TACTILE READING

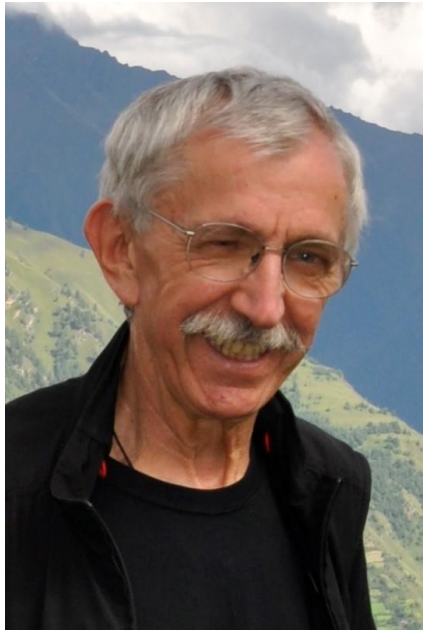
Oslo 29-30 April 2021

Blending digital and tactile learning to develop skills for tactile reading

SonokidS®

Hungry Fingers

www.hungryfingers.com



Collaboration

Blended teaching method that aims to build a bridge between traditional tactile graphics and grids on the one hand, and digital grids and mental mapping skills on the other.

Moving from the concrete to the imagined!

Digital learning with Ballyland

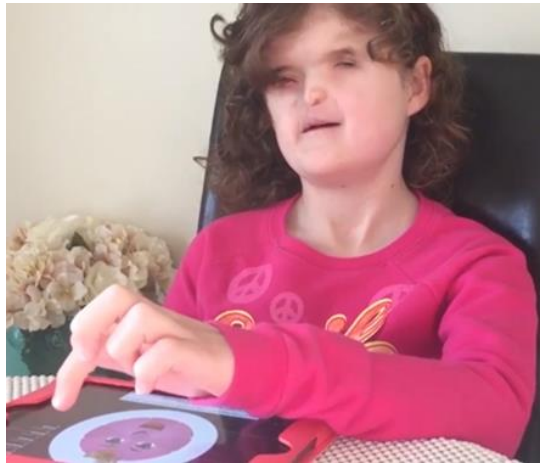
Zero Project AWARD WINNER 2020

Ballyland is an imaginary world full of songs, stories and sounds, where the Ballylanders live. These are six characters who are ball-shaped, each have a signature sound and a specific way of moving around.

Ballyland is a suite of software and apps:

- Supporting Early Learning of essential digital and STEM skills by students who are blind or visually impaired
- Providing fun, interactive and inclusive (remote) learning (with storytelling by real voices, spoken instructions and guidance, audio alerts and sound effects)



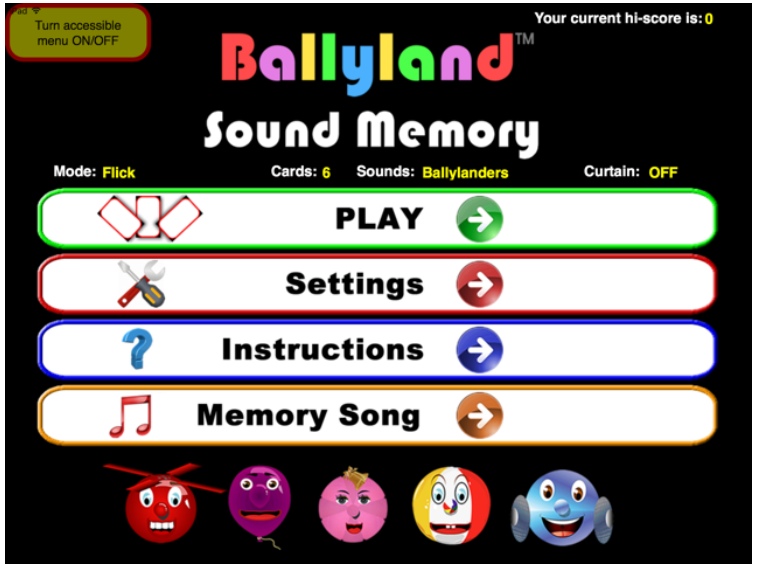



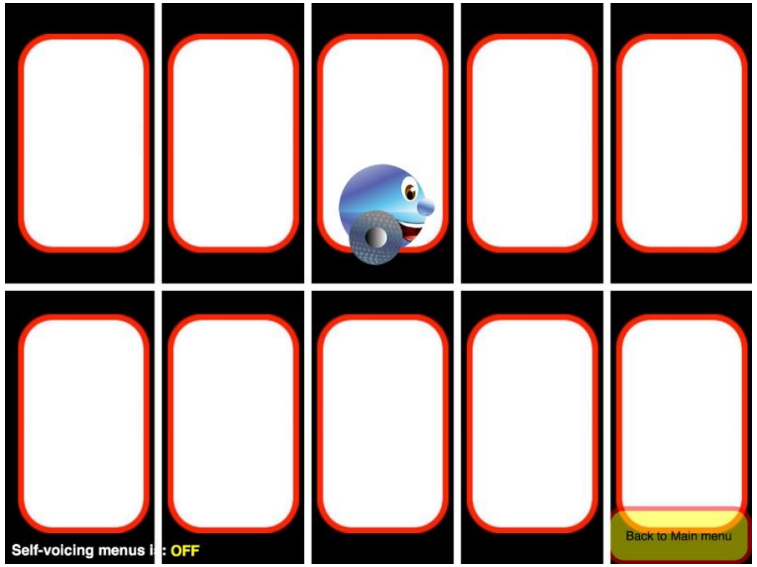
Sonokids Ballyland accessible gamified eLearning pathway consists of:

Ballyland apps for iOS (iPads and iPhones), for Android, one for Alexa smart speakers, software for Windows computers, and supporting tactile learning tools. The apps are available in multiple languages, from the App Store and Google Play. Visit www.sonokids.org.

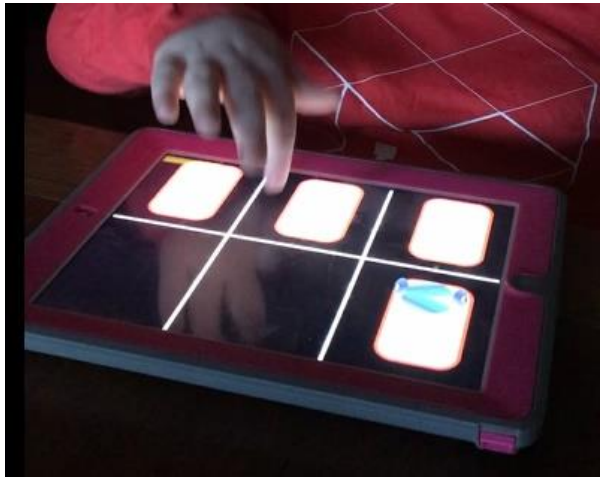
Ballyland Sound Memory (iOS)

- Matching game - Find matching pairs of sounds (cards).
- Self-voicing
- Gestures: Finger drag, flick, double tap
- Multiple sound sets (e.g. musical instruments, Ballylanders, animals).





Ballyland Sound Memory in action



- **The game uses different sized grids**
- **In each game grid, the rows and columns are spoken**
- You use the flick gesture to move to different cards and double tap to open the card. You hear whether you have found a correct match or not through the fun audio feedback. Matching cards are removed and the resulting empty spot in the grid also has a specific sound.
- Blind children need to use mental mapping skills and spatial orientation skills
- The game can also be played as an audio-only game.

Moving from concrete to imagined - gameplay

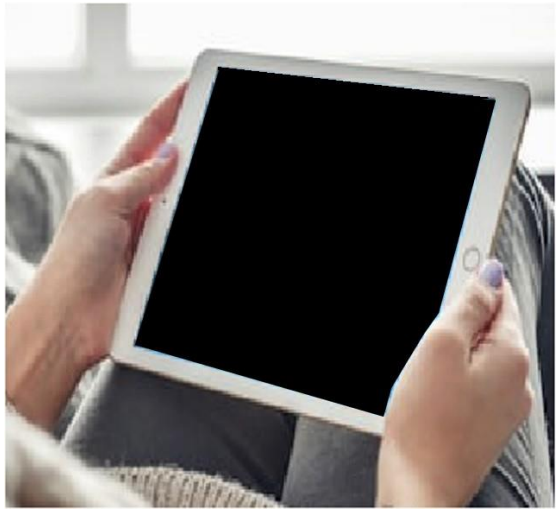
To help children with the gameplay, Sonokids has developed tactile learning tools with the digital apps. This is Wheelie, one of the Ballylanders in the game. The line image can be printed on swell paper to make a tactile image. For schools or organisations who have access to 3D print technology, Sonokids has developed a large size model of Wheelie, with turning wheels, which the child can explore to get to know what Wheelie looks like.

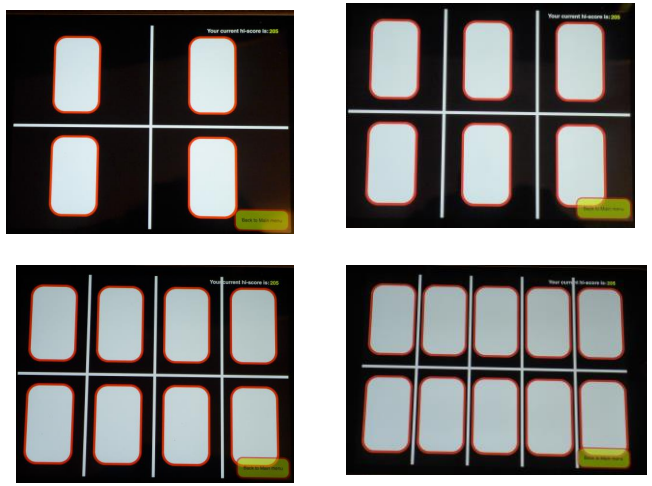
From concrete to imagined - navigating a grid

- Conceptual understanding of grids: rows and columns
- Directional concepts
- (Mental) Mapping
- Spatial orientation

Imagining the Virtual

For a sighted person it is almost impossible to imagine how someone with congenital blindness, can make sense of what is happening on an i-Pad screen, which is just a smooth piece of glass. How can a blind child imagine that the screen can be divided into sections – be it 4, 6, 8 or 10, arranged into some **rows** and **columns** which together make a grid!

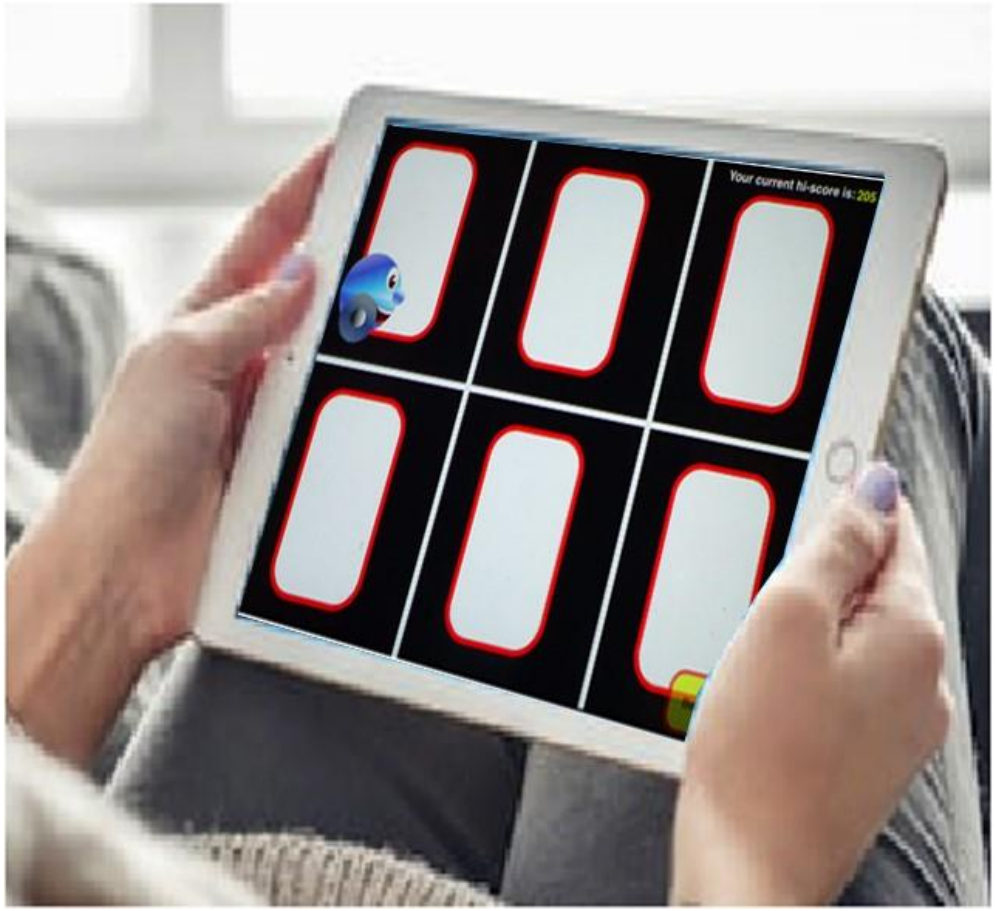


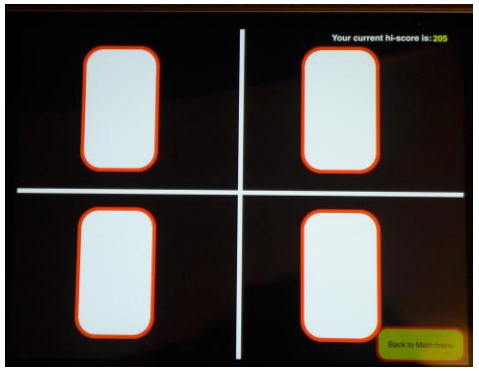


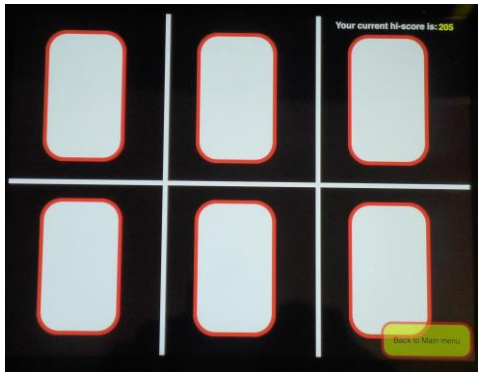
Imagining the Virtual

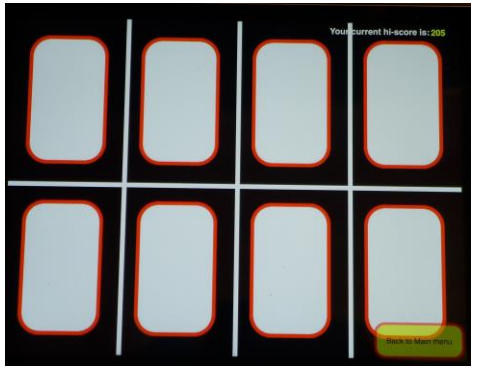
And as if building a mental picture of a grid wasn't a big enough challenge, how can a blind child, on tapping on one of the cards, direct Wheelie back to the card which the child remembers as a good match? Or, finally how does the grid change when a matching pair is removed? To cope with all this, the child must first feel confident with the concept of a grid and with audio instructions identifying individual sections of the grid.

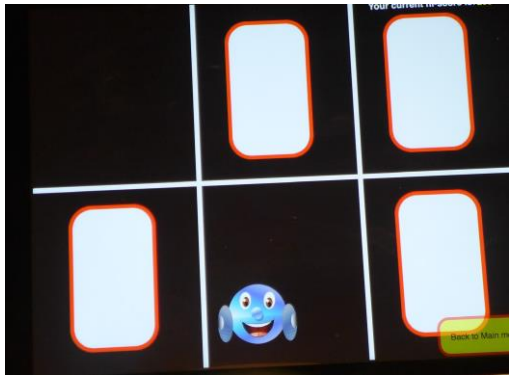
Imagining the Virtual











Moving from concrete to imagined

To explain this concept, one must use a language which a blind child can understand best – the language of touch.
One way to do it is to start with a simple crossword puzzle. For example, a horizontal tactile **row** of squares filled with letters making the word ’flower’, and a vertical tactile **column** made of three squares making the word ’dog’, when brought together, make a simple crossword puzzle grid. Grids can have different numbers of sections, as for example the tactile grid made of six squares arranged into two rows and three columns.

Moving from concrete to imagined

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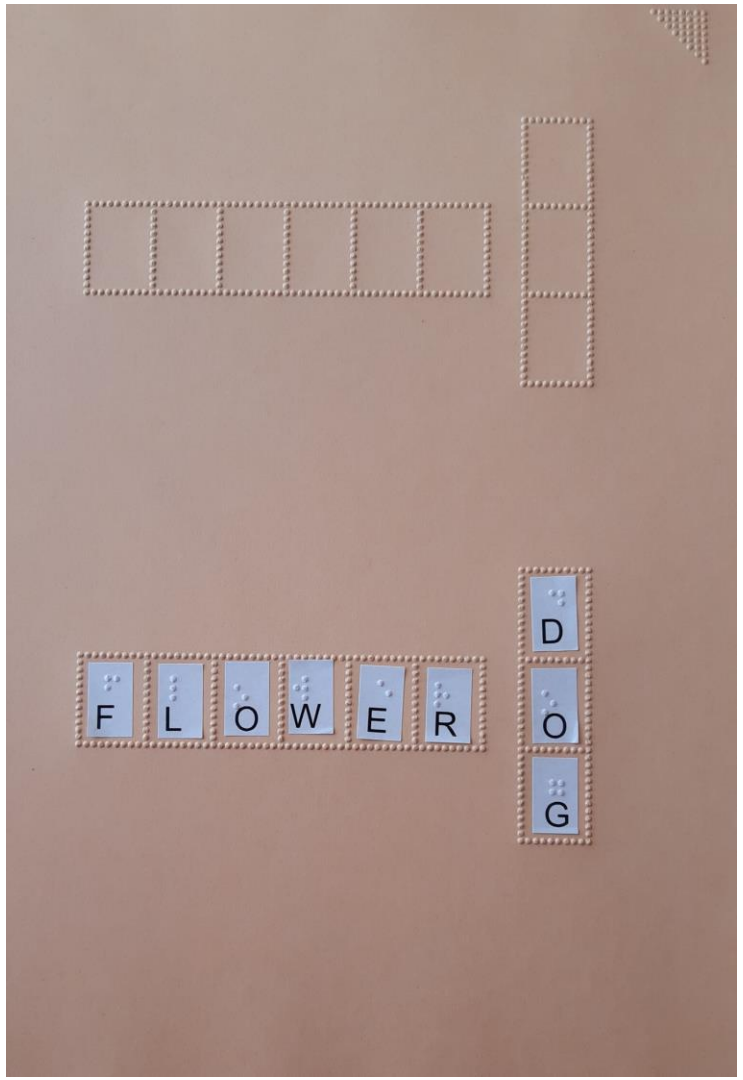
②



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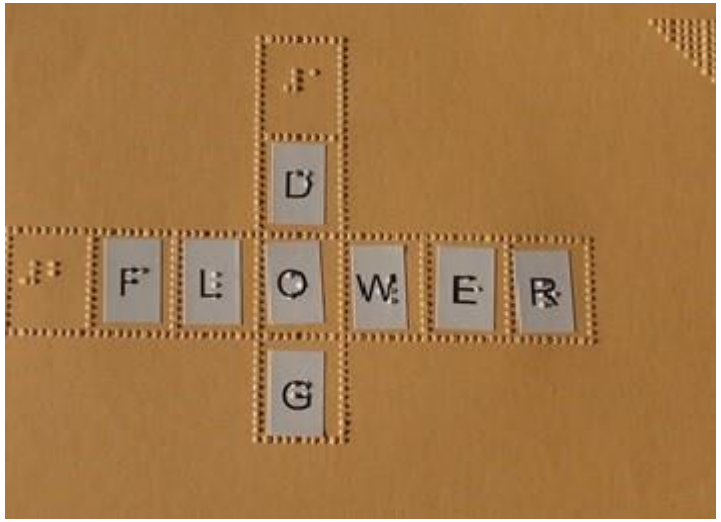

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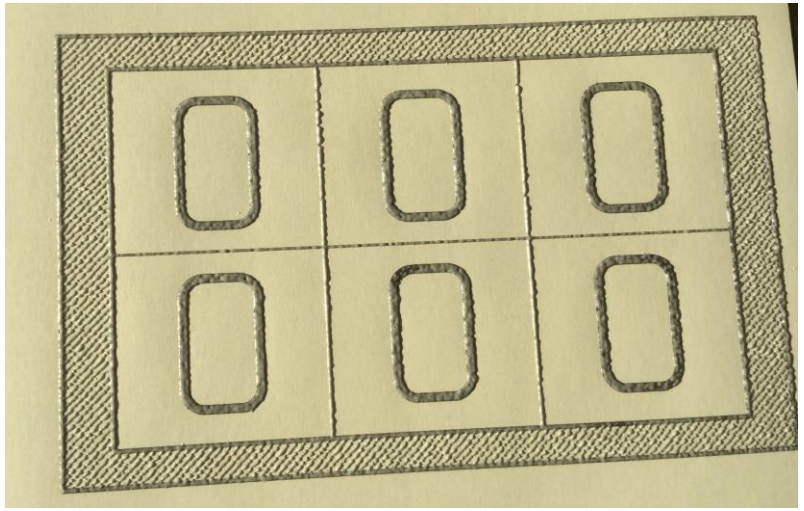
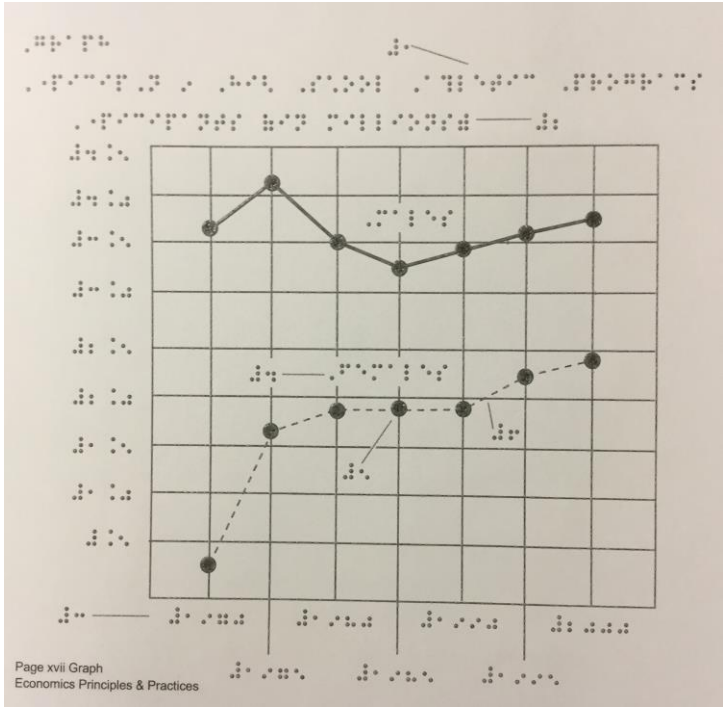


Grids in education and leisure activities

	$1	$2	$3	$4
$1	b	n	s	r
$2	l	h	e	c
$3	f	d	k	o
$4	t	g	i	h

Good understanding of grids is important in a wide range of contexts – word games (word diagrams), all kinds of graphs with coordinates and chess, to mention just a few.

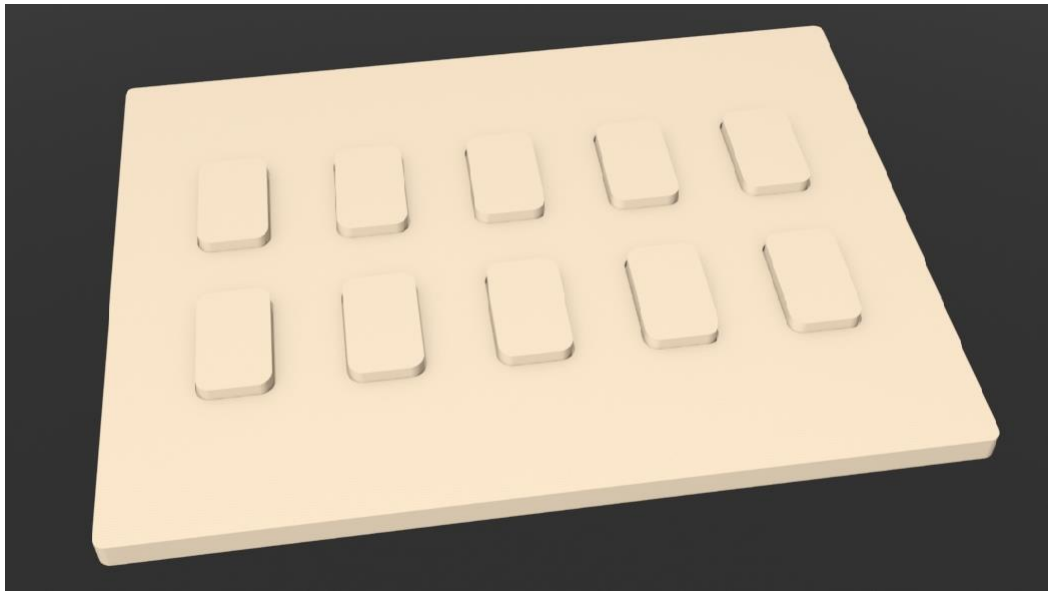


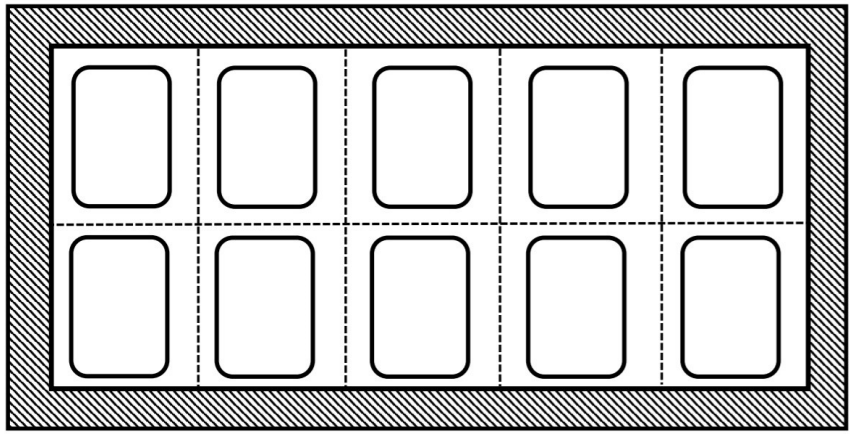
1-1 **b**; 3-4 **i**; 4-1 **r**; 2-3 **d**

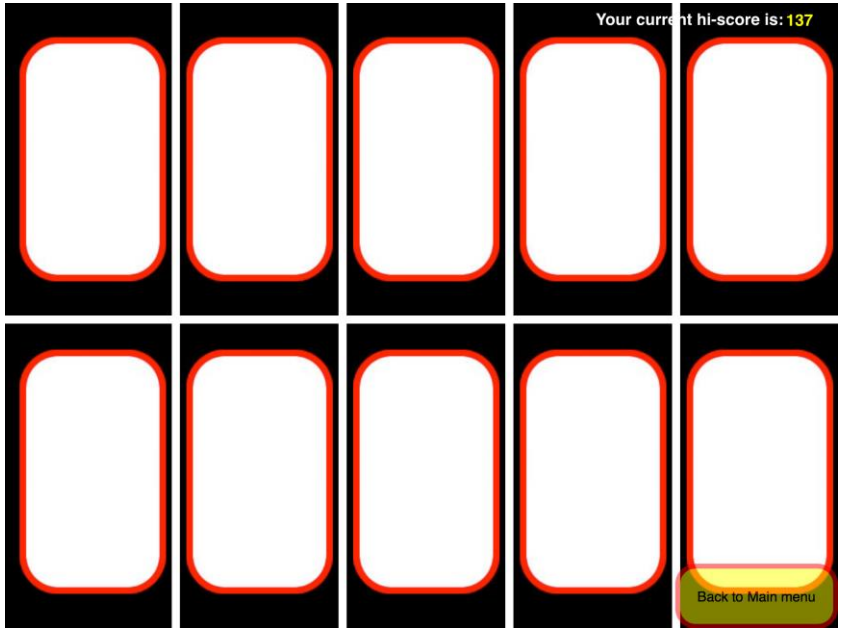
Moving from concrete to imagined

To help children understand what is happening on the screen, and how the grid changes when a pair of matching cards is removed, a special manipulative was designed. Configurations of the cards on i-pad screen can be checked on this manipulative – which is a plate with removable blocks, each representing one card. Configuration of cards can additionally be confirmed on a tactile graphics grid – a useful intermediate 2-dimensional stage between the concrete, 3-D manipulative and an abstract, ‘imagined’, or virtual grid.

Moving from concrete to imagined



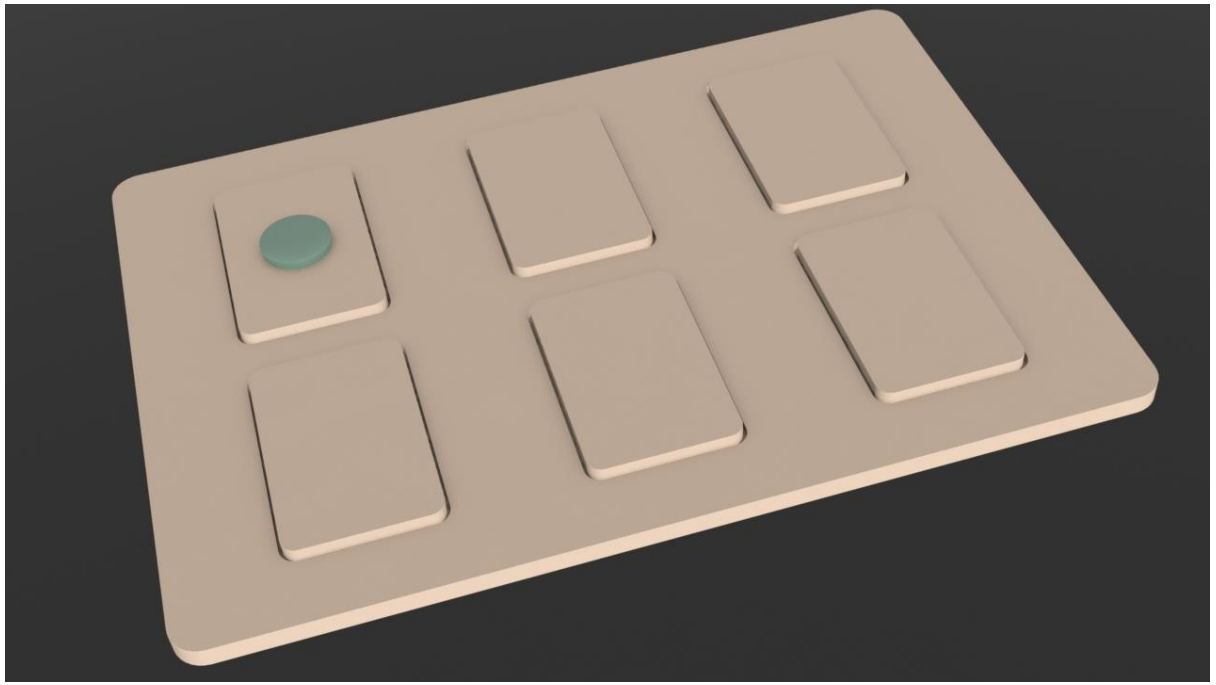


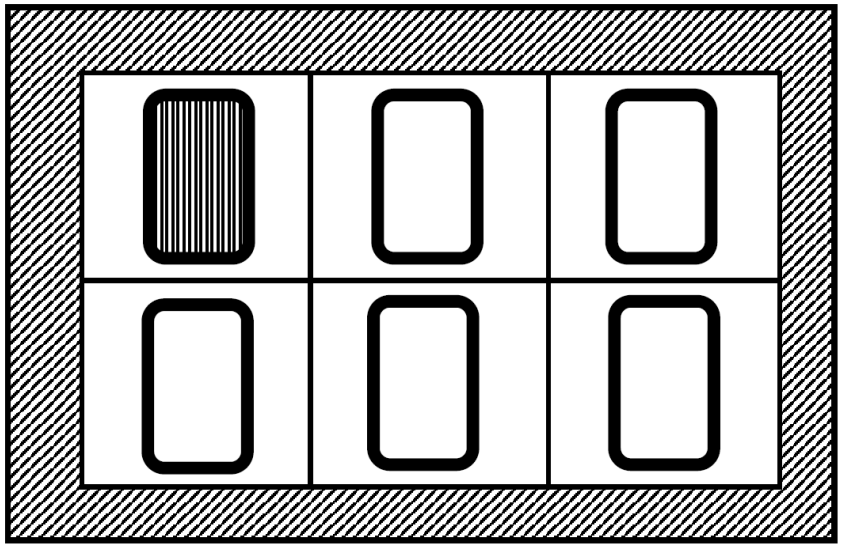


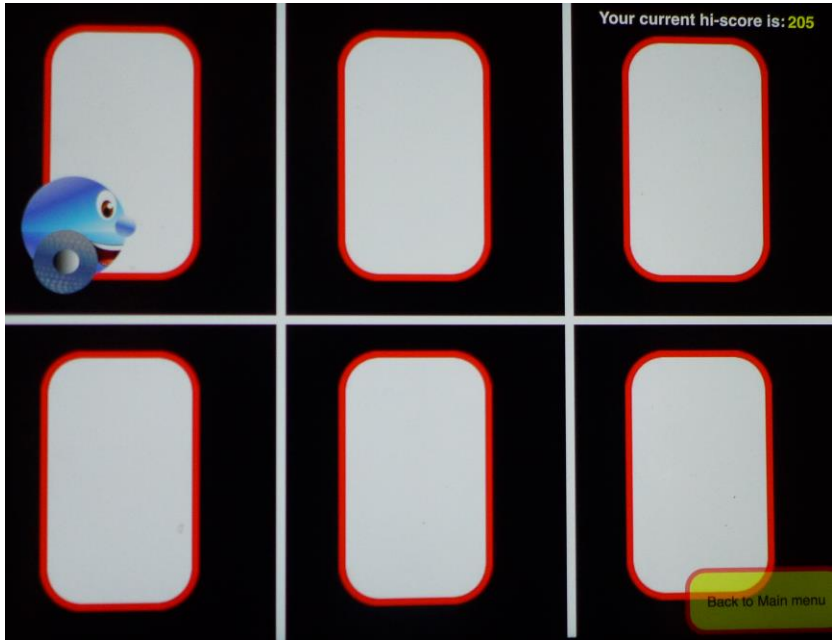
Moving from concrete to imagined

Tapping twice on a card (in this game on the card in row one, column one) activates the voice of a barking dog. On the manipulative, the activated card can be identified by turning over the corresponding block and revealing a tactile symbol (a circle). On the tactile grid, the activated card is shown as a textured rectangle.

Moving from concrete to imagined



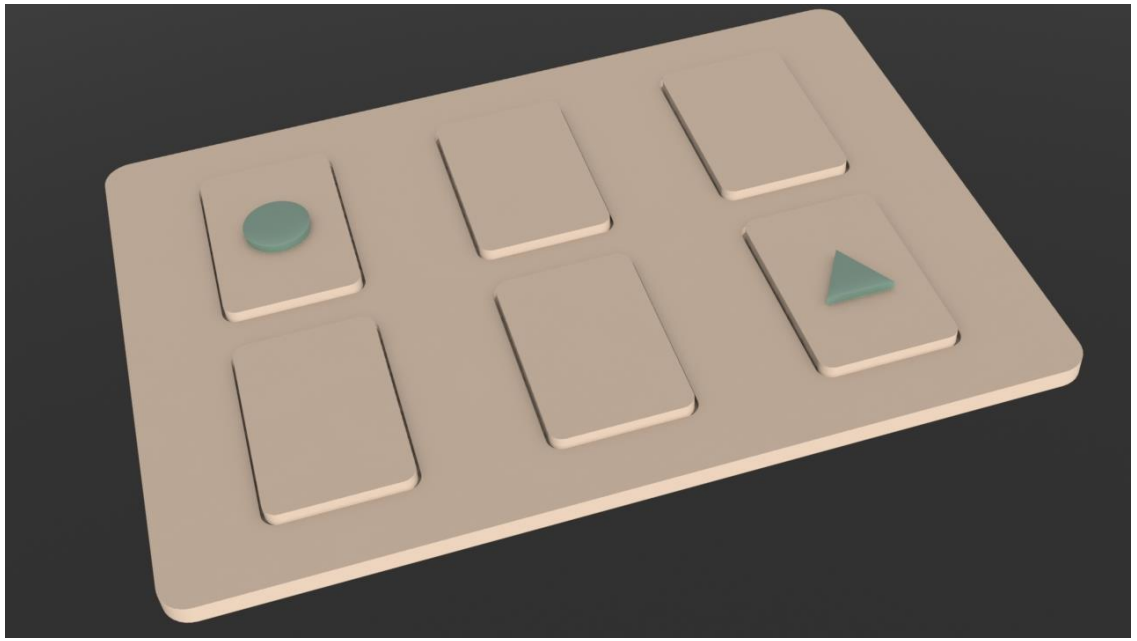


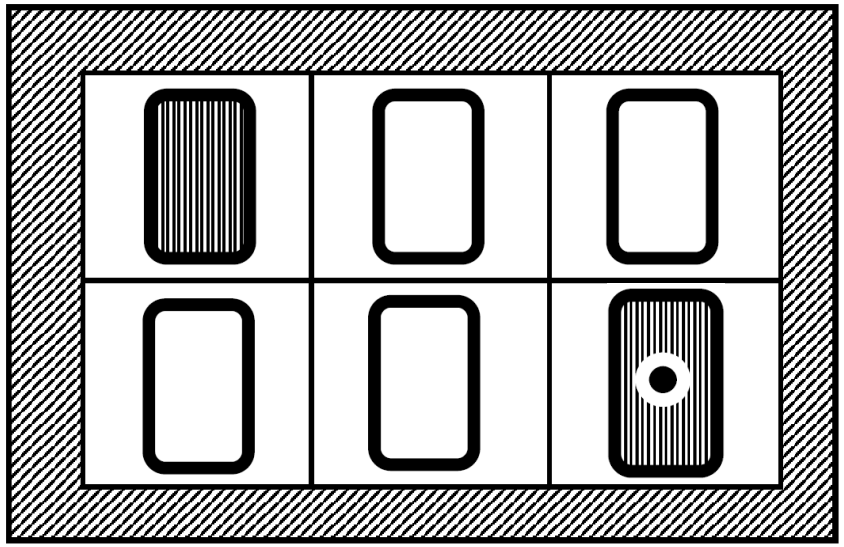


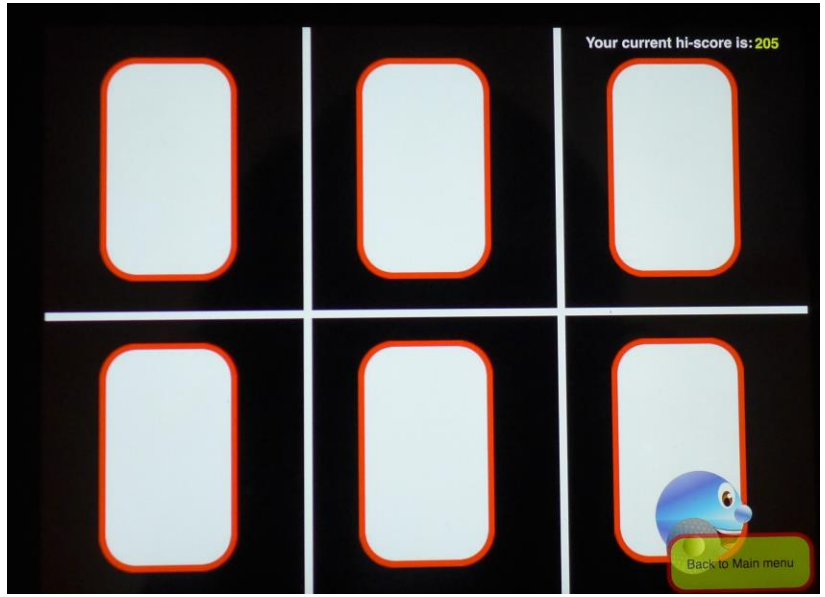
Moving from concrete to imagined

On the next slide, an incorrect guess is shown. The card in row one column one, and the one in row two column three are not a matching pair. This is confirmed by different tactile symbols on the manipulative (a circle and a triangle) and on the tactile grid where the two cards have different textures.

Moving from concrete to imagined



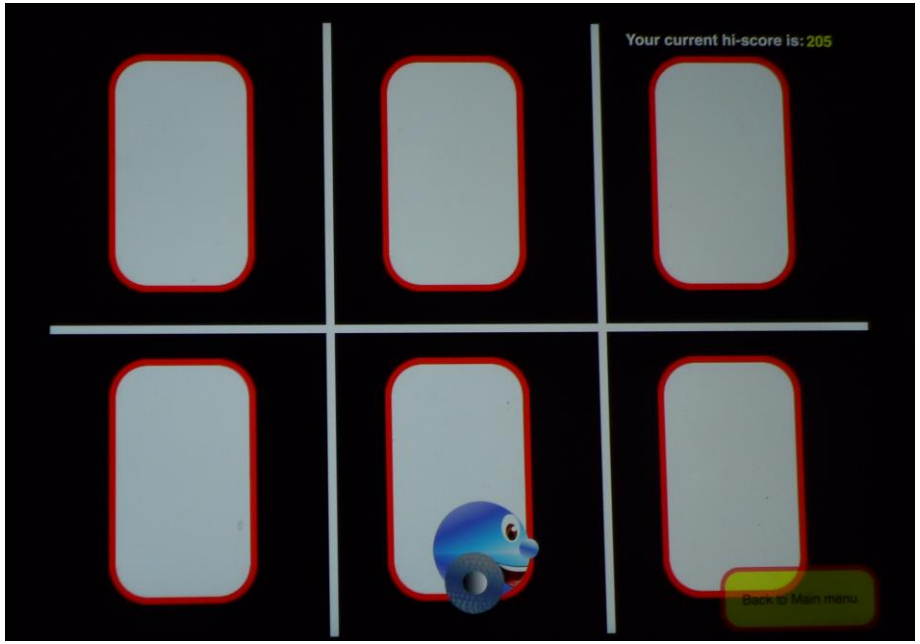


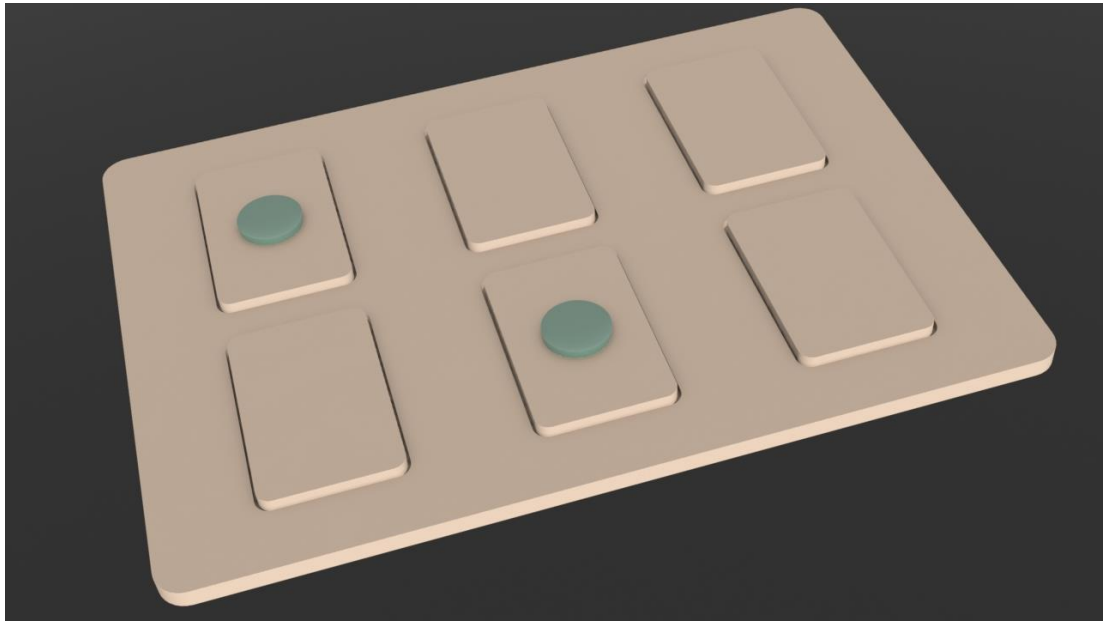


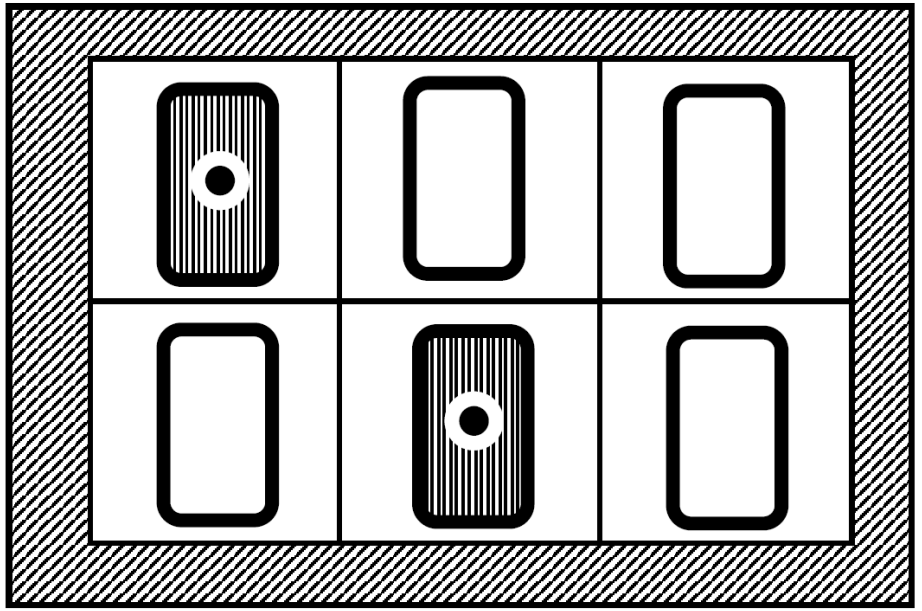
Moving from concrete to imagined

On the next slide, the child has flicked Wheelie to row two column two, which hides a matching card for the one selected earlier, in row one column one. Voice output (the word ’dog’) confirms the right choice, and so does the manipulative where the corresponding blocks have identical tactile circles. On the tactile grid the two matching cards have the same textures.

Moving from concrete to imagined







Moving from concrete to imagined

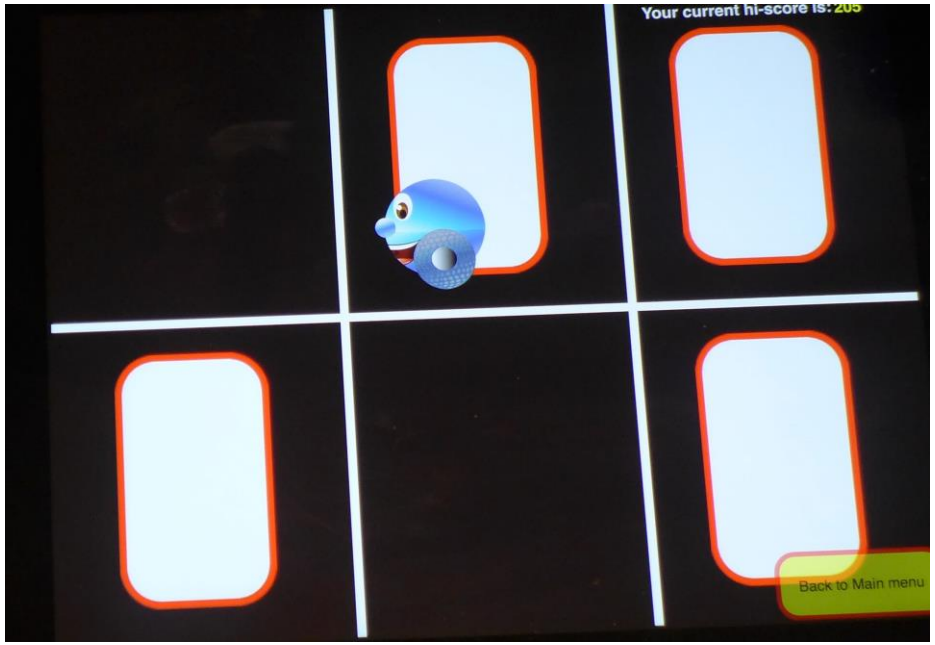
As in any memory game, the matching cards are removed. On the iPad screen they disappear, leaving two blank spaces in the grid. The child can check this by removing from the manipulative the two blocks with tactile circles, which leave indentations symbolizing blank spaces. Also on the tactile grid, removed cards are replaced by blank spaces.

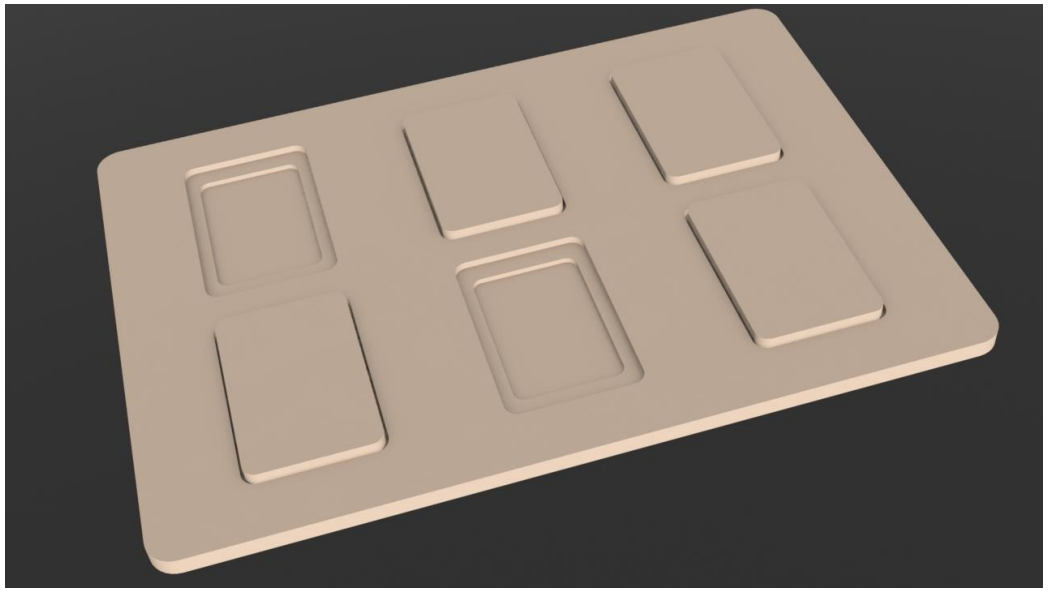
The child can now plan the next move for Wheelie and can at any point check the location of the remaining cards either on the manipulative or on the tactile grid.

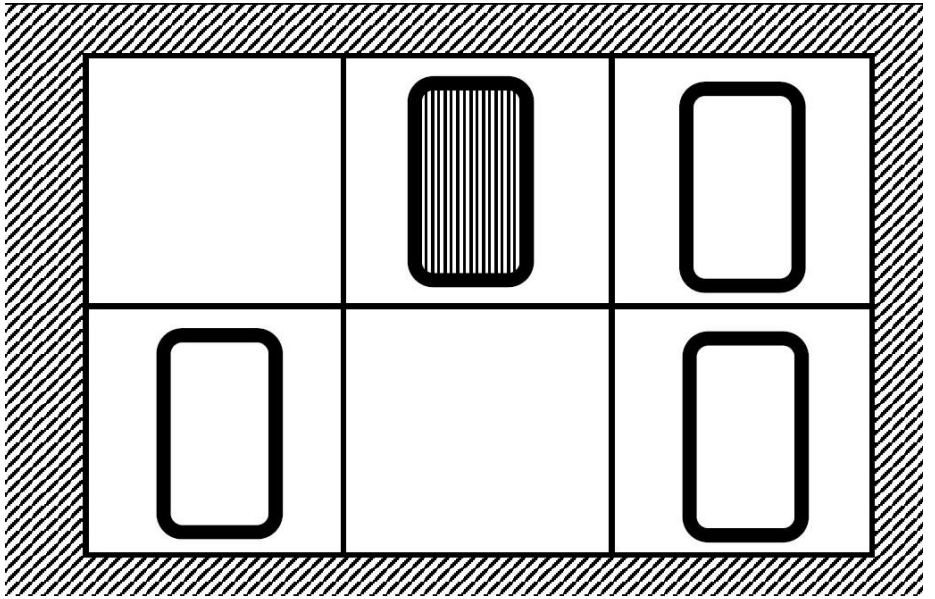
As a result, rather than leaving it to chance and an uncontrolled chain of flicks, the child will learn to make conscious choices as to where to direct Wheelie within the virtual grid and which cards to open.

With time, (some children can do this very quickly) the child will be able to make these choices without the aid of the concrete manipulative or a tactile diagram..

Moving from concrete to imagined







Checking understanding of grids: Which card to open?

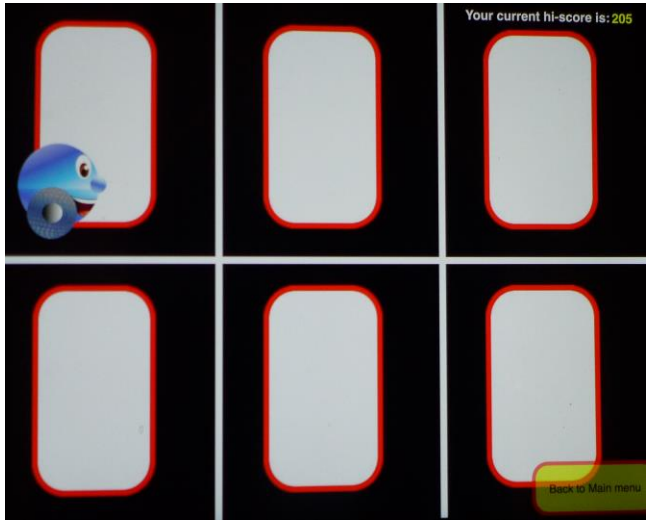
Given the complexity of the process of building a mental image of a grid and various configurations of the elements which it contains, it is always good to make sure that the child really understands the spatial relations which appear during various stages of the game.

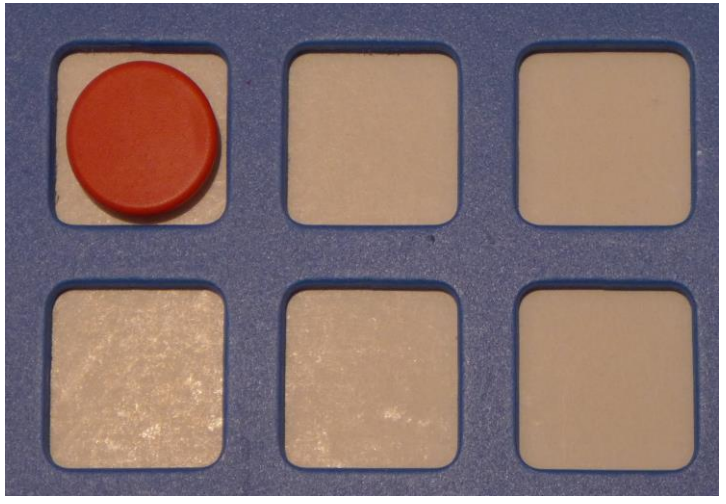
One way to do it is to make a simple 2x3 grid cut out from a sheet of cardboard, start a new game and ask the child to place a small object (such as a round magnet) in compartments described by voice instructions, e.g. in row one, column one as in picture (a) or in row two column three, as in picture (b) on the next slide.

The same grid can be used for practicing and checking understanding directional concepts. The child can check tactilely how the location of active cards changes with each flick left or right, and confirm that ‘flick down’ and ‘flick up’ can be used to switch between the rows.

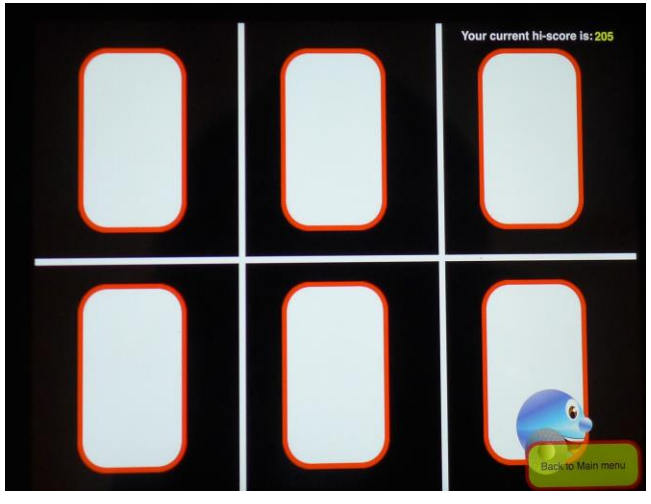
Checking understanding of grids: Which card to open?

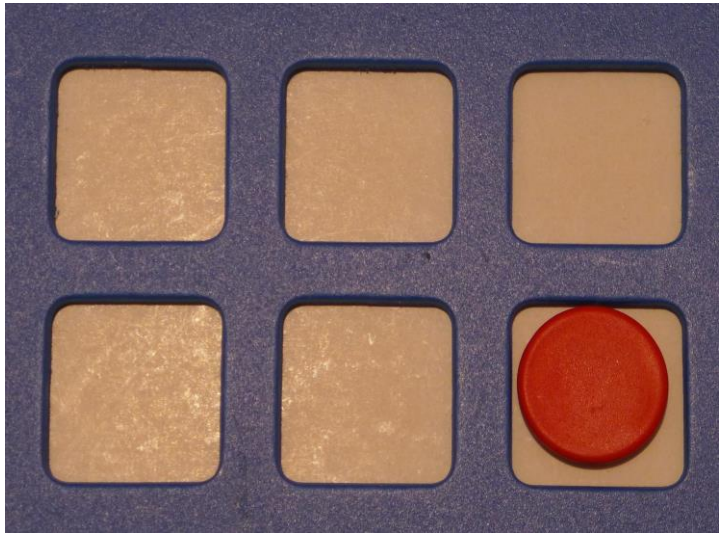
(a)





(b)





Checking understanding of spatial concepts represented graphically

Understanding of spatial relations represented graphically can be practiced and reinforced in a number of situations in real life or in play.

This photo shows a boy whose task is to place a cup on a placement mat in a location shown in one of four tactile drawings, and then to move the cup to a new location. To do that, the child will need good understanding of concepts describing location and direction: right, left, top, bottom, up and down.

Digital grids - Ballyland Code apps

The Ballyland Code apps also use grids. This is a series of three apps for iOS, Ballyland Code 1: Say Hello, Ballyland Code 2: Give Rotor, and Ballyland Code 3: Pickup. They increase in difficulty and should be played in order. The Code apps provide an audio-based introduction to coding for young students who are blind or visually impaired with no coding experience and limited VoiceOver skills.

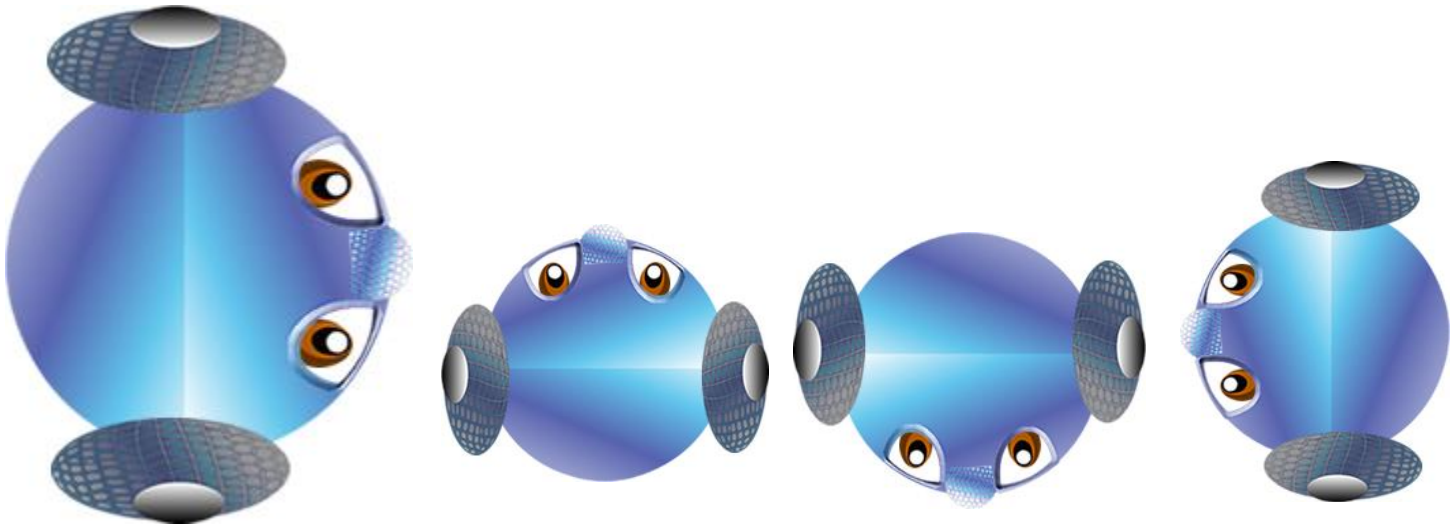
From concrete to imagined: life size grid

In coding workshops, children start by moving around a life size grid. This could be readily available at the school playground, or created with bright tape or tactiles on the floor. Children can then experience moving around the grid, one step at a time, which is relevant for coding, where you can only give one coding command at a time. They experience to move forward, turn right and avoid obstacles..

Getting ready for coding: life size grid

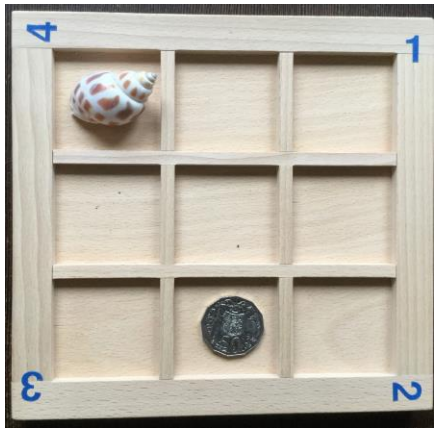
Getting ready for coding

- The Code apps use a grid, and moving in this grid, Wheelie needs to reach a target, avoid obstacles, and find the shortest route.
- This requires Computational thinking: commands, one step at a time
- Which way is Wheelie facing, where will he move if he moves forward?



Getting ready for coding

In the Ballyland coding games a 3x3 grid is used within which Wheelie will be moving around visiting friends or helping to solve unexpected problems. The grid can best be illustrated by noughts and crosses, which children may be familiar with. For directing Wheelie and planning his different routes, a wooden plate divided into nine compartments comes useful. Small objects can be placed as obstacles in selected compartments allowing children to find ways around them…



Tactile exploration

… as in these two photos of children in India getting ready for a coding challenge.

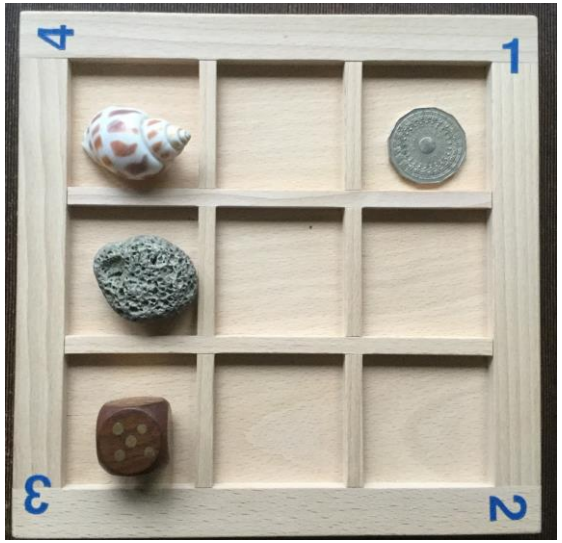
Ballyland Code 1: Say Hello

The tactile representation makes it possible to illustrate with concrete objects the situation on the virtual grid – spaces within which Wheelie can move, and those which are blocked. In Coding challenge 1, Wheelie has only one route available to reach his friend ….

Ballyland Code 2: Give Rotor

…while here, the child can plan several routes for Wheelie to reach Ballicopter waiting for a new rotor.

Before engaging in coding, the child can first practice and choose the shortest route with the help of the wooden board and concreto objects.



From tactile to digital

Before engaging in coding, children can first practice and choose the shortest route by planning it on the „concrete” wooden board.

Orientation, decomposition, sequencing: Coding

Having prepared and learnt through tactile means, students can then use the Ballyland Code apps on the touch screen.
This requires the use of orientation skills, decomposition skills and sequencing skills. Together these are coding skills.

Digital Ballyland Code 1, Challenge 1

Wheelie is in the grid of 3 rows by 3 columns. He starts in row 1 column 1, facing right. There are 2 obstacles that Wheelie needs to avoid: a pond with ducks and a rubbish bin. The student needs to find the shortest route for Wheelie to move to Tinkleball, and when he is in the same cell as her, to say Hello. The coding commands that can be used are: move forward, turn right and say hello. As a special tool for tactile representation, Sonokids has developed a tactile grid and mini moveable Ballylanders and obstacles for 3D printing.

Open Accessible Coding Panel

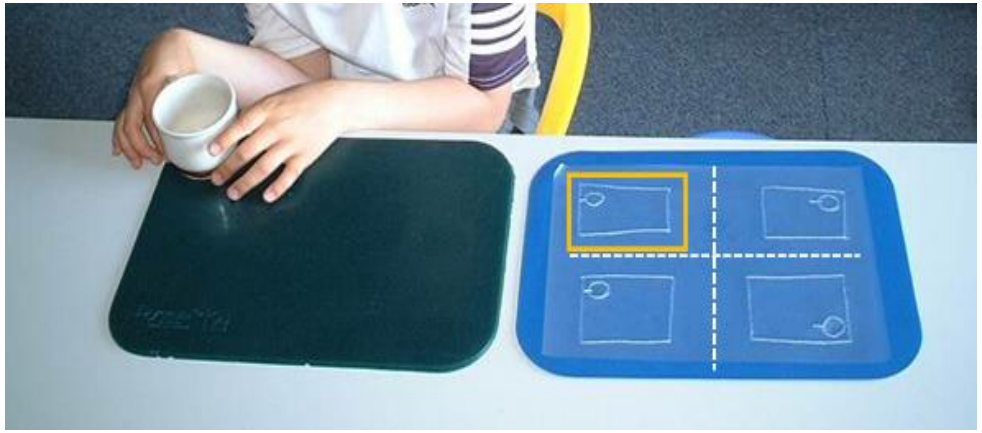
The app is fully accessible. A double tap opens this coding panel in which you enter the code. You can flick right and left through the lines of code, and flick down and up to select the correct command for that line (no need to type).

Computational thinking and coding skills

Having entered commands in the coding panel on the iPad, double tap the screen to ‘Run your code’. The output is visual (Wheelie moving to Tinkleball on the screen), but also as an audio story, to make it fully accessible. The student who is blind can enjoy the successful outcome of the Coding Challenge in a digital grid.

Tactile reading - Digital skills

The blended teaching method is designed to build a bridge between traditional tactile graphics and grids on the one hand, and digital skills in a digital environment and mental mapping skills on the other. We have demonstrated that tactile reading skills support the learning of digital skills, and that accessing digital learning also supports learning of skills that are important for tactile reading and exploration.



Learning outcomes blended teaching method:

- Mental mapping and Memory skills
- Spatial awareness on touch screen
- Understanding and Navigating around a Grid (rows and columns)
- Computational Thinking and Coding
- Improved spatial orientation and ability to move around tactile floor plans, maps, and large diagrams
- Empowerment!

Thank you for your attention!

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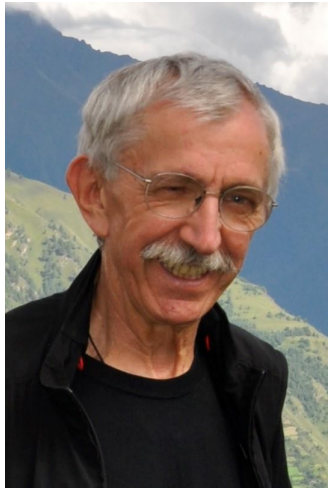

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