

New Gazes at the Industrial Design of the Bauhaus from Descriptive Geometry

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1 Introduction

The Bauhaus was born in the city of Weimar in 1919, after the end of the First World War, with the aim of unifying the Higher School of Art and the School of Arts and Crafts, both of the Grand Duchy of Saxony [1]. The German architect Walter Gropius was commissioned to set up and run the new and most modern art school of his time in which artists, craftsmen and architects had to cooperate together in the construction of the future. The main novelty and at the same time the goal of the school was the collective construction of the building, all trades had to contribute to that end. The Staatliches Bauhaus, founded as a state-ranked school, was housed in the headquarters of the two merged schools designed by the Belgian architect Henry van de Velde, who had directed the School of Arts and Crafts before the war. In March 1925 the Bauhaus had to leave Weimar due to sociopolitical pressures. On the other hand, it would be well received in Dessau, although downgrading to a provincial school, where Gropius would have the great opportunity to build a new headquarters that would become an architectural landmark, where it remained until 1932, the year in which it was expelled from there by the Nazis and stayed in an old abandoned telephone factory in Berlin. Its final closure occurred in April 1933, three months after the rise to power of the party led by Adolf Hitler [2], putting an end to the fragile democracy of the Weimar Republic, which had lasted fourteen years, the same as the school.

1.1 Pedagogy and Design at the Bauhaus in Weimar: 1919–1925

The organizational conception of the Bauhaus represented a complete break with the academic tradition, stuck in the division of students and teachers, returning to the medieval position of apprentices, officers and masters. The new pedagogy, included in the preliminary Vorkurs preparatory course, followed the same principles that Montessori applied to early childhood education. According to Prieto [3], Johannes Itten, the master in charge of directing the preliminary course until he left the school in 1923, there were three fundamental tools in learning: natural spontaneity within one's own bodily and mental introspection, disinterested play aimed at bringing to light the creativity of the individual and the principle of "learning by doing". The Bauhaus was established as an artistic and egalitarian community, formed by men and women, which would contribute to the spiritual transformation of the country [4]. In its first phase, coinciding with the presence of the Swiss master Itten, the school's motto was "art and craft, a unity". The student had to discover his own natural creative talent to later go to a workshop where he would develop his individual practical training. But in 1922, Gropius decided to turn the school around, now embracing the motto "art and technology, a new unity" [5], motivated, on the one hand, by the need to receive commissions from the industry that served as financial support to the tight budget of the school and, on the other hand, influenced by the criticism received by the Dutchman Theo van Doesburg [6], standard bearer of the rational, abstract and geometric simplification movement De Stijl. Since 1923 the preparatory course has been directed by the Hungarian László Moholy-Nagy, master of form from the metal workshop, who together with the Russian Vasili Kandinsky led geometric abstraction at the school.



Fig. 1. Axonometry of MT49 teapot by Marianne Brandt (student: Fernandez, G., 2021-22).

Starting in 1922, innovative objects for industry emerged from the metal and joinery workshops, of great technical precision, whose design obeys a careful combination and assembly of basic geometric shapes, such as circles, triangles, prisms, spheres or cylinders (Fig. 1). The basic shapes and colors played an essential role in learning within the preparatory course, associating a certain character with each shape: fluid and central the circle, serene the square and diagonal the triangle [7]. In turn, each shape was assigned a characteristic color: blue for the circle, red for the square and yellow for the triangle.

1.2 Bauhaus Models for Learning Descriptive Geometry

In teaching the subject Architectural Graphic Expression 1 of the degree in Architecture Studies at the University of Granada, for almost ten years we have used architectural references, built or projected, and furniture objects for theoretical-graphic explanations and practices of classroom. This subject is the heir to the old Descriptive Geometry, which with the arrival of the degrees changed not only the name, but also the approach, now linked to the direct application of knowledge of geometric shapes, their use and procedures in the different systems of representation -dihedral, axonometric and conicalto historical or contemporary heritage references.

During 2021–22 and 2022–23 academic years, we selected four objects designed by Bauhaus students as teaching-learning models, two of them from the metal workshop and the other two from the joinery workshop. The chosen objects had to be representative of what was called the "Bauhaus style", pioneers and symbols of modernity, and at the same time be composed of elemental shapes and colors. The references with which we worked were: the teapot by Marianne Brandt and the table lamp by Wilhelm Wagenfeld and Karl J. Jucker, from the metal workshop, and the furniture for the children's room in the model house "Haus am Horn" by Alma Siedhoff-Buscher and the cradle by Peter Keler, from the joinery workshop. All the models were designed and built between 1922 and 1924 at the school, by men and women, the great forgotten Bauhaus for almost a century [8], until recently their works are being recognized as important milestones in industrial design of the early 20th century. The case of women like Brandt or Siedhoff-Buscher is quite meritorious when they managed to access workshops that were closed to the female gender, directly redirected, after the preparatory course, to the weaving workshop.

2 Objectives

The main objective of Architectural Graphic Expression 1 is the study of geometric forms, their projections in the different representation systems, through graphic procedures and Descriptive Geometry operations, applied to very significant heritage references, which motivate and support the learning of student.

As secondary objectives, which we set out to achieve with this research and teaching experience in the subject, we have mainly four. The first, by choosing easily understandable objects as models for the practices, we achieve a better assimilation of geometric abstraction and the theoretical contents of the subject by the students, at the same time that it allows them to better understand the object taken as a learning model. The second, the necessary cross-curricular approach with other subjects of the degree such as History of Architecture, Composition or Graphic Ideation and Introduction to the Architectural Project. In these subjects they will also be able to study and analyze the selected objects, their authors, including the Bauhaus school, from different points of view or approaches, which must always be complementary and essential for the development of critical thinking in the student's architectural training. The third consists of motivating students in their learning, thanks to the use of attractive and suggestive references, as well as useful, granting contemporaneity to the design of everyday and modern objects [9], with more than a century of history. Last but not least, we get our students to "apprehend equality", rescuing forgotten pioneers or not sufficiently recognized by historiography. History cannot be told in a biased way, omitting or making invisible approximately half of the Bauhaus students, who were women. By the way, women of extraordinary talent, who went through an important screening in their admission process.

According to Hervás [10], it was enough for the students to be ordinary men, but to admit a woman among the large number of women who applied, they had to have great potential, it was the first time they had been given the opportunity to study in a mixed school, sharing classrooms and teachings with their male classmates. From the direction of the Bauhaus, they would not admit that the number of women became greater than that of men, they did not want to become a school with a female majority as the School of Arts and Crafts directed by Van de Velde had been before the First World War.

3 Materials and Methods

In Architectural Graphic Expression 1 we use direct procedures for learning Descriptive Geometry, through the use of drawing tools and A3 size formats, of different thicknesses and finishes. Our methodology also includes the use of other tools that facilitate the development of spatial vision, such as physical models [11], which accompany and undoubtedly help to understand the two-dimensional representations made with pencil on paper.

The selection of Bauhaus referents, during the last two academic years of Architectural Graphic Expression 1, entailed a first phase of research by the teaching staff, necessary for the theoretical and practical explanations in which, in addition to explaining the procedures of Descriptive Geometry and the fundamentals of the different systems of representation, we had to contextualize the characters, their works and the Bauhaus, with the appropriate focus for first-year students, newcomers, to the School of Architecture. In addition, we select a series of bibliographic and audiovisual recommendations [12, 13] for consultation by the students.

4 Results and Conclusions

The results obtained, of great plastic beauty in the case of the models and graphics of the drawings, have served to revisit, investigate and reinterpret, through Descriptive Geometry, icons of Bauhaus industrial design, from an inclusive perspective, from gender, in a profession, that of architecture, par excellence attributed to man.

During the 2022–23 academic year, we worked with "children's furniture for the Haus am Horn" by Alma Siedhoff-Buscher, within the monographic work that students had to carry out throughout the first semester. In the first phase, we initiated them into the investigation, they had to carry out the search for information and analysis themselves, for its subsequent inclusion and composition in a panel A3 (Fig. 2). They had to investigate what the Bauhaus was, who Alma Siedhoff-Buscher was and the children's furniture designed and built by her in 1923.

The students themselves are responsible for their own learning, under the tutelage of their teacher. They had to investigate and decide what measurements the pieces that made up the children's seats and the versatile adult seats would have, which could also be used as children's tables. They would analyze the existing proportions between seats and shelves. These shelves were intelligently designed by Alma to accommodate the seats of the set in the lower parts, once collected. The door of one of them included a long hole that would serve as a puppet theater stage. Within the set of furniture, they also had to include the ladder designed for said room that could be used in two different positions.

The monographic work, within the line of project-based learning [14], is developed in parallel to the theoretical-practical explanations of each block of the subject and as a direct application of them. In the Dihedral System block, in addition to the panel resulting from the research carried out, they must obtain the projections or views in plan, elevations and sections (Fig. 3). It is in this block when they build their own scale model of the different pieces that they will deliver in a box also designed by them (Fig. 4). To finish Dihedral's monograph, they made two consecutive changes of plane, first the vertical and then the horizontal (Fig. 5). In the Axonometric System block, they drew two axonometries of the pieces of furniture, one orthogonal and the other oblique, which they could choose between the cavalry or the military perspective, applying the corresponding reduction coefficients and graphically. In conical perspective, they must choose the point of view, as well as the arrangement of the pieces, which in their opinion can best explain the reference studied (Fig. 6). Finally, in the block of shadows, they had to obtain the axonometric shadows of the furniture, the students themselves determining the direction of the light and the arrangement of the pieces.



Fig. 2. Composition of children's furniture research (student: Villar, M.B., 2022-23).



Fig. 3. Dihedral views of children's furniture by Alma Siedhoff-Buscher for the Haus am Horn (student: Muñoz, E.D., 2022–23).



Fig. 4. Photographs of the model of children's furniture by Alma Siedhoff-Buscher for the Haus am Horn (student: Villar: M.B. 2022–23).



Fig. 5. Dihedral System, changes of plane of children's furniture (student: Rabadán, A., 2022–23).



Fig. 6. Conical perspective of children's furniture (student: Rabadán, A., 2022-23).

In addition to Alma Siedhoff-Buscher, within the joinery workshop we used for the class practices the cradle of 1922 by Peter Keler, made up of two blue circles and a red and yellow prism, with two base equilateral triangles (Fig. 7).

Marianne Brandt was one of the greatest exponents of the metal workshop [15], author of the MT49 (Fig. 8) and MT50 (Fig. 9) teapots, made up of a hemisphere, one or two cylinders and circles. The fourth reference used as a model is the WA24 lamp (Fig. 10), designed by Wilhelm Wagenfeld and Karl J. Jucker in 1923–24 [16].



Fig. 7. Dihedral views of cradle by Peter Keler, in a certain position (student: Valdés, A., 2021–22).



Fig. 8. Conical perspective of MT49 teapot by Marianne Brandt (student: Valdés, A., 2021–22).



Fig. 9. Dihedral views with shadows of MT50 teapot by Marianne Brandt (student: García, S., 2022–23).



Fig. 10. Dihedral views with shadows of WA24 lamp by Wilhelm Wagenfeld and Karl J. Jucker (student: García, S., 2022–23).

As conclusions, we believe that we have managed to demonstrate the undoubted usefulness that today continues to have the Descriptive Geometry, applied through direct procedures to real cases, beyond the basic isolated shapes, such as prisms, cones, pyramids, cylinders or spheres, in addition to transmitting to the new generations that the history of architecture and industrial design was not only starred by the masculine genre, but there are references of female authorship, that even having it more difficult than their male counterparts, they knew how to make a significant and very relevant space within the design of industrial modernity.

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