

IF YOU DON'T DRAW IT YOU WILL NOT SEE IT

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Introduction

The activity of drawing has characterized the human being since pre-historic times. The 'language' of drawing was utilized long before writing was there. It is an expression of human's unique creativity and an example of human's near-exclusive usage of tools.

In this paper, the broad definition and relevance of drawing will be addressed first. Subsequently, the position of the professional and educational field of design drawing takes will be discussed, and its specific functions within the context of product design. The overall goal of this paper is to summarize the various uses of drawing as a 'design language', discuss the educational value and present a preliminary learning model, which describes the sequential and additional steps that need to be taken into account when teaching students how to draw. The variety of functions of the drawing medium are integrated in the so-called design drawing curriculum of the Industrial Design Engineering program at the Delft University of Technology, which will be elaborated on. Subsequently, as an exemplifying and representative approach for suggesting an object's volume - one of the most important goals of design drawing - a specific method and technique will be described and shown.

Definitions of drawing

To be able to clearly describe the specific field of 'design drawing', first the generic activity of drawing will be discussed shortly. The literal meaning of the verb 'drawing' can be described as the manual activity of creating an image, mostly on a rather flat surface. Drawings are representations of either existing things and situations, or of rather conceptual thoughts and imaginary concepts. In David Hock-

ney's words: 'With drawing you can express all kinds of ideas that might otherwise be lost - delight, frustrations, whatever torments you or pleases you'[1]. Etymologically, drawing means producing or tracing an image of (someone or something) by making lines and marks on paper.

Both the drawing activity and the drawing result refer to the communicative function of the drawing medium.

Drawing in the past

As a representation of the origin of drawing, the animal drawings of the Chauvet Caves in France (approximately 32.000 years ago) need to be considered (Figure 1). Although theories of why they've been made vary, their communicative functions are obvi-

ous, even today. Experts consider the drawings to be there for documentation of knowledge about the animal species for when these would return after a long time of absence [2]. Among other theories, the cave drawings are seen as a preliminary writing language, although there are many differences [3].



Figure 1: Grotte Chauvet Pont d'Arc, Ardèche, France, approximately 32.000 year old, source cc (creative commons).

The preservation and transfer of knowledge has always been an important function of drawing, from pre-historic times until the industrial age, in which patterns and shapes were recorded in 2d for later reproduction.

Apart from the rather practical purpose of both the early cave drawings and the later drawings for reproduction, drawings were mostly a means to express artistry in different periods of time: attempts

to make a beautiful or correct representation of a thing, living creature or thought. The free medium allows exploring and creating visions and scenarios that could comprise anything. Like art, drawings can be expressions of creative intentions [4], of the identity of the artist, or the identity of a group, a people, a religion or a certain culture. Drawings in these cases can be depictions of stories and myths (Figure 2).



Figure 2: Façade of restaurant Ostradamus, Ribeirão da Ilha, Brazil. Picture taken by the author'

According to D.A. Louw, drawing serves as basic means to support and express creativity and feelings [5]. It is closely linked to the capacity to think and feel [6].

Considering the artistic expression assigned to many of the artists of the early days, it is important to emphasize and distinguish the analytical purpose of many of the works of artists as Da Vinci, Michelangelo, Rafael and others (Figure 3).



Figure 3: Michelangelo, The Resurrection of Christ, 1532, collection of Teylers museum, Haarlem, The Netherlands, source cc'

Drawings were sometimes a preparation for other works of art, as paintings, sculptures and architecture [7], these are rather called sketches.

According to literature and various scholars, the activity of drawing is one of fundamental relevance to human development [8-10]. Representing thought and action while drawing helps developing children's understanding of numeracy and literacy [9] (Figure 4). But it is an error to think that only children need to draw and learn how to draw. According to John Ruskin, art critic and social thinker (i.a.), the discipline of drawing tunes the sensitivity of the drawer to a higher pitch; it refines the drawer's vision [1]. Instead of taking pictures, one should draw the observed, is what he pledged for. In short, drawing sharpens observation, it increases perception, and it supports visual imagination [7].

A process of didactic value Learning to observe, learning skills

The activity of capturing a scene or object with a line on a canvas is a very helpful way to better understand that very scene or object, and of how they're affected by perspective and aerial perspec-



Figure 4: The didactic value of drawing (picture with permission of the child's mother)

Drawing in a design context: 'design drawing'

Specific drawing functions apply to the field of product design and design education.

Within the context of product design and education, the ability to sketch has always been a very important asset. Historically, since the origin of the product design profession, drawing and sketching have had a variety of functions: mostly depicting a certain design outcome, e.g. documenting for re-production, drawing ornaments and details, product representation drawings for catalogue function, archiving of product information, building instruction and design presentation. Besides drawing as a means for presentation, the drawing discipline has always had the function of exploring and developing new designs.

A very brief history of design drawing

Since the emerge of mass manufacturing, in order to assure a certain consistency of the many products that were produced of one item, the source products were manually drawn and filed [11]. These drawings served to exchange product information between sites and departments. In the early days of commercial sales of produced items, people would order from what was exhibited in a manufacturer's product catalogue (Figure 5). The depictions therein included i.a. drawings of household objects as tableware, furniture and details of ornaments. Until the final decennia of the 20th century, though before CAD (computer aided design) appeared, manually made technical drawings were still the medium for exchanging information for manufacture and assembly.



Figure 5: Matthew Boulton, Manufacturer's Catalogue of Silver Plated Ware: Creamer and teapot, 1790, etched, cc, credits: The Elisha Whittelsey Collection, The Elisha Whittelsey Fund, 1954'

Raymond Loewy is a well-known representor of the industrial designer profession. He combined a flamboyant appearance with being a superb negotiator and, last but not least a great visual communicator: he was able to convince clients and partners with representational and inspirational drawings. Some examples of Loewy's work can be found in multiple publications and websites.

When the communication between manufacturer and consumer is concerned, instructional drawings sometimes help the consumer to assemble or

understand the purchase, as part of the offer with the product. In the past, instructional kits from Gerrit Rietveld [12] or for example Enzo Mari [13] form examples of designers who would offer their designs for people to assemble themselves. In the 1950s' age of DIY (toolkits, templates), and in today's context of user participation in product design [instructables.com, e.g.], drawings are there to explain and facilitate (Figure 6 shows an example of an amateur template).

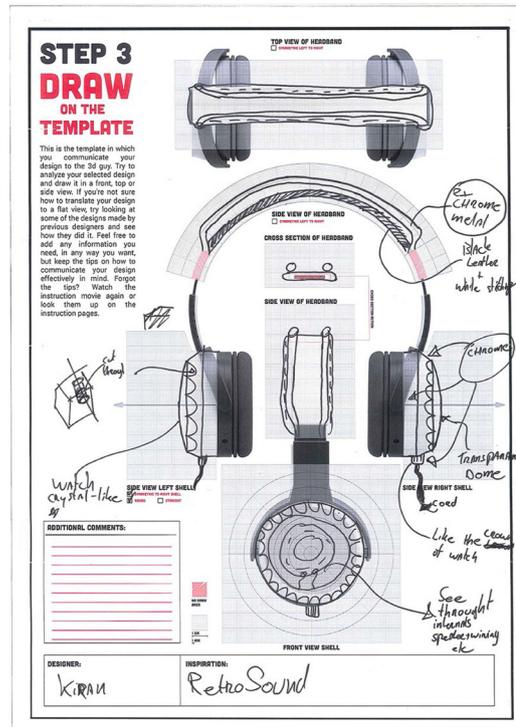


Figure 6: Participant example of Design for DIY template (K. de Waard, Delft University of Technology)

Throughout the history of industrial product design, drawings have functioned as legal documentation of product patents, since text was not sufficient to capture neither the essence nor the constructional details of new inventions.

Today

Today, as part of the design process, designers use concept sketches and drawings to suggest project or future directions, and negotiate with stake holders. In fact, in a preliminary state of a design project, steps are taken and decisions taken with the help of physical (models) and picture (drawings) representations of the anticipated outcome, supported with CAD models if appropriate. The function of design drawing today is threefold: (1) Exploration (or design development): the designer visually explores, develops, iterates. Visual exploration helps him/her to search for solutions and shapes freely, and reflect on first drafts of thoughts on paper (or

tablet). (2) Communication to an internal audience: the designer visualizes design ideas, concepts, proposals, as a means to be able to discuss and negotiate these developmental proposals with project members. Typically, this takes place at several stages in the development process (see Figure 7). (3) Communication or presentation to an external audience: the designer visualizes the design of a product as a result of the preceding design trajectory or specific stage, and presents to an audience of project stakeholders. Although there are strong reasons to explicitly distinguish these three stages and the matching drawing methodologies (distinguish e.g. for reason of client expectation and efficiency), these practices of design drawing tend to overlap sometimes.

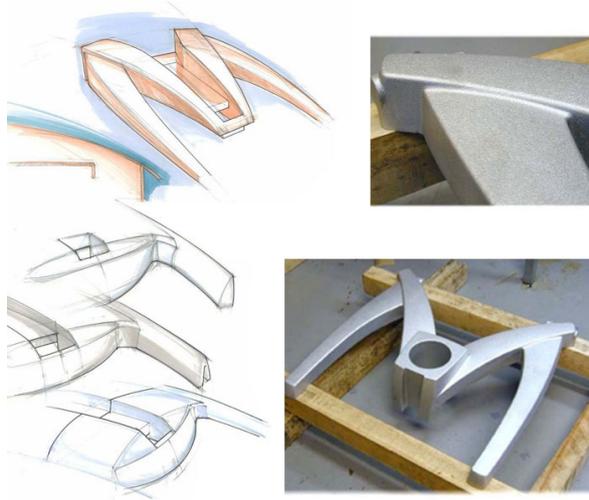


Figure 7: Example project of concept design (project of People Creating Value, The Netherlands, design a.o. by the author)

The discipline of design drawing is as broad as the field of product design has become. Besides the traditional visual product design stages, this also includes the strategic stages, areas of user-product

interaction (Figure 10: Example of student exercise that considers human-product interaction (by D.Volmer)8), ergonomics, product service system combinations, story-telling, visual thinking, narratives, scenarios. The discipline of design drawing has broadened its scope.



Figure 8: Example of student exercise that considers human-product interaction (D.Volmer, Delft University of Technology)

how to teach?

Design drawing education

Both the generic didactic value of the drawing activity and the specific design drawing aspects are important elements of educating a future product

designer. That means a program must include (1) observation and analysis exercises in order to support the student in learning proportions, develop spatial awareness, reflect, and consequently improve skills and knowledge, (2) exercises that teach about the various drawing types, materials, media, tactics, stages, situations (and many more) that have a direct relation with the way how it's implemented in practice, meanwhile helping the student to learn while doing.

A model of stages of learning how to draw

Cohen describes four of the main purposes of drawing: (1) train the perception of the object, (2) making representational decisions, (3) develop motor skills, and (4) the perception of one's own drawing [14]. In the specific case of design drawing education, an additional step should be included that comprises the 'imagination' of a new concept (that is: without direct observation). After all, a product designer will eventually have to be able to draw his or her own concepts from scratch.

Although one could defend that the stage of 'observation' (1) might as well mean the observation of the imaginary, the specific design drawing educa-

tional model will include an extra step for it. However, this step represents the first step of a second cycle of learning, as shown in Figure 9. In fact, the specific learning model, which refers to the circular learning model of Kolb [15], has a spiral shape, in which each circular 'level' is a new learning cycle. The first cycles start with observation, and could or should be repeated many times, so that in later cycles (inner cycles) skills and knowledge will be sufficiently trained. In the following cycles, the first step will be 'imagination' (Figure 9). There is no need saying that stages do not always run a continuous and uninterrupted path. The process depends on student's prior knowledge and skills, on his or her motivation, a bit on talent, and on the steepness of the learning progress.

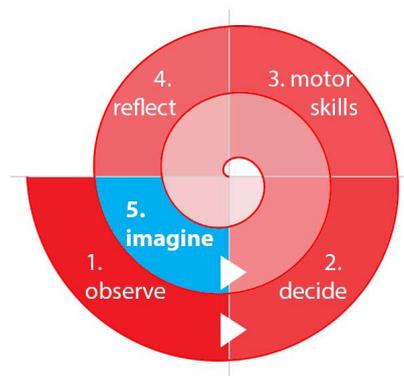


Figure 9: Model for learning how to draw (Hoftijzer, inspired by D.J. Cohen [14])

Learning stages of design drawing

1. Observing: Observe and understand shapes and environment (spatial relationships).
2. Deciding: Based on the observed, choose what to draw and how to draw it (methodology, techniques and tactics). This includes decisions that concern the perspective context of drawings.
3. Imagining: In order to be able to put thoughts on paper, to develop shapes and solutions from scratch, the training in observation (1) and the other first cycle stages is necessary.
4. Reflection: Reflect on your own drawing. As proclaimed by many scholars, one of the best ways to learn is from reflecting on your own work: what went well, what went wrong, why? Reflecting obviously comes before redoing, adjusting, customizing, and reflection as a major aspect of learning to observe and anticipate.
5. Motor skills: When choosing and depicting a representation of the observed or an 'expression' of the imagined, at the same time student practice their motor skills: learn to apply vigour, dynamic, signature, eye-hand coordination.

- In reality, imagining is not a separate activity or stage; it is an integrated part of design exploration, helped by drawing and analysing.
4. Further steps. After the reflection stage (4), either or both the activities of (1) observing and (5) imagining are next. And after stage 5, one has to make decisions again: stage 2.

Drawing courses of IDE Delft/ a design drawing curriculum

At the Delft University of Technology, The Netherlands, as part of the Industrial Design Engineering program or faculty, the design drawing courses have been structured along a certain drawing curriculum path. In Figure 10, the courses that together form this path have been depicted in circular shapes. The design drawing courses and modules have been positioned in a graph of the various fields of application. The basic courses of drawing 3d shapes (fundamentals, see Figure 11) form the centre.

Design drawing & visualization: iteration and communication

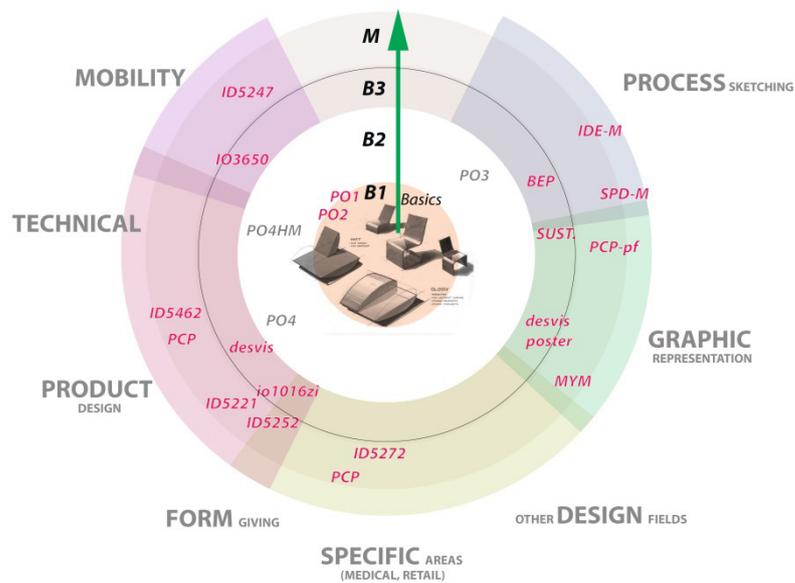


Figure 10: Drawing courses, related to the program and fields of implementation

Referring to the model of learning how to draw (Figure 9), observation exercises are included in both bachelor’s courses and master’s courses of IDE. These include the observation and depiction of tones of light and dark, of product proportions and perspective, the detailed depiction of specif-

ic materials as plastics, glass and chromium, the product analysis needed for drawing exploded views, human figure drawing (Figure 12), the painting of colour specific arrangements. In many of the other, later, drawing courses, drawings skills are applied in design related exercises, in which imagination has a larger share.

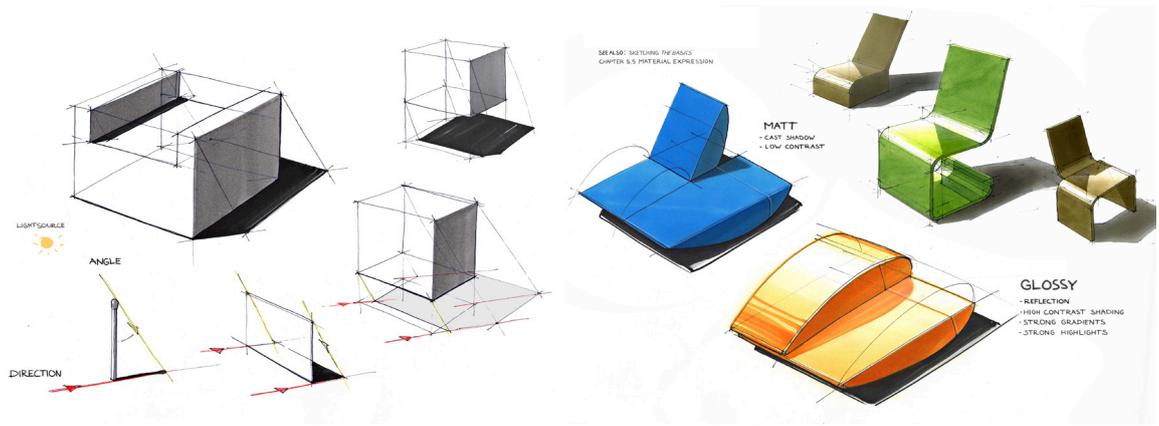


Figure 11: Delft design drawing basics, fundamentals of perspective and shading



Figure 12: The course 'Human Figure Drawing'

Concerning the items that are subject of the exercises, a very important element of the Delft drawing 'philosophy' is the fact that all starts from learning the fundamentals (Figure 10 and Figure 11). The fundamental knowledge of (and skills that concern) how to draw in 3-d perspective is not

only necessary for drawing products, but also for drawing processes, scenes, stories, etcetera. Figure 13 shows how drawings used in so-called 'visual thinking' are directly related to the fundamentals of 3-d drawing.

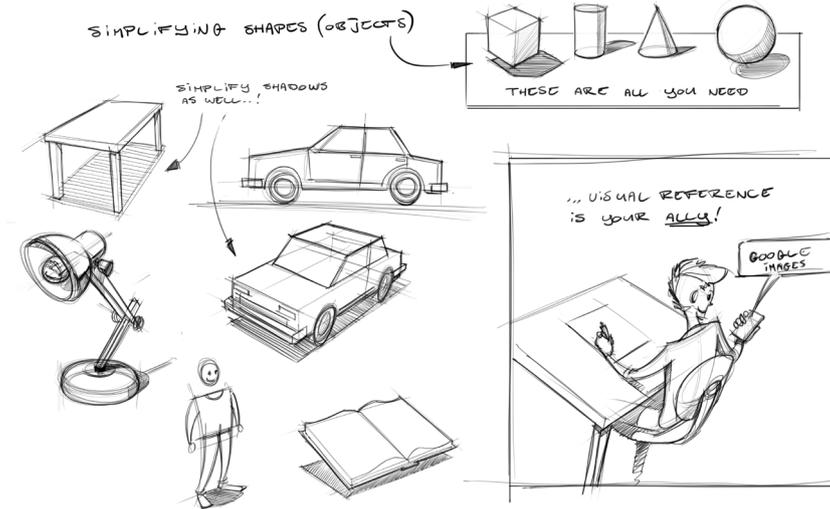


Figure 13: 3d shapes and knowledge needed for visual thinking (picture by M. Sypesteyn, drawing staff IDE)

Today, a reasonable part of the design drawing practice has moved to the digital drawing tablet, mostly in combination with analogue sketches. In education however, the analogue medium is required to learn the skills before entering the digital medium. Students have to learn drawing the 'hard' way, and the paper medium offers the feedback and connectedness that is required. In the IDE drawing program, students start drawing digitally in the 3rd year of their bachelor'.

essential for learning how to draw, it would be '**visualizing the volume** (or plasticity) of an object or shape', which starts at the fundamentals of applying (1) 3d perspective, and (2) applying light and dark tones. Or in other words, it is most essential for students to learn see, and then be able to depict a 3-dimensional subject on a 2-dimensional paper canvas or tablet. A traditional name in art for the use of light and dark used to emphasize and distinguish shapes is 'chiaroscuro', or 'clair obscur', literally light and dark. In history, 'chiaroscuro' has been an important element of the works of e.g. Rembrandt or Watteau (Figure 14, Figure 15), and many others.

An essential element: 'chiaroscuro'

If one would have to define the one element of design drawing that is essential for all courses, and



Figure 14: Rembrandt van Rijn, Bust of Rembrandt, ca. 1629, collection Germanisches Nationalmuseum, Nuremberg, Germany



Figure 15: Antoine Watteau, Seated Woman, 1716, collection Metropolitan Museum of Art, New York, U.S.

With the help of dark respectively light tones of paint or pastel, suggestions of depth were created. Although such an intensive and time consuming painting technique obviously is not how product design sketches and drawings are executed, the

goal and methodology are quite the same. Both then and today, applying chiaroscuro distinguishes works of art respectively design drawings from graphic depictions without any depth.

A student Experiment: chiaroscuro with pastel

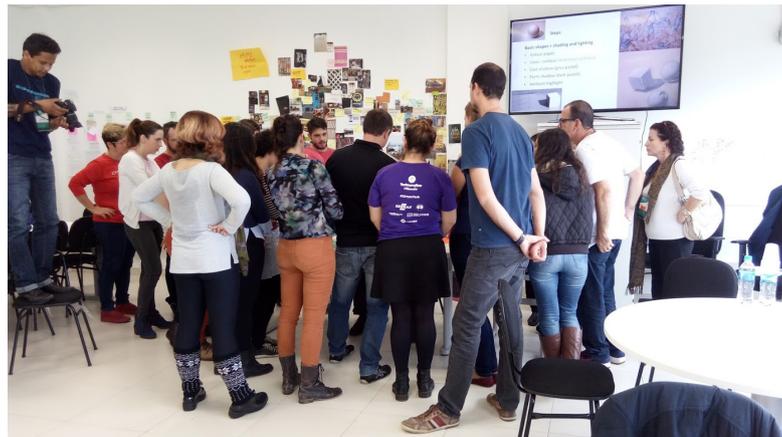


Figure 16: Workshop at the 16th Ergodesign conference 2017, photos taken by UFSC, Florianopolis, Brazil.

Contents

As an example exercise of ‘chiaroscuro’, a workshop was organized with approximately 20 participating students. In this workshop, the starting points were

the use of pastel powder and the creation of ‘chiaroscuro’ by applying pastel. A short explanation of the subject ‘chiaroscuro’ precluded a demonstration of drawing with pastel powder (n.b. the pastel tool for drawing has a long and interesting history itself [17]), in which steps, technique and methodology were explicated (Figure 17).



Figure 17: Workshop participants and in-between results

After some exercises in which basic shapes (spheres) were drawn and ‘rendered’ with pastel, students were asked to imagine and draw a random – fluid or organic though – contour. Starting with

a contour, the methodology prescribes the addition of cross section suggestions and a cast shadow, before turning to the several pastel stages (Figure 18).

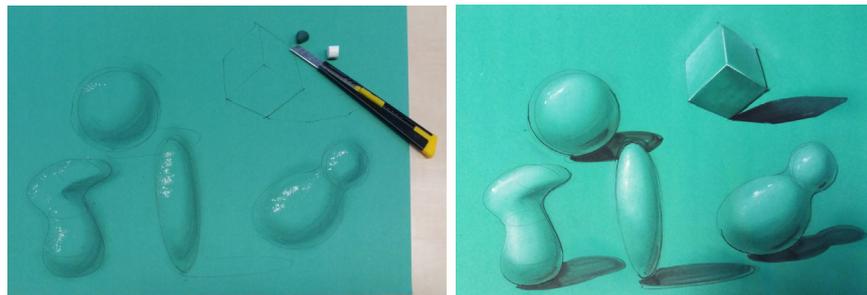


Figure 18: Steps taken: contour, cross sections, cast shadow, dark pastel, white pastel, details

The workshop had an interactive and informal character, in which the tutor/ facilitator answered questions and demonstrated steps and elements (Figure 17).

The students proved to be highly motivated to create their own ‘blob’ shape, based on theory and technique as demonstrated. The students’ efforts resulted in a variety of shapes, all depicted on an A3 colour or grey paper sheet. The colour paper functioned as a mid-tone colour to which both light and dark tones could easily be added (Figure 17, Figure 18).

Some conclusions from the workshop

Although the technique of scraping pastel and then smoothly applying it to the canvas, was understood and implemented generally well, some had trouble to manage the amount of powder that was needed. In fact, one needs to anticipate the function of the paper colour, and not fully cover it with pastel. Generally speaking, female students seemed to be more open to suggestions, whereas male participants sometimes were less open. The warming-up exercises, that helped to (1) get acquainted with the material and technique of pastel, and (2) explained the methodology of ‘rendering’ a sphere, were valuable: it was a relatively easy step to move to a random shape from there. In a next set up, probably it would be wise to run two exercises of random shapes instead of one though: it’s still a rather complex shape that requires daring to draw, from

scratch.

The full process of drawing basic shapes based on an example, and then drawing random shapes from imagination, included all steps of the 'learning how to draw' model as depicted in Figure 9: participants analysed and observed the examples and demonstration (1), related those to a real spherical shape, then followed: (2) deciding what to draw, (3) exercising motor skills, reflecting (4), and in the second cycle there was stage 5: imagining new 'blob' shape. It was clear that students were willing to and needed to practice more extensively, however a lot of the results were great and truly revealed the depth in the drawings one strived for.

In a succeeding workshop set up, the first step could as well be executed with a real life 3d shape of a sphere to observe rather than a picture. However, that would require a very strict lighting and viewpoint protocol, which could be challenging for a group of 20.

Discussion and future steps

As referred to in previous writings [17], the analogue technique of applying pastel has strong resemblances with the digital medium. In that sense, the demonstrated analogue way of adding 'chiaroscuro' to a drawing serves very well as a preparation to or parallel exercise using the digital medium (Figure 19). However, one must keep in mind that learning to draw should take place analogously, before entering the digital medium, since drawing on paper offers much more interaction and learning opportunities.

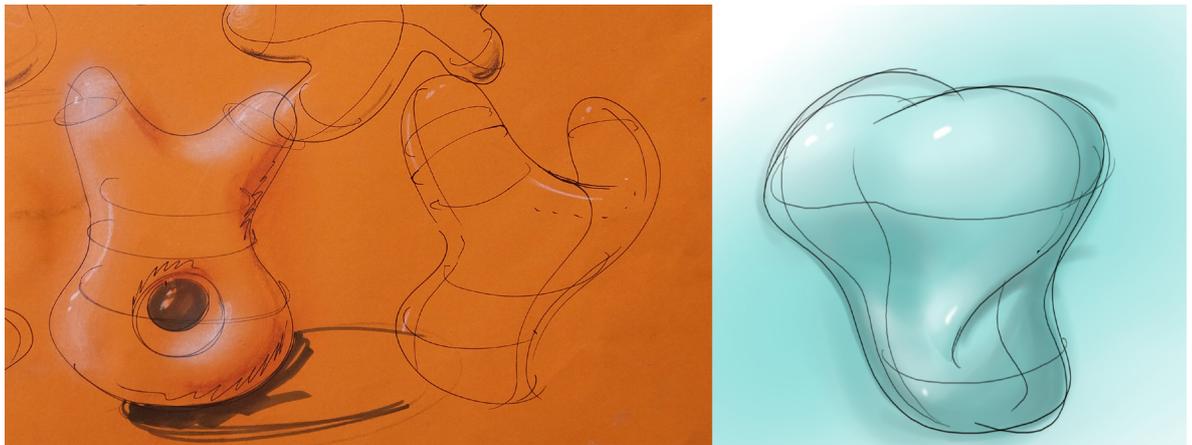


Figure 19: Figure 19: Comparing analogue pastel (l) and digital drawings (r).

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During the workshop it was nice to see and find out that the difference in language spoken by the facilitator respectively by participants did not cause any severe communication problems. In fact, this could be interpreted as a validation of the fact that 'drawing' serves as a universal language. In that sense, the medium of drawing provides access to all people.

Although some talent would help to be motivated and get started, spending a lot of time practicing (preferably according to the methodological steps as suggested) is most important. It would help greatly to analyse the world around us by repeatedly drawing it. In the words of John Ruskin: 'There's one thing we should do and that is 'attempt to draw the interesting things we see, irrespective of whether we happen to have any talent for doing so' [18].

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