A NEW APPROACH TO EMPOWER THE BASICS OF REPRESENTATION SKILLS FOR PRODUCT DESIGN STUDENTS

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Abstract

We assume that representation techniques play a fundamental role in the Product Designer’s activity because of the needs to describe in the most efficient way the different phases of an industrial design project: the creative one, the development step and the documentation step. We prefer to use the word “representation” rather than “drawing” because we believe that today the project representation is no more only drawing, but it’s still, also drawing. Because of this starting assumption, we are trying to improve the effectiveness of project representation courses by an innovation in the structure of the teaching activities in which we are involved at Politecnico di Milano Design School.

The paper will describe at first the main topics treated and the standard organization used for several years, and later the goals, the contents and the results of a course, Drawing Studio, that has been deeply renewed from the A.Y. 2017/2018. The framework and the results highlighted in this paper are part of a still ongoing basic research project, funded by the Politecnico di Milano Design Department. The experimental course described in this work is a practical evolution of the activities described in a previous paper (F. Brevi, M. Celi and F. Gaetani, 2018).

The main objectives of this course are to train a quite large group of freshmen students to the representation techniques for product design and, at the same time, to assist them in the change of their mental approach to studying, from high school to university.

The organization of this course has been setup on a mix of different skills and tools, based either on lectures and on practical exercises, along three paths: an analog one focused on descriptive geometry and on hand sketching, a digital one focused on technical drawing and a third one based on the building of physical models by hands.

The results of this experimentation appeared promising, but at the same time we faced also few problems that we will describe as well as the changes we will try to implement to fix them.

The final goal is to define a precise and detailed syllabus to be submitted for adoption by all the people involved in teaching this course at Politecnico di Milano.

Keywords: Project Representation, Product Design, Integrated Tools, Drawing.

1 INTRODUCTION

The representation techniques have a crucial role in the design process. In the past they were based on a range of different drawing techniques. Today the digital worlds put in the designer’s hands a wide range of different tools able to support the goal to represent and to communicate a project in an effective way. Some of these tools are simple digital versions of long time used techniques; some others are certainly new, first of all the digital 3D modelling.

The 3D digital modelling is not only a digital way to create a prototype, it’s much more because the same model could be used for several different checks. Today there is no more any industrial product design process able to avoid totally the use of digital models [1].

The teaching curricula for the design representation incorporated these new techniques, but they did it reducing the time for teaching students techniques and methods of drawing. So several students currently think they don’t need to acquire good skills in drawing because of their self supposed positive attitude to 3D digital modelling; but that’s simply a wrong assumption.

Indeed, representation techniques in the Product Designer’s activity play a structural role to better describe the different phases of the project development [2]: the "ideational" phase, the “intermediate” phase and the "technical - documental" one, and sketching on paper still play an fundamental role in the ideational phase of the process. That’s because sketching on paper is still the best and fastest
way for industrial designers to describe their ideas, visions and projects [3], but also because
designers are used "to draw while they are designing and to design while they are drawing" [4].

The challenge we are facing with this research is how to teach students at a technical university the
tools to be used for the representation of all phases of an industrial design project and how to use
them in an integrated way with digital tools.

In this work we’ll highlight a renewed course focused on teaching how to start drawing in a proficiency
way for a product designer.

2 METHODOLOGY

The education on design representation for the Industrial Product Design curriculum at the Design
school of Politecnico di Milano has been organized mainly on four courses, arranged in the first two
years of the bachelor program, one for each of the first 4 semesters. They have been named as:
“Drawing Studio”, “Methods and Instruments for Design”, “Digital Representation Studio” and "CAD
Models”.

The second year courses are fully dedicated to 3D digital world: the first one mainly on modelling and
rendering for concept design; the second one more oriented to the engineering development of the
project and to its production. The course titled “Methods and Instruments for Design”, scheduled in the
second semester of the first year, was designed as a course in which to teach the digital tools for 2D
graphic, typically Autodesk AutoCAD for technical drawings and the Adobe Suite, mainly based on
Illustrator and Photoshop, for managing graphics of project presentations.

So there was only one course left to teach drawing, the course named “Drawing Studio", but that
means students should acquire different methodologies, techniques and skills in a short timing (a
single semester is organized in 14 weeks of lessons plus the time for exams).

At the same time, there are roughly 300 students subscribing every year at the Industrial Product
Design program of Politecnico di Milano. The school splits them in 5 classes and each class has 3
teachers involved in the “Drawing Studio” course but not being in the classroom at the same time, so
every teacher has to manage a group of 60-70 students.

Having these constraints as background, the research has been setup with three main goals: to find a
way to give students better opportunities to acquire strong skills in drawing without any changes in the
courses structure; to update the contents of all the four courses; to share a syllabus that could be
adopted by all the teachers involved.

The first step has been to look for the more distinguishing topics previously covered by the five
classes of the first year. We have been able to identify six main areas: descriptive geometry; survey;
technical drawing; sketching; rendering; physical modelling. Leaving temporarily aside the physical
modelling topic because of its specific characteristics and because it’s not really a drawing activity, we
explored the way to keep all the other topics improving them.

Because the drawing activity is a practical activity whose quality can be greatly improved only with
regular and constant efforts, we decided to explore a way to give students more time and more
opportunities to train themselves on some of these topics.

The first area on which we focused for possible optimization has been the technical drawing area. In
the past we were used to teach the hand made technical drawing in the “Drawing Studio” course in the
first semester and to ask for applying this knowledge in the second semester using a digital technical
drafting system, typically AutoCAD by Autodesk. We believe this approach is no more a well updated
way to teach it because today the technical drawing is always managed using digital tools, so probably
we can save time using sooner the digital tools in the teaching activity too.

Therefore we decided to move the teaching of the digital way to technical drawing from the "Methods
and Instruments for Design" course directly into the “Drawing Studio” course so to have the
opportunity to move something else in the opposite direction, from the first semester to the second
one. The choice has been to move the hand made rendering techniques and to extend the sketching
training over both the semesters. The reason of the choice to move the hand made rendering to the
second semester is related with the idea to merge the teaching of hand made rendering techniques
with the use of Adobe Photoshop software both to give an easier understanding of colours
management and to have the opportunity of using the painting capabilities of the software. To have
some training activities on the hand sketching over the two semesters instead is related with the idea that today this is the most important technique for product designers' purposes.

3 RESULTS

In the last two years we led an experimental group of students: prof. Fausto Brevi taught the “Drawing Studio” course and prof. Flora Gaetani the “Methods and Instruments for Design” course; a continuous and strong coordination and discussion has been useful to keep them both updated and to share ideas and suggestions. In Fig. 1 we summarized the global skills and tools useful for being able to represent a product design project in an effective way; the highlighted areas are the topics we have planned to cover in the new “Drawing Studio” course.

Figure 1. Drawing Studio areas of competences within the Representation skills & tools map.

The “Drawing Studio” course contents have been rearranged in a framework of 120 hours (90 hours dedicated to drawing topics + 30 hours for the physical modelling experience taught by prof. Matteo Dall’Amico) managed by prof. Fausto Brevi. The 90 hours have been split in two modules as 60+30 hours. The class activities happen twice per week. We have decided to use very soon all the 30 hours module taught by prof. Marco Abbate, for giving to students a strong review on descriptive geometry because we strongly believe it’s the theoretical and practical basement of every drawing technique.

Figure 2. One of the exercises related with the descriptive geometry review (by S. Morelli).
Meanwhile, in the second day of the first 3 weeks, we have taught simple 2D exercises, very useful to increase the quality of hand made strokes. Indeed one of the most common problem is to train students on moving their quality from uncertain childlike strokes to a good professional level [5]. It's a time consuming activity but students have to practice it on an every day base for being successful; forcing them to do that during the first three weeks is based on the theory that repeating an action for 21 days changes that action in an habit. Obviously that's not true from a scientific point of view because the reality is more complex, a strong role is played by personal motivation and by intrinsic difficulty of the action [6], but we believe this storytelling could be of some help in supporting the students' self motivation and it's anyway a very useful practice to step up the strokes quality. So we use this fake theory in a provocative way, as a challenge.

Figure 3. Some of the exercises used to improve the quality of the students’ strokes (by M. Alberico).

The other lessons are spent on global survey and on technical drawing. The adjective global, close to survey word, means it’s not a simple dimensional survey, but a more general and complete survey that takes care about morphology, relationship with the user, functionalities, materials, dimensions, etc. [7]. The works for global survey are able also to keep alive the training on sketching.

Figure 4. An example of global survey applied to a simple object, a clothes peg (by H. Mestria).

Last but not least there is a cycle of lessons focused on technical drawing. This group of lessons starts immediately after the first three weeks and it has been placed in alternated weeks as preliminary reference idea. The standard lesson on technical drawing starts with a review of homeworks, then the explanation of new rules and later some exercises to apply immediately the just taught rules. The technical drawing has been managed at the beginning by hand with a series of simple exercises useful to learn the basic rules. Students had to draw on a white paper the exercise with a graphite pencil using set square, ruler and compass; then they had to redraw by free hand pen over the pencil strokes; then to copy the same exercise aside, directly by free hand pen.
The last step has been to introduce the use of Autodesk AutoCAD software for managing in a more efficient way the technical drawings. The idea is students have to learn the basic rules drawing by hand but later, when the complexity of the exercises grows, the practice of only hand made drawings becomes an ahistorical approach. The very last exercise has been a resume of global survey and technical drawing principles applied to an industrial design product, developed using a mixture of analogue and digital techniques.

4 CONCLUSIONS

The new release of “Drawing Studio” course has been tested twice and it will be tested a third in 2019-20 before taking final decision about its spread. At the moment we have collected positive feedbacks both in perceived quality and in students’ and in other teachers’ comments. We believe that the area of possible improvement is mainly concentrated in the mix of analogue and digital approach, used for technical drawing, because actually we are non fully satisfied by the quality of both; probably we will try to introduce earlier the digital tool so to be able to reach a better awareness on its characteristics and potentialities.

The results of the first year of “Methods and Instruments for Design” course have been already reported in another work [8], while the second year is still carrying on.
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