Brai-cks: a didactic toy to learn reading Braille (Universidad Iberoamericana Ciudad de México)

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Abstract

One of the most important aspects of the education of people with visual disabilities has to do with access to information. Knowing the Braille system is an access medium for writing, music, literature, calculus, etc. Our project consists of a didactic toy to teach blind or low vision children how to read Braille. *Brai-cks* is fun and easy to use and can also be used by children without disabilities.

Introduction

People with visual disabilities go through a process of learning to read. This process begins by teaching the child the concept of what a number is. Then they learn the concepts of top, middle, bottom, right and left. Once the child handles these concepts, he continues to learn the Braille code. The braille code consists of a 3x2 matrix with 6 raised points designed to be perceived by touch. To identify the positions' points, each one has a number that identifies it from 1 to 6 as shown in Fig. 1. In braille each letter is represented by a combination of raised points.

When the child is learning to read, the size of the relief points is great, as the learning progresses, the size of the relief points decreases until the 6 points fit in the fingertip.

In schools, the amount of aids they have to teach a child to read Braille are very few. Our project consists of a didactic toy to teach blind or low vision children how to read Braille. *Brai-cks* is fun and easy to use and can also be used by children without disabilities. It comes in a box and it contains 230 individual pieces that include a collection of all letters and numbers from 0 to 9 and the arithmetic symbols. Each individual block is also printed with the corresponding letter. Block are large enough to be easy to manipulate and safe for small children. Each block has a notch that helps children orientate each piece. 3D printing instructions and drawings are open source.

This idea was initially developed in Brazil by Lew'Lara TBWA and Fundacion Dorina Nowill for the blind (Braille Bricks) and made available through the terms of Creative Commons.

Problem Statement

There is a need for an aid that allows blind children to learn to read Braille, while playing and, in turn, encouraging inclusion at schools.

Designs and Development

In the process, 3 different types of pieces were designed in Autodesk Inventor and 3D printed. **Prototype 1** had a notch on the left side at the top that indicated that the piece had to be placed with that notch upwards, these pieces were very thin. **Prototype 2** had a notch in the bottom of the piece that indicated that the toe was positioned correctly with that notch pointing downwards. These tokens were three times the size of the first pieces. After the tests that were carried out in the Foundation Illumina for people with low vision (http://ilumina.mx/), the feedback was obtained with which the final prototype was designed. For the **final prototype,** a mixture of the parts shown above was made: a rounded notch on the right side was attached at the top to indicate that the piece should go with that notch upwards to have the plug placed correctly. The size that was used was that of prototype 2 since the little thickness of the pieces of prototype 1 was dangerous for the child

Testing and Results

Outcomes

Test 1

In the first tests that were made with prototype 1 and prototype 2, we found that the pieces of prototype 1 were too thin to fit on the tablet; also the thinness of the piece was very dangerous because the child could swallow it. Because of this, prototype 1 was discarded. Of prototype 2 the size was correct and placing the pieces on the tablet was simple, but the notch confused children because they told us the notch is usually on the right side at the top. They also told us that it would be a good idea to have the font letter for each block, this is because moms and teachers do not usually know the Braille alphabet by heart and it would be very helpful to have the font letter to identify them faster.

Test 2

After the tests at the Ilumina Foundation we obtained favorable results of our design. We verified that notch on the upper right side serves as an identifier in order to place the pieces in the correct way and to be able to read the letter that corresponds to each block. The points were also detectable by the subjects who performed the tests, and in terms of size and texture subjects were comfortable. The quality of the blocks, and that these can fit between them, depends a lot on the 3D printing, taking into account the type of print, the material of the filament, among other aspects. So it is sought to have an impression as detailed as possible so that the quality of the pieces is quite good and that these can fit without complications.

Cost of Materials		
3D Printing	$ 5,577.00 mxn	$ 298.63 USD
Box	$ 100.00 mxn	$ 5.35 USD
Total	$ 5,677.00 mxn	$ 303.99 USD

Discussion and Conclusion

On the one hand, the prototype designed allows blind children to learn to read Braille in an easy and fun way. On the other hand, the prototype works as an arithmetic box, with which the child can learn to add, subtract, multiply or divide.

With this aid we help children with visual disabilities learn to read Braille and at the same time to generate interaction with children at schools and thereby break the barriers by promoting the inclusion.

We think that one of the most important features of the project is that it can be replicated by anyone who has a 3D printer, because the files for the print will be available (open source)

Acknowledgments and References

http://www.brai-cks.com

http://www.ite.educacion.es/formacion/materiales/129/cd/pdf/m5_dv.pdf