# EdCubes

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# Research question

**How to build a foreign language learning game for children?**

# Why children?

*“Speech and brain mechanisms” (Penfield, Wilder, and Lamar Roberts, 1959)*

**The brain plasticity theory** -- the younger the individual when learning a foreign language, the higher the chances to acquire native pronunciation and enrich vocabulary

# Methods for Foreign Language learning

1. Computer Assisted Pronunciation Training (CAPT) system [1]
2. Joint lessons with peers from other countries [2]
3. Music applications for passive listening and active singing [3]

# Impact of AR tech

*A real world context is dynamically overlaid with coherent location or context sensitive virtual information*

AR could help learners develop their skills and knowledge in a more **effective** way than other technology assisted system [4].

Pros:

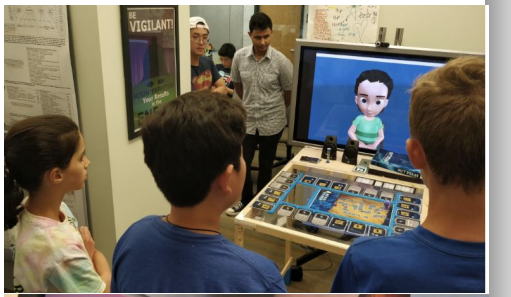
- increase content understanding
- retain long-term memory
- increase student motivation
- improve collaboration.

Cons:

- attention tunnelling
- usability difficulties
- ineffective classroom integration
- learner differences

# Related projects

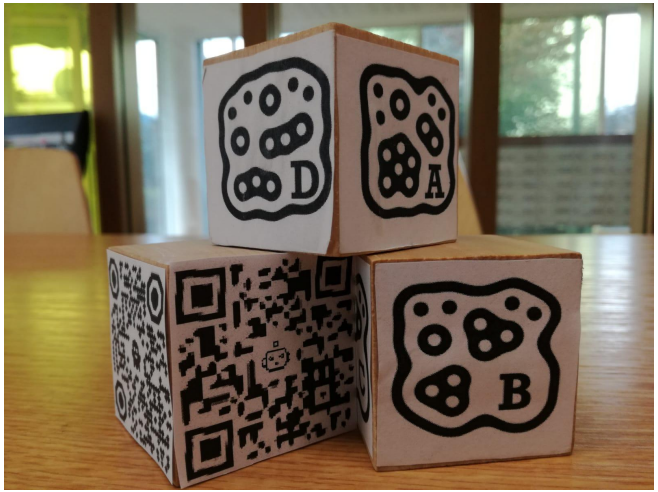
1. FingAR [8]
    a. social pretend AR play
    b. enhance storytelling ability
2. Child-like Virtual Peer [9]
    a. intelligent virtual child as a peer to trigger curiosity
3. wIzQubes [10]
    a. view the story from different angles in the virtual world


# What is EdCubes?

**A multimodal AR language learning environment for children**

- Cubes with markers
- AR and tangible interaction
- Collaborative or individual
- Serious game



# Design motivation

**Target group:** children 6-12 yo

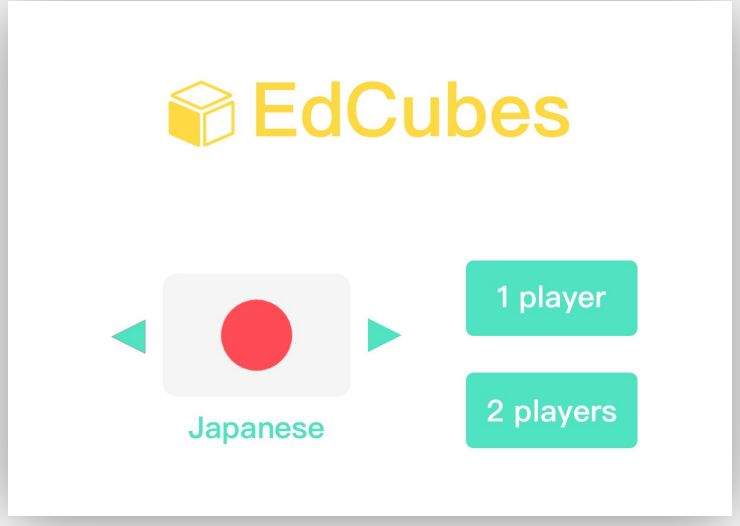
**System design:**

- Less text
- Less elements for children, more for parents
- Attractive
- Real-time feedback

# Design motivation

**Collaborative**

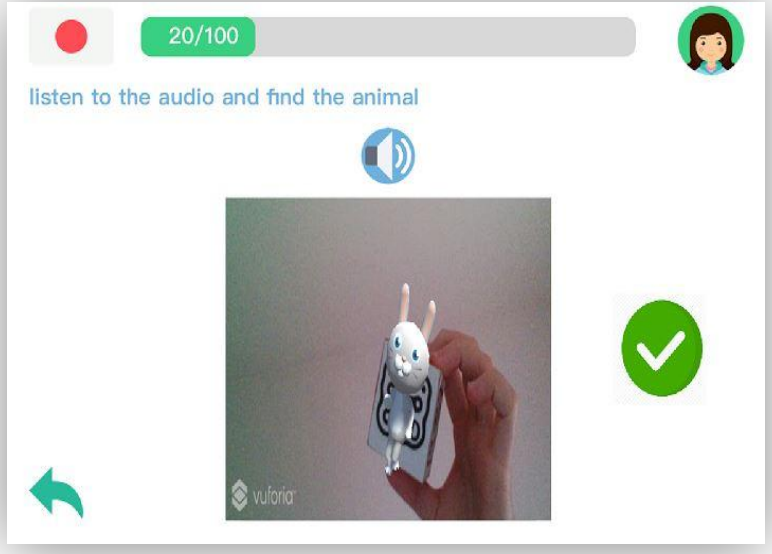
- Play with someone
  - Peer or parent
  - more motivating for children
- Complete task together



# Design motivation

Why tangible?

- Children learn better if they physically interact with the focus objects of their learning [2]



# Design motivation

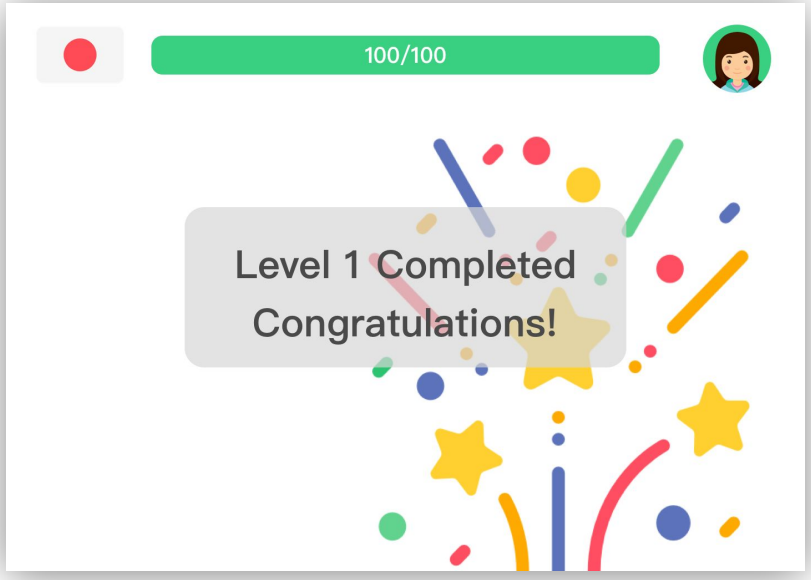
Why AR?

- Immersive
- Interesting
- Effective

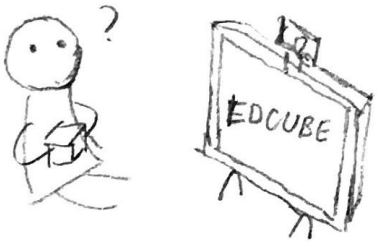
# Design motivation

Feedback

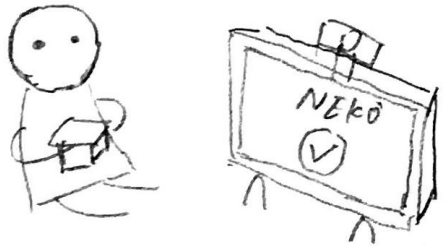
- Progress bars
- Experience points
- Game badges/Achievements



# Scenarios

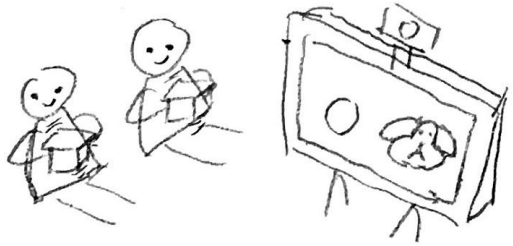


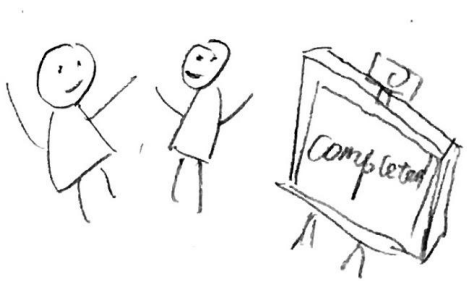












# Prototype

# Evaluation

## Hypotheses

A. Using AR with physical objects increases the enjoyment and motivation of children when learning a foreign language compared to the traditional way of learning in class.

B. Using AR with physical objects increases the efficiency of learning for children compared to the textbook.

C. Having collaboration increases the enjoyment and motivation of children in the same game setting comparing with playing alone.

# Evaluation

## Protocol (for hypothesis A and B)

- Between-subjects experiment design
- The participants are 50 children, aged between 6 and 12 and are split equally into two groups, G1 and G2, according to their age.
- G1 - children use {EdCubes} to learn specific number of new Japanese words (vary from 5 to 12) in 40 minutes.
- G2 - children use {Traditional} method to learn the same new words in 40 minutes.

# Evaluation

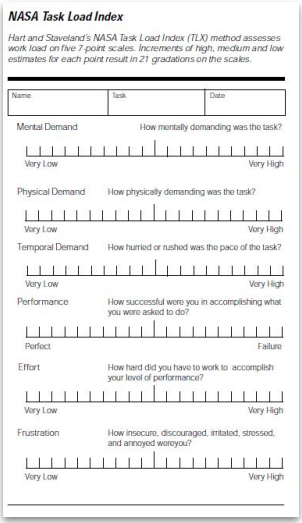
## Study for hypothesis A

**Measures**

Motivation, arousal and enjoyment.

**Methods**

Children will be asked to filled in the redesigned version of NASA TLX.



**NASA Task Load Index**

*Hart and Staveland's NASA Task Load Index (TLX) method assesses work load on five 7-point scales. Increments of high, medium and low estimates for each point result in 21 gradations on the scales.*

Name | Task | Date

Mental Demand — How mentally demanding was the task?
Very Low — Very High

Physical Demand — How physically demanding was the task?
Very Low — Very High

Temporal Demand — How hurried or rushed was the pace of the task?
Very Low — Very High

Performance — How successful were you in accomplishing what you were asked to do?
Perfect — Failure

Effort — How hard did you have to work to accomplish your level of performance?
Very Low — Very High

Frustration — How insecure, discouraged, irritated, stressed, and annoyed were you?
Very Low — Very High

# Evaluation

## Study for hypothesis B

**Measures**

Time1:The time children used for learning 5 new words

Time2:The time children used for learning 6 new words

Num1:The number of words children learnt in 20 minutes

Num2:The number of words children learnt in 25 minutes

**Methods**

Record the experiment and extract data from the video record. Then conduct data analysis.

# Evaluation

## Protocol (for hypothesis C)

- Between-subjects experiment design
- The participants are 30 children, aged between 6 and 12 and are split into two groups, G1 and G2, according to their age.
- G1 - 20 children. They use the two-player mode in {EdCubes} to learn specific number of new Japanese words (vary from 5 to 12) in 40 minutes.
- G2 - 10 children. They use one-player mode in {EdCubes} to learn the same new words in 40 minutes.

# Evaluation

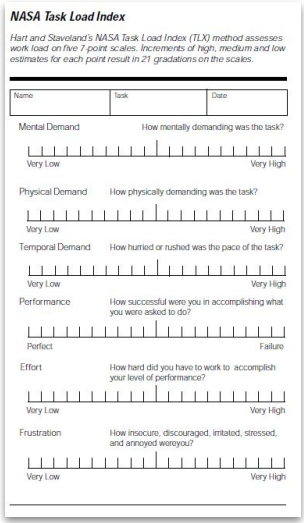
## Study for hypothesis C

**Measures**

Motivation, arousal and enjoyment.

**Methods**

Children will be asked to filled in the redesigned version of NASA TLX.



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# References


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