

19



COMMUNICATION DESIGN A PART



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WOMEN IN ACTION

The Role of Women in Technologies According to the Media

How Communication Design Can React

Valeria Bucchetti & Francesca Casnati

Politecnico di Milano

Keywords

Communication Design, Gender Stereotypes, STEMs, Education, Design Tools.

Abstract

As far as Design is concerned, while the presence of women in the applied arts is historically consistent, the role of women in the technological dimension is still underestimated and their presence still scarce. According to a report about gender segregation published in 2018 by EIGE “in all EU Member States men dominate specific fields, such as engineering and technology”, among the elements that contribute to fuel the gap EIGE highlights “stereotypes, social norms and cultural practices” (Reingarda, 2015) in a culture which is still oriented towards male. From the communication design perspective, the issue mainly concerns the representation of women in the media and the repercussions it has in reinforcing gender stereotypes.

This paper aims to provide a contribution regarding the responses that communication design can offer to fight gender inequalities in the area of technologies. At the centre of the reflection is the work of research group DCxCG (Communication Design for Gender Cultures, Politecnico di Milano) in the fields of research and teaching.

The contribution will focus on the projects developed by some students in response to the stereotyped representation of women in technologies. The projects represent educational experimentations aimed at strengthening the critical instrumentation of young designers and support reflections around new communication models.

1. Introduction

Only 17 women have won a Nobel Prize in physics, chemistry or medicine since Marie Curie in 1903, compared to 572 men. Today, only 28% of all the world's researchers are women. (United Nations Educational, Scientific and Cultural Organization, 2017)

We happened to experience during the teaching activity an episode in which, in front of a project presented by a group of girls, teachers and assistants let themselves go to considerations such as “Well done, we did not expect it by a group of girls”. The project required a good knowledge in coding and the fact that five female students were perfectly self-sufficient in learning and managing the required programming languages was the object of jokes and, perhaps worse, of surprise throughout the semester. We consider the episode to be in its own small representative of how *theoretical equality* (Halimi, 1992) – in this case equal rights in accessing STEM or STEAMD university courses, mentioning Paola Antonelli who includes Art and Design as essential disciplines of technology and science (Oxman, 2016) – does not coincide to the reality of everyday life, still permeated by gender stereotypes that affect the perception of the Self and the individual biographies (Bourdieu, 1998; Ghisleni, 2004; Baule & Bucchetti, 2012), stereotypes and models that limit girls in university and professional choices.

Data on the female participation in STEM university courses still show a numerical imbalance strongly oriented to the male.

According to the report *Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM)* published by UNESCO in 2017, female students represent 35% of students enrolled in STEM courses at global level and the gap increases in disciplines as engineering, natural sciences, mathematics and statistics and ITC (United Nations Educational, Scientific and Cultural Organization, 2017).

The situation of Italian universities also seems to be in line with the survey carried out by the United Nations. According to the *2018 Reports on the employment status of graduates* published by the interuniversity consortium AlmaLaurea, in Italy boys (59%) outnumber girls among graduates in STEM disciplines. This imbalance is accentuated if we consider male graduates in engineering (74%) and in science (68.4%). Data also confirm what emerged from the *Gender Balance Report* of the Politecnico di Milano (2019). Out of the total number of students enrolled (44,012), female students are 34% (14,450). If we take a look at engineering courses, girls represent only 23% of students. A similar situation could be found in the teaching staff, with 403 women out of a total of 1,403 teachers. Surveys carried out in the academic and professional field highlight further imbalances in the assignment of responsibilities within companies and in wages, and merely point out the weight of an issue that has long been at the center of the fight for gender equality.

In this framework the Politecnico di Milano has been working for several years to fill the gender gap and promote STEM subjects among young female students. It works through the de-

velopment of numerous projects such as *POP – Pari opportunità politecniche* born in 2018 to “ensure a study and work environment that respects gender identities”, among the main stated objectives POP aims to “bring girls closer to STEM studies”; or through “on the field” actions such as *Le ragazze possono* (2014-2015) a project of Fondazione Politecnico that promoted meetings and workshops in schools to encourage girls to make a conscious choice concerning STEM courses and professions; with the participation of the University at *STEM in the city*, an event promoted by the City of Milan with the support of the United Nations, aimed at spreading the culture of STEM and removing “cultural stereotypes that alienate girls from the study paths in technical-scientific subjects”. The Design Department of the Politecnico has also been involved in gender issues for years, specifically with the work of the research group *DCxCG - Communication Design for Gender Cultures* engaged in research and teaching activities to promote the social responsibility of Communication Design within Gender Cultures.

The activity in the educational field led to the birth of the first teaching in *Communication Design and Gender Cultures* in 2014, aimed at students enrolled in the Master’s degree courses of the School of Design in order to provide them with the tools for a critical reading of mediatic forms of representation and for a gender-sensitive approach to the communication project. The teaching activity in particular allows to work on different levels, on one hand the training of conscious designers, on the other hand the development of communication projects that experiment new formats and communication languages to achieve equality.

Starting from this scenario, the paper intends to provide an insight into some experimental activities – developed within the course *Communication Design and Gender Cultures* – that have their own focus on STEM representative issues and which constitute methodological models in the area of design concerning contrasting actions and new languages and communication models. These are three case studies that address gender stereotypes related to STEMs through different approaches, which we believe can be explanatory of the different responses that communication design is able to offer to counter the stereotyped representation of women in STEMs.

2. Femininity vs Technological Expertise. The Point of View of Communication Design

To adopt the point of view of Communication Design means first of all to consider the sphere of media representation, providing a critical reading of the communication project itself (Caratti, 2015). The visual communication project, and in a broader sense the media, plays a role of vehicle of models and stereotypes within society, returning them amplified and contributing to their rootedness.

Giovanni Baule in *Anticorpi comunicativi* adopts the image of a “deforming mirror”. He describes the media as a “mirror both faithful and deforming the reality”, within a short circuit of sense that feeds itself: media communication draws from models and stereotypes already established and returns them through reiteration, supporting their fixity. We could schematize this vicious circle as an infinity symbol whose center is constituted by the *stereotype* and the two antipodes respec-

tively by *media message* and *social identity*. The arrows represent its flow and feedback mechanism (Bucchetti & Casnati, 2019). The schematization (Fig. 1) allows us to highlight the system of responsibility that involves the different actors behind the communication project – client, designer and broadcaster – at different levels all responsible for the quality of the images that are produced and distributed.

In these terms the designer needs tools that enable him or her to exercise a self-critical reading of his own work, from design choices to behaviors acted in the division of labour within the team. This specific issue is the object of one of the case study that focuses on the stereotype “as one of the many tricks of the mind to guide our processes of knowledge” (Baule & Bucchetti, 2012, p.97) and behaviors.

One concrete example that helps to decrease the schematization within the STEMs issue can be represented by the packaging of some games for school-age children.

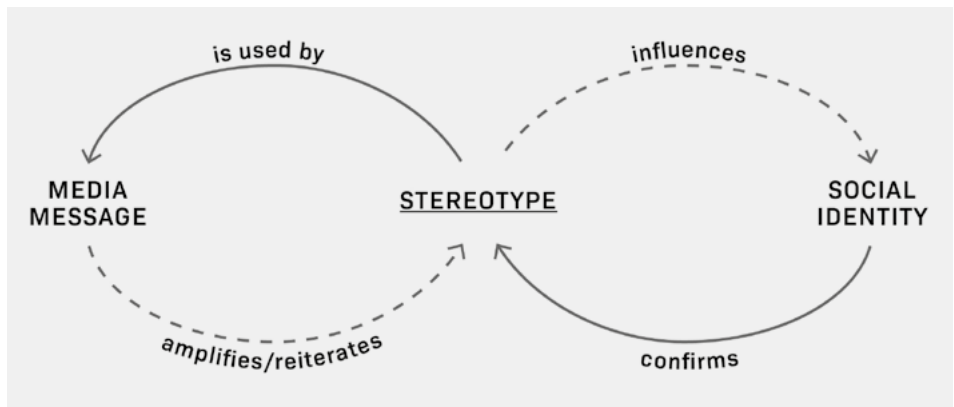


Figure 1. Stereotype loop.

In this specific case the game, one of many, belongs to the *science and technology* category of a well-known Italian brand and according to what on display to play *manual skill, ingeniousness and planning* are required. The game is designed to bring boys (and girls?) closer to the field of biomechanics and natural sciences. On the box, however, a boy and a girl are already representative of gender roles. The boy plays the active role of inventor and proudly shows his project, while the girl has her mouth open, her eyes grainy and the hands around her face in an expression of amazement and surprise for the work done by him. The designer has simply translated the commonplace that differentiates male and female skills and consequently games from male – science, technology, sports, adventure – and from female – home care, body care, child care. The resulting message puts in contrast science expertise with femininity, telling that science and technology are male things and implicitly influencing the self-esteem and future choices of children.

The issue of STEM gender stereotypes could be simplified and traced back to a single macro-model that contrasts the sphere of the feminine with the competence in technology, attributed by default to the masculine. The gender stereotype acquires sense only if placed on the background of the male universe, starting from this assumption the use of the semiotic square (Fig. 2) allows us to highlight the relationships between what we have defined as the two opposing poles: technological competence, attribute of the male universe, and female universe. The two terms are semiotically in opposition but can, on the other hand, contract a relationship of implication through

assertion, so for example non-femininity implies masculinity and therefore being competent in technology and vice versa. The square of Greimas is useful to us in reference to visual languages because it allows us to examine all the meanings of the message and to bring out positions of meaning present in the conceptual universe of a given communicative action but not explicitly expressed (Agnello, 2013), thus facilitating the process of the deconstruction of the stereotype that underlies the gender-sensitive project.

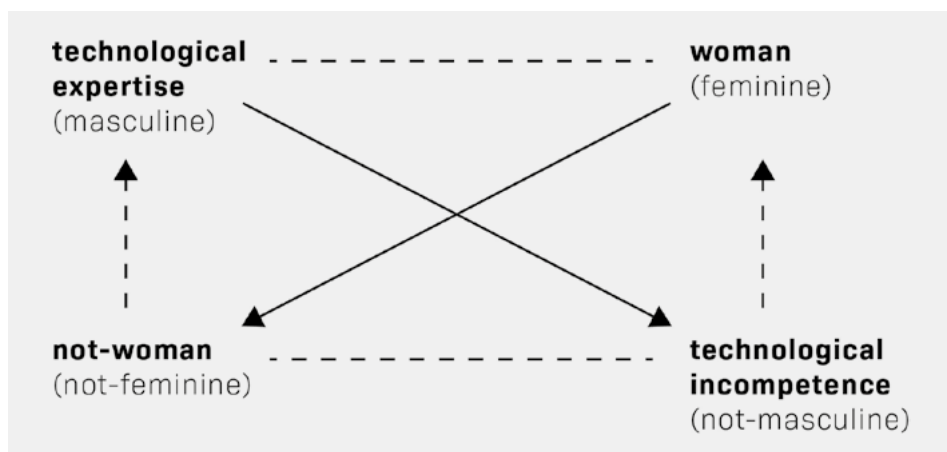


Figure 2. The semiotic square of Greimas.

The opposition of the female universe to the sphere of technology, with all the facets that derive from it, is the common thread at the base of the three projects reported as case studies. The students, starting from common bases, identified specific stereotypes that were deconstructed and analyzed through methods that bring into play different aspects and skills of the communication designer. The research work has given rise to communication projects aimed at raising aware-

ness of gender issues related to STEM and stereotypes in communication artifacts.

3. The Reactions of Design Students

As previously mentioned, the three case studies have as a common starting point the macro-area of gender stereotypes in STEMs, from the point of view of communication design. The area was left deliberately wide to allow students to move within it according to their attitudes and interests. A first phase of reconnaissance allowed them to trace a state of the art from which they defined a very specific research area to focus on. The projects show, on the methodological level, three different reactions of communication design.

3.1. Tech(wo)man – Semantic Flipping

The assumption from which the students based their work refers to the representation of women and technology in the editorial field, in order to investigate the forms of representation through which gender stereotypes are *translated* (Federici & Leonardi, 2013; Baule & Caratti, 2017) into images. First of all, the students delineated the area of analysis. In this phase it was decided to reduce the field to the most read STEM periodicals in Italy, selecting twelve issues (the most recent) of the five most popular periodicals. The methodology draws on the *Mixed method research* which integrates both qualitative and quantitative approaches by exploiting their respective potentialities and allowing, according to Capecchi, “to achieve at the same time an objective of corroborating the reliability of information and one of information enrichment, to reach generalized results, but also to go into depth of the empirical material” (Capecchi, 2018).

The students then conducted a taxonomic collection of all the female figures found in the selected magazines, performing a critical deconstruction of the image in order to isolate and analyze the recurring structures. This made it possible to identify and cluster two macro-areas that concern respectively:

1. explicit stereotypes, the woman has mainly four different functions:
the *grechina*, with a function of embellishment without any connection to the content; the *object holder*, when the only function is to expose a product holding it in the hand, the *erotic* or *object of desire* and the *incompetent* when the relationship with technology generates expressions of astonishment or incomprehension.
2. Implicit stereotypes which refer to a series of editorial and scenic choices that work at an implicit level. They can be summarized in a numerical disparity between the clearly inferior female figures and the male figures; and in the lack of relevance between the use of the female image and the content of the article.

The point of interest to which we aim to bring attention concerns the perspective assumed during the analysis work. The deconstruction of the images allowed to bring out a similarity between the visual codes that characterize the representation of the female in computer-technology magazines and the expressive conventions in the field of porno-soft. The observation led to a deepening of the relationship between the two areas. This similarity, which can then be translated into se-

mantic ambiguity, has been translated into a game of substitution aimed at highlighting the recursiveness and sharing of visual codes, in some cases impossible to distinguish. Therefore, a web page has been designed to denounce the phenomenon, which included an interactive section with the aim of making the recipients directly experience the evidence of a sexist use of images.

Few covers of STEM magazines have been placed, in random order, next to some covers of the porn-soft magazine Playboy (Fig. 3). Through a horizontal scroll the images of the female figures, taken from the covers of both categories, can be scrolled on the layouts to recompose the whole. This transposition game made the equivalence evident.

Women's images are indistinguishable – by style of shooting, aesthetic features, posing, expression, clothing – and therefore interchangeable between the covers. The students exploited a flipping mechanism (often declined in gender flipping) which in this case could be defined *semantic flipping* aimed at allowing the user to experience firsthand the paradox in front of which he or she is facing.

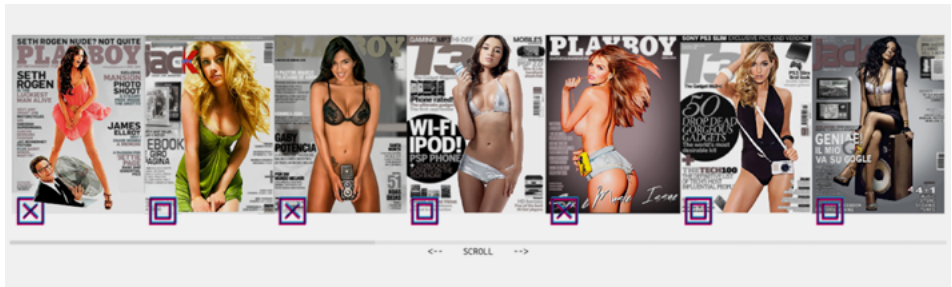


Figure 3. Authors: F. Casnati, C. Cingottini, C. Della Longa – Master degree students in Communication Design, Politecnico di Milano. Project title: *Tech(wo)man*.

The tool designed is at the service of the connections detected between apparently very distant areas, technology and porn, to give concrete form to a contrast action that plays on the user's displacement in order to raise awareness of the issue and trigger a more in-depth reflection.

3.2. Hack the Stereotype - Disciplinary Contaminations, a Designer Self-Analysis

The second case study that we want to focus on has as object of analysis the community of designers itself, specifically a group of students, both male and female, of Communication Design of the Politecnico di Milano. The observation starts from two assumptions: (1) the percentage of women involved in coding is much lower than the percentage of men; (2) a designer who knows at least the basics of coding is facilitated in the design of user interfaces. The young designer who conducted the observation decided to focus on the behaviors acted by students in approaching coding for the first time, in order to verify if and how they were influenced by gender stereotypes and if these stereotypes influence the perception of their technical skills. The point of interest is the method of observation adopted, which draws from the fields of cultural anthropology and sociology, focusing on the multidisciplinary character of communication design. The observation activity conducted hybrids some peculiarities from the participant observation (used in gender research) with the methods of design.

This allows to develop a direct contact between the phenomenon under study and the subjectivity of those who study it, avoiding intermediated data.



Figures 4-5. Author: B. Verrotti di Pianella - Master degree student in Communication Design, Politecnico di Milano. Project title: *Hack the stereotype*. Some shoots documenting the workshop activity.

A workshop was thus designed in which three male and three female design students without coding knowledge were involved. In order not to influence the participants' behaviors and conversations the objectives were not stated. The activity included a first introduction and a brief explanation of basic notions of programming, some individual exercises and subsequent team work (Fig. 4-5) The analysis can be divided into the following phases:

1. "Description, report of what has been observed, enriched with meanings and interpretations through the assembly of different materials" (Decataldo & Ruspini, 2014). The workshop activity was documented through videos and the conversations were transcribed, this allowed to affect as little as possible the data with the subjectivity and preconceptions of the observer;
2. Clustering of the recursiveness in the acted behaviors (gestures, proxemics etc.) and in the conversations. An emblematic example is the assumption of leadership in group activity by young people despite the fact that they were all newcomers;
3. Analytical phase, in order to elaborate some abstractions from the results of clustering.
This phase led to identified the implicit and rooted gender stereotypes of which the subjects themselves are not aware but which lead them to act according to predetermined patterns.

This work has allowed to highlight some points summarized here: (1) in the group work the girls did not expose themselves, while the boys were more confident and serene and they acted as group leaders even if clearly less prepared; (2) in the individual work it was the girls who were more active and contributed with questions and reflections; (3) in coding the girls were more easily discouraged by throwing in the towel or asking the neighbor for help; (4) the girls said that coding is not important for their professional career, the opposite was said by the boys; (5) in conversations was often present the stereotype of the nerdy boy who loves video games.

After the activity individual interviews were conducted with the participants to reveal them the objectives of the workshop and documenting the reactions. All the participants had a surprise reaction and after an initial moment of disorientation they had a chance to activate a self-reflection process. Most acknowledged that they were probably driven by gender stereotypes in their approach to coding, particularly the girls admitted that they felt “unable” when it came to coding, even if they had never tried before.

The activity that led to empirical evidence of how much STEM stereotypes implicitly affect the work of designers, offers a concrete example of tools for a work of self-analysis: the designer who takes as an object of study the community of which he is part.

3.3. Not Only Dolls – the Restitution of the Research Through an Awareness-Raising Action

Studies on the development of gender identity show that the process of acquiring roles and stereotypes happens very early. According to the survey conducted by UNESCO (2018) girls tend to lose interest in STEM subjects growing up, especially during the transition to adolescence. The research question underlying the last case study concerns STEM gender stereotypes conveyed by the packaging of children's toys defined as educational. The objective was to analyze the visual composition and text messages that characterize the packaging of toys in order to capture any gender stereotypes that could negatively affect the choices and orientations of girls. The first phase of research follows a method of taxonomic collection of the visual compositions on the boxes (Fig. 6 - some of the analysis sheets used for the data collection). 179 games were collected from the online catalogs of the six international companies which were most present in Italian stores and that responded to the categories “educational games” or “scientific games”. The collected images were deconstructed through the use of analysis cards that allowed to identify the recursiveness in terms of visual languages – color palettes, illustrations, fonts, etc. – and verbal languages.

The experimental nature of the case study is given by the kind of output produced, which meets the dual objective (1) of synthetic visual restitution of research results and (2) of raising awareness of the target audience - parents in their role as purchasing responsible.

IDENTIFICAZIONE DEL GIOCO

Marchio: **Clementoni**

Ambito/professione: Biologia evolutiva

Età: 8-12



COLORI E AMBIENTAZIONI

Colore:

tenu
intenso

cald
fredd

Contrasto:

alto
basso

Modalità di rappresentazione:

illustrazione
fotografia

Sfondo:

contestualizzato
decontestualizzato

PROTAGONISTI E AZIONI

Non presenti

ELEMENTI TIPOGRAFICI E VERBALI

Font:

light
bold

soft
hard

dinamico
statico

tipografico
handwritten

Contenuti testuali:

scienza e gioco ORIGINAL Il mondo dei Triops

Osserva la crescita di queste misteriose creature!... e Ricrea fossili di animali antichi tuttora viventi. Questo set educativo NON CONTIENE ANIMALI VIVI NE' MANGIMI, in linea con le disposizioni del Ministero della Salute.

Ricevi gratis a casa tua le bustine con le uova di Triop ed il mangime per nutrirti, all'interno il coupon per effettuare la richiesta.

IDENTIFICAZIONE DEL GIOCO

Marchio: **Clementoni**

Ambito/professione: Meteorologia dinamica

Età: 8-12



COLORI E AMBIENTAZIONI

Colore:

tenu
intenso

cald
fredd

Contrasto:

alto
basso

Modalità di rappresentazione:

illustrazione
fotografia

Sfondo:

contestualizzato
decontestualizzato

PROTAGONISTI E AZIONI

Genere:

maschio
femmina

Marcatori di genere:

Interazione soggetto con oggetto:

sì
no

ELEMENTI TIPOGRAFICI E VERBALI

Font:

light
bold

soft
hard

dinamico
statico

tipografico
handwritten

Contenuti testuali:

scienza e gioco Tornado e Cicloni

Scopri l'incredibile potenza del tornado!

Crea meravigliosi vortici in acqua!

Studia l'origine e il movimento dei cicloni

IDENTIFICAZIONE DEL GIOCO		COLORI E AMBIENTAZIONI	
Marchio: 		Colore: <div> <div>tenue</div> <div>caldo</div> <div>intenso</div> <div>freddo</div> </div>	
Ambito/professione: Astronomia		Contrasto: <div> <div>alto</div> <div>basso</div> </div>	
Età: 9-14		<div> <div></div> <div></div> <div></div> <div></div> </div>	
		Modalità di rappresentazione: <div> <div>illustrazione</div> <div>fotografia</div> </div>	
		Sfondo: <div> <div>contestualizzato</div> <div>decontestualizzato</div> </div>	
PROTAGONISTI E AZIONI			
Genere: <div> <div>maschio</div> <div>femmina</div> <div>maschio</div> <div>femmina</div> </div>		Marcatori di genere:	
Interazione soggetto con oggetto: <div> <div>si (attivo)</div> <div>no</div> <div>si (passiva)</div> <div>no</div> </div>		Interazione tra i soggetti: <div> <div>si</div> <div>no</div> </div>	
ELEMENTI TIPOGRAFICI E VERBALI			
Font: <div> <div>light</div> <div>bold</div> <div>soft</div> <div>hard</div> <div>dinamico</div> <div>statico</div> <div>tipografico</div> <div>handwritten</div> </div>			
Contenuti testuali: <div> <div>scienza e gioco Telescopio</div> <div>CD INTERACTIVE Scruta il cielo e riconosce le stelle della volta celeste</div> <div>Ottiche intercambiabili 20x-40x-60x</div> <div>CD INTERATTIVO CyberSky per conoscere il cosmo, i pianeti, gli astri e le costellazioni</div> <div>Sistema di messa a fuoco</div> </div>			

Figures 6a, 6b, 6c. Authors: S. di Nardo, M. Felicetti, Su Xizi – Master degree students in Communication Design, Politecnico di Milano. Project title: *Not only dolls*. Some examples of analysis sheet.

On this purpose the students designed a short animation that shows through its own narrative flow the confusion of a parent within a games department. The video opens with the title “Not only dolls”. A parent and his daughter are in a lane of male games (Fig. 7 - storyboard showing keyframes); STEM toys to build, learn, experiment; and female games: dolls, tricks, household appliances. The story draws attention to the hesitation – which verges on perplexity of the father, whose gaze bounces from one side to the other, alternating between the so-called male and female toys. The situation is resolved for the best when the child explodes her enthusiasm in front of a “scientific” game, a game to discover the world of insects, and therefore belonging, according to convention-

al codes on which the identity of the product is based, to the first category. Everything ends with an invitation to adults so that we can go beyond conventions. The setting, the lane of a shopping mall, follows a recurring real situation, taking advantage of data emerged from the research. The color palette, illustrations and texts on the boxes represent the recursive-ness identified during the analysis phase, through a synthetic reconstruction and assembly operation. Some zooms on the words respectively addressed to boys – observe, build, analyze, experiment... – and girls – care, iron, princess, makeup, baby – highlight the most recurrent models and languages. Although the students did not have the opportunity to publish and test the effectiveness of the video with the target audience, it was tested in the following years during the course *Communication Design and Gender Cultures*. The animation was shown to the students who were not yet aware of the theme, and triggered a more in-depth collective reflection about gender stereotypes in products for kids, proving to be an effective tool at the service of awareness actions.

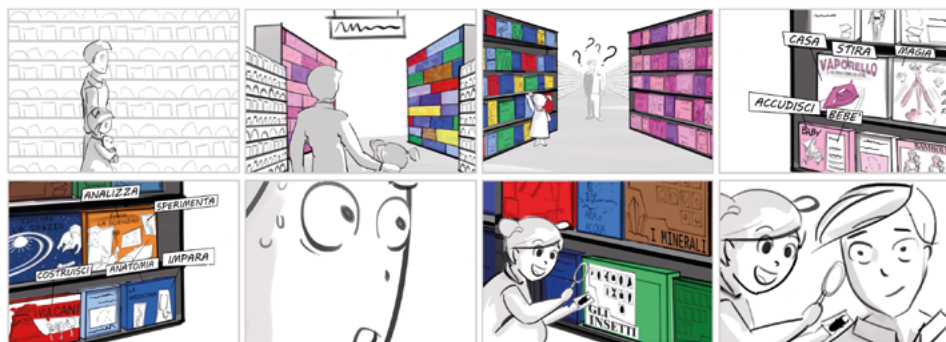


Figure 7. Keyframes of the video – *Not only dolls*.

4. Conclusions

The three cases show the contribution in terms of tools and methods that Communication Design can use to analyze and contrast the STEMs gender stereotypes perpetrated by the communication designers themselves. The points of view of the selected cases allowed us to introduce observation methods and new approaches to communication design in the field of gender research, with a view to contamination and multidisciplinary. They constitute models which are transferable and repeatable in different contexts, moreover, the experimentation conducted by students constituted, in terms of method, a model based on experience, aimed at building tools to observe and critically interpret the reality in which we act both as designers and as citizens. The contribution therefore highlights the kind of experimentation that the DCxCG group conducts in the educational field, highlighting through concrete examples the contribution of Communication Design to the training of conscious designers, able to manage complexity and to exercise a critical reading of their work, fundamental requirements for the gender-sensitive project.

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Co-founder of *PAD. Pages on Arts & Design* journal, since 2011 she has been the PAD editor in chief. Since 2015 to 2017 she has been a member of ADI's executive board, and currently coordinates the technical-scientific committee for long-life professional training of design professionals.

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She has recently joined Lab4Living's 100 Year Life and Future Home project at Sheffield Hallam University. Her doctoral research explores ways to navigate aging and lifecycle changes where embodied shame can be a barrier to agency in co-design. She co-hosts the annual Sheffield Zine Fest and her zines are held in a number of international zine libraries and collections. She performs and exhibits regularly at science, literary and comedy festivals.

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TI SENTI POCO BENE? AIAP HA TUTTE LE SOLUZIONI PER TE. SCOPRILE.



Aiap CDPG, the Graphic Design Documentation Centre. Working to collect, catalogue, archive, enhance and promote any documents related to graphic design and visual communication. These documents (originals as well layouts of projects, books, posters, prints, catalogues, correspondence, photographs) help reconstruct the history of graphic design in Italy and support research and educational activities, as it is the CDGP's intention to make these documents widely available.



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