Learning Numeracy Skills through card games

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Context

- NCF (2005) highlights the need to strengthen numeracy skills (Section 2.3.2).

- There is a gap in this knowledge due to which children with blindness underperform in comparison (Clamp 1997) and eventually drop Science and Math studies in high school.

- Current pedagogy of math instruction is extremely visual and therefore inaccessible for visually impaired children (Quek and Oliveira 2013)

Objectives of the Study

- To create a curriculum for teaching concepts of numeracy through play.

- To understand the modifications and accommodations necessary at various levels of comprehension to play cards and gain numeracy skills.

Ludic Design for Accessibility

Technology solutions for accessibility have long been created using a narrow utilitarian lens. In our work we follow a new design methodology called the Ludic Design for Accessibility, that puts play and playfulness at the center of all Accessibility design and use.

Methodology

- Sample: 10-12 children each from 3 residential schools for the blind.

- Grades 2nd – 4th

- Games period: 1 session per week

- Games were designed with help from a special educator through an iterative process also informed by the findings.

- Game design is informed by the LDA framework which specifies that play should be free, interest agnostic, social, have boundaries, and desired Side-Effect.

Methodology

| Games	Numeracy Concepts
Counting	Counting, associating numbers with objects
Distributing a certain number of cards to others	Counting, addition and subtraction, the concept of total, comparison of numbers (more, less and same)
Gathering all cards of a	Number recognition, pattern identification, skip numbers, sorting,
Go fish	Number recognition, concept of equal
Biggest and smallest number	Comparison of numbers, place value
Raise to 27	Addition, logic, drawing a card from the deck
Last man	Place value and face value
Sequence	Pattern recognition, sequencing

Preliminary Findings

- Students have "**Fun**" during the sessions.

- The informality of the session encourages "**Curiosity and Creativity**".

- Students "**Learning**" of basic numeracy concepts enhanced.

- The play environment stimulates "**Collaborative Learning**".

Game Accommodations

- Dealing directly into the child's hand

- A card holder in the center

- 2 levels of cards were deemed necessary
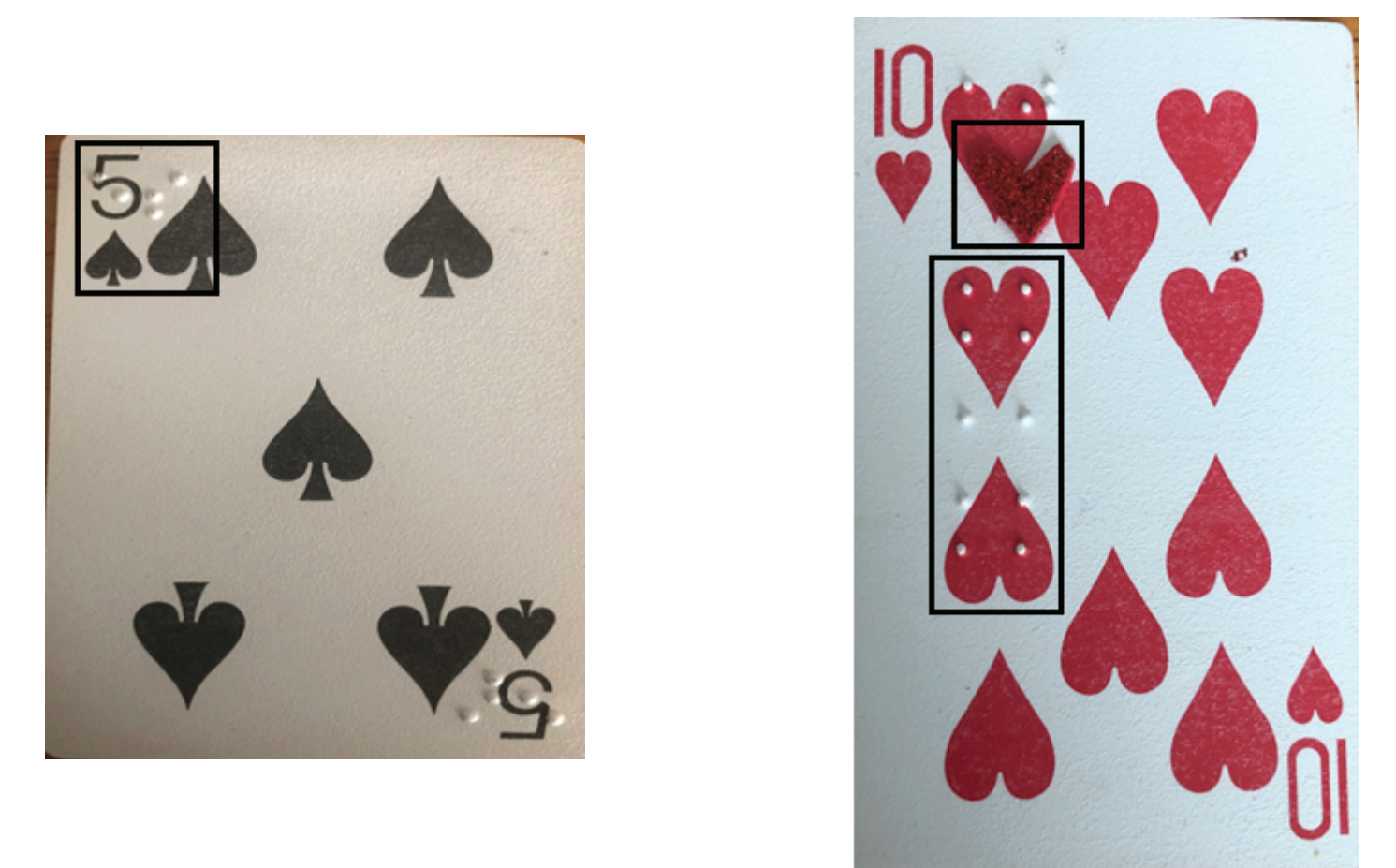
Conclusions

- Initiative inculcates some of the features of the LDA.

- Play sessions are based on free and voluntary participation.

- Children get no incentive other than the joy of playing.

- Games are played in a specific time slot and in a specific room every week

- Games encourage collaboration but how well it promotes formation of social groups is unclear as participants were already well-acquainted.

- As a side effect of play, children learn specific numeracy skills.