TESTING AND PROPOSED IMPROVEMENTS TO THE TACTILE ILLUSTRATION SYSTEM

TESTING

For potential iterations of the models, we organized two guided tours with the possibility of conducting interviews and testing in the context of the exhibitions: one with deafblind adults in collaboration with the Center of Illustration, and the Deafblind Association of Slovenia DLAN (1 October 2024) and with blind and partially sighted children in cooperation with the Centre IRIS – Centre for Education, Rehabilitation, Inclusion and Counselling for the Blind and Partially Sighted (3 October 2024).

The insights we have gained from this are very valuable, as they allow us to improve and iterate the content. Due to the heterogeneity of the groups, the low number of participants with whom we managed to organize guided tours in the limited time available, as well as the age and characteristic differences of the participants, it is impossible to draw definitive (statistical) conclusions. Nevertheless, the guided interviews, observing the participants and interacting with them were one of the most interesting experiences of the project. If we had the option of involving additional groups, we would probably opt for more in-depth interviews and a longer time span next time.

We were able to observe how blind and partially sighted users go about touching the objects, whether our scale is appropriate, and how the users go from the details to the large illustrations and vice versa. The advantage of having direct contact with the target group also lies in being able to have a discussion. The direct questions we posed gave us a starting point to consider what information we might have forgotten to include, have not highlighted enough, or have not stressed enough in the guided tour scenario itself.

Identifying Animals

Through a structured questionnaire, we gained numerous interesting insights.[1] Mostly, participants were able to identify all parts

1 Notes of the questionnaire test, blind and partially sighted people from the Centre IRIS, Thursday, 3 October 2024. The participants were primary school children.

of the animals by touch (or residual vision), but in some cases, crucially, the sound recording also helped them to do so. For individual animals (e.g. seahorses), some had difficulty in pinpointing the fin under the abdomen. For all respondents, the 3D prints helped them to get a better idea of the organisms. The amount of new information gained depended on their background knowledge, which was as varied as their age, and the statements also reflected their level of enthusiasm for the subject of marine organisms in general.

They had more difficulties identifying completely unfamiliar animals (e.g. green chiton). For this organism, one of the participants did not recognize the difference between the thicker and thinner line, which he attributed to the complexity of the organism. Elsewhere (e.g. cuttlefish), they expressed the opinion that the division into planes and lines in the illustration was very good for orientation, although other participants (from observation) had difficulty in identifying the number of tentacles and eyes in this organism. Interestingly, when asked when they found objects (e.g. animals) most comprehensible, between the options a) 2-dimensional reliefs, b) 3-dimensional magnifications of details and c) models in space, most participants chose the models in space (e.g. objects or dioramas in museums).[2] This was also confirmed by some of the adult participants.[3]

Subtitles, Letters and Braille

The partially sighted participants were satisfied with the size of the letters, which did not cause them any problems with reading. The braille was also appropriately sized and positioned.[4]

2 IRIS testing.

3 Direct insights, testing on 1 October 2024, deafblind adults from the DLAN Association. Adult participants.

4 IRIS testing.

Animal Details

When the detail of the shore crab was discussed, some people expressed their excitement over the experience, as they had never felt the armour of the crab before and that made it much easier to imagine the animal. They could also identify where the detail belonged on the animal.[5]

Material and Touch

When asked about the material, participants reacted positively, finding it pleasant to the touch. Despite our concerns, they were not bothered by the plastic material (which is not natural), and some were even impressed by it. Participants who touched the illustrations (some were partially sighted and spent more time observing) stated that the illustrations were pleasant to the touch. The amount of convexity on the illustration was correct for optimum tactility.[6]

Audio Content

Regarding the informative audio content (animal descriptions), there was a consensus that the recordings are very easy to understand and have the right amount of information. They were perceived as an excellent source to get information in the quickest and most efficient way. They also found it useful that they could listen to the recording several times.[7] The ambient sounds of the sea were also positively received, the participants did not find them distracting and wished there had been more.

In any case, the above shows that the 3D prints have been received with enthusiasm and participants have stated that they are better than previous editions of illustrations with embossing.[8] This was also the opinion of a deafblind person (deaf since birth,

5 IRIS testing.

6 IRIS testing.

7 We also had some technical problems with the audio content, where the recording was not loud enough in the crowded environment. IRIS testing.

8 Direct insights, testing on 1 October 2024, deafblind adults from the DLAN Association. Adult participants.

blind since childhood): the convex embossing is clearer than the linocut matrix, but his attention was particularly drawn to the 3D-printed relief, which he said immediately upon touching was the best because it was smooth, solid (stable) and clearer.[9]

PROPOSED IMPROVEMENTS AND CONTINUATION OF THE PROJECT

During the design and after testing, we identified certain shortcomings of the system, which we list here as a springboard for considering possible improvements. One of the necessary improvements relates to the perceptual distinction between the blind and the partially sighted. Already with the very first participants, we saw that all the convex surfaces on the illustrations and captions (including the braille) should be augmented by adding colour contrast on the tactile illustrations—black lines on a white background—in order to optimize the experience for partially sighted users.[10] The vast majority of people with visual impairment are not blind, they have impaired vision. If the colours in an illustration are contrasting enough, people with low vision can distinguish them and use a combination of visual and tactile stimuli to identify the image.

This also applies to the details of organisms: they can be painted in the colours and patterns found on the actual organism. The detail tries to represent a part of the organism as realistically as possible. It is true that this process is more technically demanding and time-consuming.

The presentation of the illustrations could also be improved by adding a scale to them to give the user a sense of size. Information on the size of a typical specimen of the animal representative is important. The current solution is to mention the size in the description of the organism, but it would be even better if the system could convey this information graphically. The most correct option is of course to present the animal in its actual size, but as this is

9 Direct insights, testing on 1 October 2024, deafblind adults from the DLAN Association. Adult participants.

10 Direct insights, testing on 1 October 2024, deafblind adults from the DLAN Association. Adult participants.

often not feasible, another element could be added to the system to show the size of the animal.

The current system also does not include information on which part of the organism is presented with the detail. Given the specific purpose of the system, it is useful to consider how its individual elements (the species name in braille, the simplified illustration, the detail and the accompanying text) are put together to form a whole. The design we chose for this project worked well for a gallery exhibition, but perhaps for other purposes (if the system is used as a teaching tool in schools, etc.) other layouts might make more sense. Consideration should also be given to facilitating the storage of illustrations when the system is not in use.

The next observation relates to the integration of colour. The final challenge is the tactile representation of an organism's colours. Patterns can be represented quite easily with relief, which can be misleading – relief can mean colour patterns or actual shapes. Such ambiguity should be avoided in scientific illustration. It is very difficult to communicate colours – for people who have been blind since birth, they are also very difficult to imagine, or they perceive them in a different way. A possible solution is to use materials with different thermal conductivities – thermal conductors (e.g. metal) represent cold colours, while insulators (e.g. wood or plastic) represent warm colours. This has its drawbacks, such as the complexity of production, the loss of clarity of the message due to the additional component of sensing heat when touching, and the fact that the full spectrum of visible light still cannot be represented in this way.

In the process, we have also learned a lot about the importance of preparation for testing. One improvement here could be to test the audio recordings in the room where the testing will take place, taking into account the ambient noise that will be generated by the crowds.

It will also be necessary to focus on detailed instructions for making and printing the models as the project progresses. This part could probably be carried out in an interdisciplinary way, either as part of the study process or as part of a future international summer school with suitable partners.