American Journal of Art and Design
2021; 6(4): 134-139
http://www.sciencepublishinggroup.com/j/ajad
doi: 10.11648/j.ajad.20210604.14
ISSN: 2578-7799 (Print); ISSN: 2578-7802 (Online)

The Lost Skills: About the Exclusion of Design and Descriptive Geometry from School Curriculums and Their Consequences

Claudio Estevão Bergamini[1, *], Gabriela Biana Bergamini[2]

[1]Civil Engineering Course – IFAL, Federal Institute of Education of Alagoas, Maceió, Brazil

[2]CEARQ - Coordination of Engineering and Architecture / UNCISAL, State University of Health Sciences of Alagoas, Maceió, Brazil

Email address:
claudio.bergamini@ifal.edu.br (C. E. Bergamini), gabriela.biana@gmail.com (G. B. Bergamini)

[*]Corresponding author

To cite this article:
Claudio Estevão Bergamini, Gabriela Biana Bergamini. The Lost Skills: About the Exclusion of Design and Descriptive Geometry from School Curriculums and Their Consequences. *American Journal of Art and Design*. Vol. 6, No. 4, 2021, pp. 134-139.
doi: 10.11648/j.ajad.20210604.14

Received: November 4, 2021; **Accepted**: December 1, 2021; **Published**: December 24, 2021

Abstract: This article seeks to demonstrate how some government decisions dismantled the teaching chain of Drawing, here understood as a support for science and a graphic extension of mathematics in problem solving and in the creation of objects or buildings. Recent researches point to an increasingly complex definition of the act of drawing, but, paradoxically, the teaching of drawing goes in the opposite direction. We begin the article with an examination of what is defined as drawing, followed by a history of drawing education in Brazil, focusing especially on secondary and higher education. Then we address the manual and mental skills obtained from the study of Observation Drawing, Geometric Drawing, Descriptive Geometry, Technical Drawing, which are of great value for personal development and for the advancement of project knowledge, support for the creation of new ones. technologies, objects or buildings. We register the weakening of the design teaching chain and the risk of extinction of the design of the curricula due to mistaken teaching policies. We emphasize the teaching of Descriptive Geometry for being the basis for engineers, architects and designers, a foundation without which there is no possible development and innovation. We also point out the false solutions offered by computer programs that present results, but do not teach the process of reasoning and spatial visualization. The adopted methodology was bibliographical research and critical reflection on the theme, it is, therefore, a descriptive and comparative analytical qualitative study. Evidencing this situation and understanding it is the first step towards a change of attitude.

Keywords: Teaching, Design, Skills, Policies

1. The Drawing

The meaning, usefulness, possibilities and manual and mental skills produced by drawing mean that drawing concepts no longer contain all of their content. Definitions such as the one from the Larousse dictionary – "The art of representing, through lines, the shape and possibly the values of light and shadow of an object or figure, (...)" seem to us to be very limited.

Recent research on brain activity during drawing demonstrates that when drawing, the individual accesses several regions of the brain simultaneously. The act of drawing boosts and reinforces other forms of reasoning and especially memory formation.

The idea that when we perceive an image, we do so in such a way that we discriminate what is seen into "parts" whose impulses are physiologically processed in different regions of our cerebral cortex is already well established, based on several neurological experiments. [2]

According to Jeffrey Wammes [12], a researcher at the University of Waterloo, the process of drawing information was compared to several other memorization strategies and the results were always superior to the former. The group of neuroscience researchers involved in the study believes that the benefits happen because the act of drawing helps in the formation of a more cohesive memory, which integrates visual, motor and semantic information.

The interest in neuroscience research is that they involve the processes of learning and memorization, and generally address the issue of Drawing, thus indicating the care that should be taken when planning Drawing in early childhood education, primary and secondary education for to obtain the desirable objectives in higher education and personal development.

The understanding of Drawing as a support for science is revealed in the interface with other disciplines such as Geography, Natural Sciences, Physics, Mathematics, Mechanics, etc. Today we can extend this observation to almost all fields of science, corroborating Massironi's statement:

Generally, drawing has been considered a docile instrument that everyone can use, but no one has ever felt the need to analyze to understand its operation and to explain the wide availability to absorb different communicative functions, which differentiates it. [7]

Walter Smith (1836–1886) art teacher at the end of the 19th century already proposed that Drawing should be part of the curriculum for primary and secondary education, stating that anyone can learn to draw and any teacher can teach, a somewhat contemporary, since, to this day, there are those who advocate that the ability to draw is an artistic gift reserved for few people. It proposed a detailed method for each step and illustrated the assumptions as shown in the table below.

Table 1. *Basic assumptions for the Teaching of Drawing indicated by Walter Smith – United States – Second half of the 19th century.*

Education in Drawing	
Item	**Assumptions**
01	If the student can learn to read and write, then he can learn to draw.
02	Drawing is one of the elements of general education. The Public School must teach you.
03	Every ordinary teacher is capable of teaching Drawing. There is no need for specialists.
04	The real function of Drawing, in general education, is to develop perception and exercise the imagination. It strengthens the love of the method, at the same time raising originality.
05	Drawing is not an object of luxury; it is, rather, a tool that facilitates the study of other subjects, such as Geography, Mechanics, History, etc.
06	We should not be concerned with teaching anything but what is accessible to everyone and, directly or indirectly, useful to everyone.
07	To advanced or special courses, we commit the teaching of developments whose acquisition may be desired among people exceptionally gifted by nature or by fortune.
08	The design that should be taught in public schools is industrial, not painting.
09	The exercises, which are constantly progressive, must be linked together from the lowest to the highest class. From then on, teaching becomes personal, with exercises varying due to differences in the capacity peculiar to each individual.
10	The only practical way to introduce Drawing in public schools is to entrust teaching to ordinary teachers.
11	Since the elements of form are a composite of arithmetic and writing, it is easy for every teacher to prepare quickly to teach Drawing, without any precision of exceptional dispositions, nor great skill of hand.

Explanatory note to table 1 – Table created by the author based on the work of Rui Barbosa, Reform of Primary Education (...) opinion and project (1883, pg. 150 to 152), in order to synthesize the didactic-pedagogical proposals from Walter Smith for teaching Drawing in the United States.
Source: TRINCHÃO, 2008, P. 383.

These demystifying ideas of drawing as a special skill are also espoused by Beth Edwards, "if your handwriting is legible (...) then you are amply able to learn to draw well."[5]. These concepts currently seem to be current among teachers, although they are not yet applied in a significant way.

It is also worth noting the connection of Walter Smith's conceptions on the progressive teaching of drawing, almost like the ABC of another language and those of EDWARDS.

By learning to draw observed objects and people, you can incorporate new ways of seeing that guide creative thinking and problem-solving strategies, just as in learning to read you acquire verbal knowledge and introject the strategies of logical, analytical thinking. [5]

2. Manual and Mental Skills Acquired by Drawing

The skills that are inherent to Drawing and that should be learned in a sequence in which each consolidated element is the basis for learning the next item, is present from the doodle drawings, continues through the basic education approach, should be in the teaching curriculum high school and higher education subject menus.

I understand that the act of drawing and drawing are highly productive resources during the learning (and memorization) of the categories that organize and classify the objects of the world and that this categorization is fundamental, fundamental, in the other learning processes. The human ability to identify similarities, discrepancies and deduce generalizations, establish classifications, definitely seems to be the process that sustains the semantic (or Not Unique) memory which allows us humans, in addition to the cognitive processes, the communication and sociability that characterize us. [4]

In learning children's drawing, the first attempts are related to space and objects and people, drawing, that is, representing the world, the child begins to interact. At the age of seven, children master composition, that is, the balance between shape, figure and background. They acquire the principles of a visual intelligence that will be the basis for the development of the following steps.

In the 1960s and 1970s, when the Drawing subject was part of the high school curriculum, we can observe how the teaching of Drawing was developed in the book “Drawing Course for 1st and 2nd Grade Courses” by José de Arruda Penteado, which therefore it was about high school. The units can be checked by index: 1/ Design material; 2/Letter design; 3/Drawing of the natural; 4/Decorative design; 5/Geometric drawing; 6/Technical drawing and 7/Techniques and plastic arts materials.

In unit 1 - presents the drawing materials and explains in detail the techniques for using squares and other drawing instruments. At this moment, the precision and the organization and cleanliness that the drawing must have been emphasized.

Unit 2 - letter design, technical calligraphy, ornamental letters in pencil and ink. The mastery of the hand over the drawing is developed, a preamble to the observation drawing.

Unit 3 - natural drawing, figurative drawing (Figure 1), observation drawing (Figure 2), observation perspective. Realistic drawing skills are developed: concentration, discipline, autonomy and self-confidence.

Figure 1. *Figurative Drawing – Penteado. 1973 – P. 84.*

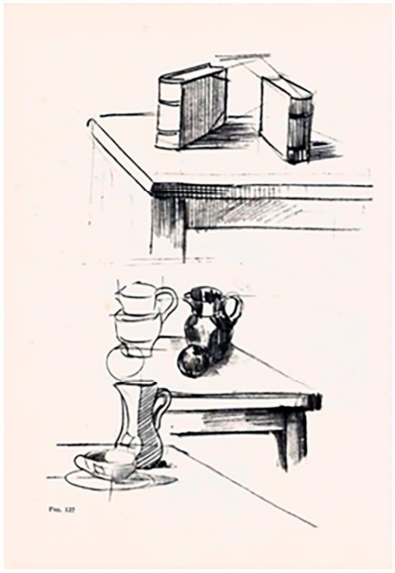

Figure 2. *Observation Perspective- Penteado, 1973 – P. 127.*

Unit 4 – decorative design, strips (Figure 3), panels (Figure 4), decorative elements. The principles of visual perception are developed: Principles of direction: Vertical, Horizontal, Oblique, Curvilinear, Mixed; Position Principles: Repetition; Alternation; Symmetry.

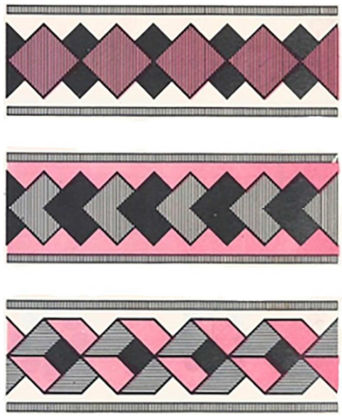

Figure 3. *Tracks - Penteado. 1973 – P. 157.*

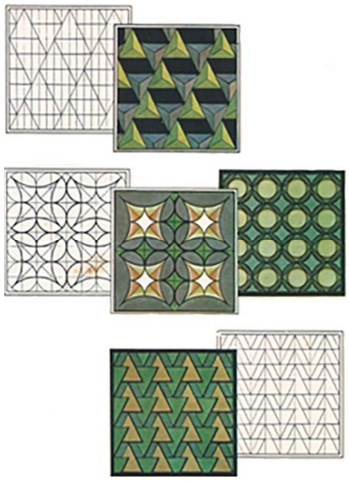

Figure 4. *Panels Penteado, 1973 – P. 181.*

Unit 5 – geometric design (Figures 5 and 6), plane geometry and spatial geometry, is the most extensive unit. Problem solving drawings, drawing interface with mathematics, precision and step-by-step construction of more complex figures are developed.

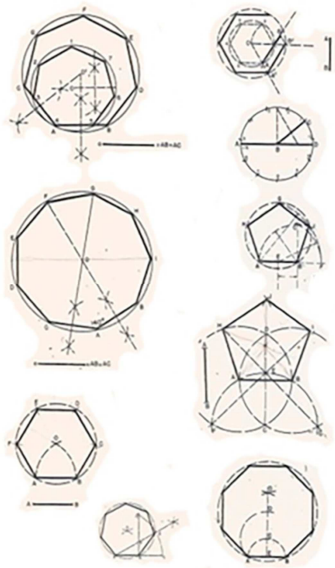

Figure 5. *Polygons - Penteado. 1973 – P. 302.*

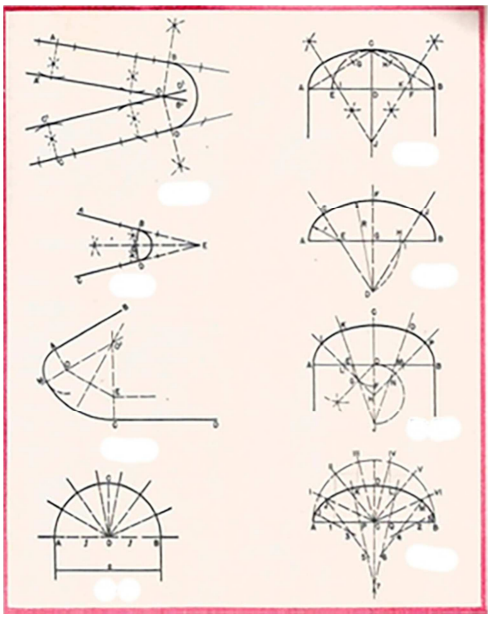

Figure 6. *Agreement - Penteado, 1973 – P. 311.*

Unit 6 – technical drawing, principles of descriptive geometry and notions of orthographic projections. Notions of design for construction that will serve as the basis for the Technical Drawing discipline in higher education courses.

Unit 7 – techniques and materials for fine arts, craft techniques for more elaborate works suitable for high school.

In this way, there was a path, a set of knowledge about geometry that enabled the teaching of Descriptive Geometry even in High School. From 1961 on, Descriptive Geometry became part of the high school curriculum and was charged in the entrance exam, according to the preface of the book Descriptive Geometry.

(...) they intend to serve especially students who aspire to enter the Higher Schools, whose entrance exam is required for this subject. (...) The use of this book therefore presupposes a reasonable knowledge of elementary geometry in two and three dimensions, (...) [9]

The book Notions of Descriptive Geometry [9], presents the initial concepts – Point, Line, Plan and Descriptive Methods. This basic program served as support for the entrance exam and initiation to Descriptive Geometry that would be developed in the Faculties of Architecture and Engineering.

The learning of DG, when it occurs properly, develops in the student several skills, among which we highlight: development of manual motor skills, planning, vision or spatial reasoning, precision, whimsy and order. [10]

Following the recommendation of PINHEIRO [9], the student would start the study of Descriptive Geometry with solid knowledge of Plane and Spatial Geometry and also with dexterity in handling squares and other drawing instruments.

The planning would come from the need to distribute the drawing on the sheet in order to achieve the drawings in épura.

The need to think about the execution of the tracings (graphical operations) step-by-step, in a convenient order, to get the solution, which is presented in the form of a graphic construction, forces the student to plan the sequence, in other words, to design. This work, well conducted, starts with small steps and becomes more complex, which requires greater attention and concentration from the student. The combination of thinking before doing manual work and obtaining a concrete result, the graphic solution mentioned above, encourages students to take bolder steps, makes them more self-confident, skills that reflect positively on their education. (SILVA, 2006, p. 5).

The primary objective of Descriptive Geometry is to represent figures in space, in order to study their shape, dimension and position, developing three-dimensional reasoning, that is, spatial vision.

Spatial vision, also called three-dimensional vision or spatial reasoning, enables the student to understand a geometric figure, represented by its projections bounced on a single plane, obtain the projections of a geometric figure, and thus become able to project and understand projects produced by other professionals. It is also through it that it is possible to "see" (with a sense of imagining) an object, to think about modifications that improve its characteristics, changing its shape or the relationship between the elements that constitute it. As for this competence - spatial vision - no other discipline develops it to such a high degree as DG. In fact, current curricula do not even provide for this competence, let alone consider it important in the education of the student. [10]

Precision, whimsy and order in the design of Descriptive Geometry are a bonus achieved by the philosophy that is embedded in the concepts of the discipline, which proposes to accurately represent any existing or non-existent object.

The GD, together with the GD, for working with tracings, which are the operations of drawing, allows the student to understand the value of precision in obtaining a final result. This precision can only be achieved as the sum of the partial precision achieved in each step of the execution. [10]

2.1. The Weakening of the Design Chain

The loss of space in Drawing and consequently the weakening of the learning chain begins in Early Childhood Education, which began to focus more on literacy at the expense of drawing. This is due to changes in the Common National Base determining that literacy began in early childhood education.

Educational director of the Arquidiocesano private school in São Paulo, Marisa Ester Rosseto identifies in BNCC an emphasis on writing and a narrowing of possible knowledge for this stage of education. "Drawing is already a type of literacy, and it also includes mathematics, in figures and dimensions", (...) [1]

The decline in drawing education worsened in the 1970s, but started in the previous decade, as a result of mistaken government measures that came up against problems in the teaching of mathematics.

Also started in the 1960s, the Modern Mathematics movement proposed a radical reformulation of curricula, emphasizing abstract and general methods with the aim of bringing school mathematics closer to pure mathematics.

Pavanello [p. 7] points out two reasons for the abandonment

of geometry teaching in Brazil: 1) the insecurity of mathematics teachers in working with geometry and, above all, 2) the way in which education was carried out in Brazil; further indicating that the development of mathematics was not a reason for geometry to give way to other areas. Passos and Nacarato [p. 1148] mention that geometry is not "assumed as a priority in relation to other mathematics content, as no one teaches what does not have a conceptual mastery" [3]

Completing this cycle of dismantling Design, the University Reform promoted during the military regime excludes Geometric Design and Descriptive Geometry from entrance exams.

Some causes are considered probable: the alleged difficulty in correcting the graphic tests in the vestibular exams; the high failure rate that occurred; the loss of position of Geometry, relegated to almost abandonment, by the implantation of Modern Mathematics; Article 21 of the University Reform Law, of November 1968, which abolished the DG and DG from vestibular exams, are some of them. The coup de grace was delivered by the governmental act, since from it onwards, teaching began to fall precipitously, both in public and private schools, until almost total extinction. [10]

2.2. Descriptive Geometry in Higher Education

With the loss of the linkage of Geometry learning in high school, and the exclusion of Plane Geometry from the learning process, the impact on the teaching of Descriptive Geometry was devastating.

In the Architecture and Engineering courses, Descriptive Geometry already presented high repetition and failure rates, with the loss of its base this worsened. The solution initially found by private universities and later replicated in the federal ones was to reduce the content of the discipline and in some cases couple them to other related disciplines, aiming to "facilitate" teaching and increase the pass rate, but in fact, hiding skills of visual thinking and geometric and spatial reasoning of great value for technological careers.

Below we illustrate the reduction in the workload in the subjects and the consequent loss of content.

Table 2. *USU Curriculum 1978.*

USU- Santa Úrsula University - Architecture Course – 1978	
Artistic Drawing I	60h
Architectural Drawing I	60h
Descriptive Geometry I	45h
Artistic Drawing II	60h
Descriptive Geometry II	45h
Descriptive Geometry III	30h
	360h

Table 3. *UFAL Curriculum 1998.*

UFAL - Federal University of Alagoas - Architecture Course - 1998	
Technical Drawing 1	120h
Graphic Expression	120h
Descriptive Geometry	160h
Technical Drawing 2	80h
	480h

Table 4. *UFAL Curriculum 2016.*

UFAL - Federal University of Alagoas - Architecture Course - 2016	
Descriptive Geometry	60h
Architectural Drawing	90h
Graphic Expression	60h
	210h

Although the decree was signed in 1968, in 1978 knowledge of Plane and Descriptive Geometry was still required in the entrance exams for Architecture in some Universities, such as the Santa Úrsula University. In 1998, the design area of the Federal University of Alagoas was still strong, there was a large workload in Technical Drawing and Descriptive Geometry, in 2016 drawing workloads dropped to less than half.

2.3. False Solutions to Growing Problems

Currently there is a tendency to reduce the drawing board with the argument that in professional life the architect, engineer or designer will work with CAD programs, which is a reality, however, when manually representing the student learns some mental skills that he will not learn on the computer, as the domain of scale, among others.

Some faculties of Architecture, Engineering and Interior Design condensed the disciplines: Technical Drawing, Architectural Drawing and Geometry in a single discipline with the generic name of Graphic Expression, which superficially deals with these important disciplines, and how the student already comes with a deficiency in Elementary and high school drawing misses the opportunity to learn about visual, geometric and spatial reasoning.

Some justifications that teaching design contents were not lost sound false and in practice are wrong. The idea that in high school the discipline of Art absorbed the old Drawing for 1st and 2nd grades is inadequate, art teachers are not trained to teach Drawing, which even in Fine Arts courses is disdained, with the justification that realistic drawing stunt creativity.

As for Plane Geometry, Spatial Geometry and Descriptive Geometry, the curriculum of Mathematics courses devotes a small amount of work to these subjects, the cause and effect of the lack of conceptual mastery of the subject and the absence of qualified teachers to teach it.

The claim that 3D drawing or parameterization programs replace the spatial reasoning of Descriptive Geometry is questionable, since students using such programs are only observers, they do not participate in the process of building the figures, nor do they dominate the concepts that govern them. There is no doubt that 2D and 3D graphic computer programs help in the execution of projects and should be part of the curriculum of related courses, but believing that this is enough and that drawing is no longer necessary is the same as excluding the teaching of Mathematics because we have calculators.

Finally, the decay process of Drawing, which began with the lack of mastery of the subject of Plane and Spatial Geometry by teachers adept at Modern Mathematics,

contaminated the entire chain of Drawing, worsened with the removal of these contents from High School and of Higher Education, and culminates in the lack of qualified teachers to teach these subjects.

The idea of modernizing education by removing the teaching of Drawing, as an obsolete subject, proved to be a mess. In Portugal, France and Spain, the teaching of Drawing continues in the same way as in Brazil, with Geometrical Drawing and Descriptive Geometry being demanded in technological careers.

The manual and mental skills obtained with Drawing and proven in neuroscience studies; visual, geometric and spatial thinking and creativity are essential tools for the development of technological education.

3. Conclusion

The more studies on brain activity advance, the more evidence we have of the most productive paths for the integral education of human beings. The industrial and technological development of a nation is compatible with the level of training of its engineers, architects and designers, and precisely at this time of start, Brazil started to dismantle the main tool of the project, which is Drawing.

Misguided government decisions have caused disorganization in this crucial area of education that involves creativity and a special kind of thinking that is visual, geometric and spatial thinking. These special skills of Drawing and Geometry need to be rescued, but for this it is necessary to first recognize that if you took the wrong path, it is necessary to improve education and not adapt it to the easier path.

All the assumptions that contributed to the decay of Drawing, Geometric Design and Descriptive Geometry were towards modernization and productivity of education in the worst sense. Showing this situation and understanding it is the first step towards a change in attitude.

References

[1] ALVAREZ, Luciana. Changes in the Common National Base resume the debate about the place of writing in daycare and preschool. Public Policies, Ed. 240, 2017.

[2] AZAMBUJA RODRIGUES, Carlos de. Brief considerations on Drawing, Memory and Thought.

[3] BASTOS, Charles. Notes on the teaching of geometry in public schools. TCC. 2016.

[4] DUARTE, Maria Lúcia Batezat. On drawing, memory and learning: a neuroscientific approach towards inclusive education. Apotheke. Santa Catarina: 2017.

[5] EDWARDS, Betty. Drawing with the inner artist. São Paulo: Claridade, 2002.

[6] EDWARDS, Betty. Drawing with the right brain. Rio de Janeiro: Tecnoprint, 1984.

[7] MASSIRONI, Manfredo. See by drawing: Technical, cognitive, communicative aspects. Lisbon, Portugal: Editions 70, 2010.

[8] HAIRSTYLE, José de Arruda. Drawing course. São Paulo: Companhia Editora Nacional, 1973.

[9] PINHEIRO, Virgilio Athayde. Notions of Descriptive Geometry. Rio de Janeiro: To the Technical Book, 1972.

[10] SILVA, Claudio Itacir Della Nina da. The irreplaceable Descriptive Geometry. Site of Descriptive Geometry. Available at: <http://descritiva.no.sapo.pt/>. Access on: 12\03\2006.

[11] TRINCHÃO, Glaucia Maria da Costa. Drawing as a teaching object: History of a Discipline from 19th-century Luso-Brazilian Textbooks. Doctoral thesis in Education. Rio Grande do Sul: 2008.

[12] WAMMES, Jeffrey. The drawing effect: Evidence for reliable and robust memory benefits in free recall - The Quarterly Journal of Experimental Psychology, Volume 69, 2016.