INCLUSIVE DESIGN AND THE IMPORTANCE OF VISUAL LITERACY FOR DESIGNERS CREATING FOR THE BLIND OR PARTIALLY SIGHTED

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Keywords

inclusive design, universal design, tactile illustration, blind and partially sighted, visual literacy, empathy.

Abstract

The article discusses inclusive design and the theoretical approaches underpinning the Kaverljag 2024 International Summer School. Although there have been design projects for the blind and partially sighted in Slovenia for quite some time, research in this field remains limited. The lack of research can be attributed to several factors: a limited number of research projects focusing on this area, the predominance of non-process-guided design for the blind and partially sighted, frequent exclusion of designers from projects, and a typical lack of interdisciplinary collaboration between fields in such projects. This contribution introduces the main topics related to the design for the blind— i.e. inclusive design, the role of empathy in design, readability, and legibility—and begins mapping the basic guidelines for visual communication design adapted to the needs of blind and partially sighted people. The article is not only intended for visual communication design students or experts in the field, but also for individuals from other areas (therapists, aides, educators, special needs specialists, etc.) who collaborate with blind and partially sighted people and wish to learn more about design tailored to this group as well as gain insights into interdisciplinary project management. The aim of the article is to contribute to the establishment of a theoretical foundation which informs the development of a visual communication design curriculum that emphasizes inclusivity and prioritizes the needs of vulnerable groups. In conclusion, the text underlines the potential for further expanding research in the realm of visual literacy by exploring its intersection with design for the blind and partially sighted.

INTRODUCTION

In Slovenia, there have been numerous past initiatives aimed at promoting culture and projects for the blind and partially sighted, particularly within the museum and gallery sectors. Professionals in these fields have organized various symposia and collaborated with experts from other domains, as well as with representatives of the blind and partially sighted communities. For instance, in 1993, the Celje Regional Museum staged the exhibition *Please Touch the Objects*. During the same decade, both the Kočevje Regional Museum and the Škofja Loka Museum were pioneers in this area (Šuštar, 2007). Moreover, the Faculty of Natural Sciences and Engineering, University of Ljubljana, researched the effectiveness of graphics designed for the blind and partially sighted (Urbas 2017). In the same field, the Academy of Fine Arts, University of Ljubljana, conducted an international research project, *Up Close* (2020–2023), in cooperation with Ljubljana's Museum of Modern Art and Zagreb's Museum of Contemporary Art under the leadership of Prof Tamara Trček Pečak.

In the sphere of design, there were similar initiatives twenty years ago, as is well described in Aleš Sedmak's contribution in this publication. The Kaverljag International Summer School 2024 project, which is part of the 'Visual Literacy' research programme at the Academy of Fine Arts and Design, University of Ljubljana, builds upon and further develops these initiatives.

We initiated this project within the contemporary context and society, which, over the past twenty years, has undergone significant transformations in the realm of visual communication. It is important to recognize that the discipline of design is grounded in 20th-century principles, and much of the activity has developed on the assumption that design must support endless economic growth—though there are some exceptions. Contemporary curricula should emphasize and bolster these exceptions, equipping young people with the tools to actively contribute to the necessary societal changes through design. The young generation belongs to a post-capitalist, post-anthropocene world and must be empow-

ered to navigate this reality. Exercising caution about concepts of anthropocene design, which has proven dangerous and detrimental in the broader design context, our project, centring on this reflection, follows theories of inclusive design aimed at bringing vulnerable groups to the forefront in an equitable and inclusive manner. In doing so, we introduced the important element of developing more rigorous scientific methods and thorough result testing. Another reason for relaunching this 'dormant' project is both very logical and pragmatic: new generations of students are entering the educational process at the Academy of Fine Arts, University of Ljubljana, and it is essential to provide them with literacy in empathy and inclusion.

Although the 'Visual Literacy' research programme encompasses all aspects related to visual perception, the paradigm was flipped for this specific project segment: we began considering how to translate visual elements into alternative formats for individuals with no or limited visual perception. This contribution could also be titled 'Visual Literacy for Designers Creating for the Blind and Partially Sighted', as it covers the basics or the 'grammar' of designing for individuals with visual impairments.

An additional purpose of the present article is to outline the context of the project conducted as part of the Kaverljag International Summer School and underscore key research methods designers can adopt to facilitate effective communication with the visually impaired. Moreover, practical guidance is provided on designing projects in this domain. The main topics discussed concern inclusive design, the role of empathy in design, research in design for the blind and partially sighted, basic guidelines concerning visual communication design for the blind and partially sighted, and potential avenues for further exploration and research in this domain.

The reasons for this are clear: there is a limited number of research projects in Slovenia focused on this area; design for the blind and partially sighted is predominantly not process-guided; designers are frequently excluded from projects; such projects typ-

ically lack interdisciplinary collaboration between fields. Hence, it is important to stress that this article is not only intended for visual communication design students or experts in the field, but also for individuals from other areas (therapists, aides, educators, relatives, special needs specialists, etc.) who collaborate with blind and partially sighted people and wish to learn more about design tailored to this group as well as gain insights into interdisciplinary project management.

WHAT DO I MEAN BY 'DESIGN'?

As we know, visual communication design constitutes only a fraction of the broader field of design activity, which Herbert Simon eloquently describes in his book, *The Sciences of the Artificial*: "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones. The intellectual activity that produces material artefacts is no different fundamentally from the one that prescribes remedies for a sick patient or the one that devises a new sales plan for a company or a social welfare policy for a state" (Simon 1996, 111). In this article, the word 'design' will therefore be used as broadly as possible.

The British designer Norman Potter identifies three categories within the domain of design: things, places, and messages (Potter 2018). Visual communication thus represents only a small portion of the design we are exposed to on a daily basis. Although the 'visual' is particularly relevant in our context, it is essential to adopt a broader perspective for reflection within the undertaken project.

Neuroscience has long confirmed the dominant role of visualization in human cognition and numerous studies focus on visual information processing. Half of the nerve fibres in our brain are associated with vision, and when our eyes are open, vision accounts for two-thirds of the brain's electrical activity, enabling rapid image recognition. This is by no means good news for this type of projects dedicated to the blind and partially sighted. However, it is evident that the scientific perspective in Western culture exhib-

its a certain degree of bias due to the disproportionate representation of vision research, as modern technologies are better equipped to obtain quantitative data on sight compared to other sensory modalities (hearing, touch, smell, and taste). This is also highlighted by Hutmacher, who notes that "there were more studies on visual memory than studies on the memory of all other sensory modalities combined. Second, while there were still a considerable number of studies on auditory memory, research on olfactory, gustatory, and haptic memory was even more limited" (Hutmacher 2019, 1).

Thus, this article will also address communication that occurs through different modalities. The designer's work encompasses a multitude of additional factors that influence the transmission of information: the story, the message, the emotions evoked by the project, and the connection people form between the image and the experiences intrinsic to themselves, their environment, and their feelings.

In this context, an important question arises: how and on what scale (limited or wider public) is the project intended to influence people and, furthermore, do we aim to tackle the issue by proposing a highly professional solution (considering that many adaptations for the blind and partially sighted fail to meet the professional standards of the design field)? This leads to the key question: what is good design? One perspective is offered by the British photographer, artist, and activist Platon Antoniou in his film *Abstract*: *The Art of Design*: "You are looking for a moment when you feel you are as close to the soul as possible. That's what good design is." (Netflix 2017) But to get close to other people's souls we need to slow our pace and reflect on their needs. This consideration should be central to design.

DESIGN FOR ALL

To begin, we turn to the visionary designer, critic, and activist Victor Papanek (1923–1998). His famous book *Design for the Real World: Human Ecology and Social Change* (1971) presents a radical vision of design, in which inclusivity, sustainability, and social jus-

tice are more important than consumerism and commerce. Since its original publication, the work has seen numerous reprints and continues to be one of the most widely read books on design. Among Papanek's most powerful and well-known statements is that "[t]here are professions more harmful than industrial design, but only a very few of them. And possibly only one profession is phonier. Advertising design, in persuading people to buy things they don't need, with money they don't have, in order to impress others who don't care, is probably the phoniest field in existence today" (Papanek 1997, xi). It is clear that the author was not very sympathetic to certain aspects of the (modernistic and capitalist-oriented) design profession. Why? One of Papanek's approaches was to challenge conventional thinking about 'ordinary people' by prioritizing all users, which is why he frequently designed for individuals with disabilities. He was convinced that "all people are handicapped in some minor or major way, throughout or for part of their lives" (Papanek 1997, 68), arguing that we should see "the whole mosaic that forms society, instead of the individual pieces we call minorities" (which, already at the initial stage of the process, become excluded from the 'general population' as 'different'). Drawing from our own everyday experiences, most of us can likely resonate with these conclusions.[1] In other words, promoting accessibility and inclusion benefits society as a whole. Therefore, design must always focus on the extremes of society, as this approach caters for the needs of all.

Inclusive, universal and accessible design

While in the past the terms inclusive, universal, and accessible design were primarily associated with physical space, focusing on the organization and accessibility of urban centres and architecture, over the past 20 years, these concepts have also been applied to virtual online spaces. The great development of information

1 For instance, consider the times we were three years old and tried to climb into an adult chair; when our child used crutches; when we helped an elderly person climb the stairs; or when we tried to board a bus with a newborn in a pram.

technologies and the widespread use of IT media have also led to an increase in research within this field. What can be observed is that individual disciplinary silos have begun to develop their own terminology and definitions in this area, which may vary across disciplines or industries. For the purpose of the present discussion, we will try to establish the fundamental characteristics of the three most common concepts, i.e. inclusive design, universal design, and accessibility.

Accessibility addresses discriminatory aspects and refers to ensuring that space, services, objects, interfaces, and technologies are usable by persons with disabilities (including hearing, cognitive, physical, and visual impairments). Of the observed terms, 'accessibility' is the one that refers the most to "compliance with official norms and standards, thus being mainly objective in nature" (Iwarsson 2003, 61).

Accessibility typically focuses on specific adaptations and represents a basic minimum—a level that should be accessible to everyone; however, the term is often erroneously used as a synonym for inclusive and universal design. "Web accessibility means that people with disabilities can equally perceive, understand, navigate, and interact with websites and tools. It also means that they can contribute equally without barriers" (W3C 2024).

Inclusive design

In response to the documents developed by countries in the past,[2] a number of organizations, initiatives, and companies actively working in the field of inclusive design have emerged.[3] The term is frequently associated with standards and legislation aimed at ensuring accessibility. Over the past decade, most of the work in establishing criteria and standards for inclusive design in the visual field has been led by institutions and associations focusing on

2 For example, the Standard Rules on the Equalization of Opportunities for Persons with Disabilities (United Nations 1994).

3 Design for All (EDeAN) is the European umbrella organization for e-accessibility, established in 2002 under the leadership of the European Commission and the European Member States. It promotes design for all, particularly in information technologies.

the web. One such organization is the Web Accessibility Initiative (WAI), operating under the umbrella of the World Wide Web Consortium (W3C). If accessibility was previously primarily oriented towards removing physical barriers, with inclusive design the focus has started to shift towards recognizing other diversities (arising from culture, gender, religions, etc.). Today, inclusive design consists in methodologies "to create products that understand and enable people of all backgrounds and abilities. Inclusive design may address accessibility, age, culture, economic situation, education, gender, geographic location, language and race. The focus is on fulfilling as many user needs as possible, not just as many users as possible" (Joyce 2022).[4]

Universal design

Universal design also began to develop rapidly under the influence of other social movements against the discrimination of groups that had been pushed to the margins of society. The coinage of the term 'universal design' is attributed to Ron Mace, who defined it as "a way of designing a building or facility at little or no extra cost so it is both attractive and functional for all people disabled or not" (Mace 1985, 147). Initially, universal design was applied in architecture and construction with the focus on ensuring physical access and enabling basic life functions for people with special needs.

In contrast to inclusive design, universal design seeks to create a unified experience that maximizes accessibility and usability for individuals of all ages, abilities, and life circumstances.[5] The principles drawn up by the universal design advocacy group are intended to guide all aspects of design, including the environment, products, and communications. According to the document's drafters, the principles can be applied "to evaluate existing designs,

4 A typical example of race-conscious adaptation in everyday life is the redesign of social media icons or 'likes' to include individuals with different skin colours.

5 A common example of universal design is the implementation of kerbs or ramps on pavements, which are not only essential for people in wheelchairs but are used by everyone else. In the realm of visual design, a positive example is the Kindle e-reader, which allows the user to adjust the font size of the text according to the lighting conditions and their specific needs.

guide the design process and educate both designers and consumers about the characteristics of more usable products and environments" (Connell et al. 1997).

These principles include:

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, knowledge, language skills, or current concentration level.
④ Perceptible information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
⑤ Tolerance for error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.
⑥ Low physical effort: The design can be used efficiently and comfortably and with a minimum of fatigue.
⑦ Size and space for approach and use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility"

(Connell et al. 1997).

However, since some people have unusual or conflicting needs (for example, a person with poor eyesight requires bright light, while another might be light-sensitive), universal design cannot simultaneously satisfy every need for every person in every situation. For this reason, the principles of universal design need to be applied in some projects—especially where the investment costs of implementing different solutions for various target groups would be prohibitive. In contrast, in other areas, where situations cannot be adequately addressed by universal design and tailoring solutions to individual user needs is more feasible and practical, a better approach is to explore the requirements of specific user groups and customize solutions through inclusive design.

Based on what has been presented so far, it is evident that while there are overlaps and complementarities between the terms and fields, there are also some differences. Only when we understand the principles of accessibility (discriminatory aspects of an equivalent experience for people with disabilities), respect the parameters of inclusive design and, if possible, adhere to universal design, can we begin to precisely design the usability and user experience, be it for tangible products, digital products, or services. The aim of this process is to create efficient, effective, and satisfying products, experiences, and services.

Other user-centred design principles

All of the above is merely a selection of the most basic theoretical approaches in this broad field. User-centred design, participatory design, universal design, inclusive design, and design-for-all methodologies have long been present in the field of design, driven by the goals of efficiency, profitability, and product growth. However, works published at the turn of the millennium started expressing doubts as to whether designers' reliance on standards and guidelines alone could produce satisfactory results when designing for marginalized groups, the elderly, and people with disabilities. One of the new concepts, called 'user-sensitive inclusive design' (as opposed to user-centred design), proposes a slightly different direction by emphasizing the designers' need to develop authentic empathy for their user groups. The term 'sensitive' replaces the expression 'user-centred', suggesting it is rarely possible to design a product that is truly accessible to all potential users, but at the same time, 'sensitive' also implies a different relationship with users than 'centred'. The shift in the concept highlights that users are first and foremost human beings with whom designers need to develop an empathetic relationship, rather than treating them as 'subjects' for user experience tests (Newell 2011, 237). This mentality is not entirely new in the field of information and service design in the Slovenian cultural space, as empathy plays an important role in

both methodological approaches. The naming itself and the concept have also influenced certain ideas of our project, which will be discussed later.

STATISTICS

Why is all of the above particularly important for our western, ageing society? According to the World Health Organization, an estimated 2.2 billion people worldwide experience vision impairment, with at least one billion of these cases being preventable or reversible (WHO 2019). In today's world, with a population of 8.2 billion, "there were an estimated 253 million people with visual impairment [...]. Of these, 36 million were blind and a further 217 million had moderate to severe visual impairment" (Ackland 2017, 71).

A summarization of data for Europe, based on statistics from the European Blind Union (EBU), is equally alarming: "There are estimated to be over 30 million blind and partially sighted persons in geographical Europe. An average of 1 in 30 Europeans experience sight loss. There are four times as many partially sighted persons as blind persons. [...] Women are more at risk of becoming blind or partially sighted than men. Sight loss is closely related to old age. One in three senior citizens over 65 faces sight loss. 90 percent of visually impaired persons is over the age of 65" (EBU 2024).

According to the data of the Union of the Blind and Partially Sighted of Slovenia, more than 10,000 individuals in Slovenia are categorized as blind and partially sighted; nonetheless, this number is definitely much higher as not everyone joins dedicated organizations (UBPSS 2024). Given the rapid growth of the elderly population, it can only be anticipated that these statistics will worsen. Failure to design systems according to the methodologies explored above could hence result in an increasing number of people being excluded from everyday life. It is crucial to recognize that well-designed products, services, and messages go beyond the mere transmission of information to people. Educational materials, for example, are also a prerequisite for social inclusion and participation in cultural life. When working with individuals with

visual impairments, it is necessary to prioritize their empowerment, their opportunities to act independently, and their autonomy. However, there is another crucial quality that designers must possess, and that is empathy.

EMPATHY IN DESIGN

What is empathy? Empathy poetically means 'to step into another's world', 'to put oneself in someone's shoes', essentially, to share and understand another person's emotional experience. Daniel Stewart Butterfield, a Canadian businessman and the founder of Flickr and Slack, has made empathy a prerequisite for good design; "It's very difficult to design something for someone if you have no empathy" (InCap 2022). Empathy in design is also part of the research approach. It is an ability that designers develop through research, aimed at gaining full comprehension of users' challenges, their needs, and desires. This understanding, in turn, serves as the basis for designing the best solutions for users. Designers strive for empathy by exploring users' worlds in depth to accurately identify their problems and generate innovative ideas for life-enhancing solutions. How? Empathy towards the user does not only entail understanding their abilities, but also their context. This process can be facilitated by excellent tools, which, despite being initially developed for digital products, can easily be adapted for any project provided there is understanding of service design. One such example is the Empathy map (IDF 2024), which assists in recording needs and insights in a structured manner.

In a pedagogical context (such as the international summer schools discussed in this publication), this means that participants meet blind and partially sighted people and collaborate with them. Moreover, they gain first-hand experience of how these individuals see, feel, and perceive as well as explore the possibilities for performing specific everyday activities when faced with such conditions.[6] While it is true that a deeper understanding of the blind

6 At the Kaverljag International Summer School 2024, interactive workshops for participants were prepared by the visual impairment educator Dr Mateja Maljevac.

and partially sighted would ideally require long-term interactions, these short collaborations undoubtedly provide more value than a purely theoretical approach to projects. Engaging with and relating to the blind and partially sighted naturally increases the designer's empathy, which fosters understanding for developing successful project solutions. Conducting additional research activities (in-depth interviews, testing, and repeating the projects) allows us to gather information about the goals of the blind and partially sighted and apply our skills, planning, and creativity to help them achieve their objectives.

The designers' attitude plays a crucial role as it is essential to recognize that blind people are simply individuals with different needs. They do not want sympathy nor do they want pity, and despite their differences, we must ensure that they enjoy the same rights as everyone else. In this regard, the right to communication and information is one of the most important.

At the same time, it is necessary to highlight that the word 'user' does not completely fulfil the intended role and does not create the right connection. The designer has to establish a personal connection, which enables them to adopt a more specific approach to the work ahead. Personal engagement is key and can be enhanced by altering the words we use. For example, if we substitute the neutral, detached word 'user' with the name of someone we personally know, we will automatically assume a different attitude towards the project. Whether it is our best friend, 'my sister', 'your boyfriend', 'his mother' etc., the situation somewhat changes. By focusing on individuals we know personally, we can more easily reflect on their behaviours and circumstances (beyond health aspects) but also on their expectations regarding the use of the product we are designing and the ways they will interact with it. In this way, we can facilitate better knowledge acquisition and contribute to a higher-quality (or more engaging) learning experience for the blind and partially sighted. When we put ourselves in the users' shoes, we realize that the question of who we are communicating to can be particularly significant, as there is no such thing as a 'sta-

tistical user', and the blind and partially sighted form a completely heterogeneous group. They have different life experiences, knowledge, needs, and desires.

The theme of 'different perspectives' is aptly illustrated in the ancient story Blind Men and an Elephant.[7] A group of blind men heard that a strange animal had been brought to the town. They had never come across an elephant and none of them were aware of its shape and form. Out of curiosity, they said: "We must inspect and know it by touch, of which we are capable". So, they sought it out, and when they found, it they groped about it. The first person, whose hand landed on the trunk, said, "An elephant is like a thick snake." Another who felt its tail, described it as a rope. The one who touched its tusk stated that an elephant is that which is hard, smooth, and like a spear. The fourth man, who placed his hand upon its side, said that an elephant is a wall. The fifth, whose hand was upon its leg, said, an elephant is a pillar like a tree trunk. As for the one whose hand reached its ear, it seemed like a kind of fan (Wikipedia 2024).

Their descriptions of the elephant differed as they had different perspectives. The moral of the parable highlights a common human tendency to claim absolute truth based on one's own limited, subjective experiences, while disregarding the limited and subjective experiences of others, which may be equally true. In the story, the blind men eventually realize that they were all partly correct and partly wrong, effectively demonstrating that although an individual's subjective experience is true, it may not represent the totality of truth.

For designers, this parable is very insightful. It is as a call to develop a more profound understanding of the individuals we design for and to appreciate the various perspectives on the same observed subject. In other words: the blind and partially sighted, like all people, are unique individuals with distinct and diverse qualities.

7 The story originated in India around 500 BCE, eventually spreading across various religious traditions and through different versions. It is present in both Hindu and Buddhist texts.

PRACTICAL PRINCIPLES FOR DESIGNING VISUAL COMMUNICATIONS FOR THE BLIND AND PARTIALLY SIGHTED

The following sections present basic information on the visual perception of blind and partially sighted people, along with principles to consider when designing for this population. The design should also acknowledge that the blind and partially sighted are a particularly heterogeneous group composed of individuals with diverse needs, experiences, perceptions, and knowledge of the communication topic. Consequently, creating an equally effective experience for everyone simultaneously can be a significant challenge.[8] However, it is possible to approach accessibility by focusing on the specific components that constitute the communication elements.

Given the nature of the impairment, communication for the blind and partially sighted is typically associated with the sense of touch. It is one of the earliest developed senses of a new human being. A child first experiences the world and seeks contact with their mother through touch, which suggests that in a way it is our primary sense, yet it is often insufficiently noticed, remaining outside conscious awareness for many sighted individuals. In contrast, the blind can efficiently rely on touch. They begin by gently feeling and testing surfaces, familiarizing themselves with materials and wanting them to be within their reach. Once they establish a relationship, they focus on the details. This is why designers should embrace using different materials, as this adds information for the tactile perception and allows for a different experience. In doing so, it is necessary to prioritize safety: the materials and manufacturing methods must guarantee that the object is safe to touch and handle. Special attention must be given to details, such as edges and sharpness, to prevent injuries to the reader.

The writing system used by blind people is braille,[9] which remains one of the important tools for obtaining information and

8 An elderly person, who may have other co-morbidities, can experience a decline in finger sensitivity over time. Thus, physical predispositions of individual target groups have to be carefully considered.

9 Braille has only been in use for about 200 years. It is startling that for centuries, when literacy was already present in the population, the blind were completely excluded from society, even though they lacked only one of their senses.

fosters emancipated participation in society. Therefore, whenever it is possible to add textual descriptions, they should be incorporated for the blind. Braille comprises several types. In Slovenia, the established standard of Slovenian braille is contained in the document of the Commission for Slovenian Braille (Gregorc et al. 2016). These rules provide a standard ensuring that blind and partially sighted people can consistently access the same materials. This standard also serves as the foundation for developing all other relationships in the visual world for the blind.

Although the challenge of reading for the blind has been solved by the introduction of braille and tactile content, it is important to note that blind people represent a relatively small proportion of all individuals with visual impairments, i.e. less than 2%. Furthermore, the use of braille is declining as the percentage of individuals who are born blind is relatively low and many people lose their vision in their senior years, thus, rather than learning braille, they often rely on other assistive (digital) tools. This is why it seems logical to design in parallel for the partially sighted. Due to the nature of tactile perception, it is important to note that all elements (illustrations and text in braille) should always be convex, not concave, to enhance tactile exploration. When designing lengthier contents, especially if they combine Latin script and braille, it is crucial to account for the considerably larger space required by braille.

General insights

The general insights that apply to effective user perception in visual communication design are, in most cases, also a relevant basis when designing for the blind and partially sighted; however, these insights have to be adapted according to the genre, purpose, context, content, and target audience. Concentrating on the field of tactile illustration, the importance of prioritizing effectiveness, perception, clarity, and functionality becomes readily apparent. This does not imply that illustration should sacrifice its appeal, semantic value, and aesthetics, but rather that attention should be

paid to certain predispositions to ensure communication occurs and becomes accessible to the blind and partially sighted. Given that these materials are often used for educational purposes, they represent one of the key elements in any project the designer undertakes. The content must be methodologically and didactically adapted to the target group of the blind and partially sighted for whom it is being designed.

Due to the non-homogeneous nature of the group, the most effective projects are frequently those combining visual and tactile images with embossed convex elements printed in a contrasting colour, which enhances the visual experience for the partially sighted. It is advisable that images in didactic materials are accompanied by text in both braille and a contrasting colour in relation to the background. It is necessary to always consider that individuals with visual impairments require additional time to explore materials through touch and vision as their analytical process involves progressing from the whole to the details or vice versa. For this reason, the volume of content needs to be adapted accordingly. This calls for interdisciplinary collaboration and the inclusion of visual impairment educators or other specialists, as they have significantly more experience in this area than designers.

The tactile illustration should be as simple as possible, stripped of irrelevant or secondary information, but not to the point where this becomes detrimental to the content it conveys.[10] To ensure clarity, the illustration should not include an excessive number of details or feature decorative elements. Additionally, care should be taken not to overuse other graphic elements that may be distracting to the blind. Based on the genre (educational materials, fiction) or the target group (children, adults) it is necessary to determine to what extent an illustration can be abstracted and typified to represent the object as a pictogram,

10 For more information on tactile scientific illustration, see the article by Marija Nabernik, p. 102, in this publication.

thereby enhancing recognition and understanding. In this process, information can be included at several semantic levels (main information, secondary information, etc.).

Since blind people perceive space differently from sighted people, perspective is to be avoided when representing objects, as it is distracting for the blind. The position of objects is also relevant; each object should always face upwards, and the left and right sides should be symmetrical.

There is a variety of technical possibilities for creating tactile illustrations. Helena Jakoubě discusses embossed illustrations featuring exposed dots of varying heights. Combined, these dots create a type of 3D-image with surfaces of different heights that transition organically—as if it were a relief map composed of individual convex dots (Jakoubě 2012, 14). The heights can be colour-coded to match the natural colour scale, the original illustration, or an accompanying legend. In this manner, more complex information can be provided. When selecting technology and materials, it is always important to base the choices on users' needs. For instance, in the context of designing publications this translates into opting for matte paper as the substrate (instead of glossy).

Formats

People who have been blind since birth have an extremely sensitive sense of touch and often use both hands to gather tactile information. The design should account for the ergonomics of the human body, ensuring that the illustration's size does not exceed the area covered by two outstretched adult hands placed on the object's surface. When designing for children, the size of the format should be adapted accordingly. Especially for individuals who have lost their sight later in life and have prior visual experience, it is important to maintain natural proportions (whenever feasible and sensible) when presenting real objects. If this is not possible, an understandable scale or legend may be added in the margin. In case of information where sequence is essential (e.g. wayfinding), we can assist the blind by indicating the starting point where they should begin exploring through touch.

Colour and contrast

Contrast refers to the difference in brightness between the foreground and background colours. It depends on and is related to the size, distance, and illumination of the object to be perceived. As maximum contrast is achieved with either white on a black background or vice versa, people with visual impairments often prefer black text on a white background or black text on a yellow background. In projects designed for the visually impaired, contrast has a crucial role, as, for example, low contrast text is more difficult to discern than high contrast text. The same principle extends to visual elements and, in the case of digital products, to any interactive elements that facilitate the functional use of the product (such as buttons on websites or within applications). For such elements, the minimum colour contrast should be three times higher (RNIB 2024, 9). A sufficient difference in colour shade or brightness helps distinguish foreground from background; however, when contrast is reduced, the ability to differentiate between these two visual components becomes impaired. Therefore, it is beneficial to use saturated colours and strong contrasts, as they significantly improve clarity for people with visual impairments.

Complementary colour pairs (red-green, purple-yellow, blue-orange, etc.) should be avoided. The RNIB points out that, "[t]he two combinations that cause the most difficulty are red and green or yellow and violet/purple. These can be quite jarring if used closely together especially if similar tonal contrast is used. Complementary colour combinations can be used together if there is enough tonal contrast between the two colours" (RNIB 2024b). Similarly, insufficient contrast between shades of other colours is inappropriate and should be avoided. Furthermore, specific visual impairment conditions (glaucoma, cataract, diabetic retinopathy, presbyopia, glare sensitivity, colour blindness,[11] etc.) need to be taken into consideration. Advanced simulation tools already exist to assist in this process (Mays 2024).

11 There are many different types of colour blindness, although it most commonly affects the ability to distinguish between red, yellow, and green.

When using negative text (e.g. white text on a black background), it is necessary to consider the increased eye strain it causes. To alleviate this effect and ensure clarity, the font size needs to be enlarged (and the typeface weight potentially adjusted). Similarly, in illustrations, contours, outlines, and lines can emphasize certain elements or eliminate the need to rely on colour as an information carrier. Alternatively, a colour scheme adapted to various forms of colour blindness can be implemented at the onset of the project.

Typography and layout design

In typography and graphic design, general rules for creating clearly legible texts, which encompass both micro-typography and macro-typography, can be used as guidelines and further adapted to accommodate the needs of the blind and partially sighted. Likewise, information design theory can prove helpful in situations where perception, functionality, responsiveness, and message are of primary importance and impact information effectiveness; equally relevant in this context are the laws of visual art theory and gestalt, familiar to every professional illustrator and designer.

Consistency is one of the main rules aimed at ensuring text readability. The use of elements must be consistent throughout all pages (e.g. of a book), as this facilitates easier navigation for the blind and partially sighted. It is important to bear in mind that excessive information can be detrimental and presenting information requires meticulous prioritization. In this regard, hierarchy and editorial decisions on which details to include or exclude play a key role. Often, information can be clearly organized into hierarchical units such as headings and sub-headings; however, it is also possible to incorporate different layers of information, which the user can either choose to read or skip.[12] Longer texts should be broken down into readable, interconnected paragraphs, allowing the reader to take a breath and pause. Columns can often be a use-

12 A good example are footnotes.

ful means for improving layout, provided they are not used alongside braille. Columns should be adequately spaced to prevent confusion for the user. Although these conventions have been present in written documents since the existence of human records and have further evolved with the invention of printing, they are often overlooked in the transition to digital technologies.

Experience in designing for the blind and partially sighted reveal that it is frequently necessary to adhere to very basic design levels, as the process of reading braille or exploring tactile illustrations through touch is more time-consuming and demands greater effort from the reader compared to the visual perception of a sighted individual. To cater to the needs of blind people, it is therefore crucial that information (for example, at an exhibition) is presented in a multi-layered format: title, basic information, and a brief description followed by more comprehensive descriptions that are also suitable for sighted people. This approach offers the blind and partially sighted the possibility to choose the level of information that aligns with their interests.

Readability and legibility are not only concerned with the size and shape of the type, but also with all the related parameters: inter-letter, inter-word, and inter-line spacing, colour, the medium of the text, the light conditions for reading, and the content transmitted by words. It is generally accepted that lines with generous vertical intervening white space are more readable.

Left-aligned text, allows the eye to move more quickly to the next line. Centre-justified text is an example of poor practice, as in most technologies it leads to automatic word spacing, which hinders reading fluency. Lines should not be excessively long, as it becomes difficult for readers to find the beginning of the next line when their gaze returns to the left. Experts have defined 'moderate' line lengths as those containing between 50 and 70 characters per line (Dyson 2023). Moreover, although vertical text direction is achievable with modern digital tools, it poses readability challenges and should be strictly avoided when designing content for the blind and partially sighted.

In addition, the text in braille should be clearly separated from other elements on the page, making for an easy reading experience. Braille differs from the Latin script, which is read line by line, and it cannot be arranged in columns. Certain typographic conventions relevant to Latin-script typography, for example numbered lists, also apply to braille. Mathematics and physics can be typeset in the same way. Tables, on the other hand, are usually translated into a numbered list. Other formatting conventions may also be used, e.g. emphasizing certain elements, such as paragraphs or subheadings, to achieve quicker and clearer orientation.

When designers consider production, it is important that elements are arranged in such a way that they are not placed near folds, as the materials need to remain flat (to accommodate the partially sighted who may use magnifying glasses). In printed publications, the binding should permit the material to open completely. Although coil binding has become a standard for publications intended for blind and partially sighted people due to its low production costs, its functionality issues (such binding deteriorates rapidly) highlight the necessity of implementing more innovative solutions.

Text and other graphic elements should be of sufficient size to ensure clear visibility, while avoiding excessive enlargement that could hinder the ability to view the entire image or sentence at once. It is necessary to ensure that visual elements (e.g. text, graphics) are adequately sized to be visible without the need to bring the product close to the eye. This cannot be achieved without testing with the blind and partially sighted. Professionals working with the blind and partially sighted recommend using font sizes ranging from 16 to 20 points, as this range has been identified as the most suitable[13] (RNIB 2024a).

However, it is not only the overall size of an image that determines how clear it is. To ensure that users can distinguish im-

13 This is a generalized rule: a typeface may have more or less legible weights and different x-heights that improve its legibility, therefore it is always necessary to consider all parameters simultaneously. For instance, a 10 points letter in one typeface may visually appear larger than a 12 points letter in another typeface.

age features or its parts, typefaces should be carefully chosen. For example, letter recognition involves distinguishing the strokes in a letter. When examining the letter itself, the ratio between thick strokes and thin strokes (modulation), which should not be in contrast, and the size of the white space within the letter are significant factors that determine readability and legibility. In addition, it is important to avoid narrow typefaces, typefaces with very thin strokes (as very light letters can reduce legibility by making it more challenging to distinguish letter shapes), and typefaces with extremely thick stroke weight. Bold or semi-bold typeface weights promote successful reading. It general, italic, and decorative typefaces are less useful, particularly when designing projects for blind and partially sighted people.

In typography, it is common practice to use serif typefaces for longer text blocks and monoline sans serif typefaces for shorter texts, labels, and (indoor) signs.[14] These typefaces are also generally preferred by the blind and partially sighted, the most optimal being the typeface weights creating clear, geometric letterforms.[15] Nonetheless, another determining factor in choosing the most suitable typeface is the context of the project.

When examining the basic building blocks of typography, attention must also be given to the individual additional characters that make up the set, as certain numbers, like 3, 5, 8, 0, and 6, can be difficult to read in some typefaces, potentially leading to errors. Moreover, it is necessary to be aware of 'dangerous' character combinations within texts, such as l – 1, O – 0, and 3 – 8, as these can be easily mixed up. Research suggests that longer texts typeset entirely in capital letters (majuscules) are more difficult to read, as capital letters lack the variation found in lower-case letters (minuscules).

14 From the perspective of typographic professionals, these rules are very simplistic, as readability and legibility have been extensively researched within the field of typography. This is particularly true today, as modern research approaches in conjunction with neurology, psychology, and various measurement technologies, make such studies possible. In the context of this publication, it is unfortunately not possible to address details. For more information, see research and publications by authors Sofie Beier, Mary Dyson, and Ann Bessemanns.

15 For a personal view on this topic, see the contribution by Tomaž Wraber, p. 222, in this publication.

However, as mentioned earlier, all the parameters of the material being designed influence all the other elements; for this reason, it is crucial to view them as a whole and, most importantly, test our designs with users.

Although many designers dislike adhering to rules, when designing for the blind and partially sighted, it is crucial to prioritize simplicity of form, contextualization and functionality, otherwise the content will fail to serve its intended purpose. Designers who succeed in this area will be those capable of effectively integrating constraints into the initial project brief, leveraging them as a foundation for innovative and creative solutions. This approach often leads to excellence both in terms of usability and distinctive aesthetics that derives from these constraints.

THE WIDER CONTEXT OF THE PROJECT AND TESTING

By designing legible materials, we support people's ability to access information and effectively carry out activities and tasks. At the same time, it is also widely acknowledged that typefaces fulfil two roles: a functional role related to legibility and an aesthetic role that determines the typeface's suitability for a certain purpose based on the meaning conveyed by its visual form. This second role has also been described with other terms: atmospheric value, semantic qualities, and identity (of a product, exhibition, book, etc.). While braille does not possess these qualities, even visually clean and legible typefaces have limited expressiveness. To ensure that blind and partially sighted people receive information about atmosphere and semantic properties, such information must be communicated in alternative ways. Although for the partially sighted vision remains the primary sense (regardless of how diminished), in the case of the blind it is possible to engage other senses beyond touch. Hearing, smell, and taste can be important components for multisensory enrichment that enhances the user's experience.[16] This incorporation

16 Although we leveraged some of these possibilities in the exhibitions of materials developed during the Kaverljag International Summer School 2024, there remains considerable potential for innovative design solutions.

naturally involves interdisciplinary collaboration with other experts in the fields of gamification, nudge theory, architecture, performing arts, music, etc.

In all of these projects, it is also necessary to consider the wider context of information reception: in what manner will the visualizations be truly accessible? How will they be presented? And how will interpretation be facilitated—will it be guided, accompanied, independent, or part of a wider educational project? Long-standing experience in the museum field confirms that every project poses its own challenges. Although the principles outlined above address good design tailored to the blind and partially sighted, it is essential to recognize that every individual has unique needs and attitudes that influence their response to the prepared materials. Curator David Kožuh from the Goriški Muzej Regional Museum, who has extensive experience in this field, even claims that "it is better if a guide leads the blind and partially sighted than attempting to adapt the exhibition for a self-guided tour" (RTV SLO 2023). A trained guide can offer a personal approach and create an interactive experience, which proves to be the most effective option. Therefore, design solutions can also be the cornerstone for a well-designed exhibition and a well-orchestrated event that integrates multiple communication channels. A combination of all these elements allows for accommodating a wide array of diverse needs.

CLOSING REMARKS

Given the heterogeneity of the user group and the wide range of needs, it is important to acknowledge that all the specifics outlined above may not be entirely applicable to every individual. Each individual has unique needs, and ideally, the approach should be tailored to accommodate these requirements. Therefore, it is crucial that designers adopt a variety of research methods in the early stages of a project.[17] The duality within the project (understanding

17 For a more detailed description of the process of the Kaverljag International Summer School 2024, see the scheme on page 247.

of the material we communicate and the users for whom we design) can only be explored with a tailored repertoire of methods. Initially, designers should investigate secondary literature and subsequently conduct observations in order to learn how to listen to others' perspectives and to acknowledge their own prejudices and judgements based on personal viewpoints and experiences. Further information should be gained through gathering insights, interviewing, generating ideas, collaborating or co-designing with users, etc. Only a project conceived in this manner, with a perspective on what modern technology has to offer,[18] can provide effective solutions in the design phase, provided that it is subject to repetitions and frequent testing.

Despite familiarity with the design tools, innovative thinking is only possible in an interdisciplinary group setting which encourages collaboration throughout the entire project life cycle. An interesting question to explore in the future is how to identify the unique strengths of blind individuals compared to sighted people, understand how they form their mental representation of the world, and integrate these insights into design projects. This would only be possible through the active participation of blind and partially sighted persons in all phases of the project. It would also be beneficial to further develop the project in collaboration with experts from the fields of neurology and the visual arts, as implementing robust testing methods would undoubtedly yield more tangible results regarding our performance.

Organizing the project in this manner may open opportunities for different reflections within the domain of visual literacy, such as rethinking the concept of imagery, which includes questioning what exactly mental representations are and to

18 For this purpose, during the Kaverljag International Summer School, we applied the cost-effective technology of 3D printing. Our goal is to establish a library of 3D-printable files for popular science illustrations at the Academy of Fine Arts and Design, University of Ljubljana, given the positive feedback from testing the project results, which also offer an excellent learning opportunity for students.

what extent it is necessary to present the blind with 'realistic' visual images as perceived by the sighted? In his book *Design as Art*, Bruno Munari writes that "'Copying nature' is one thing and understanding nature is another" (Munari 2008, 158). The better we understand what we aim to communicate and the audience we are designing for, the greater the impact the resulting projects will have.

The key is to transform such initiatives into our daily practice, rather than treating them as isolated events driven by individual groups of enthusiasts. Through exposure to these topics within the curriculum, visual communication design students (illustrators, graphic designers, photographers) should be given the opportunity to realize that by developing creative solutions they can enhance any project, making it suitable for the entire population within the broader society.

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