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# UNMASKING BIASES IN DESIGN EDUCATION

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## ABSTRACT

This paper presents two master graduation design projects that address *unconscious biases* (UB) in the context of design education related to two topics: gender and skin colour. In addition to their sensitivity to exclusion and injustice, two design students brought in their analytical, design research and creativity skills to find solutions for design education. The projects revealed UB regarding the two topics of both teachers and students. The databases with examples from the real world and a poster campaign helped them to unlock these biases, and to understand that implications of prejudice are critical. The developed model, method, and guidelines provided them with lenses to discover biases, and also to have opportunities to find solutions by design. Evaluation of training material showed the need to have a language to talk about these sensitive topics in a nuanced way. Finally, these cases show the possibility of involving students in the development of curricula that strive to unmask biases.

*Keywords: Biases, design education, diversity, inclusion, gender, skin tone, filter bubble*

## 1 INTRODUCTION

Diversity, equity and inclusion have been a focus of attention in product design processes for decades, and today the attention for these themes is still relevant and even more compelling. Through the internet, migration and other developments that enhance globalization, awareness about the issue of exclusion increases rapidly. Social movements, such as 'Me too' and 'Black lives matters' influence the discourse at the same speed. The interest in the problem of exclusion in the current era is recognized by a large group of people and by our design students. Attention is shifting from exclusion due to physical barriers, such as in the design of public spaces that are, for example, unsuitable for wheelchair users, to interests in social and psychological barriers, such as minority groups that confronted with biased labour selection procedures or by AI driven apps that exclude user groups. This is reflected in an increasing attention in design education to not only physical ergonomics, but also to perceptual and cognitive ergonomics. Less attention is paid yet to social and emotional aspects of inclusion [1] and exclusion caused by unconscious biases (UB), that is the learned stereotypes that are natural, automatic, unintentional, and so deeply engrained that they can easily influence one's behaviour [2]. Stored experiences – a.o. in education – in the human brain later influence behaviour and can trigger the conformation to harmful stereotypes [3]. Avoidance of UB is sought in teachers moderating the classroom culture, using psychological mechanisms, such as awareness, motivation, individuation, and empathy [3]. Focus is often on teachers and teaching activities such as grading and education material, and less on the content, in our cases design. This paper shows how design and design students could be actively involved in shaping open mind attitudes and possibilities for the reduction of UB. The context is a 1<sup>st</sup> year bachelor at a Dutch design school. It addresses the question: How can design education broaden design students' views, increase their sensitivity for unconscious biases, and motivate them to find design solutions that overcome these biases? Answers are based on two cases, *master graduation projects*; 'One Size Fits Some' about unconscious biases regarding sex and gender [4]; and 'Beige by Default' about skin tone exclusion [5]. Both students are Dutch, the first raised in The Netherlands, and the 2<sup>nd</sup> in Curacao and with a dark skin herself. The projects were with self-initiated design goals, and each supervised by two Dutch academic staff members and with external parties that were consulted during the design process.

## 2 THE CASES – APPROACHES AND OUTCOMES

The author was part of both supervisory teams, which influence the objectivity of the work, though made it possible to monitor the projects in detail. The design process (including literature research, interviews with staff members and bachelor students, and evaluations), and (intermediate) findings from research

and design of both projects were extensively reported and presented in a poster and oral presentation (video). Below, the two cases are explained and with references to relevant literature.

## **2.1 One Size Fits Some – UB regarding sex and gender**

A father is changing a diaper for his son in a public toilet, while squatting on the ground, because he is not allowed to use the baby facility in the ladies-room. A musician cannot play a music piece of Rachmaninov, because both the dimensions of the piano keys and the composed music (the chords) do not attune with the size of her hands [6]. A transgender person is confused when using icons in a smart phone. The icons represent gender stereotypes only [7]. A female user of voice recognition feels underserved, because her voice is less accurately processed by voice recognition software and artificial intelligence assistants, due to software trained on datasets in which women are underrepresented [8]. These are a few examples of designs that do not include considerations related to gender and sex. The consequence is that a large part of the potential users feels excluded. Assuming the examples are results of designers' unconscious biases, research has been done on how to prevent these biases. In her project Maartje van Proosdij collected and analysed a considerable number of products and services with functions and properties that exclude groups of people. Gendered Innovations [9] and Invisible Women [8] provided many examples. She developed a model, three lenses that help designers to overcome undesirable effects. One lens 'Associations' refers to the designer's own associations with and preconceptions about the related topic. Reflection and discussion with team members about first associations and presumptions about possible users and context of use should deconstruct prejudices. Another lens is 'Standards' and refers to norms and standards developed, for example, in the industry to increase efficiency, such as for car crash test dummies with dimensions based on data from a data base with anthropometric data of white male men. Current standards that might be relevant for the design project need to be identified and evaluated for their inclusiveness. The last lens is called 'Behaviour' and invites the designers to study current (public) opinions and behaviour of the targeted people. With the support of research methods such as interviews, observations, role play, personas and cultures, the context of intended users, their social roles and expectations need to be explored. This should provide a better understanding of the target group and helps to understand and predict possible excluding behaviour more accurately.

Furthermore, five semi-structured interviews in one-hour video calling sessions were conducted (recorded, transcribed and clustered). These were with the course coordinators (four male, one female) of five courses (related to design, technology, people, and organisation) under construction for a new bachelor curriculum. None of the courses considered the influence of gender and sex explicitly. The course coordinators seemed already overwhelmed with content that needed to be addressed in their course. *'During the interviews nearly all course coordinators voiced beliefs that could be considered gender biased. Many of these beliefs were related to how male and female students, were in essence different. For example, it was said that girls are better at planning, and boys are better in taking control over a project, or that women are more motivated by social needs, and men by competition. These beliefs might be affecting the way the course coordinators set up, and teach their courses.'*[4, p.41]

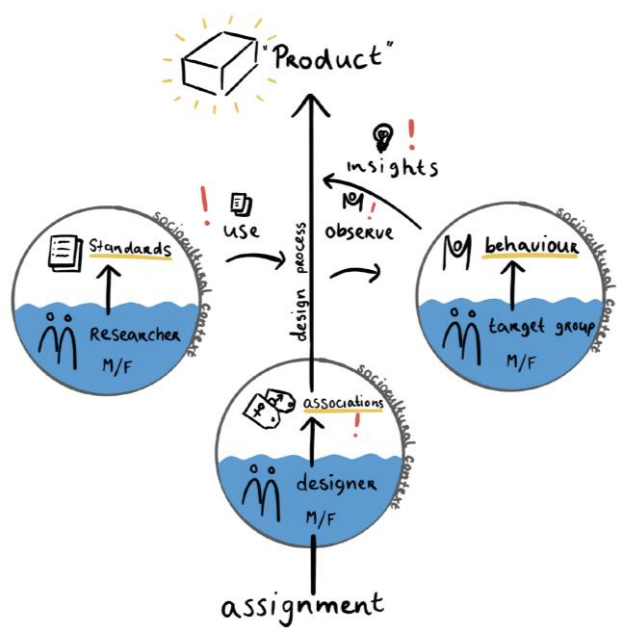


Figure 1. One Size Fits Some: The poster campaign to sensitize design students for the topic (left) and the model (right) to help design students to reveal possible biases; three lenses (associations of the designer, current (product and other) standards to be studied, and current behaviour related to gender – by Maartje van Proosdij [4]

Therefore, Maartje decided to start with a bottom-up approach by creating awareness among students. To involve students, she organised two creative sessions, a conversation with students that were about to start their industrial design bachelors and concept testing. She developed the ‘Become Average’ advertising campaign for first year design students, consisting of four *posters* and a *website* with examples, references and the gender bias model (see Figure 1). The final design was evaluated with seven design students (four male and three female; four bachelor students, of which were freshmen; and three master students) from which was concluded that except from some small improvements the effect is promising. Unfortunately due to covid the poster campaign could not be executed, though Maartjes work received attention; it was selected for the online exhibition Voices of Women in Science [10] and as illustration in an interview for the documentary series Reference Man [11].

## 2.2 Beige by Default – UB regarding skin colour

A ballerina cannot find ballerina shoes that matches with her skin colour. They are rarely available in the market [11]. Children learn that the colour ‘flesh’ on a crayon is for colouring skins, a light colour by default. Several soap dispensers do not work for hands with a dark skin [12]. Like the One Size Fits Some project, Cindy Jantji studied in her Beige by Default [5] project how products are designed with an unconscious bias, that is here the Caucasian skin colour as a default in mind, and - deliberately or not - excluding people from usage and from a sense of belonging. She developed a lens, a strategy and a website with product examples to address the issue in design education. First, she identified three reasons to match products with a person’s skin colour: 1. *Reduction of the social stigma*, for example, healthcare products, such as compression stockings to combat varicose veins attune with the skin colour to make the user less outstanding; 2. *Increase of intrinsic acceptance*, for example, when the user must accept the product as part of the body, such as with a prosthetic leg that replaces the wearer’s leg; and 3. *Enhancement through illusion*, for example, in ballet, the pointed shoes match the colour of the skin to create the illusion of long, elegant legs. From further analysis of collected products, she identified four categories of issues that are important to designers to know: 1. Inadequate colour selection (see above); 2. Failing technology and software; 3. Undereducated service providers; and 4. Unequal communication & representation. For each issue she developed design guidelines regarding: Target group definition (e.g., bystanders can become victims of UB, for example, pedestrians that are not detected by self-driven cars); User research aim and execution; Skin tone knowledge; Level of education of actors in a service; Product evaluations during the design process. The guidelines are formulated in the form of questions to check possible biases and stimulate action. From an analysis of a first-year bachelor curriculum and 6 interviews with teachers (experience with professional design practice,

master between 1989 and 2012, male, one with dark skin tone) she concluded that course developers do not pay attention to the issue of skin tone exclusion by design. The interviews revealed that teachers were shocked by examples. They never thought about the topic. Some of them stated to be nervous or know other teachers who are uncertain to talk about such a sensitive topic in the classroom, because they are worried to say something wrong. Therefore, she developed the Skin Tone Inclusivity Lesson Plan with the aim to: Raise awareness; trigger self-reflection; trigger self-awareness; and finally, trigger inclusive design behaviour. With the help of cards, students are led through a few hours session that leads to an understanding of the skin tone inclusive design guidelines. Using the three designed components, the Beige by Default website, the card set, and the skin tone inclusive design guidelines, the students complete different activities to ultimately reach a more inclusive design behaviour. The session was appropriated to similar sessions in which student reflect on a certain key concept in the 1<sup>st</sup> year bachelor course Understanding Humans.

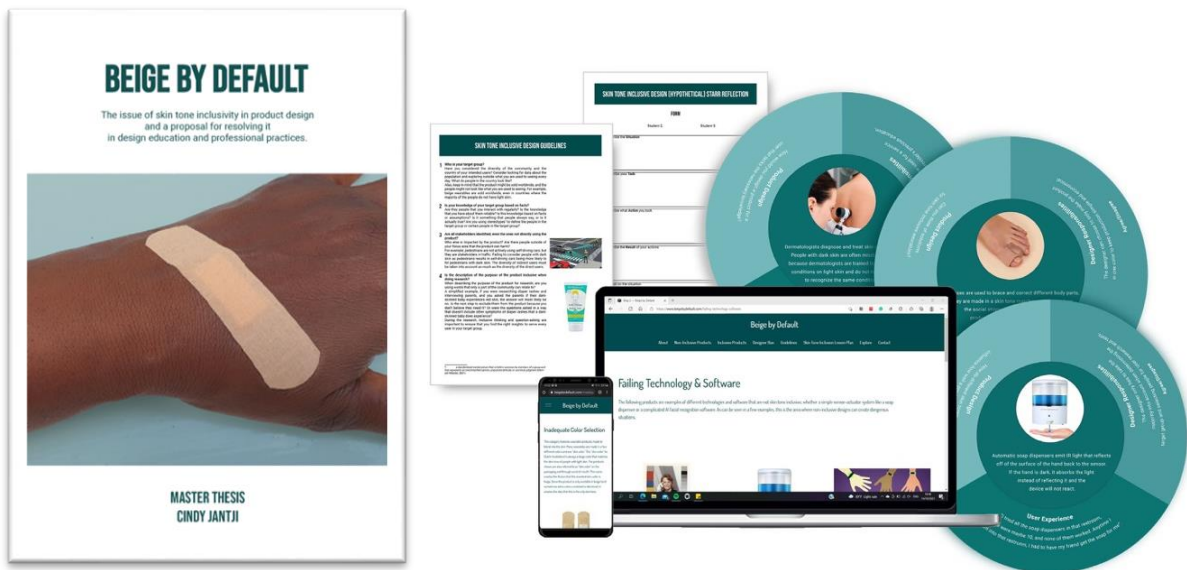


Figure 2. An impression of Beige by Default: Cover of the report (left) and educational material; a database with examples, a card set as conversation starters, and guidelines – by Cindy Jantji [5]

The final result was evaluated with two experienced teachers in two online interviews. Overall, the feedback was positive, though more extensive testing of the card set and working with guidelines, followed by another design iteration, is needed.

### 3 EVALUATION & DISCUSSION

The reports with the design process and results and the video presentations of the two cases, and feedback from the supervisors were analysed and complemented with additional literature on unconscious biases, resulting in the following insights.

#### 3.1 The power of examples

In both cases the master students first started collecting and analysing product examples. They were clustered in a - for designers - meaningful way and together with the knowledge, they were made accessible via online databases. The examples helped both students and teachers to better understand how unconscious biases in society manifest themselves. Analysis led to guidelines and the examples were put together in such a way that they could be valuable to other students. A disadvantage of the collected examples is that they could be outdated, something from the past, and therefore lead to denial of present biases. Another problem arises if they do not match with the students' projects. An exemplary case can suddenly undermine the aim to make students sensitive to possible prejudices because it is outdated. It is therefore important that examples are accompanied with credible reference and the historical context.

### **3.2 The need for lenses to see what is hidden**

Examples are exemplary and students will not always be able to make or ignore the translation to their own project. A model as developed for the gender bias project could support this translation and reveal some practices that would otherwise be hidden and overlooked in a design project where a multitude of aspects usually preoccupy the designer. Previous research shows that designers need tools to organize the many aspects of design, have a language to talk about and collaborate in teams [13]. The gender bias model offers three lenses to ask unconscious biases specific questions and to structure thoughts and insights. Obviously, such models are simplifications of the real world, and if we don't know their meaning and put them into context, we run the risk of students misinterpreting the models and using them as quick-fit tools, acting as masks rather unmasking the UB.

### **3.3 Interventions need to be appropriated to courses**

Examples and lenses are not sufficient to overcome UB of both students and teachers. Interventions are needed to raise awareness, trigger self-reflection and self-awareness; and learn inclusive design behaviour. A session as suggested in the skin tone project would be a solution, however, a barrier is the many topics already addressed in courses. Teachers are not always receptive to new learning objectives and activities. Therefore, teachers need to be supported to intertwine the mission of UB with ongoing teaching activities. Websites with easy to find examples and campaigns run by students could be a first step to the bottom-up approach in which students co-develop courses.

### **3.4 Language and representation matters**

It was surprising that the interviewed design teachers seemed to be unable to add much nuance when discussing the topics of gender and skin colour. Apparently, they too lacked a lens and the language to talk about these topics. Even though they knew that the topics were about avoiding prejudice, stereotype claims were made. Also tests with design students revealed the importance of the development of a sensitive attitude and language. For example, the skin tone project reported that discussion in class sometimes caused friction, whether it be teachers or students who were afraid to say the wrong thing, or students feeling uncomfortable with the way the topic is handled. Several teachers indicated being nervous or knowing other teachers who are nervous about sensitive topics in the classroom because they are worried, they might say the wrong thing. A safe space and appropriate language are needed for the students to learn, but teachers also need a safe space to teach.

## **4 CONCLUSIONS**

The question for this exploration was how design educators could broaden the design students' views, increase their sensitivity for unconscious biases, and motivate them to find design solutions? The studied cases revealed that design teachers themselves are not always aware and do not explicitly address the topic in their work. A first step is to discuss and review own practices and start with the 'low hanging fruit' that is check examples, visuals, and language and examples used in lectures, assignments, study guides and other study materials for possible UB. The results from the cases could be used to raise discussion among teachers. Furthermore, students could be stimulated to co-develop courses. Not only their analytical, design research, and creative skills can be of great value, also their sensitivity for exclusion can help to unravel and see the unseen. These students could serve as barometers that identify underserved issues in society. They help to rethink values and practices in design education and – even more important – to critically reflect on the effect of their designs in society. The attention for diversity, equity, and inclusion in organisation focus usually on HR related concerns and activities, such as selection procedures. Less attention is paid to biases in material culture. The cases show how designers could help here to fill the gap and built bridges, providing real life examples, guidelines, models, training materials, and campaigns.

Hopefully this paper feeds further discussion on this topic and the difficulty not to have biases, but to find and accept them, and to reveal them rather than to hide or overlook.

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