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UNIVERSAL DESIGN

Thinking and designing through the lens of postphenomenology

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Abstract

In recent years, there has been an increasing focus on Universal Design (UD) – design that aims to make the world more accessible to all people, regardless of ability. Through the research project ‘Shared Spaces – Life Between the Buildings from a Universal Design Perspective’, we explored how UD can be conceived and designed through a postphenomenological lens. The aim was to examine how the creation of inclusive stabilities and increasing the multistability of design can influence the way we experience ourselves, each other, and the world around us. In the project, 17 participants with varying abilities participated in Universal Design walks and interviews to identify the barriers they encounter in a public housing area in Denmark. Based on their perspectives, ten temporary urban experiments were developed and tested to address the needs identified by the participants. Three of these experiments are presented in this article. Through these experiments, the mediating effects of design are examined – not only what inclusive design is, but what it does. The article concludes with a proposal for five design criteria that can be integrated into how we conceive and design UD to create better conditions for inclusion in public space through increased multistability.

Plain Language Summary¹

- This article shows that urban design is more than just a matter of physical elements—it deeply influences how we, as human beings, experience ourselves, others, and the world around us.
- By working with people with diverse physical, sensory, and cognitive needs, the study identifies disabling barriers in urban environments and develops and tests design solutions through temporary real-world urban experiments to eliminate these barriers.
- The article combines Universal Design with a postphenomenological perspective and shows how these approaches can be integrated to create design solutions that can be used by a wider range of people.
- To explain these effects, the study highlights that by thinking with the concept of multistability and creating multiple stabilities, design can support different ways of use, allowing people to participate on their own terms rather than adapting to a single standard solution.
- Based on these insights, the study proposes five practical design criteria—height variation, sensory variation, seating variation, orientation variation, and participation variation—as guidelines for developing more flexible and inclusive public spaces.

¹ AI-generated; author checked and approved.

1 INTRODUCTION

Design and design processes are never neutral. The forms, materials, and technologies that surround us reflect specific conceptions of the body, normality, and modes of participation in public spaces. Throughout history, urban planning, architecture, and product design have been grounded in implicit assumptions about a standardized and “fully functional” body; one that can see, hear, walk, understand, and act in particular ways. This underlying assumption, described by Campbell (2009) as *ableism*, is deeply embedded in societal institutions and design practices. It privileges certain ways of being in the world while simultaneously producing barriers for others (Shew, 2023; Falster, 2024). As a result, many urban spaces enact exclusionary practices, and through our design processes, we sustain subtle hierarchies between bodies and abilities, thereby contributing to discrimination, marginalization, and social inequality (Imrie, 1996; Shakespeare, 2006; Titchkosky, 2011; Hamraie, 2017; Gissen, 2022; Dokumaci, 2023). For people with physical, sensory, mental, or cognitive disabilities, this means that public spaces, which ought to be open and accessible, often become environments marked by barriers and obstacles. Alongside this growing awareness of the social and political implications of design, there is an increasing need for new ways of conceiving and creating urban spaces, which are not merely about access in a technical sense, but about inclusion as an experienced, sensorial, and relational practice (Steiner & Zeller, 2024, p. 13). In this context, Universal Design (UD) has emerged as an approach with the potential to challenge the ableist norms underpinning many design decisions (Falster, 2024, p. 84). The original aim of UD rests on an ideal of equality and dignity for all (Ryhl, 2023, p. 9).

Temporary urban experiments can serve as important tools for developing and testing more inclusive design and design practices. Over the past years, such experiments have gained increasing attention from both practitioners and researchers (Beekmans & de Boer, 2014; Lydon & Garcia, 2015; Crowther, 2016; Madanipour, 2017; Schaller & Guinand, 2019) because they enable experimental processes and prototypes that challenge existing norms and test new ways of shaping urban spaces (Lydon & Garcia, 2015, p. 2). The temporary nature of these interventions provides opportunities to experiment with both the process and product: to foster creative collaborations, citizen participation, and rapid prototyping that may, in the long term, lead to more lasting transformations in design practice (Guinand et al., 2020, pp. 55–56). As Jensen (2023, p. 129) notes, temporality allows for an exploration of the questions “What is?”, “What if?”, and “What could be?”, thereby encouraging reflection on both current and potential future design practices. Moreover, temporary urban experiments hold an intrinsic value in themselves. They do not necessarily need to result in permanent solutions but can instead be understood as processes that promote experimental approaches within the urban environment (Bråten, 2024, p. 819). From a postphenomenological perspective, such experiments can be understood as mediating technologies that shape how people experience themselves, others, and the world around them (Ihde, 1990; 1993; Verbeek, 2005; 2011; Rosenberger & Verbeek, 2015).

This article explores how temporary urban experiments can be used to create inclusive design, and how design practices can be approached through a postphenomenological lens. The article first introduces the theoretical perspective, including the concepts of UD and postphenomenology, with particular emphasis on the notions of *mediation* and *multistability*. It then presents the data collection methods, followed by three UD experiments developed through the research project and the empirical insights gained from these. Based on these findings, the article proposes five design criteria for UD, incorporating multistability as a means of producing inclusive stabilities. The article concludes by summarizing the key contributions of the study.

2 THEORETICAL FRAMEWORK

In recent years, UD has gained increasing attention as an approach to creating inclusive environments and products that can be used by all people, regardless of differences in ability. UD not only compensates for impairments but also integrates accessibility and equality into the design process from the outset (Ryhl, 2024, pp. 265–270). UD functions both as an applied and analytical framework across fields, such as architecture and design (Imrie, 2011; Steinfeld & Maisel, 2012), transport and mobility (Preiser & Smith, 2011), learning and education (Molbæk & Hedegaard-Sørensen, 2023; Murawski & Gulløv, 2024), as well as digital technologies and interaction (Steinfeld et al., 2019; Wickramathilaka et al., 2025). A classic example of UD in urban design is the installation of ramps alongside stairs at building entrances, benefiting wheelchair users, people with strollers, and pedestrians. In this way, UD illustrates how design can enhance accessibility and foster participation in everyday life.

The concept of UD was formulated by American architect Ron Mace in the 1980s, with the ambitious goal of creating designs that are inclusive of all people (Hamraie, 2016). UD does not necessarily mean that encounters with the world should be effortless, but that they should, at a minimum, be possible. It also does not imply the design of a single solution for all, since diversity among people and bodies equally requires diversity in design solutions (Winance, 2014). Mace developed seven principles of Universal Design to make these ideas operational in design practice:

1. Equitable use: The design is useful and marketable to people with diverse abilities.
2. Flexibility in use: The design accommodates a wide range of individual preferences and abilities.
3. Simple and intuitive use: Use of the design is easy to understand, regardless of the user's experience or literacy.
4. Perceptible information: The design communicates necessary information effectively to all users.
5. Tolerance for error: The design minimizes hazards and adverse consequences of accidental or unintended actions.
6. Low physical effort: The design can be used efficiently and comfortably with minimal fatigue.
7. Size and space for approach and use: Appropriate size and space are provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility (Frandsen et al., 2023, p. 17).

The choice of UD in this article stems from its original ambition to create environments that are both accessible and inclusive for all users. This aligns closely with the article's aim of exploring how urban spaces can be designed to support inclusion and participation for people with diverse abilities. However, it is also essential to acknowledge that UD has been the subject of significant criticism within Disability Studies (e.g., Hamraie, 2017; Imrie, 2011; Titchkosky, 2011). Critics have pointed out that UD can inadvertently reproduce normative assumptions about the body and ability, and that the very notion of the "universal" risks erasing individual and contextual differences. Hamraie (2017) argues that UD often relies on Western, normative ideas of functionality and rationality, thereby offering technical solutions to political problems instead of challenging the social construction of normality itself. Imrie (2011) describes how UD can operate as a reductive and functionalist tool that downplays the sensory and experiential aspects of participation. Titchkosky (2011) emphasizes that UD frequently overlooks the emotional and social dimensions of exclusion. Dolph (2021) further points out that Mace primarily conceptualized UD through an architectural lens, which resulted in a limited focus on areas such as information technologies and user interfaces. Rasmussen (2023) also questions who is actually included in this so-called "inclusive thinking"—humans, animals, or plants—

raising the issue from a more-than-human perspective. Keeping this criticism in mind, it is useful to return to Mace and the elaboration offered by Ryhl (2024, p. 16):

Mace wanted to define a concept and a vision of design that accommodated the vast diversity in user needs and the fact that living with different and changing abilities throughout a lifetime is not a minority matter but a fact of any human life.

Thus, Change and fluctuating ability are inherent conditions of human life. Therefore, in this project, UD is not applied as a fixed or normative ideal, but as a critical and evolving analytical framework. By combining UD with a postphenomenological approach, it becomes possible to examine how urban design mediates people's experiences of participation and inclusion in public space.

The following section turns to postphenomenology, a philosophical and technology-oriented framework that combines classical phenomenology with pragmatic and empirical perspectives on human–technology relations. The principles of postphenomenology originate in the thinking of the American philosopher Don Ihde (Ihde, 1990; 1993), further developed by several influential thinkers (e.g., Verbeek, 2005; 2011; Hasse, 2015; Rosenberger, 2016; 2017; Kudina, 2021), and offer new ways of empirically investigating how humans experience themselves, others, and the world through human–technology relations (Verbeek, 2005, p. 101; Rosenberger, 2016, p. 471). Within postphenomenology, there is a growing research interest in, among others, genomic technologies (de Melo-Martín, 2022), educational and learning technologies (Hasse, 2008; 2015), artificial intelligence (Coeckelbergh, 2019; Kudina, 2021), human and cultural geography (Ash, 2019; Ash & Simpson, 2014), and urban furniture (Rosenberger, 2017; 2019; Jensen, 2019; 2020; Giamarino et al., 2023; Nielsen, 2024). Postphenomenology aims to investigate technology in terms of “the *relations between human beings and technological artifacts*, focusing on the various ways in which technologies help to shape relations between human beings and the world” (Rosenberger & Verbeek, 2015, p. 9, original italics) and is grounded in the idea that technology is not merely a neutral tool but actively shapes us as human beings (Verbeek, 2005, p. 114), which in turn affects and is affected by the contexts in which it is situated: a double hermeneutic process (Kudina, 2021, p. 244).

From a postphenomenological perspective, technology is understood broadly, both as advanced machines, digital systems, or electronics, and as all human-made artifacts that mediate our relation to the world. At the same time, it is emphasized that there is no direct way to access “things in themselves”, since they are always in a constituted and constituting relation with the subject (Rosenberger & Verbeek, 2015, p. 12). This means that to gain a greater understanding of the significance and impact technologies have for humans, we cannot describe them from a single world, but we must understand the relations between each individual and their world.

Postphenomenology offers many analytical concepts that investigate the concrete ways in which technologies mediate people's experiences of their world. Central here is *mediation*, which refers to how technologies function as intermediaries that shape our perception, actions, and understanding of the world (Verbeek, 2005, p. 114). For a technology to mediate a perception of the world, it does not simply neutrally transmit a pre-given reality to the user but actively contributes to creating the very reality that is experienced. This implies that any technology both opens up and constrains certain possibilities for action and understanding. Verbeek (2005, p. 113) states that, by directing attention toward technology itself, one is encouraged to investigate the mediating role that technologies play:

That “the things themselves” are accessible only in mediated ways does not interfere with our ability to say something about the role that they play, thanks to their mediated identities, in their environment. And it is precisely the postphenomenological perspective that offers a new way of so doing.

Technologies also possess *multistability*, which means that they can be used and experienced in different ways depending on context, culture, and user. Ihde (1990, p. 144) introduced the concept of multistability to describe how technologies do not have one fixed or inherent function but can stabilize in many different ways depending on context, use, and cultural setting. Thus, multistability describes the capacity of technology to participate in multiple meaningful uses (Rosenberger, 2017, pp. 4–5). Ihde (1990, p. 145) illustrates how we can visually perceive an object as polymorphic through the famous Necker cube. The transparent cube is drawn with opposing sides parallel so that the figure's perspectives can be read in several different ways. The figure can be seen as a two-dimensional shape, where the innermost lines resemble an insect with six legs stretching out to the corners of a hexagon, or as a three-dimensional transparent cube, or as a three-dimensional closed cube with the smallest surface forming the top of the figure, as illustrated in Figure 1.

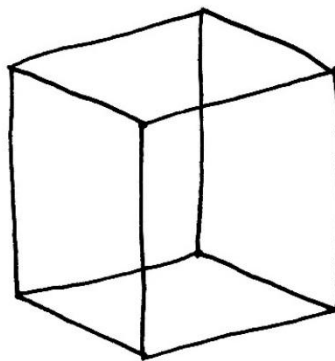


Figure 1: Necker Cube

Note. The illustration shows the polymorphic Necker cube, which can be interpreted in different ways (Ihde, 1990, p. 144).

The figure thus offers multiple possibilities of interpretation (Verbeek, 2005, p. 118), and the concept of multistability emphasizes that technologies do not have one fixed essence; rather, their meaning and function are always relationally determined by the user, the situation, and the cultural context. By orienting attention toward the mediating role of technology, it becomes possible to gain insight into both the direct and indirect character of a technology in relation to the mediation of meaning. The direct form concerns the mediation of sensory perception and is described as *microperception* (Verbeek, 2005, p. 128), which refers to our multisensory direct contact with the technology and its impact on our body and sensory apparatus. Here, we relate to the technology's form and material, its "drawing attention to" itself, and its mere presence at a bodily–sensory level. The indirect form concerns the technology's mediation of a meaning-giving framework for understanding the human relation to the world, which is described as *macroperception* (Verbeek, 2005, p. 128). Here, we place the design within a larger meaningful context in cultural terms (Verbeek, 2005, p. 135). Before delving into the concrete empirical examples, where the theoretical perspectives are applied, the following section outlines the data collection methods and the analytical approaches used.

3 METHOD

The study is based on a qualitative, participant-involving research method, inspired by ethnographic work and experimental design practice. Fieldwork was conducted in the housing area of Toveshøj in Aarhus, Denmark, as part of a larger research project on inclusive urban spaces and urban furniture. Toveshøj is a public housing area consisting of nine four-story

apartment blocks with a total of 624 dwellings, built in the late 1960s and the early 1970s. The area features extensive green communal spaces, pathways, parking lots, playgrounds, outdoor fitness equipment, a bonfire area with a shelter, and benches where residents gather for barbecues and social activities.

Data were generated through Universal Design Walks – a form of urban walking interview (inspired by Marling, 2003; 2005) – where participants, together with the researcher, move through selected parts of the area while being interviewed (Jones et al., 2008) about the barriers or obstacles they experienced in the existing urban design and infrastructure. In total, 14 Universal Design Walks were conducted during the winter of 2024–2025, each lasting between 60 and 90 minutes. The material was analyzed using an eclectic analytical strategy, allowing for flexible selection and interpretation of the data (Pors & Husted, 2021). This approach made it possible to develop Universal Design experiments based on the disabling barriers described by participants, as well as to assess which design prototypes could practically be built and tested to create a more inclusive urban space. The eclectic strategy also enabled the integration of methods from Grounded Theory (Boolsen, 2025) in developing the design criteria for UD presented later in the article. These design criteria were allowed to emerge and elaborate from the empirical material, evolving throughout the project around the central question: “What’s going on?” (Boolsen, 2025, p. 378). In practice, this meant that data from the Universal Design Walks and interviews were continuously compared and related to one another in an iterative process through which patterns and themes gradually took shape.

Across the 14 Universal Design Walks, 17 participants took part (on three of the walks, two participants joined together). They represented a broad range of abilities, including physical, psychological, cognitive, and sensory impairments. Participants included, among others, individuals using wheelchairs, rollators, or walking sticks; parents with strollers; people with anxiety, social anxiety, or Post-Traumatic Stress Disorder (PTSD); people with dyslexia, learning difficulties, or autism; as well as individuals with low vision or blindness, Deaf participants, and those with heightened sensitivity to sensory stimuli such as sound, light, or smell. Participants’ ages ranged from 28 to 82 years old. The participants were not selected to be statistically representative of a larger group or reach a saturation point, but because they were relevant to the study’s aim of including diverse perspectives from people with varying abilities (Harrits et al., 2012, p. 161).

The project was carried out in accordance with Aalborg University’s ethical guidelines (Aalborg Universitet, n.d.). Participants were recruited through organizations working with and advocating for people with disabilities, as well as through the residents’ association at Toveshøj. All participants were informed about the overall purpose of the study (Kvale & Brinkmann, 2015, p. 116) and gave informed consent to participate. They retained full autonomy, with the option to participate voluntarily, take breaks, or withdraw from the study at any time without consequences (Bryman, 2016). All Universal Design Walks and interviews were conducted by the author of this article, who also transcribed and analyzed the data. All temporary urban experiments were designed based on participants’ expressed needs and wishes, constructed and installed by the author, after which five of the participants took part in testing the interventions. The research participants’ names have been anonymized using pseudonyms in this article.

4 UNIVERSAL DESIGN EXPERIMENTS

Based on the participants’ accounts, a total of ten temporary urban experiments were developed during the project and tested in Toveshøj beginning in the spring of 2025, with the testing phase expected to continue for approximately one year. The aim was to explore how design thinking through the lens of postphenomenology and the principles of UD can be used to

investigate how urban technologies can influence the way we experience ourselves, each other, and the world around us.

This section presents three of the ten temporary urban experiments that were designed, constructed, and tested during the research project. The three experiments—the round table, sandpits at varying heights, and a dome-like element—are each temporary spatial interventions developed using the Design Thinking method (Lydon & Garcia, 2015; Doorley et al., 2018). This method enables the exploration and resolution of complex problems in an inclusive and creative way through five iterative phases: Empathize, Define, Ideate, Prototype, and Test (Lydon & Garcia, 2015, p. 172). The Design Thinking approach further allowed for an experimental and participatory process, involving the participants as co-creators, while the design work was conceptually informed by postphenomenological notions such as mediation and multistability. The following three examples illustrate how design, when grounded in the needs of individuals and responsive to those needs in ways that enable each person to feel included, mediates experiences of inclusive urban spaces and urban furniture.

4.1 TECHNOLOGY 1: THE ROUND TABLE

At Toveshøj, several picnic table–bench sets have been installed, traditionally constructed with a rectangular table and two benches fixed to the long sides. During the “universal design”-walks at Toveshøj, several participants pointed out that the existing table–bench sets (see Figure 2.1) hinder their ability to take part in the community. Alice, a wheelchair user, explained how the design of the existing benches creates barriers for her:

I don't think these benches, where I can't really get underneath, are very good. If I have to sit here at the end, my footrest hits down here, so I can never really get all the way in. Well, I can, but then I have to sit sideways. (Alice, January 15, 2025)

In the current table–bench design, the ends are constructed in such a way that Alice and other wheelchair users cannot move their wheelchairs underneath, which means they end up sitting sideways. Christopher, who is deaf, also pointed out the disadvantages of the existing table–bench sets:

For us deaf people, it can actually be difficult to sit at a rectangular table, because we have to lean across it to communicate. And if there are many of us and we push two tables together, well, then it becomes impossible to talk to those at the far end. (Christopher, February 4, 2024)

For Christopher and others who are deaf or use sign language, it is crucial to be able to see each other's faces and hands clearly to communicate effectively. Lisa explained that, due to her dyslexia, she finds reading challenging and struggles to decode letters. As a result, she does not recognize street names but instead navigates by landmarks, which she feels are lacking in the area:

There are no landmarks here, and landmarks are absolutely necessary. It can be anything from a tree to a piece of art — just as long as it doesn't involve letters. (Lisa, February 14, 2025)

The large number of identical table–bench sets does not provide variation in landmarks in the area for Lisa, whose statement also contributed to the development of the design criteria for the upcoming UD experiment. In the design process, the principle of multistability (Ihde, 1990, p. 144) as well as Mace's seven principles of Universal Design (Frandsen et al., 2023, p. 17) were applied. The round table, designed as a UD experiment, has a diameter of 160 cm, making it possible for up to 10 people to gather around it. The table, benches, and the accompanying movable plinth are built from lumber and clad with wooden slats (see Figure 2.2). The round

table is a multistable technology that can be used and experienced in multiple ways depending on users' perspectives, situations, and needs. It was designed with a focus on enabling multiple stabilities in the way that it can be used:

- Equitable use (Principle 1): For wheelchair users, the open shape of the table makes it possible to get closer to the tabletop from several sides, so they are not limited to the ends or forced to sit sideways. For deaf and sign language users, the round form supports eye contact and visibility of hands, making communication easier, while at the same time serving as a landmark in the area.
- Flexibility in use (Principle 2): The round form of the table and the movable plinth support different ways of gathering, whether in small, intimate groups at a distance or in larger communities around the table.
- Low physical effort (Principle 6): The design requires minimal effort to approach, whether walking, using a walker, or a wheelchair.
- Size and Space for approach and use (Principle 7): The circular form, the attached benches, and the movable plinth make it possible to access the table from multiple angles.

The round bench was tested by several of the research participants, and their accounts underscore that technologies are not merely neutral artifacts but strongly mediate how they experience themselves, each other, and the world around them. Alice's account highlights how the round table mediates a sense that she can participate in the community on equal terms with others:

What I like about the round table is that I can move around more sides and that I'm not locked into only sitting at the end. It's more community-building in a way, and I can also be part of it. (Alice, August 6, 2025)

Helene, who, like Alice, is a wheelchair user, also emphasized how the round table mediates her sense of belonging to the community and the significance this has for her:

Being able to meet and be part of the community just means so much. Simply having the possibility of joining in means everything, and at the same time, you also get the opportunity to connect with one another. That also means a lot for good neighborly relations. (Helene, May 18, 2025)

Anna, who has an autism diagnosis, explained that she is especially sensitive to, among other things, many people at once, sounds, light, and smells. Anna needs the option of being able to withdraw, and the movable plinth provides her with that stability:

I like that I have a social opportunity, but that I can also take this bench and move it somewhere else if I need to. That's an option I really appreciate. (Anna, July 31, 2025)

These accounts show the mediating role of the round table for the research participants, and how multistability in the design (the round table, benches, and the movable plinth supporting different needs and experiences) and mediation (the design shaping relations and experiences) play a central role in a postphenomenological view of the UD experiment. By orienting toward the mediating role of technology, the experiences with the round table can be understood both on a micro and a macro level (Verbeek, 2005, p. 128).

At the micro level, the table mediates participants' direct sensory and bodily experiences: wheelchair users can get closer to the tabletop, deaf participants can maintain eye contact and see hands more clearly, and a participant with autism can feel secure in the possibility of moving the plinth to create distance. The technology's form, materiality, and physical presence thus become decisive for how the body interacts with the table.

At the macro level, the table mediates a meaningful framework for participants' understanding of community and belonging. The round design creates new social opportunities: wheelchair users experience inclusion on equal terms, deaf participants experience communication without barriers, and residents emphasize the importance of being able to meet at eye level as a foundation for good neighborliness. Here, the table is not only a piece of furniture but a culturally meaningful symbol of inclusion and community in public space.



Figure 2: Technology 1: The Round Table

Note. The illustration shows (1) one of the existing table–bench sets at Toveshøj, and (2) the UD experiment the round bench, with benches and a movable plinth.

4.2 TECHNOLOGY 2: SANDPITS

In Toveshøj, there are also several playgrounds where the ground surface primarily consists of sand areas, and most play equipment is placed within these areas (see Figure 3.1). At first glance, this seems child-friendly because it enables playing with sand and creating a safe surface in case of falls. However, during the “universal design”-walks, several research participants pointed out how the sand, both in the sandpits and as playground surfacing, constitutes a barrier to their participation in and experience of the community. Jane, who uses a wheelchair, described the following challenges:

This playground is full of sand, and that's not very smart for a wheelchair user. Both because you simply get stuck in it, but also because you drag a lot of sand into your home as it sticks to the wheels. (Jane, January 11, 2025)

Helene, who also uses a wheelchair, put words to a similar experience:

If you look at the playground, it's all sand, and that's not very good to drive in. I simply can't move in it – either I get stuck, or I tip over. (Helene, January 16, 2025)

For Jane and Helene, the sandy areas are barrier-creating elements. They constitute a physical obstacle, preventing access and the experience of being able to participate on equal terms. Natalie, who has PTSD, expressed a more general critique of the existing playground areas and their aesthetics:

When I stand here between two dilapidated swing sets and a couple of sad benches, I get the feeling that this area is neither thought of nor loved by anyone.
(Natalie, February 4, 2025)

Same as with the round table experiment, the principle of multistability (Ihde, 1990, p. 144) and Mace's seven principles of universal design (Frandsen et al., 2023, p. 17) were applied in the design process of the sandpits as a UD experiment. The sandpits were redesigned as raised, accessible, and differentiated in height (see Figure 3.2) to accommodate both children and adults who use wheelchairs, while creating new opportunities for social interaction. The sandpits consist of three separate boxes, each measuring 40x80 cm, built in wood and mounted on wooden structures at heights of 30, 40, and 50 cm above ground level.

- Equitable use (Principle 1): The raised sandpits allow wheelchair users to participate directly in play without getting stuck in the sand. At the same time, walking children and adults can also play in them on equal terms.
- Flexibility in use (Principle 2): The different heights and sizes provide variation and opportunities for play in many ways – for children alone, in small groups, or together with adults.
- Simple and intuitive use (Principle 3): The sandpits work immediately and require no explanation. Children and adults can approach them on their own and find their own way of playing or gathering.
- Size and space for approach and use (Principle 7): The sandpits are placed with accessible surfaces around them, making it possible to approach with wheelchairs, walkers, and strollers.

The sandpits were tested by several of the research participants, and their accounts once again emphasize that technologies are not merely neutral artifacts but, to a large extent, mediate how people experience themselves, each other, and the world around them. Helene, who as a child often experienced being left outside when other children played, described the significance of the new UD sandpit experiment:

This is a really good idea, and also that they're at different heights. I think the concept is really well thought out, and at the same time, children who walk normally can of course also use these sandpits ... It means a lot to me to be able to join in. As a child, it was absolutely essential to be part of the other children's play, and it is just enormously important to feel like part of the community, otherwise you just sit outside watching the others play. (Helene, May 18, 2025)

Alice, similarly, described how the sandpits created new opportunities for interaction, highlighting that, previously, her participation was often as a passive observer beside the play. Now, she can take part as an active participant in the play:

When I've looked after my friend's daughter, I often just sit there staring while she plays in the sandpit. It's great that I can sit here with her, and she can be there too. It makes me feel much more like part of her play, and it also creates a completely different interaction when we're sitting across from each other. (Alice, August 6, 2025)

For Alice, the opportunity to participate in play, make eye contact, and be in direct interaction with the child strengthens her sense of equality and the possibility of engaging in a new social role alongside the child. A different perspective was described by Natalie, who pointed to the importance of aesthetics and materiality in relation to her experience of accessibility and the feeling of being welcome and comfortable:

I think the aesthetics of accessibility are really very different because I think it depends on the mental state you come in with. I've lived with full-blown PTSD and fought through all kinds of things not to be triggered. But the things that triggered me could easily be things that gave other people calm ... It's extremely difficult to talk about one kind of aesthetics. It's probably more kinds. But something I think we all have in common is that we all come from nature, and our nervous systems find calm in natural materials. It's like getting a hug from nature. (Natalie, August 1, 2025)

The accounts highlight the mediating role of the sandpits for the participants, and how multistability in the design (sandpits at different heights, accessible from multiple sides) and mediation (the design shaping relations and experiences) play a central role in a postphenomenological perspective on the UD experiment. Once again, by orienting toward the mediating role of technology, the experiences with the sandpits can be understood on both a micro and a macro level (Verbeek, 2005, p. 128).

On a micro level, the sandpits mediate the participants' direct sensory and bodily experiences. For example, when wheelchair users can get close and join the play without getting stuck in the sand, when children can play at eye level with adults, and when direct interaction between children and adults takes place. The technology's form, materiality, and physical presence thus become decisive for how the body interacts with the space: hands in the sand, eyes meeting across the edge, and the feeling of engaging in the same activity at the same time.

On a macro level, the sandpits mediate a meaningful framework for the understanding of inclusion and community. The sandpits at different levels create new social opportunities where children and adults can meet across functional variations, and participants experience the sandpits as a caring technology that is not merely a play element but mediates a culturally meaningful symbol of inclusion and community in Toveshøj.



Figure 3: Technology 2: Sandpits

Note. The illustration shows (1) one of the existing playground areas in Toveshøj. (2) The UD experiment sandpits at different levels.

4.3 TECHNOLOGY 3: DOME-LIKE ELEMENT

In Toveshøj, several large, open, and transparent areas provide little shelter or protection from wind and weather (see Figure 4.1). The open and transparent areas in Toveshøj allow for free visibility and overview, and they initially seem fine. Yet, during the “universal design”-walks, several research participants pinpointed the challenges they experience in these open areas and their effects. Jane began by explaining:

People with disabilities, or at least wheelchair users, often struggle to keep warm. When areas are completely open, like here, it gets very windy, and you get cold quickly. If there could be a glass dome or some kind of shelter, it would be really good, because then I could also enjoy being outside for more days of the year.
(Jane, January 11, 2025)

Alice highlighted a similar experience and referred to the Dome at Aarhus Ø (a harbor district in Aarhus) as an inspiration:

It would be great to have something that provides shelter and cover – a bit like the Dome at Aarhus Ø. It stays really warm there from May until well into October. But it could also just be some kind of transparent tents, where the sides can slide back and forth. (Alice, January 15, 2025)

Anna described how the large open spaces affect her social positioning in the area, since the many sensory impressions – visual, auditory, and movement – quickly become overwhelming, but how shelter could support her ability to be present on her own terms:

I would probably sit down and see what’s going on, a bit from a distance. That would be my standard behavior observation, and I’ve done that a lot. That was how I learned a lot about other people and about my own feelings. (Anna, February 13, 2025)

The statements point to how the open areas in Toveshøj, for some participants, appear as barriers to their participation in the neighborhood. Similar to the previous experiments, designing the dome-like element as a UD experiment also involved applying the principle of multistability (Ihde, 1990, p. 144) and Mace’s seven principles of universal design (Frandsen et al., 2023, p. 17). The construction was developed to create a “room-within-the-room” in Toveshøj’s open areas, where residents could find shelter, spend time, and meet in a more protected environment, without the space becoming closed off (see Figure 4.2). The construction consists of triangles made of wood with attached acrylic panels in various colors. In some of the triangles, painted plywood panels have been mounted, while in others no material has been added, creating a varied surface for testing. The dimensions of the element allow it to accommodate both small groups and individuals seeking a quiet moment in the urban space. The elements placement makes it possible to sit either on the existing bench or in a wheelchair next to the bench, while still being sheltered and protected by the construction.

- Equitable use (Principle 1): The shelter allows residents with different functional variations to spend time outdoors on equal terms.
- Flexibility in use (Principle 2): The construction can be used both for individual retreat and for social gatherings.
- Low physical effort (Principle 6): The construction requires no physical effort to use; one can simply walk or roll in and make use of the space.
- Size and space for approach and use (Principle 7): The curved shape and open sides make it possible to access the dome-like element with a wheelchair, stroller, walker, or on foot.

After the dome-like element was established and tested by participants, it gave rise to entirely new experiences and descriptions. For example, Alice emphasized how important it is that the construction both creates a space while remaining open and accessible:

It could be a bit higher and wider, but I like that it's not too closed, because you quickly feel cramped and in the way when you're in a wheelchair. That's not the case here, because it's so open. And you can easily back up here without bumping into too many things. (Alice, August 6, 2025)

Natalie described how the form, materiality, and patterns of the construction create a sensory and aesthetic experience that invited her to explore:

I really like how it curves overhead and the patterns in the triangular forms – I think that's just super nice. The construction and the fact that it's transparent in some places give me a sense of Eastern or Indian architecture, where it's much more detailed. And since it's geometric, it constantly creates new patterns. There's the triangle, the hexagon, and I also get a star-like feeling in the joints. There's so much to explore in the structure. (Natalie, August 1, 2025)

Anna further described how the colors, light, and forms create an aesthetic dimension that gives her a place to stay while also inviting her to be part of the community on her own terms:

It really has something good about it. Playing with colors, shapes, and expressions helps create life in the area, and it draws me in – and probably others too – into the community. (Anna, July 31, 2025)

The accounts reveal the mediating role of the dome-like element for the participants, and how multistability in the design (the curved construction, the transparent fields, and the possibility of shelter) and mediation (how the design shapes relations and experiences) play a central role in a postphenomenological view of the UD experiment. By once again orienting toward the mediating role of technology, the experiences with the dome-like element can be understood both on a micro- and a macro-level (Verbeek, 2005, p. 128).

On a micro-level, the shelter mediates participants' direct sensory and bodily experiences: wheelchair users experience being able to stay outdoors longer without freezing, a person with PTSD finds the aesthetic qualities and geometric forms fascinating, and a person with autism finds calm and attraction in the dome-like element. The materiality and spatial form of the technology thus become crucial for how the body senses its surroundings: the warmth behind the shelter, the wind slowed by the construction, and the light filtered through the transparent colored surfaces.

On a macro-level, the dome-like element mediates a meaningful framework for the understanding of inclusion and community. It creates a gathering point where people can meet across functional variations and experience themselves as part of a shared space that both protects and invites presence. The shelter thus becomes not only a physical protection, but also a culturally meaningful symbol of care and community in Tovesshøj: a sign that the residents' different needs have been considered, and that the communal space can embrace both the individual and the social.



Figure 4: Technology 3: A Dome-like Element

Note. The illustration shows (1) one of the existing open and transparent areas in Toveshøj. (2) The UD experiment a dome-like element, which provides shelter and creates sensory and aesthetic experiences.

Taken together, the three examples show how urban technologies do not solely function as physical artifacts but as meaning-making frameworks that support the possibility of inclusion and community across different abilities. This insight provides the foundation for the following section, which presents a proposal for five UD criteria that integrate a systematic approach to producing inclusive stabilities and increasing the multistability of design.

5 PROPOSED DESIGN CRITERIA FOR UD SEEN THROUGH A POSTPHENOMENOLOGICAL LENS

The three examples from the empirical work demonstrate how technologies in urban space—whether the round table, sandpits at varying heights, or a dome-like element—always contain the potential for multiple, simultaneous meanings and uses; in other words, they are multistable. The findings indicate that it is precisely within the tension between these differing interpretations that UD finds its strength. Supporting this multistability in design requires a deliberate focus on how technologies can open up multiple forms of participation, rather than restricting themselves to a single function or user group. As Ryhl (2024, pp. 268–270) notes, to emerge and elaborate from the empirical material

... the universal design solution may, at times, be one solution for all, and other times, it may be a catalogue of different solutions that together offer a solution for all. It all depends on the brief, the context, the user profile and the specific project.

The emerging design criteria emerged from the participants' lived experiences and narratives, elaborated throughout the project around the guiding question: "What's going on?" (Boolsen, 2025, p. 378). This means that the criteria stem from situated, sensory, and social encounters in urban space—moments in which participants actually interacted with technology and environment. Consequently, the criteria represent an attempt to expand UD beyond a functionalist and technical tool, where "inclusion" is understood only as adaptation to a pre-given norm, toward an understanding of design as a situated and mediating practice that

explores difference: not how everyone can use the same design to do the same thing, but how everyone can use it on their own terms, together.

Thus, the UD design criteria viewed through a postphenomenological lens concern the production of inclusive stabilities and increasing the multistability of design. This involves designing urban spaces and furnishings that can simultaneously support multiple bodily positions, needs, and meaningful experiences. UD design criteria should therefore be grounded in variation and in the multistability inherent in technology's ability to open up diverse stabilities of meaning and function, thereby creating spaces of possibility rather than singular solutions to narrowly defined needs (see Figure 5).

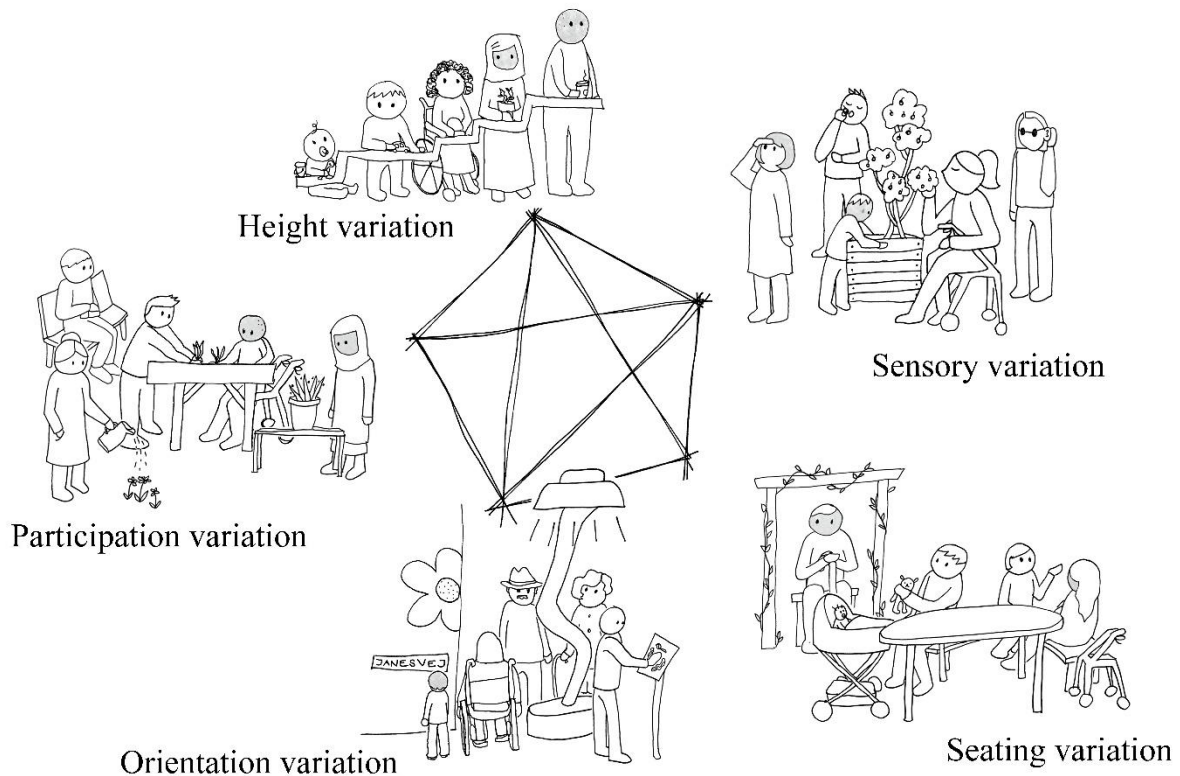


Figure 5: Design criteria for UD seen through a postphenomenological lens

Note. The illustration shows the five proposed design criteria for thinking and designing with a focus on UD and multistability.

The UD design criteria, when seen through the lens of multistability, illustrate that each criterion does not create a single “correct” way to use or experience an element, but rather several legitimate and simultaneous possibilities that can coexist within the same urban design element:

- **Height variation:** Different heights allow the technology to be used by both children and adults, by those standing or sitting, or by wheelchair users. Each height offers its own “stabilization” of function and experience, allowing the technology to operate on several levels at once.
- **Sensory variation:** By stimulating multiple senses, the technology can be experienced differently depending on the user’s sensory preferences or needs. For example, some may focus on tactile experiences, others on visual or auditory impressions, thereby creating multiple parallel meanings and experiences of the same spatial technology.

- Seating variation: Different types of seating and resting zones allow users to interact with the technology in different ways – alone, in small groups, or in social gatherings. Each seating pattern stabilizes a function for a specific user group.
- Orientation variation: Clear orientation points and wayfinding elements mean that the technology can be understood differently depending on the user's experience and needs. Some use the technology as a navigation point, others as a meeting place or playground – several functions can coexist simultaneously.
- Participation variation: By offering multiple ways to participate (observing, physically active, socially engaged), the technology becomes multistable, as it allows different forms of interaction at the same time and supports diverse user experiences and participation.

In the design process, attention must therefore be given to how technologies are interpreted differently by different users (Verbeek, 2005, p. 118). Designers should ask: *“How can this design accommodate multiple ways of being experienced and used?”*. As the examples demonstrated, a round table can be inclusive for wheelchair users, facilitate eye contact for deaf users, and serve as an orientational anchor in shared spaces—different yet equally legitimate interpretations. This understanding calls for a reflexive design practice, in which designers continually examine their own positions and the assumptions underpinning design decisions. As the sociologist Madeleine Akrich (1992) observes, designers always embed particular assumptions about use within technological artefacts. In the design process, a script, a material scenario for expected interaction, is “inscribed”. Yet, as Akrich (1992, p. 209) notes, there often arises a discrepancy between “the world inscribed in the object and the world described by its displacement”, that is, between the designer's intention and the artefact's actual use in practice. Building on this, Rosenberger (2017, p. 15) describes design as a “social script”, where technologies embody social norms and values, and where material inscriptions may enable or constrain certain actions. In the context of urban space, design decisions can both enable and prevent inclusion (Rosenberger, 2020). What may appear to be neutral design choices are, in reality, moral decisions that materialize particular assumptions about the body, normality, and participation in public space. Accordingly, a reflexive and ethically grounded design practice that aims to produce inclusive stabilities and increase the design's multistability must continually question the norms and expectations embedded in urban design. Designers might ask: *“What is my own societal reference point? And which forms of behavior and use do I imagine as legitimate in public space?”*.

By posing such questions, we can begin to identify the normative structures that silently shape design decisions, thereby opening up more conscious and ethically informed design practices, in which the goal of UD is to expand the possibilities for meaningful participation. The three empirical examples—the round table, sandpits at varying heights, and a dome-like element—served as catalysts for developing the proposed UD design criteria. The goal is not to create one design that “fits all”, but to create conditions that allow diverse ways of using, experiencing, and interpreting technologies to unfold side by side.

6 CONCLUSION

This article has presented empirical examples of how temporary urban experiments can function as testing grounds for developing more inclusive design and design practices. By combining UD with postphenomenological perspectives, the study demonstrated how technologies in urban spaces mediate people's experiences of participation and inclusion, and how these experiences can provide an expanded understanding of UD design criteria.

The empirical work showed that creating inclusive urban spaces and designs requires thinking in variation rather than standardization. The guiding principle is that people with varying abilities

should be met with varying design solutions that offer multiple opportunities for inclusion. This insight forms the core of the article's theoretical contribution: that UD should be understood as a relational and situated practice, rather than a functionalist ideal of "one solution for all". Instead of focusing on universal standards, this article proposes working toward the production of inclusive stabilities and increasing the multistability of design to support multiple bodily positions, needs, and meaningful experiences simultaneously. This constitutes a new analytical and practical framework for understanding and creating inclusive urban spaces and furnishings.

By emphasizing temporary urban experiments as a method, this study contributes a tool for learning and reflection, allowing designs to be physically and situationally tested, not only focusing on what a design is, but more importantly, on what a design does. Based on this, this article proposes five empirically grounded UD design criteria—height, sensory, seating, orientation, and participatory variation—as a reflective and practical framework for treating diversity and variation as core design parameters. These criteria also offer a concrete approach for integrating postphenomenological concepts such as mediation and multistability into urban design practice, thereby expanding the understanding of how designers can work with inclusion in the public realm.

Data Access Statement

The study is based on ethnographically collected empirical data, including interviews with the 17 research participants, testing of the implemented UD experiments, and observations in Toveshøj. The participants' names are pseudonyms. The raw data is not publicly available due to ethical considerations to ensure that participants remain anonymous.

Contributor Statement

Carsten Hvid Nielsen is the sole author of the article. He conducted the collection of the empirical data as well as the curation, conceptualization, and writing.

Use of AI

During the preparation of this work, the author used ChatGPT (OpenAI) in order to proofread the article. After using this tool, the author reviewed, edited, made the content their own, and validated the outcome as needed, and takes full responsibility for the content of the publication.

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Conflict of Interest Statement

There is no conflict of interest.

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