

Computational Thinking as Play: Experiences of Children who are Blind or Low Vision in India

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Challenges to Computational Thinking for Blind in India

- Lack of accessible learning material for computational thinking
- Lack of teachers trained in teaching CT to blind children
- Late introduction to computers (~after grade 4); focused on basic skills like typing
- Beyond high school, few blind children go for STEM

Project Torino

- Tangible programming environment for children with mixed visual abilities
- Demonstrated to be effective in teaching CT to children in an integrated school setting (UK)



Torino is now commercially available as CodeJumper

Research Question: Can we present Torino as a toy for creativity and **play**, with stories, songs and music, and still introduce concepts of **computational thinking** to children in India?

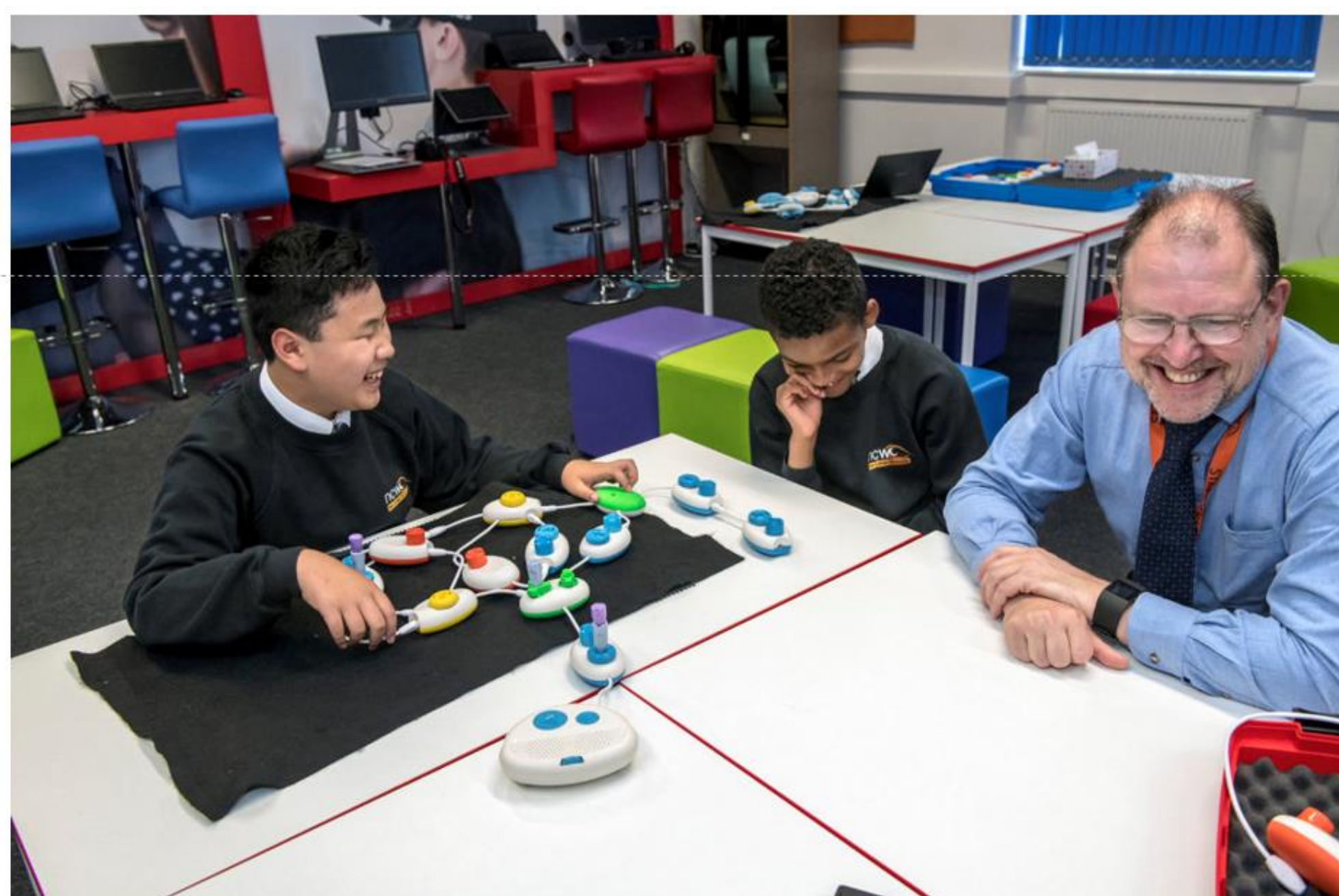
Ludic Design for Accessibility

1. **Free Activity:** A free activity standing quite consciously outside "ordinary" life as being "not serious", and where the player has the complete freedom to engage with the activity or not
2. **Interest agnostic:** An activity not necessarily connected with material interest, and no profit is necessarily to be gained by it
3. **Bounded:** An activity that proceeds within its own proper boundaries of space and time
4. **Social:** An activity that promotes the formation of social groupings
5. **Desired Side-effect:** The activity the LDA practitioner intends to deliver some benefit to the end users of the artifact or activity

Observations

- Exploration led by peer learning and collaborative play
- Children demanded individualized content in multiple languages like Kannada, Tamil, Telugu, Hindi and English
- Teammates took turns making programs and assisted each other debug programs
- Pods distinguished as **sound pods** (play pods) and **non-sound pods** (pause, loop, if-else, merge)

Overall, children enjoyed Torino play sessions and demanded extra play time with the toy. By the end of sessions, they were also evaluated to have learned *flow of control, threads, loops, tracing and debugging*.



Children playing with Torino in a school in UK



Children playing with Torino in a school in India



Play sessions in progress

Computational Thinking as Play: Torino Study in India

- 12 participants (7-13 years old); low vision to blind
- Each play session duration 45-60 mins
- **Exploration:** learning focused on exploration with minimal interruptions
- **Playful Programming:** interesting songs and stories as programs
- **Evaluation:** playful evaluation, tasks suggested in "New frameworks for studying and assessing the development of computational thinking"

On-going Work

- Transition to CT vocabulary, while at the same time not distracting from play and creative exploration
- To understand challenges in integrating this approach into the school curriculum and practice
- Identify challenges in scaling the ludic design methodology
- Teaching computational thinking with play to teachers of blind students