

## **The experience of drawing courses in higher education large classes during the covid-19 pandemic scenario**

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### ***Abstract***

*Representation techniques -in particular freehand drawing- in the Product Designer's activity play a fundamental role in describing the different phases of the project development: the "ideational" phase, the "intermediate" phase, and the "technical - documental" one.*

*Because of this role, at Politecnico di Milano Design School we are trying to improve the effectiveness of representation courses by innovation in teaching activities used with relatively large classes. The process started during the academic year 2017/2018 with the revision of two foundational courses of the first year of BSc in Product Design: "Drawing Studio" and "Methods and Instruments for Design".*

*In March 2020, the covid-19 pandemic forced us to change the methodologies and tools quickly. Some methods and tools used in the emergency have performed above expectations. This work aims to describe methods and tools used in a fully online teaching environment having to teach a "hands-on" subject such as freehand drawing in large classes.*

**Keywords:** *Design Representation; Drawing; Online Teaching; Product Design; Large Class.*

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## **1. Introduction**

In the early days of March 2020, just before starting the academic year (AY) 19/20 second term, the restrictions in free movements due to the covid-19 pandemic faced us with a significant challenge for university teaching. In the space of a few days, we had to retune all the didactical programs designed for traditional in-person education towards a fully online teaching environment.

The Politecnico di Milano university has invested heavily in acquiring software tools and training teachers with dedicated lectures and workshops in a short amount of time to support the teaching staff in this sudden transition. First, the university provided a framework of tools and general indications. Then, each professor had to develop specific procedures to adapt the content to the courses' needs.

This paper will investigate the tools and methods in which freehand sketching was taught in fully online teaching mode. Afterwards, a critical evaluation of these methods and tools will be made, and the effects they had on the students' work results will be analysed.

## **2. Literature Review**

The research has been based on the idea that design has a pervasive dimension and specific cognitive properties (Cross, 1982; Oxman; 1999; Schön, 1983) and that representation techniques in the product designer's activity play a structural role in describing better the different phases of the project development (Celaschi & Deserti, 2007): the "ideational" phase, the "intermediate" phase and the "technical/documental".

In this scenario, analogical freehand sketches still play an essential role in teaching the disciplines of representation. Freehand sketching on paper is still the most intuitive and fastest way for industrial designers to describe their ideas, visions, and draft projects (Henry, 2012).

For product designers, a good skill in freehand drawing is consequently crucial for two different reasons: for a better self-refinement of the initial idea because "to draw 'in order to' design also means drawing 'while' designing and designing 'while' drawing" (Maldonado, 1987, translated from p. 59) and for better communication of the idea (Pasca, 2010).

Therefore, the challenge we faced is how to teach freehand sketching online to a relatively large class (60/70 students) at a technical university while maintaining the experiences that took place during in-person teaching. These included watching the teacher drawing, delivering, revising, correcting sketches and, finally, debating with the students. Active learning is the best way to empower student engagement (Grunert, 1997) and maintaining the high levels of engagement and interaction between students and lecturers is fundamental

(Hornsby, 2020). The concept of what constitutes large in terms of higher education class size remains contested, and a large class may be understood very differently depending on the discipline of study and the nature of the learning task (Hornsby & Osman, 2014). In this context, teaching a very “hands-on” practical skill of freehand sketching to first-year students required very high levels of interaction between students and lecturer and ongoing formative assessment and feedback. Arguably, this represents a large class and challenging teaching and learning context in disciplinary and pedagogical terms. Additionally, from this experience, possible opportunities to make the teaching of drawing at the university level more effective will be assessed. Some of these opportunities made teaching more inclusive (Holmes, 2018) during the pandemic. This was true for some sensitive groups as well as the day-to-day issues students faced that were difficult to address individually in a large classroom. Lastly, methods and tools that can be used in ordinary teaching once this will be back carried out entirely in presence will be identified for a relatively large class (60/70 students) at a technical university while maintaining the experiences that took place during in-person teaching.

### **3. The Teaching and Learning Context**

In this paper, two courses were analysed: “Drawing Studio” in the first term and “Methods and Instruments for Design” in the second one. The number of students in each course was 60 and 70 respectively, with most of the students connected from Italy.

The purpose behind this work is to maintain or increase the high-quality of the Design School’s teaching. The software initially made available by the university was Microsoft Teams (second term of AY 19/20). This software was then replaced by Cisco Webex Meetings (first term of AY 20/21). During the first two months, teaching was carried out in blended mode, with part of the students in the classroom and part online from remote locations; in November 2020, teaching switched entirely online due to the worsening of the health situation. A few considerations before describing the tools and methods used:

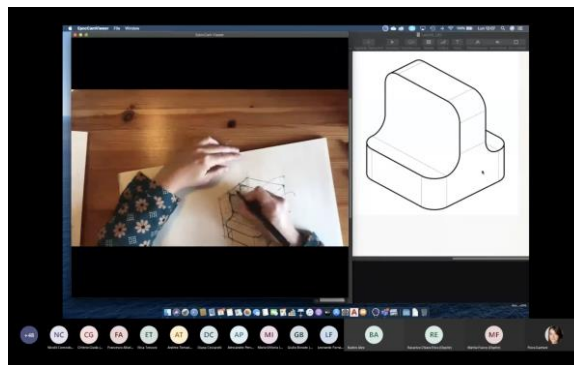
- The technical setup is essential. It should be as smooth as possible, and it should meet the demands of the teaching situation (Müller, 2020). The teacher’s internet connection must be broadband, especially for uploading (video transfer).
- In addition to all tools made available by the university, teachers must be creative by adapting tools to his/her own needs.
- It is necessary to base the student’s evaluation on objectives to be achieved instead of checking in an exam and searching for alternative approaches to evaluation (Hornsby, 2020).
- It is necessary to be aware that interactions need to be managed and guided much more in online situations.

Therefore, below is a description of the procedures chosen and their relationship to the teaching of freehand drawing.

### **3.1. Cameras**

Two cameras were used during the lessons: the first was the computer's webcam to frame the speaker, the second was a top-view camera pointed at the desk. During a typical lesson, the professor's webcam remained on, the top-view camera was switched on only as needed, and the students kept their webcams off.

While having the teacher's webcam switched on is a standard procedure in all courses, using a top-view webcam makes students see the body's movement during drawing operations. This method allows students to learn by seeing through their mirror neurons (Freedberg & Gallese, 2007; Cattaneo & Rizzolatti, 2009), which activate when we see an action being performed, as drawing is (fig. 1).



*Figure 1. Screenshot highlighting the screen sharing layout during exercise execution.*

Screen sharing was enabled with moving image optimisation: this compression tends to optimise the movement visualisation, maintaining a high framerate at the loss of the quality of the single-frame sent. However, the movement of the teacher's hand is transmitted with a sufficient degree of fluidity.

### **3.2. Recordings**

The recorded videos lasted four hours, as the duration of each lesson, because no post-production was ever done. In this way, the videos were made available in a short time. The possibility of recording videos was also used as off-line support for some communications or exercises' clarification. However, the recordings were not intended to substitute lessons attendance, except in exceptional cases due to health emergencies. The lesson, by its nature,

must be attended in real-time because it is also made up of digressions, jokes and anecdotes, aimed at more significant involvement of students.

### 3.3. Assessments and Feedbacks

The exercises submissions were made digitally. Two methods were used: the submission of the exercises made during the lesson time and the submission of the exercises made as homework. The submission of the exercises in the class had the additional purpose of verifying the confirmed attendance of students during lessons. The homework assignments were always launched with an explanation text, links to videos and websites that could further support. In both courses, they were also asked to complete a sketchbook with sketches and various graphic experiments.

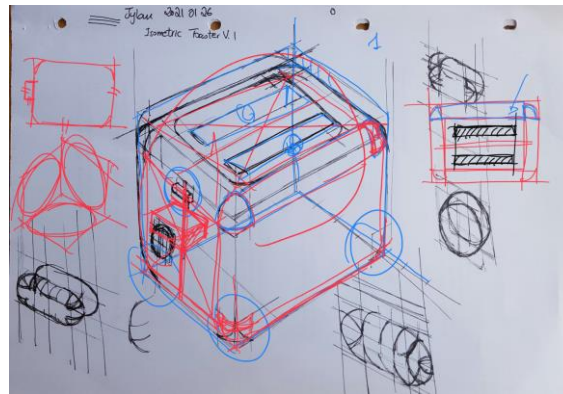


Figure 2. Reviewed drawing with tablet (red and blue strokes).

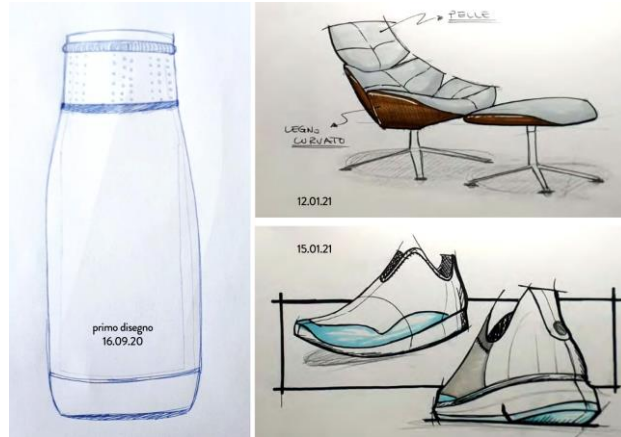
As suggested in some studies of student's engagement, a more holistic, socially embedded conceptualisation of feedback given to students is needed (Price et al., 2011).

For this reason, a significant part of the course was allocated to collective feedbacks, which was made possible by online delivery and screen sharing. Occasionally, lecturers used a tablet to fix the submitted drawings (fig. 2) directly. The collective review was chosen to allow each student to understand their own mistakes: several feedbacks are the best way for students to overcome their difficulties.

### 3.4. Results

The quality of students' work has been as good as, if not better than, the classes that had attended the course in previous years. In some cases, the difference between the drawings produced in the first few weeks and those delivered at the end of the course was genuinely remarkable (fig. 3).

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*Figure 3. Comparison of a drawing made on the first day (left) and two made at the end of the course (right) by the same student.*

#### **4. Conclusion**

For a product designer, the expressive ability through drawing is fundamental (Eissen & Steur, 2016). Therefore, it is necessary to develop and encourage this ability from the first lessons of the degree course. Even if assisted by digital technologies, drawing remains an analogical gesture that involves hand-eye coordination and the ability to perceive and analyse shapes and proportions (Coradeschi, 1986). Due to the manual nature of the subject, organising the two courses online was very complex and required a refinement of methodologies that have not yet fully achieved.

The isolation and distancing required to contain the effects of the covid-19 pandemic forced a review of many of the teaching methods usually used to adapt them to the online modes of remote teaching. In the case described in this paper, these changes have nevertheless made it possible to activate the use of specific tools and adopt certain methodologies that could bring a valuable improvement to classroom teaching once the current restrictions have been lifted.

The top-view camera has been the most successful tool to be maintained, also in face-to-face teaching. Indeed, using it instead of the blackboard allows all students to see in the same way and allows teachers to draw in the same position as students do.

Recordings should only be those necessary for the explanation of exercises. Regardless, recordings produced during lessons are not considered a substitute for attending the lesson in real-time. In order to include any students who are unable to attend the class for health reasons, whole lessons could be streamed.

The number of exercises and the collective reviews has proved to be an excellent teaching tool integrated with the horizontal teaching scenario in face-to-face courses. Overall, it is believed that this experience could become an essential source of innovation both within university teaching in general and in design teaching processes with relatively large cohorts.

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