

# VISUAL ELEMENTS OF PRODUCTS - AN EDUCATIONAL EXPERIENCE ON “RESETTING AND RESHAPING A PRODUCT”

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## ABSTRACT

This paper aims at describing an educational experience held at the Design School of Politecnico di Milano, Italy, during the first year of Bachelor Course in Industrial Product Design.

The course was divided into two parts. In the first one, teachers transferred the students the visual elements of the project through theoretical lectures and basic design exercises. The objective was to make the students aware of the fundamental principles of perception that concur to define the shape of a product. The second part was dedicated to an exercise called “resetting and reshaping” consisting in the application of such visual elements to generate and control the form of a product.

The aim of “resetting and reshaping exercise” was to choose some visual elements and use them to reconfigure - from the formal point of view - a set of silverware.

The students were free to stretch the shape of products even omitting to consider the function. This was a very extreme choice, made with the purpose of simplifying the process of form giving. Thus the exercise did not have any ambition of teaching how to design a product, even a simple one as a fork; rather it merely focused on the visual elements. The students were asked to deliver their work as a mock up of any preferred material and describe the aim of their work with a short abstract. The form giving process based on tri-dimensional modelling was chosen on purpose to let the students perceive as soon as possible the effect of their manufacturing activity on the final perception (crossing the limits of two dimensional drawings).

The interesting feature of this process was to see how the students transferred the knowledge acquired during the first part of the course to a real object.

The paper will shortly hint the principles of basic design in order to create the connection between the preparatory part of the course and the final exercise. A selection of mock-ups will be shown and explained in the paper in order to highlight the relevance and faults of such a process. The objective of the course was indeed to introduce students to the laws of perception and to the impact of visual elements to the definition of product's shape.

*Keywords: Laws of perception, visual elements, product shape*

## 1 INTRODUCTION

From the point of view of theory, the course starts from the assumption that what we see might be different from what physically is. This issue is treated through a brief insight into psychology of perception, in particular trying to overcome *naïve realism*, a psychology of mind according to which “we see things with certain features (form, colour, texture etc.) because they actually are in that way” [1], [2], [3].

In this perspective all the lectures and exercises of the course were meant to transfer the main understanding that: sight and perception are not as “objective” as people tend to think. This is explained through some examples, such as the Sander's illusion (Fig.1), where the observer might think the diagonals are not the same length. Actually the diagonals are geometrically the same but perceptually different. This difference in *physical* and *perceptual object* represents an issue for designers. Indeed they should early learn that what they design and present to others might be interpreted differently from what they thought.

This lesson was repeated through all the course activity from the first basic design exercises to the final exercise.

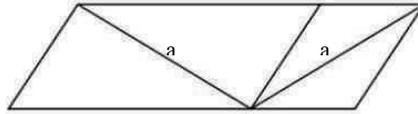


Figure 1 Sander's illusion

From the point of view of educational process, the design studio was focused on transferring knowledge mostly by practical activities. That is why it was organized in two main phases both featuring exercises developed by students with the tutoring of teachers, as described in this article.

## 2 AIM OF THE COURSE, A FRAMEWORK TO THE FINAL EXERCISE

### 2.1 Design studio's aim

The "Laboratorio di Elementi Visivi del Progetto" (Design Studio of Project's Visual Elements) is meant to be a preparatory course for product design students.

The aim of the course was to study the elements that help to determine the compositive/morphological / expressive quality of a two-or three-dimensional product. Among these elements more attention was devoted to those perceptual and interpretative factors that are predominantly originated from the sense of sight, which will be accompanied by aspects of perception influenced by other senses. This choice came from the awareness that "We primates are highly visual creatures and it turns out we have not just one visual area, the visual cortex, but thirty areas in the back of our brains which enable us to see, perceive the world" [4].

The key visual elements of the project (proportions, symmetry, composition, colour, etc.) were studied and analyzed individually through theoretical lessons and practical exercises devoted to each of them.

The idea behind the design studio is the fact that this theoretical knowledge can best be gained by integrating the inductive approach to the deductive one [5], [6]. The exercises let students apply the theoretical knowledge and experience tools to communicate their work (through models, images, views and sensory elements) [7]. At last, the skills acquired in the first basic exercises merged into a final more complex exercise that led students to define the shape of an object according to a selected set of visual elements.

### 2.2 Basic design exercises

This kind of exercise follows the "basic design" approach where single design features (colour, material, proportion, etc.) are studied isolating them from the whole complexity of a product.

In this perspective, the exercises focused on: laws of perception, motion and depth, ambiguity, symmetry, proportion, light and colour. These subjects were selected because they are fundamentals for a preparatory course, in particular for a *product* design course. Very often these contents are taught to graphic and communication students, while the authors think that they are very important also for product designers. Therefore, the subjects - and the way they were treated - were selected to be most useful even to the design three-dimensional objects.

From the point of view of process of learning, students were given basic design exercise [8]. That is, they had a clear goal and a set of rules to follow (i.e. use of only coloured paper and glue) given by teachers. These rules were very strict in order to excite their creativity to be expressed within given constraints and, also, to produce results that are easily comparable [9]. At the end of the activity students displayed their products on the tables, evaluated each-others work and discuss them with the teachers.

The subjects selected were the following ones.

#### **Laws of perception**

The first lecture was about perception and different theories about it [2], [3], [4]. In particular the "principles of grouping" derived from Gestalt theory [1] were described and experimented: law of proximity, law of similarity, law of common fate, law of closure, law of continuity, law of good gestalt, law of past experience. Students were asked to elaborate three collages of coloured paper based on some of these perceptual laws (Figure 2a).

### **Motion and depth**

The second lecture and exercise were about perception and representation of motion and depth [2], [10]. The lecture about motion was limited to the concept of “dynamic vs. static”. The exercise was to make two compositions of paper that had a clear static or dynamic aspect (Figure 2b).

The lecture about the perception of depth covered: monocular cues, binocular cues, and depth representation in art. The exercise asked the students to use a cardboard empty box to build a 3D composition of paper exploiting the laws of perception of depth (Figure 2c).

### **Ambiguity**

The third lecture and exercise were about the concept of ambiguity in perception [1], [2] such as geometrical optical illusions, impossible figures, ambiguous images, anamorphous, trompe l'oeil, etc. The aim was to focus on the basic teaching of the course: there might be a perceptual difference between the phenomenon and physic objects. In this case, the students were asked to make two collages of paper experimenting a specific case of perceptual ambiguity (Figure 2d) and, later, a three-dimensional composition of different materials that projected an unexpected shade (Figure 2e).

### **Symmetry and proportion**

The fourth lecture and exercise were about the perception and representation of symmetry and proportion. The students were asked to create a composition following the rule of “*sectio aurea*” and set in it three-dimensional boxes choosing any kind of symmetry: axial, bilateral, circular, translational etc. (Figure 2f) [12].

### **Light and colour**

The fifth lecture and exercise were about light and colour [2], [10]: what are they, how do we see them, three chromatic vision, additive and subtractive synthesis, perceptual phenomenon of colour. The students made four exercises meant to understand how variable is colour depending on the context it is inserted in. In the exercise called “Antiprimadonna”, developed by Thomas Maldonado [13], the aim is to have a plain effect on a composition of coloured papers and black and white textures, so that none of them shows up against the others (Figure 2g).

All these exercise were meant to train the ability of eyes to perceive the differences, as more precise as possible, in the effects of choices of composition.

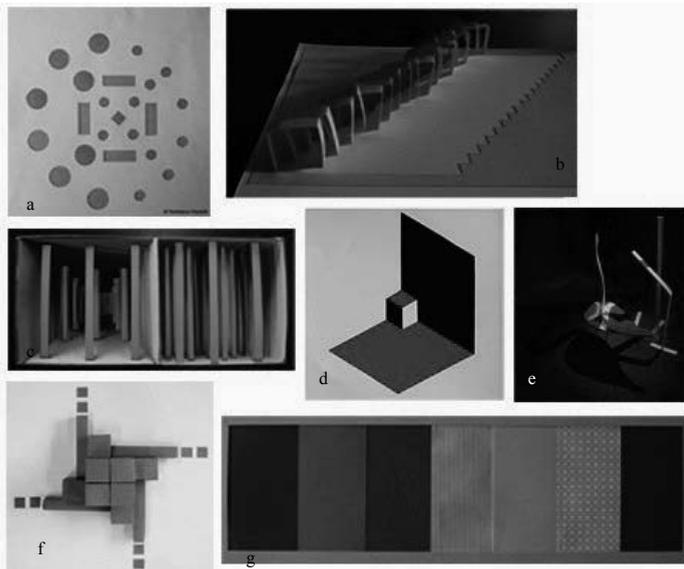


Figure 2. (a) principles of grouping; (b) dynamic composition; (c) depth cues; (d) geometrical ambiguity; (e) object-shadow ambiguity; (f) symmetry; (g) “antiprimadonna”

### 3 FINAL EXERCISE OBJECTIVES AND DESCRIPTION

#### 3.1 Theoretical background

According to Munari [14], a good design project is developed through single sub-phases in which each design element is individually investigated and deepened in order to get the best single solution from each phase and gather them in a final synthesis.

Munari approach was in some way replicated in design studio here described. Indeed, during the design studio the visual elements of design were separately investigated and merged in the final exercise.

The education experience based on the theory of basic design helped students to generate a body of knowledge, literally distilled in single exercises, which are "generalization, simplification of a recurring design problem"[15].

As previously described, Basic Design uses some different theoretical concepts and operational tools in order to pursue the development of skills of product configuration, that very often end up in creating a good equilibrium in its shape.

A pleasant, well-balanced shape is achieved through the skill of understanding and interpreting the real world as a whole in which each single design features (proportion, composition, colours, etc.) exist contemporaneously. Besides, there is the awareness that what we see might be different from what we actually have at sight.

This is well explained by Joseph Albers in his famous lecture taken at Trinity College: "In design, one plus one equals, three sometimes". In Albers' opinion, "a grass as a vegetable is a factual fact; grass as forest, is an actual fact." [16]

This means that there are various ways we can relate to an object (represent, name, etc.); the represented object, the "actual fact," is always more than the object itself, because it contains the interpretation of this difference.

In brief, world is more than a simple objective fact: it is a mediation of received input interpreted by our brain where each element is influenced by another one and by the surrender.

For this reasons students have to master both single design features and the way to interpret the reality.

#### 3.2 Resetting and reshaping exercise

The final exercise called "resetting and reshaping" consisted in using the visual elements studied in the design studio and to reconfigure a set of products in a conscious, designed way, from the shape point of view. The objective was to transfer to a whole object the principles of perception investigated through the single exercises developed in the first part of the Design Studio.

The students had to compose and configure a set of silverware according to a preferred visual element. They were asked to set objectives through a design brief, for example: "*The set of silverware is designed following the laws of closure and good shape, it is static, asymmetric, using the sign of depth and gradient shading, geometric ambiguity*".

During the exercise students were asked to focus just on aesthetical aspects without considering the mode of use. The teachers were aware that such a choice was extreme, but it was made with the purpose of deepen the ability of handle the process of form giving through the application of the laws of perception.

Indeed the aim of the design studio was not to teach how to design a product, but how to see and understand the reality according to all its visual elements and be able to use and synthesize them in a good balance through the product shape.

The students had to design and compose a set of silverware made up of:

- Three cutlery (knife, spoon, fork)
- A kitchen tool agreed with the teacher (i.e. cheese knife, potatoes peeler,)
- A food towel realized in any kind of a preferred material

The final output of the exercise was a design board and soft model in real scale.

The students faced the last phase with the support of "models and prototypes laboratory" of the School, thanks to which they could use machines and tools in order to realize physical three-dimensional models.

The form giving process based on three-dimensional model was chosen to let the students perceive as soon as possible the effect of their conceptual ideas on the final perception (crossing the limits of two dimensional drawings). The soft model was also required in order to show the way they were able to handle the visual elements and express them in a real product.

The novelty of this approach consists into connecting a traditional way of teaching basic design to the teaching of products' form. Typically they are taught in different courses and students shall find the connection by themselves. It is not uncommon to hear complaints about the aim of basic design courses in relation to product design. For this reason, the idea of teachers developing a final exercise where basic abstract concepts on perception laws are directly transferred to the shaping of real products. Teachers have realised that, no matter how well students applied and performed in the first part of the course, during this last phase they all have a certain degree of mental block in making this connection. This block was overcome by the discussion during the one-to-one reviews on projects.

#### 4 RESULTS' EXAMPLES

Hereafter six examples of the final exercises are presented.

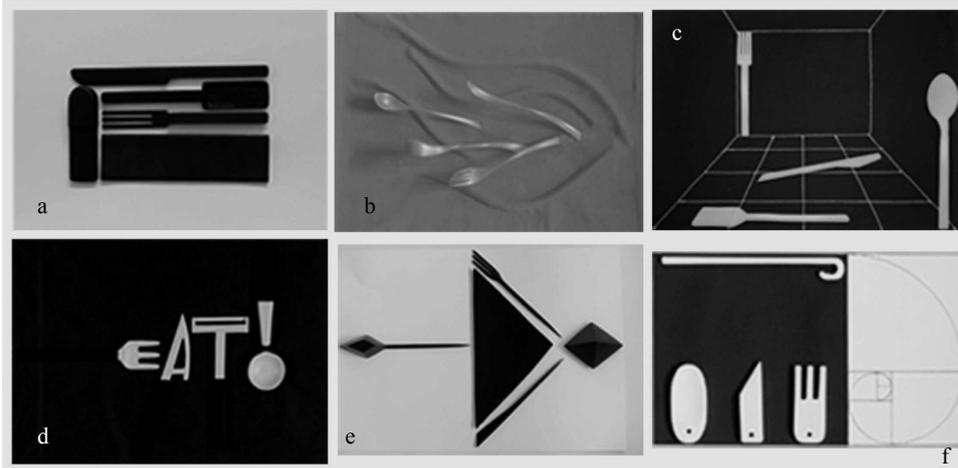


Figure 3. (a) principles of grouping; (b) dynamic composition; (c) depth cues; (d) ambiguity; (e) symmetry; (f) proportion.

The first one shows a composition of the three silverwares plus a cheese knife and a folded towel. They are displayed so that they visually form a rectangle. This is obtained by the use of the grouping laws of closure. The effect of unity is maximized by the use of the grouping laws similarity and proximity the composition is also static and balanced (Figure 3a).

The second one is a dynamic composition of silverwares and towel. Even the objects' shape is designed by dynamic lines. Altogether with the red colour, it reminds the concept of fire, with a successful final expressivity (Figure 3b).

The third one exploits the clue to design depth on a bi-dimensional canvas. The silverwares fit into a three-dimensional representation designed by the stitching on the towel. The single dimension of the objects are proportioned and displayed according to the illusionary space (Figure 3c).

The fourth composition is ambiguous. At first the observers see the expression: "eat!"; later they can notice the presence of four elements, at the end they recognize three silverware and a potato peeler (Figure 3d).

The fifth one shows how to balance the spatial relationship between the elements using the bilateral symmetry. It is also an ambiguous figure, because the silverwares are not immediately perceived. On the contrary, the geometrical figure based on rhombus development prevails (Figure 3e).

The sixth is a well-designed example of applying the rule of *sectio aurea*. The student indeed, created an original harmonic composition replacing the golden spiral by splitting the cutlery in each single piece. Even though the elements are not closed to each other, their relation can be guessed thanks to the grouping law of similarity (Figure 3f).

These examples show how different can be the visual impact of similar elements (in this case silverware and towel), if their shape, composition and colours are designed with different visual aims. Also they show how visual perception can be a starting point in the design process of new products.

On the other hand, silverware proved to be not the best objects for this exercise, because their usability is fundamental, while in this case, several results are clearly very far from being “real” functional products. Even this gap was expected by the brief of the exercise, it might disorient young students who are not able to discern the difference. The teachers were explaining it quite often during the course.

## 5 CONCLUSIONS

The aim of this educational experience was to make the students able to master the visual elements that concur to define the form of a product. A two-steps process was developed for this educational purpose, as before said.

The results of the Design Studio show the effectiveness of such a process. Indeed, most of the students’ works proved that they actually acquired the ability to exploit and transfer the visual elements to product shape.

On the other, the soundness of the course was also confirmed by the positive assessment given by the students at the end of the course. They also participated with interest and enthusiasm to the design studio both during the work in class and making their homework.

Nevertheless, the teachers realized the choice of “silverware” didn’t exactly fit with purpose of the last exercise. They are simple products, but very strictly related to usability. Thus the results of this activity (that featured form to the extreme) might look and actually be unfeasible, which is certainly an unhappy result for a design exercise. Therefore in the future the subject will be selected to be a less functional and more decorative product, so that the final results will be effective from the point of view of the design studio’s aim and also from the point of view of design. Indeed in the same course of the current academic year, the subject of final exercise will be a set of ceramics tiles for wall application. In this case decorative function exceeds the mode of use therefore the gap should be less wide.

Furthermore it was understood that, no matter how clear the results might look at the eyes of teachers, they must be explained one by one to students to make sure they “see” what the results feature in relation to the aim of the course. The connection is not easy to find by every single student.

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