to guide artistic creation. Proportion has always been fundamental in the aesthetic of art, guiding composition, design, and form. Mathematically, this translates into the observance of ratios. Whether these are canons of human proportion, architectural design, or even symbols and letter fonts, ratios connect parts of a design to the whole, and to each other." (Schattschneider, 2003, p.4) In the event, learners become more aware of the importance of such notions as *structure, proportions, geometry, and relativity* as they construct expression. They recognize that artworks are constructs, measurable by simple means.

GEOMETRY AND UNITY

> Then, my noble friend, geometry will draw the soul towards truth, and create the spirit of philosophy, and raise up that which is now unhappily allowed to fall down[1].
>
> Plato

Plato had a comprehensive picture of the cosmos divided into a higher divine, intelligible world and a lower human, sensible world, with mathematics as a crucial link between these worlds. "Humans are to attempt individually to divinize themselves, somehow attaching themselves to that higher world." (Mueller, 2005, p.117) Plato saw mathematics as a key factor in all human attempts towards a higher existence. A notion that was imperative to Leonardo Da Vinci who saw a work of art as a unique unmediated experience of nature. Many artists who came after him believed that art could be a universal language. Equally, Ernest Cassirer sees "art theory" as converging with mathematical idealism to temper the new naturalism [of the Renaissance] and give birth to a recognizably modern science. (Cassirer, 1963, pp.134-35) This, in turn, gave rise to the ideas that a materially real physical world could be understood from this universal point, and that once gained, this knowledge could be mathematicized. (Summers, 1987, p.323)

Art and design can but implicitly be mathematical in their production. Artworks remain in the realm of the measurable as units of knowledge. Unity remains a fundamental dynamic visual factor in art and design production. Seeing an artwork as a whole is always more than the mere sum of its parts. This implicit notion of the part–whole relation, a key principle in the "Gestalt School" of thought, is at the very root of visual awareness. (Koenderink, 2013, p.1)

In a composition, simple geometry[2] and mathematics play an important role as structural implementing practice and visual thinking. They effectively edify artworks as holistic units. Drawing the structural frameworks of artworks to illustrate their apparent complexity in simple form has highlighted the relative measures, regardless whether these are visual or rational, between the constructs in visual creations, as they are presented within defined spaces.

The progression of understanding artworks may parallel the processes of conceptualization and creation. The recognition of underlying geometric configurations progresses through a hierarchy of levels, following a progression from general to specific. This hierarchy is noteworthy because, although learning can occur at several levels simultaneously, learning of more complex concepts and strategies requires a firm foundation of basic skills.

WAYS OF SEEING

> "Vision is not a mechanical recording of elements but rather the apprehension of significant structural patterns."
>
> (Arnheim, 1974, p.6)

Rudolf Arnheim, in *Art and Visual Perception: A Psychology of the Creative Eye*, specifies "What a person or animal perceive is not only an arrangement of objects, colors, shapes, movements and sizes, but, perhaps first of all, an *interplay of directed tensions*. Because they have magnitude and direction, they can be described as psychological "*forces*." (Arnheim, 1974, p.11) These underlying forces play a significant role in the conception and realization of an artwork or a design. They, if not, constitute its expression and aesthetics.

If we consider a work of art as a closed system relying on internal, interrelated, and established frameworks, it must be examined autonomously. The visible shapes are largely determined by their outlines and contours. In "speaking of *shape*, we refer to two quite different properties of visual objects: the actual boundaries, or outlines, masses, volumes, and the structural skeleton created in perception by [the] material shapes, but rarely coinciding with them." (Arnheim, 1974, p. 92)

Artworks exhibit definitive perceptible frameworks and structures that unite their composites. Marks of different kinds may contribute to this structural geometry, although it may not be visible on the surface. Discovering these inter-relational systems empowers learners as they succeed in recognizing the underlying geometry within, and especially the proportional relations between the parts which become both intuitive and *empirically* evident.

By the tracings of the visible outer boundaries, contours and shapes, used as masses or surfaces, a record of the initial reading of the visible composition as a whole is set. Shapes may express one or several axes. Forms that are composed of several components with a dominant axis may as well incorporate sub-axes for each of their component shapes. (Samara, 2012, p.37) Yet, deeper observations of the marks, shapes, or masses inevitably lead to the perception of connections between their interior divisions, sometimes with increasing complexity. Imaginary *invisible* lines may bisect forms or connect fragments

throughout the composition. The mapping of an artwork, by drawing its visible components and its underlying geometry and structures, gives a clear and implicit insight into the composition as a whole, and highlights the inner, and sometimes not so apparent, relations between the parts. Mathematics and geometry, in this case, offer visualization of a "functional unity"[3]; in the sense that they offer instruction on how the parts are organized as parts of a functioning whole. (Tenen, 2011, p.210)

The outcomes of this analysis are sensible visual records of the visible final decisions made by the artist and their embedded underlying mathematical configurations. They are clear abstract systems that can be used by the learners to reinvest and expound upon in their creations. Developing art and design teaching through a problem-solving attitude can be very effective in passing on fundamental knowledge.

DRAWING IS THINKING AND UNDERSTATING

"Visual experience is dynamic."

(Arnheim, 1974, p.11)

"Delacroix said that in drawing an object, the first thing to grasp about it is the *contrast of its principal lines*: 'one must be well aware of this before one sets pencil on paper.' All through a piece of work, the artist must bear in mind the structural skeleton he is shaping while at the same time paying attention to the quite different contours, surfaces, volumes he is actually making… What shall be seen as a whole in the final work is created piece by piece. The guiding image is in the artist's mind… the structural skeleton, the configuration of the visual forces that determines the character of the visual object. Whenever that guiding image is lost sight of, the hand goes astray." (Arnheim, 1974, p.93)

Drawing offers intimate personal qualities that are necessarily notable experiences, and an added value to research, visual thinking and making. "*Learning to see*" through drawing helps to build up the necessary self-awareness and self-confidence, thus enabling learners to engage in the iterative creative process and thereby encouraging generative self-criticism. (Lecanides-Arnott, 2014)

Analytical drawing as an active investigation practice can only edify a learner's imagination as to clarifying the settings of a visual creation. By depicting the variation in line and surface rendering, analysis reveals the importance of placement, proportions, and structure in a composition as a whole, while raising awareness as to the artist's visual thinking and technical methods of application. The understanding of such underlying interactions and visual mechanisms do not only contribute to the narrative embodiments in artwork, but also to thinking of *Art as expression*.

As marks accumulate and disperse over the picture plane, they give rise to composites of lines, shapes, and planes that construct the artwork in varying degrees of naturalism or stylization. Complex structures become easily recognized as they are identified. The underlying geometry becomes a tool to *play* and construct with. These new venues of visual thinking empower learners with novel means to experiment and apply. They become familiar with the processes that have led to the complexity they are studying. Once these ways of thinking are integrated, they can undertake intuitively similar venues and work. They experience through the dismantling process of the artworks the methods, notions and ways of their re/construction. Deconstruction and reconstruction provide rare insight into compositional mechanisms and open potentials. However, there can be different, competing, and contradictory interpretations of the same artwork, which will only challenge and enrich their understanding of a work of art. (Barrett, 1994)

Analytical studies examine and analyze space, mass, scale relationships and configurations of form clusters over the picture plane or in space. And therein, it lays the first step to de-structuring an artwork by recording its shapes and the elements underpinning its complexity. These structures, being reductions of the compositions to the basis or the iconic interpretations, call upon fundamental geometry. (Samara, 2012, pp.36-37) Considering a simple composition, for example; any point placed or any line traced in the physical world, creates visual tensions and mathematical and geometric interactions within its defined pictorial space. Consequently, in all cases, the correlations between these tensions define its expression. Analysis has shown that there are various underlying sub-structures pertaining to certain artworks that add to their complexity and meaning.

VISUAL THINKING IN PRACTICE

"Everything in the world is ruled by proportions…"

Frans Xaver Messerschmidt

Teaching art and design is not merely a program with a potential to produce artistic images. It transmits a way to create a rapport between forms inducing meaning, expression, and aesthetics.

Studio-art teaching implies essentially passing on knowledge on how to create relationships between forms and visual components that induce meaning and expression in their interaction. Organizing these elements inevitably sets invisible structures within a composition. In other words, for the learners' to develop their creativity, they are to *see* artworks or designs as conceived within cohesive visual spaces, whether they were accomplished intuitively or rationally. The associations between their parts have consistent proportional mathematical relations

between them that relate to their size and space. It may be easier here to invoke the analogy of architecture, such as in a physical building: an artwork has a framework that holds the parts together. It is also similar to a structure whose framework is made up of parts; it may appear difficult to perceive, because of the layers on top of that framework or around it.

Yet, "the structure of these features seems to embody the way a culture perceives, categorizes, and organizes a particular segment of its world." (Washburn, 1983, p.1) It also conveys the perception and visual thinking of the *artists*, as individuals, in reference to the classification processes intrinsic to their culture, while the revelations of the analysis are compound information in its purest form as to how and what the learner was able to perceive of what the maker has shaped culturally, consciously or unconsciously.

In artworks, the apparent marks over the picture plane define both the underlying structure of visual interconnections and the unity within the perceptual space. The perception of the interactions between the apparent marks, regardless of their technical rendering, implies their visual inner mechanisms and structures. While frameworks and structures are explicitly revealed in geometric compositions for example, and in many cases, other frameworks, patterns and structures underlie the apparent identifiable arrangements. These interpretations, again, are contingent on the observer's perceptual abilities and his or her cultural background.

Art-making can be at the same time analytical, intuitive, structural, and descriptive or not of the observable *object* or *concept*. Analysis helps to clarify the frameworks of what is perceived in the form of registered empirical outcomes. And, at the same time, this process of deconstruction clarifies the inherent conceptual methods and techniques. Analysis allows a deeper understanding of the singular mechanisms of creation of form, visual articulation, and consequently, of expressive qualities. Gradual conscious exploitation of these visual thinking methods directs learners into a more intuitive practice and a more innovative application. They will learn to follow their mental projections, along Delacroix's description, as visual guidelines when configuring their own creations.

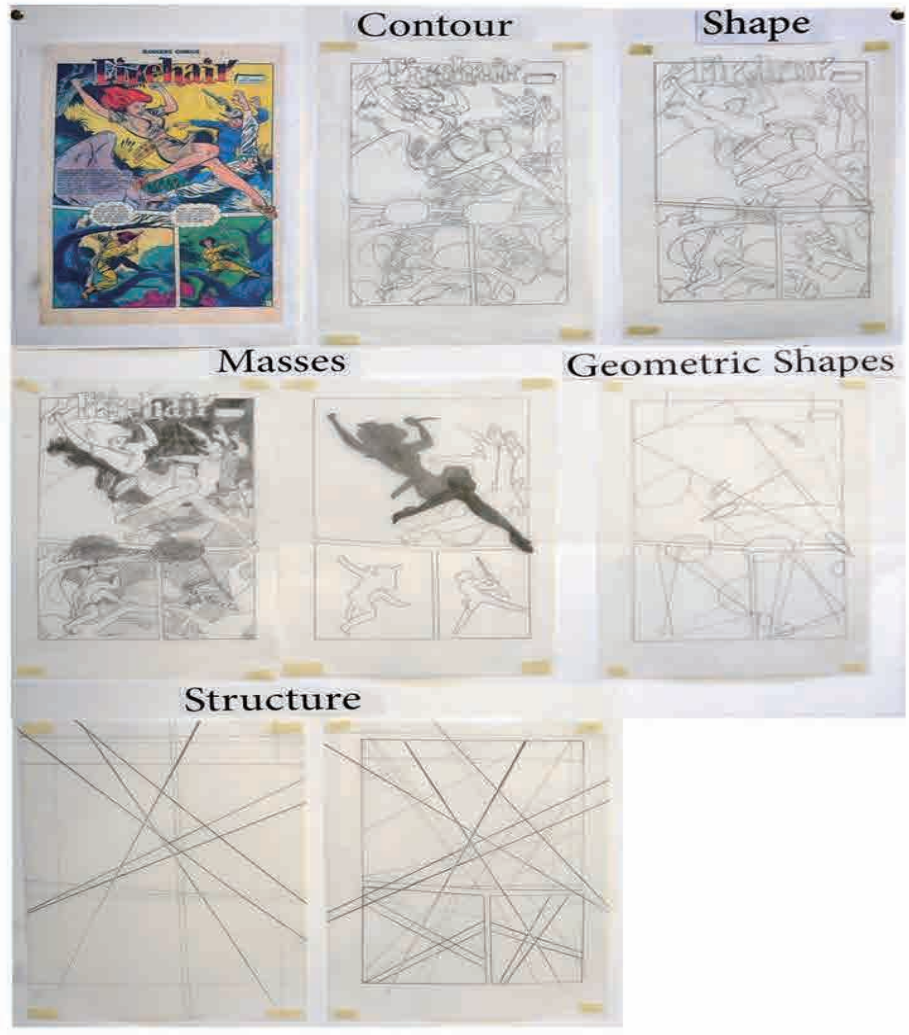

Figure 2
Student's analysis of a vintage comic strip
(With enthusiasm, students applied into different visual compositions the same methods of analysis they had exercised on Classical and Modern paintings.)

CONCLUSION

> The union of the mathematician with the poet, fervor with measure, passion with correctness, this surely is the ideal.
>
> (James, 1987, p.356)

The vitality and complexity of artworks can only impact teaching and learning in art and design, as they combine disparate skills: cognition, perception, visual thinking and intuition in creative practice. These sources of visual knowledge are underexploited in studio art education. The analysis of artworks helps to build a conceptual and interpretive base, thus opening potential to novel applications and aesthetics. It exhibits different inherent methods of visual thinking, expression, and techniques relating to the dynamics of the recorded knowledge in compositions. These methods are implicit cognitive guidelines. When recognized and recorded, they become powerful cognitive tools open to development.

Basic knowledge as to how artworks are conceived is necessary to develop creativity in art and design. The analysis of significant artworks and designs has proven useful in passing on comprehensive and applicable knowledge. It improves perceptual skills and mental visualization, and gives insight into different modes of visual thinking and technical applications. More specifically, it clarifies the manner in which the geometry and the mathematical relations reflect the artist's decisions throughout the creation process.

The recorded observations of the analysis are directly related to the learner's perceptual capacities and processes. They are also directly influenced by the learner's cultural background and social factors. Such disparity indisputably presents an added value as it makes the depictions unique to the observer's cognition and culture. In all cases, and especially in art education, this will open up possibilities towards more personal interpretation and development. Analysis remarkably contributes to *thinking through making* methodologies, and must be introduced into universities' and art schools' curricula at an early stage. It plays a significant role in art and design education, especially in the foundation year. Learners gain valuable knowledge through personal involvement, and enhance their critical thinking and assessment that reflect directly on their self-awareness and self-confidence. They will emerge with added knowledge and armed with the necessary means to engage in and challenge compound subjects and concepts.

This paper illustrates how perceptual, analytical, and expressive abilities are developed through the use of simple skills: *Learning to see and read artworks*. By recognizing and re-investing the knowledge and the methods they acquired, learners will be able to engage in more complex iterative creative processes. This framework ensures continuous learning and development in an increasingly complex world.

REFERENCES

Adams, N. E. (2015). Bloom's taxonomy of cognitive learning objectives. *Journal of the Medical Library Association*, *103*(3), 152-153.

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing. Boston, Massachusetts: Allyn and Bacon (Abridged Edition).

Arnheim, R. (1974). Art and visual perception: A psychology of the creative eye. Berkeley: University of California Press (expanded and revised edition of the 1954 original),.

Barrett, T. (1994). Criticizing art: understanding the contemporary. Mountain View, California: Mayfield Publishing Company.

Baxandall, M. (1972). Painting and Experience in the Fifteen Century Italy. Oxford, New York: Oxford University Press.

Bloom, B. S., Krathwohl, D. R., & Masia, B. B. (1964). Taxonomy of educational objectives. Classification of educational goals. *Handbook 2: affective domain*. Boston: David McKay Company, Inc..

Bloom, B., Englehart, M., Furst, E., Hill, W., & Krathwohl, D. (1956). Taxonomy of educational objectives. Classification of educational goals. *Handbook I: cognitive domain*. New York: Longman, Green & Co..

Cassirer, Er. (1963). The individual and the cosmos in renaissance philosophy (M. Domandi, Trans.). New York: Harper.

Delacroix. E. (1972). *The Journal of Eugene Delacroix* (W. Pach, Trans.). New York: Viking Press (A Viking compass book, C335).

Field, M. J. (2000). Mathematics through art–art through mathematics. In D. Salesin and C. Séquin (Eds.), *Proc. MOSAIC 2000* (pp.137-146). University of Washington.

Grabiner, J. V. (2011, Jan.). How to teach your own liberal arts mathematics course. *Journal of Humanistic Mathematics*, *1*(1).

Grunbaum, B., & Shephard, G. C. (1985). Handbook of applicable mathematics. In W. Ledermann and S. Vajda (Eds.), *Combinatorics and Geometry* (Vol.V). New York: John Wiley & Sons, Inc.

Hankins, T. L., & Silverman, R. J. (1995). *Instruments and the imagination*. Princeton, New Jersey: Princeton University Press.

James, W. (1987). *Essays, comments, and reviews*. London: Harvard University Press.

Koenderink, J. (2013). *Part & whole*. Utrecht, Netherlands: De Clootcrans Press.

Lecanides-Arnott, M. (2014, Feb.). Drawing as learning to see: A strategy to locate the 'White/Open Space', That encourages intuitive thinking in designers. *Studies in Material Thinking*, *10*, The Art of Research, Paper 04.

Mueller, I. (2005). Mathematics and the divine in Plato. In T. Koetsier and L. Bergmans (Eds.), *Mathematics and the divine: A historical study* (Chapter 4). IL: The University of Chicago.

Plato. (2004). *Republic* (C.D.C. Reeve, Trans.). Indianapolis: Hackett.

Rawes, P. (2008). *Space; geometry and aesthetics: Through Kant and Towards Deleuze.* New York: Palgrave MacMillan.

Samara, T. (2012). *Drawing for graphic design: Understanding conceptual principles and practical techniques to create unique, effective design solutions*. Beverly, MA: Rockport Publishers.

Schattschneider, D. (2003, April). Mathematics and art - So many connections. *Math awareness month.* Retrieved from: http://www.ams.org/publicoutreach/msamhome/03-essay3.htm

Smith, P. H. (2004). *The body of the artisan: Art and experience in the scientific revolution.* Chicago, Ill.*:* University of Chicago Press.

Srouji, H. (2017). A Methodology of Teaching Fundamentals of Art and Design. *Asian Journal of Education and E-Learning, 5*(4), (ISSN: 2321 - 2454).

Summers, D. (1987). *The judgment of sense: Renaissance naturalism and the rise of aesthetics*. Cambridge: Cambridge University Press.

Tenen, L. (2011). The value of mathematics within the 'Republic'. *Res Cogitans, 2*(1), Article 22.y K.

Washburn, D. K. (1983). Towards a theory of structural style in art. *Structure and cognition in art* (Chapter 1). Cambridge: Cambridge University Press.

NOTES

Note 1. Plato, The Republic, IDPH, p. 386. Retrieved from: http://www.idph.net/conteudos/ebooks/republic.pdf

Note 2. Geometry is a word derived from Greek, where "geo" means "earth" and "metria" means measure.

Note 3. Tenen opposes two concepts of "unity.": a "functional" unity that is understood as a balance between parts, and the second unity implying to think of "unity as something lacking parts that he called "metaphysical". A "functional unity between parts" is opposed to variety or disunity (chaos). Whereas Plato's sense of unity is more of "metaphysical" unity. (L. Tenen, 2011: 210)

Note 4. Frans Xaver Messerschmidt (1736-1783) was popular among the German nobility for whom he produced numerous portraits, busts, and monumental statues. Messerschmidt believed "that the true secret of proportions actually lies in the relationship of the limbs of Egyptian statues, particularly in the drawing that he hung on his window, that was supposedly the result of measuring different parts of various statues… He imagined, at the same time, that the proportional relationship that could be found on the head of a person was spread throughout the whole human body. To him, matter and nature are alive, and one must work with and against them to produce naturalistic representations. His search for "laws of proportions", although it can be regarded as unscientific with regards to its method, remains nevertheless astounding. (P. H. Smith, 2004, pp.5-6)

