

TEACHING DESIGN & ENGINEERING STUDENTS HOW TO HANDLE THE FORM GIVING ISSUE

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ABSTRACT

This paper goes over an educational activity held at Design&Engineering Master Course of Politecnico di Milano, an inter-faculty course where great emphasis is given to technological aspects; such emphasis, if from one side teaches students to master all feasibility aspects, on the other makes them prone to underestimate product's formal aspects. Indeed, in the development of a project, among all issues involved (user requirements, feasibility, ergonomics, aesthetics), form is the most subjective one and it is also the most difficult to teach and to master: this is the reason why Design&Engineering students tend to ignore it, preferring to take refuge in more objective technological and ergonomic issues. For this reason, at the Design Studio of the first year a three weeks exercise focused on the product's formal aspects was set up, during which students were provided cultural tools aimed at enabling them to critically analyze and to implement the form of products. The aim of the exercise was to make students thinking about and practicing the issue of form giving, in order to understand the importance for a designer to control the form of objects he/she is designing. Basing on students feedbacks, the exercise proved to be effective in terms of knowledge gained and of critical abilities about form-giving.

Keywords: Form-giving, teaching approaches, cultural tools

1 INTRODUCTION

A lack of form giving skills can be observed among all the students of industrial design courses at Politecnico di Milano. Indeed, such courses are mostly based on a functional approach, where great attention is given to user basic needs and technical aspects, causing the students to perceive the product form as just a consequence of ergonomics and feasibility limitations and constrictions.

This tendency gets even worse when it comes to the Design&Engineering Master Course, an interfaculty course aimed at educating professional figures able to manage every phase of the industrial product development process, from concept phase to engineering one. Design&Engineering students can be both from design and engineering bachelor courses, therefore they have heterogeneous backgrounds. The advantage of merging students with different background within a design team is that of providing a richer design practice, since designers' contribution is mainly focused on addressing experience and usability problems, while engineers' tendency is to find technical solutions for the concept proposed. This way, students have the possibility to learn from each other. The disadvantage is that design students tend to underestimate the subjective issues related to the project development, specifically the form giving one, preferring to focus on more objective issues such as production technologies and materials.

For this reason, at the Design Studio of the first year it was decided to set up a three weeks exercise focused on product's formal aspects. The aim of the exercise was to make students reasoning on the issue of form giving, in order both to understand the importance for a designer to control the form of objects he/she is designing and to acquire a set of cultural tools for analyzing and managing such form. In this paper the educational experience performed about form-giving is reported, together with the theoretical assumptions it was based on.

2 THE IMPORTANCE OF PRODUCT FORM

Industrial design discipline most distinctive concern is related to the form giving issue. Indeed, drawing inspiration both from the famous definition given by Maldonado in the 1960s – “Industrial design is the creative activity whose aim is to determine formal qualities of manufactured objects” [1]

– and from the “semantic turn” declared by Krippendorff in 2004, we can define industrial design as “the creative activity that lends form and meaning to industrially manufactured objects, both for mass and limited production”. Form and meaning are, indeed, intrinsically correlated: “Something must have form to be seen but must make sense to be understood and used.” [2].

The form of a product communicates product’s function, makes consumers categorize the product, shows product’s usability: this is what is called product semantic [3]. In connection with knowledge about product semantics, an industrial designer must be able to control a series of attributes related to the product itself such as: parts geometry, composition and proportion, material, color, texture [4][5]; moreover he/she must know the meaning of signs and symbols in a certain cultural context. Indeed, the form giving topic covers two connected but separate levels: the figurative and the meaning one; regarding this, Rindova and Petkova (2007) affirms that formal features of a product can cause both visceral reactions, falling in the field of aesthetics, and cognitive and emotional reactions, falling in the field of meaning. [6]

Designers should therefore be able to manage product form in order to foster both an appropriate aesthetic and semantic interpretation of their products.

2.1 Form and product success

Many authors, such as Dreyfus (1967), Kotler and Rath (1984), and Ulrich and Eppinger (2003) [6][7][8][9] stress the importance of form (intended as the sum of shape, proportion and color), in order to attain differentiation on the market. Form can improve the product attractiveness and therefore accomplish a higher level of attention by consumers. It indeed has been argued that since products are nowadays often similar in technical characteristics, quality, and price, the importance of product form as an opportunity for differential advantage in the marketplace increases [10][11][12][13]. Given the importance ascribed to product form in many industries, several scholars analyzed the existing connection between aesthetics and consumer choice: [14][15][16][17]. It becomes evident that products form and its management by designers is a relevant aspect in design practice that can strongly influence a product success.

3 FORM GIVING IN DIFFERENT TEACHING APPROACHES

In order to manage the form giving issue, designers are usually guided by their ‘educated guesses’ that result from both their educational training and their experience. When defining products formal features they usually base on their ‘intuitive judgements’ [18] deriving from their ‘tacit understanding of perception and visual composition’ [19][20]. In the field of form giving indeed “very few of the scientific studies have led to generalizations which are useful for students or practitioners of design.” [18]. Education activity about form-giving becomes therefore relevant for the preparation of design practitioners who will develop their designs basing on the educational training received so far and on the experience gained.

Nevertheless most of the time, at Politecnico di Milano, the form-giving ability is given for granted and it is not taught to students. Students themselves point out this lack that can represent a large loss in their preparation. Hereafter the reasons behind this lack within Politecnico di Milano Industrial Design courses are explained.

3.1 Politecnico di Milano approach

Within the educational Courses of Industrial Design at Politecnico di Milano, from the very beginning students are asked to face design problems (such as the design of an industrial product) considering it in its whole entity and complexity [21]. It is a good way of teaching how to design, because it puts students in front of real problems. On the other hand, to look at design problems in their whole complexity does not allow students to concentrate on singular formal features (shape, parts geometry, color, texture etc.) thus their ability to handle them is not stimulated or improved.

This lack originated from the teaching tradition that characterized different design schools’ philosophies. Indeed, when design is taught in polytechnics it is based on a deductive approach: first an amount of theoretical knowledge is taught to students, then it is applied all together in a complete design activity. As a result, at Politecnico design students tend to underestimate the importance of formal issues since they prefer and find it easier to refuge in the objectivity of engineering and ergonomics aspects related to the product. This is a dangerous practice, since it can cause a loss of the

focus of design discipline, getting our students dangerously closer to engineering and ergonomist expertise without having the necessary knowledge.

The result of this misunderstanding can be exemplified by several products for elderly and disabled people whose hospital-like appearance prevents them from a larger diffusion into the home environment: when designing these products, the designer focused only on function and technology, without keeping in mind that form also matters. At this regards, Bürdek affirms: “A discipline of design oriented on the postulate of forms and context had focused significantly more strongly on studying the contexts than the forms. Indeed, one could almost believe that designers no longer need concern themselves with anything so trivial as giving form”. [22]

3.2 Basic Design approach

Design schools derived from the Bauhaus apply an inductive approach. In these schools the theoretical contribution is subordinate to the practical experience: Anceschi [23] affirms that in Basic Design it is the teaching activity that transmits and contemporaneously generates the corpus of knowledge. Such knowledge is distilled in exercises which are paradigmatic and exemplary: they are a generalization, a simplification of a recurring design problem. According to this view, at the time of Basic Design origins, several different design problems were analyzed and translated into exercises. “As with the Bauhaus, the foundation course was taken very seriously at Ulm. [...] Here too, the teaching method aimed to sensitize the faculties of perception through experimentation with the elementary tools of design (colors, forms, Gestalt laws, materials, surfaces)” [22]. The distinguishing feature of these exercises, developed with most accuracy at the Ulm Hochschule für Gestaltung, is the selection of a single problem to develop, for instance how to obtain and handle “color balance”, “symmetry” and “contrasts”.

In the light of considerations about the importance of products form, authors retained that training about this specific aspect of design should be provided to Design&Engineering students of Politecnico: they thus developed a three weeks workshop activity inspired by a Basic Design approach. The aim was to make students focus just on the matter of form generation, stimulating their skills to analyze and master the form character.

4 THE FORM GIVING EXERCISE

As said, formal aspects related to a product are specifically what designers usually deal with in their practice. Being these aspects subjective, they often result largely difficult for professors to teach and for students to master. For this reasons, in this three weeks exercise, students were asked to focus on form giving aspects.

Like in the basic design approach, students were required to isolate an issue (the formal features of products) and to deeply analyze it, without taking into consideration the product mode of use and its feasibility. Nevertheless, since this activity was not supposed to be a typical basic design exercise (i.e. applied on “elementary tools of design”), students were asked to reason on a real product, first analyzing its form and then applying the same formal features to another product.

This exercise took also inspiration from the Project 1 “Form as a language” inside ‘Design and Experience’ Course held by professor Ger Bruens at Delft University.

4.1 Exercise description

The first part of the exercise, lasting one week, dealt with a formal analysis of a home appliance chosen from a given list of categories: kitchen scales, coffee machines, toasters, food processors and electric squeezers. Students, grouped in teams of three, were asked to choose a product category and to collect 10-15 products images taken from both internet and design magazines; the main criterion of choice was that these products should have a well recognizable aspect. In more details, the choice had to be made according to their geometry and composition.

Regarding product geometry, a lecture on the use of primitive versus free forms was given; regarding product composition, the three concept of “addictive”, “integrative” and “integral” were introduced. Then students were suggested to use a map with geometry and composition as axis in order to graphically arrange the products images on the base of their main formal features (see Fig. 1).

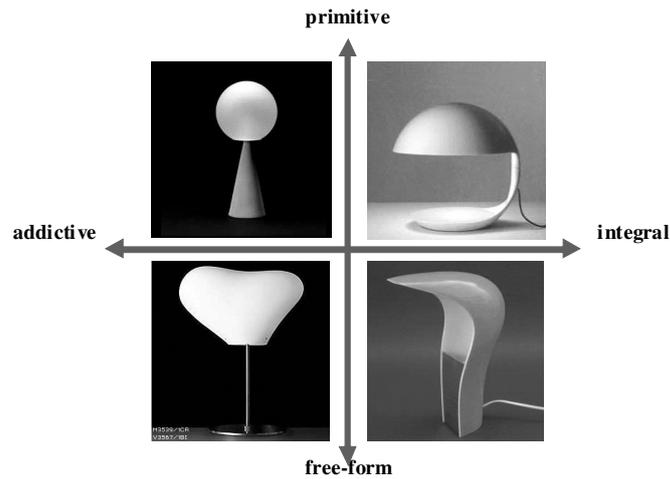


Figure 1. Geometry-Composition map

After this phase, each students team chose one of the mapped home-appliances and analyzed it according to a list of six formal features:

- geometry
- composition
- proportion
- dimension
- color and texture
- material and finishing

They were also required to define the product “character” (modern, classic, masculine, feminine, etc...) basing on the individuated features. Product character, or product personality, was intended here as “a high-level description of the product variant as a whole” [24].

In the second part of the exercise, lasting two weeks, each student was asked to apply the character of the analyzed product to a new one, chosen in the initial list of product categories; for instance, if a team analyzed the character of an electric squeezer, one student had to apply the same character to a toaster, another one to a kitchen scale and the third one to a coffee machine.

Students therefore tried to apply to the new product the distinctive formal features previously identified. In Figure 2 two examples from students’ works are reported: they show the transfer of a character from the original product to other three.

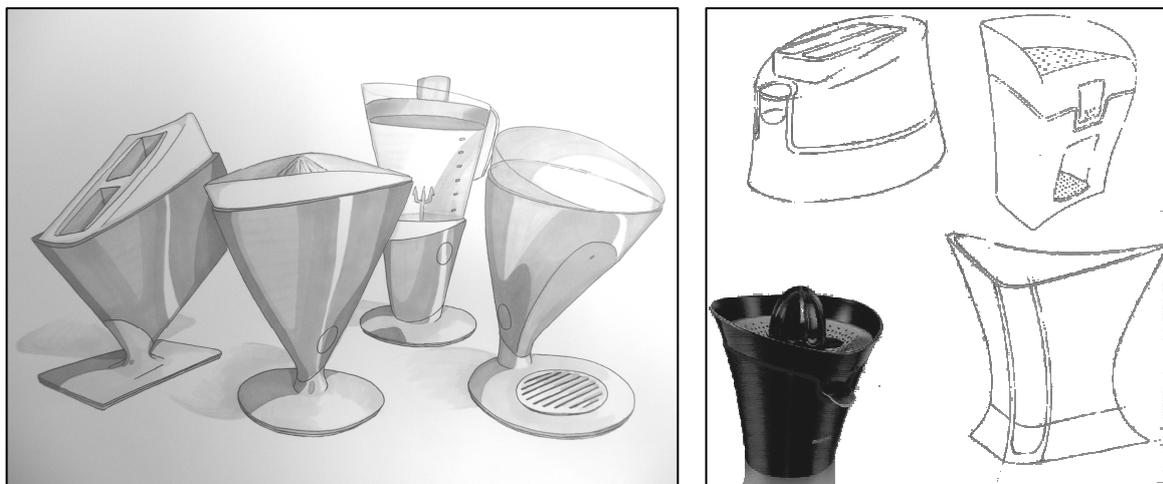


Figure 2. Example 1 by students: S.Bosatelli, A. Cecere, L. Muñoz; Example 2 by students: R.Piccolo, R.Negri, P.Vercesi;

4.2 Exercise background

In the educational experience above described, the authors objective was to provide students with cultural tools aimed at enabling them to critically analyze and to implement the form of products.

The first furnished tool was a Geometry-Composition map for the classification of product samples.

As said, a lecture on the use of primitive versus free forms was given. In this lecture, a number of images of design products representative of the two opposite geometrical approach were showed to students, pointing out that historically the use of primitive forms was introduced by the De Stijl group - "The reduction aesthetic of De Stijl was characterized [...] in the three-dimensional world by spheres, cubes and pyramids" [22] - while the use of free form can be traced back to the Streamline movement in the 1920s. Of course, students were also made aware of the possibility of using intermediate approaches.

Regarding the product composition, the three concepts of additive, integrative and integral were presented to students. These three concepts emerged in the studies of formal aesthetics by Dieter Mankay of the Offenbach School of Design [22]; they are defined as follow:

- additive: the product is the assembly of different parts perceived as single shapes. Given to manufacturing methods, this approach was dominant till the end of the 1950s. Nowadays using this approach is a free design choice.
- integrative: in this approach each part is not added but related to the others. The result is that the elements of the product are perceived as integrated into a dominant shape. This kind of composition spread out in the 1960s thanks to the development of new thermoplastic materials and manufacturing processes;
- integral: all the elements of the product are subordinated to a principal shape which is generally mathematically geometric. In this approach, the designer treats the product as a sculpture.

The second cultural aid provided to students was a set of six formal variables for the critical evaluation of product form: geometry, composition, proportion, dimension, color and texture, material and finishing. A similar list was introduced by Crilly, Moultrie and Clarkson in their review about consumer response to the visual domain in product design [18]. Leitherer in Bürdek (2005) [22] points out that "Giving form to industrial products as designers do – that is, concretely determining their groups of qualities and especially their external appearance, their aesthetic-cultural quality – is an extremely risky matter". Therefore the mentioned list of products features was intended as a list of underlying aspects of products on the base of which a product can be decomposed and analyzed. These same formal aspects were also the tools provided to implement a specific character into a new product.

As said, proposing this exercise authors aimed both at giving students useful knowledge to analyse a product form and at training their form-giving ability. The analysis phase was intended as the moment in which students should learn how to divide product form into its peculiar characteristics: indeed, during this phase they experienced how to recognize formal features and to classify them and also which kind of messages specific formal sets convey. Formal features were introduced as signs of the language designers should exploit to transmit intended messages with their products [18][25]. Thus these elements represented a tool both for 'reading' the form structure of products and for redesigning it.

During the presented exercise, Design&Engineering students were provided their only chance to train their ability of analyzing and mastering the form of products without worrying about the technical aspects related to industrial products development.

5 CONCLUSION

In order to test the effectiveness of the approach here described, authors asked the 50 students involved in this design exercise to give their feedbacks about it. Specifically, students had to give comments about the educational structure and its effectiveness in terms of acquired knowledge.

In general, feedbacks resulted highly positive with most of the comments reporting that an exercise focused just on form giving proved valuable in formative terms. Students frequently reported that the exercise allowed to train their critical abilities in giving form to products and in considering form as a central aspect in product development. Some of them also commented that in previous design studios the form giving issue was not tackled and they were not trained in thinking deeply about aesthetic and meaning issues. Therefore the 'separated' approach here described, inspired by the Basic Design tradition, resulted effective due to the dedicated focus on this matter.

According to authors, students reported positive feedback since this educative experience allowed them to deeply reason on aspects that often are given for granted by teachers.

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