FORMATIVE EVALUATION

MAKING COLLABORATIVE LEARNING EFFECTIVE AND AFFORDABLE

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1.1 INTRODUCTION

Our project is to understand the collaborative learning methods that are being practiced currently in the smart classrooms and discussions and build a cost-effective system that can be used with minimal resources. The goal of our project is to build a system that improves the quality and effectiveness of collaborative learning in smart classrooms or in group discussions and to bring them closer to as many people as possible by making it affordable.

1.2 EVALUATION METHOD: WIZARD OF OZ

1.2.1 PREPARATION

To prepare for our wizard of Oz formative evaluation we designed a mock setup of our system and defined the tasks to be performed by the users.

1.2.2 USERS

The wizard of Oz study was conducted on 4 users. Two users from CS-522 class and two external users.

1.2.3 FORMATIVE EVALUATION STEPS

1. Before the users were asked to perform the tasks, they were given a brief introduction of the system setup and interactions supported by our systems by a facilitator.
2. Users were asked to perform 5 tasks related to our system.

3. Two members from our team observed the users while performing tasks for observations.

1.3 SYSTEM SETUP FOR WIZARD OF OZ FORMATIVE EVALUATION

Our system setup included the following components:

1. One large screen for all team members to view shared information.
2. One Hologram 3D projector so users can view objects in not only 2D but also 3D.
3. A leap motion gesture sensor to interact with the 3D object in the hologram projector.
4. A software component that runs on each user's laptop to control the information flow between screens.

LAYOUT OF THE SOFTWARE COMPONENT

SHARED LARGE SCREEN:

(Top Right). This area is a replica the display on the shared large screen

3D Projector Container:

At the corner of the shared large screen, we have a container to represent the Hologram 3D projector. This container will show the object shared in the 3D projector.

Shared Items (Large Screen Items):

This is a list of items which displays all the items currently shared on the large screen.

Local List:

 This is on the left and contains a list of items on user's local computer.

1.4 WIZARD OF OZ STUDY - USER EVALUATION

Before conducting the wizard of Oz study each user was given a brief introduction on the system setup mentioned above and the purpose of each component. Each user was also introduced to a few interactions supported by our system given below:

## 1.4.1 INTERACTIONS SUPPORTED BY THE SYSTEM

Software Interactions**:**
- User can drag and drop items from one panel to another.
- User can click on the arrow buttons to open context menus.

Interactions 3D Hologram**:**
- User can rotate object displayed in the projector.
- User can zoom in/out the object displayed in the projector.

At the end of the introduction the system was started, and the user was shown the initial state of the system as shown below sections (assuming a few items are already on the shared large screen).
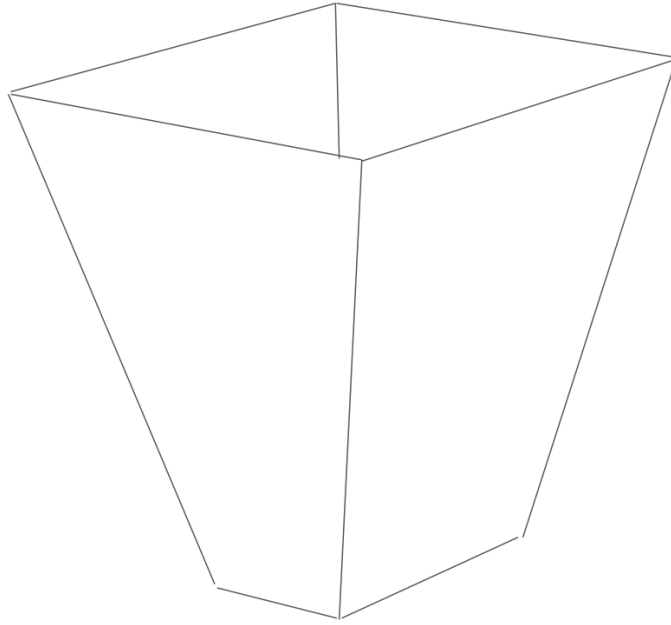
1.4.2 LAPTOP SCREEN VIEW
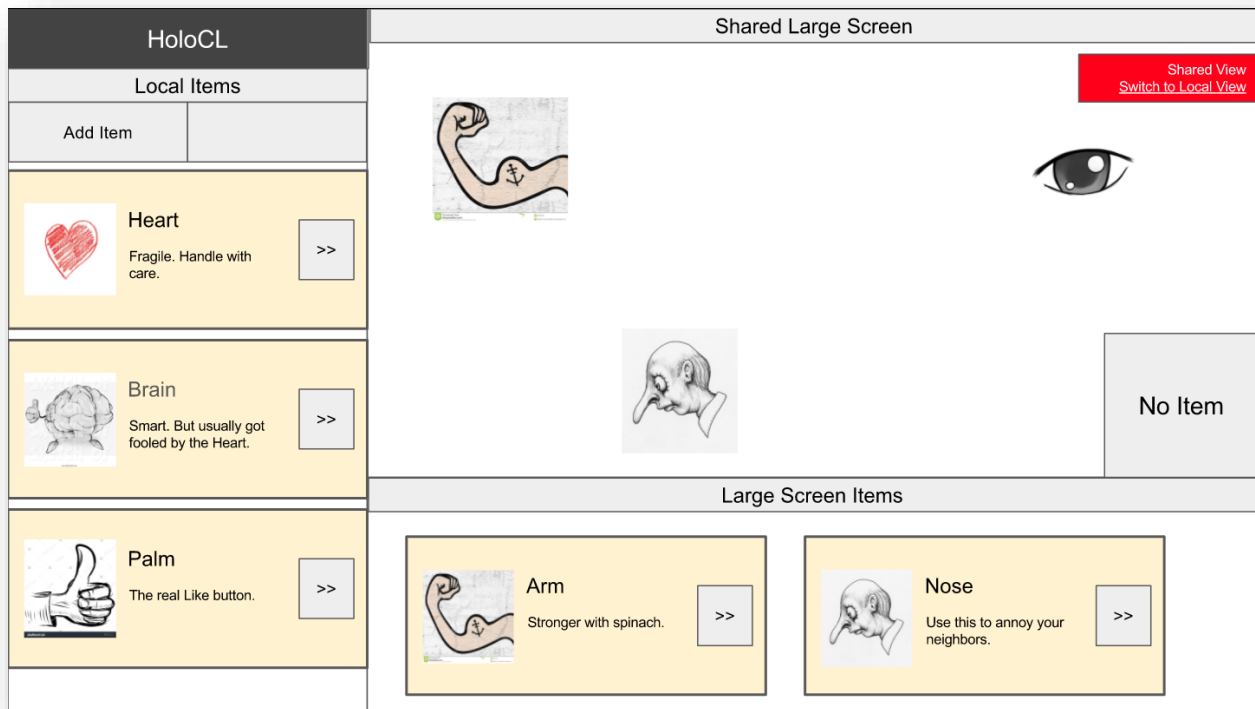
1.4.3 SHARED LARGE SCREEN
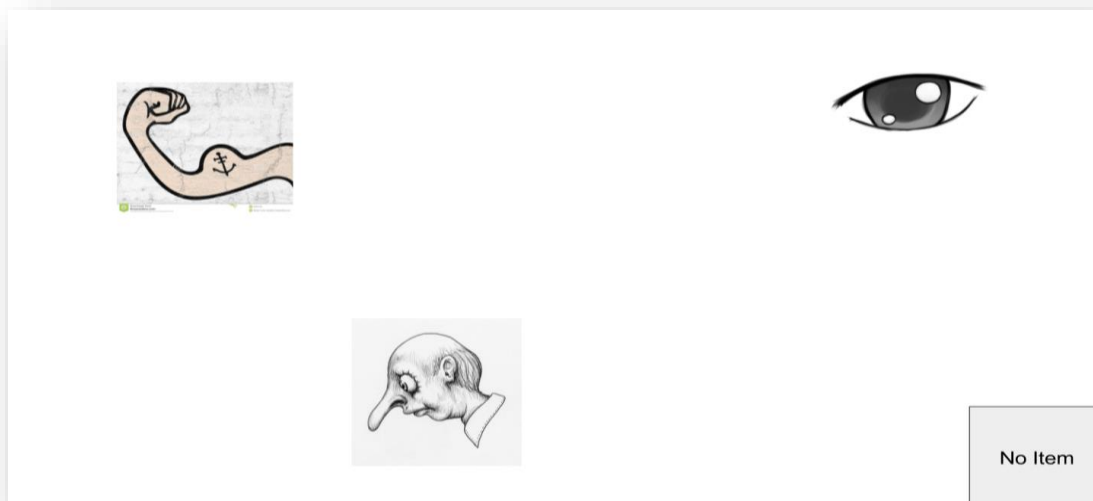
1.4.4 HOLOGRAM 3D PROJECTOR

1.5 TASKS

Each user was asked to perform 5 tasks as explained below.

1.5.1 TASK 1: SHARING INFORMATION FROM A LOCAL COMPUTER TO THE SHARED LARGE SCREEN

1.5.1.1 DESCRIPTION

You are at the second meeting of a group project in your Biology class. On the shared large screen, everyone is sharing their research on different parts of the human body. You have prepared your report on the heart, the brain, and the palm. You want to start with the brain.
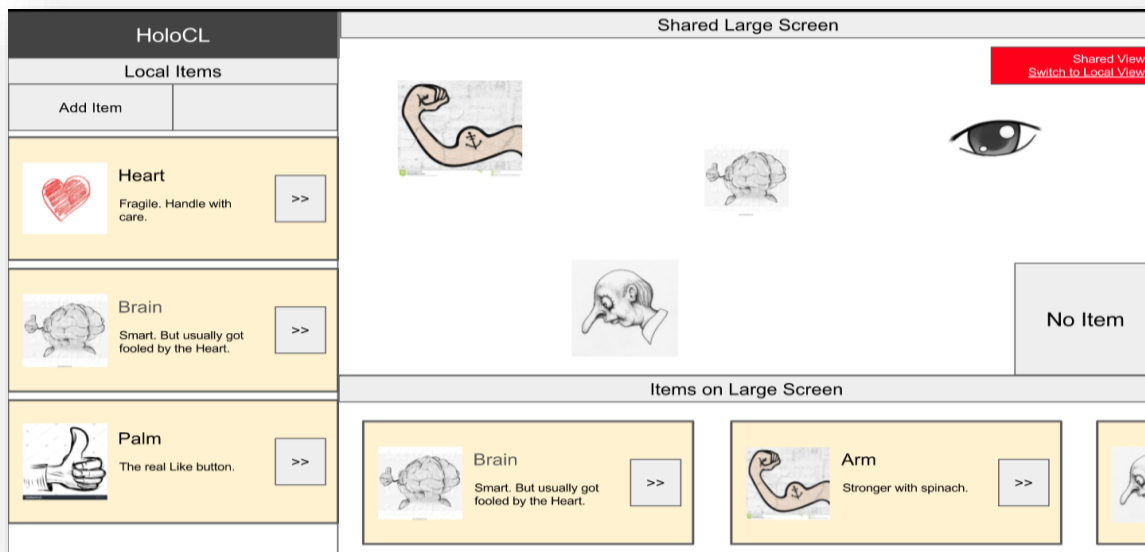
You want to bring the brain report from your local computer to the shard large screen so all of your peers can see it.

1.5.1.2 SCREEN FLOW

- **STARTING POINT:** The user has three items in her local computer: heart, brain, and palm. She is using the Shared View on *Shared Large Screen*.
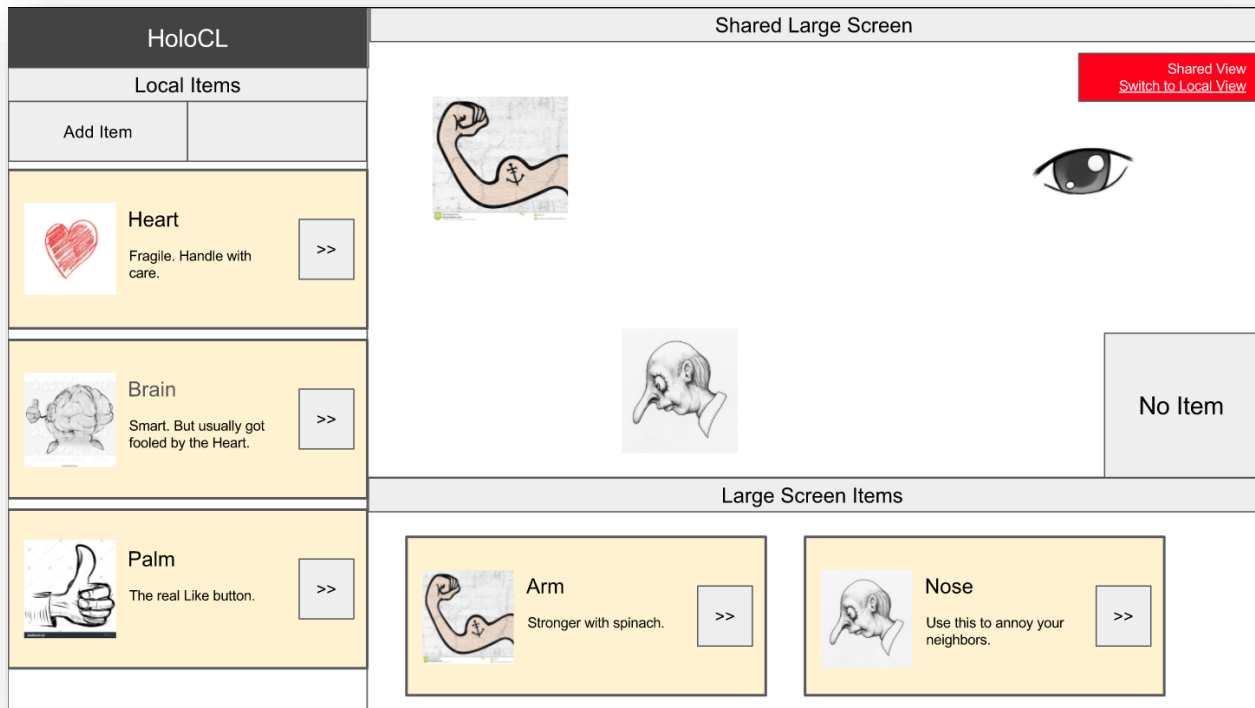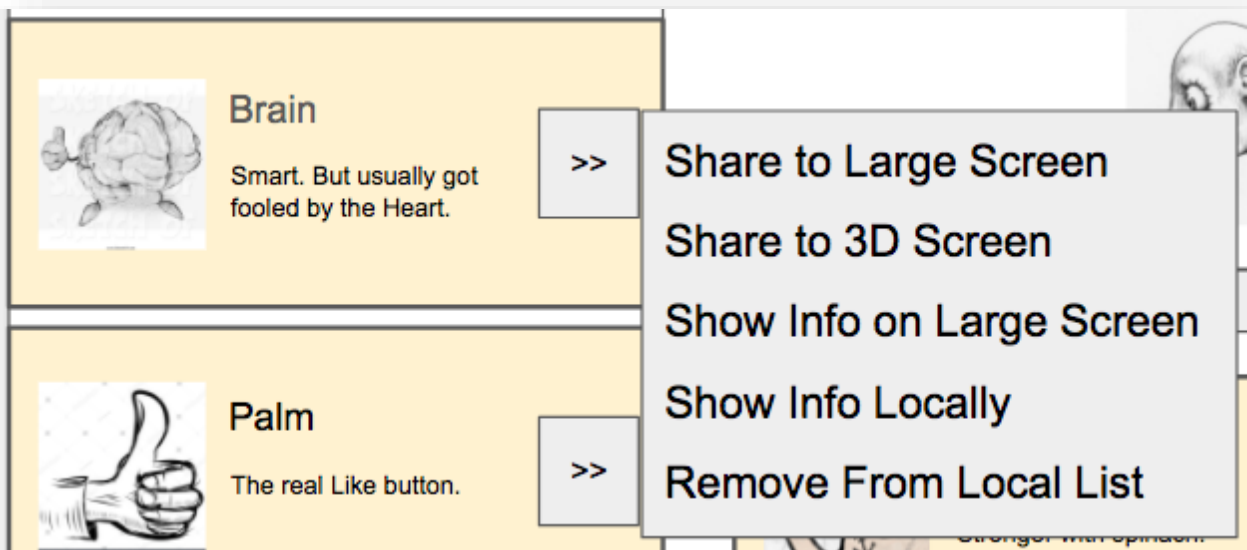

- **END POINT:** The brain report is added to *Shared Large Screen*

- **POSSIBLE PATH(S):**
  - User can drag the brain item from *Local Items* and drop it in *Shared Large Screen*, or
  - User can drag the brain item from *Local Items* and drop it in *Items on Large Screen*, or
  - In *Local Items*, user can click on the button on the right of the brain to open up a context menu then choose *Share to Large Screen*

1.5.2 Task 2: Show detailed information of a shared item on the shared large screen

### 1.5.2.1 Description (continue from the task 1)

Your group wants you to be the first who reports.

You want to show the detailed write up of the brain report (which is already shared on the shared large screen) so your presentation can be started.
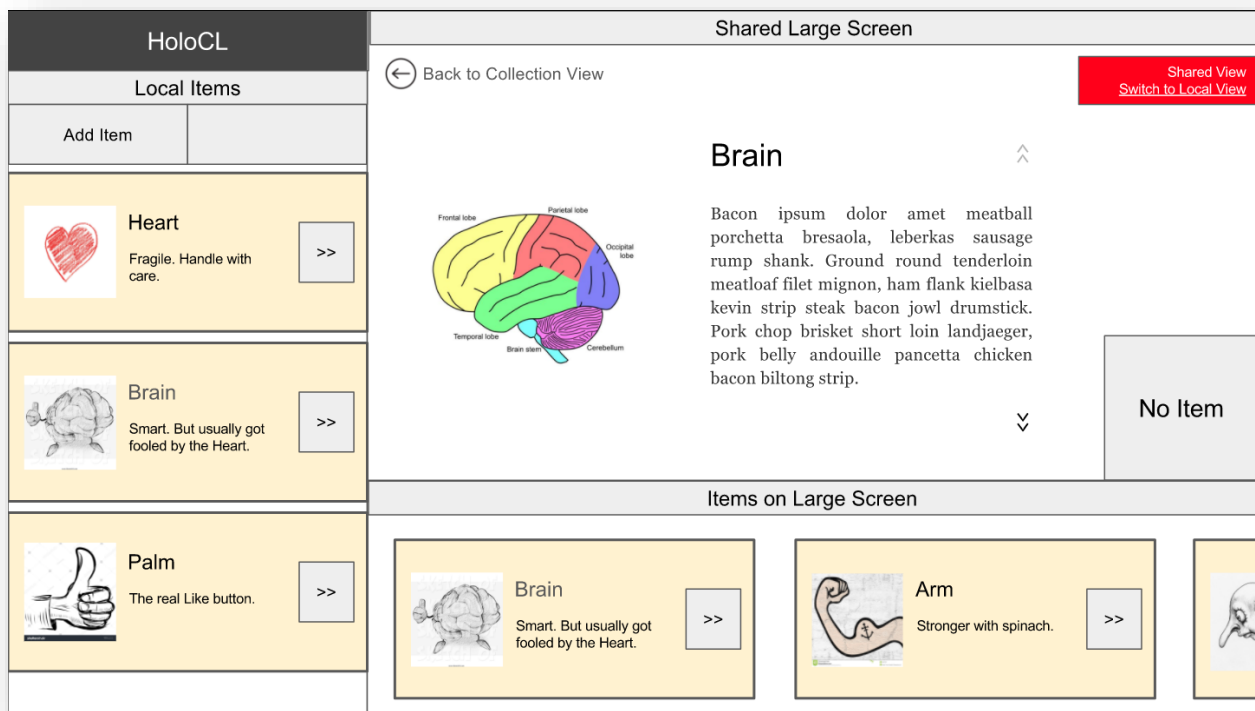
After showing the detailed information, please go back to the Collection View on the shared large screen.
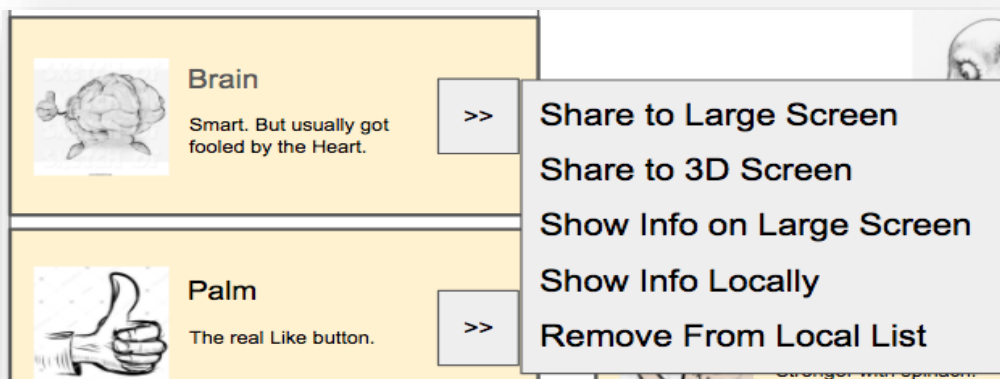
1.5.2.2 Screen flow

- **Starting Point**
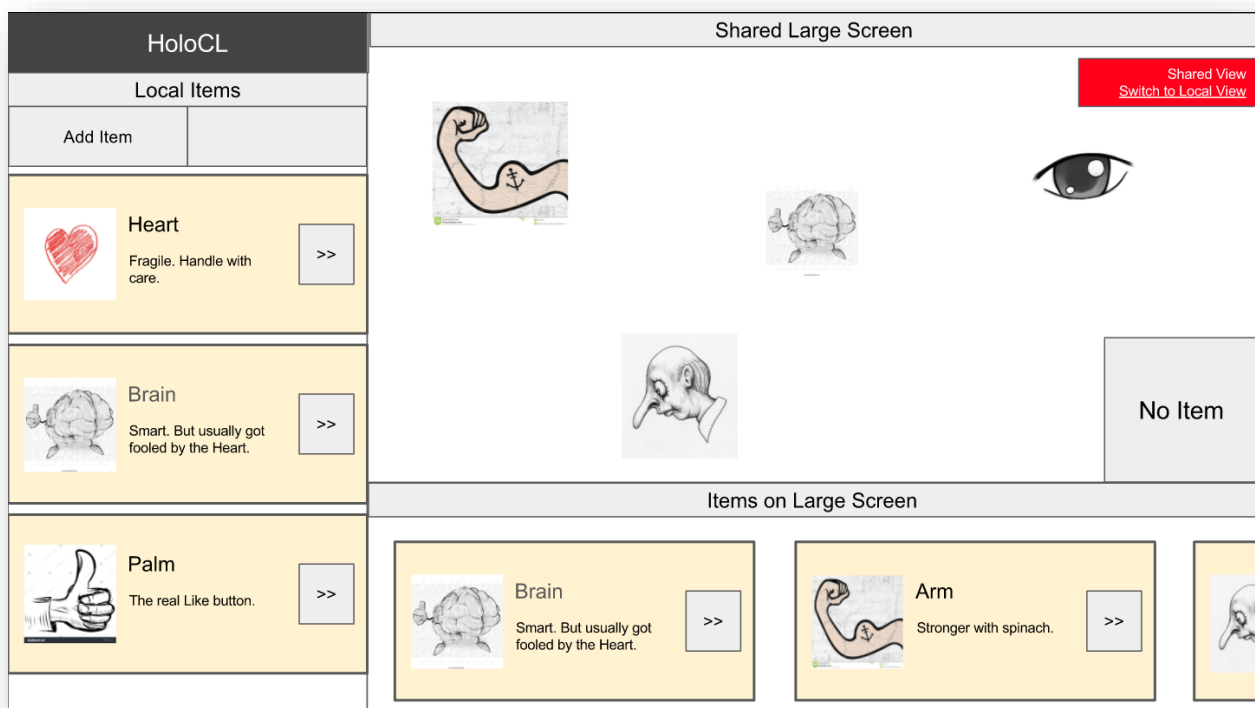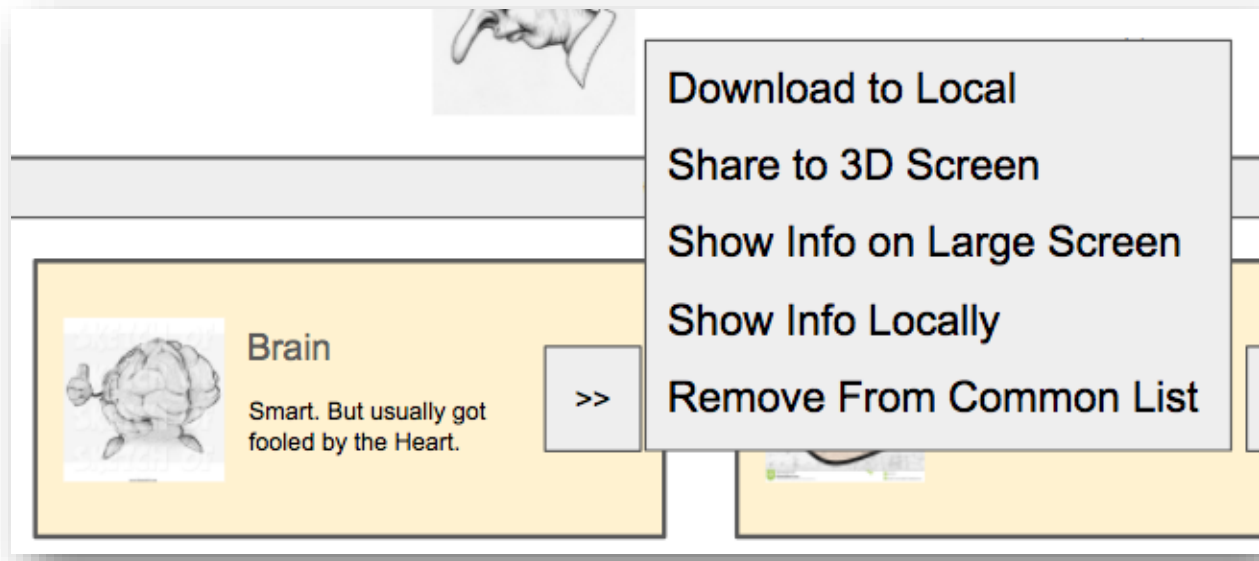
● **END POINT 1** (showing detailed information)

● **END POINT 2**: go back to the Collection View): same as Starting Point.

● **POSSIBLE PATH(S)**
  ○ In *Local Items*, user can click on the button on the right of the brain to open a context menu then choose *Show Info on Large Screen*.

OR

- ○ User can open a context menu in *Items on Large Screen* then choose *Show Info on Large Screen.*

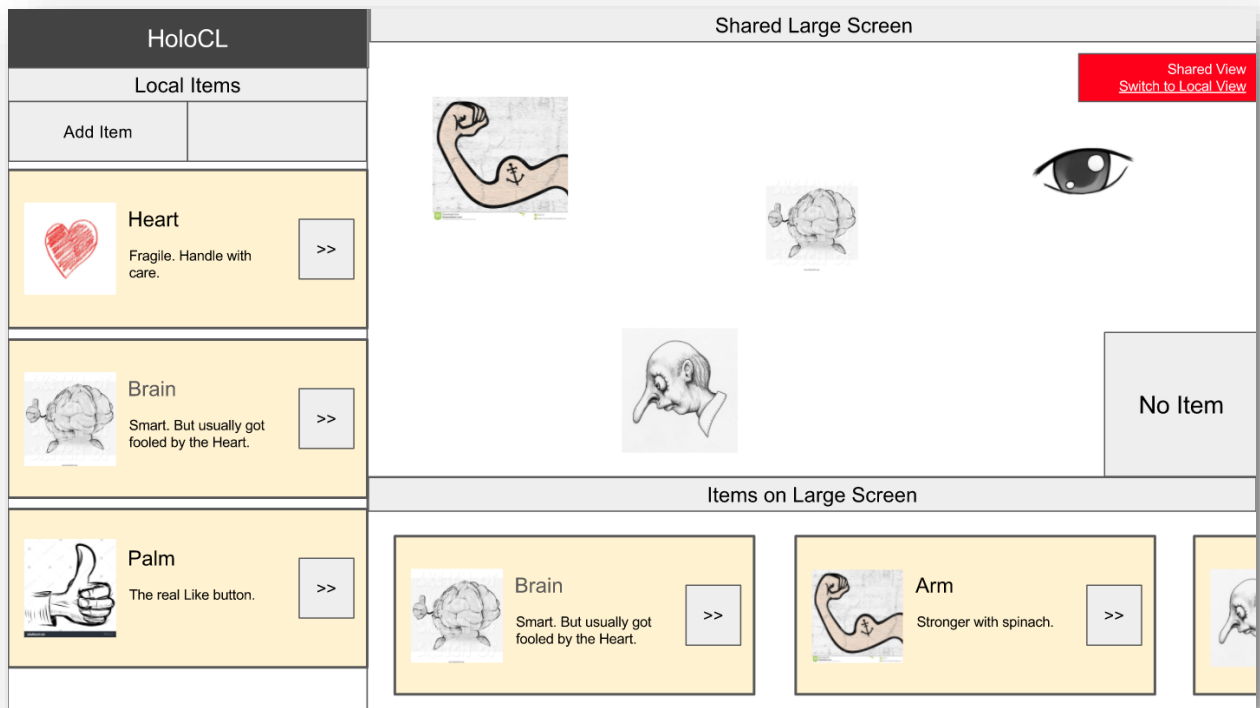## 1.5.3 TASK 3: PLACE AN OBJECT FROM SHARED SCREEN TO THE 3D PROJECTOR

1.5.3.1 DESCRIPTION

Before this meeting, you have spent tons of time on collecting materials for your report, including a cool 3D visualization. You want your friends to see it too.
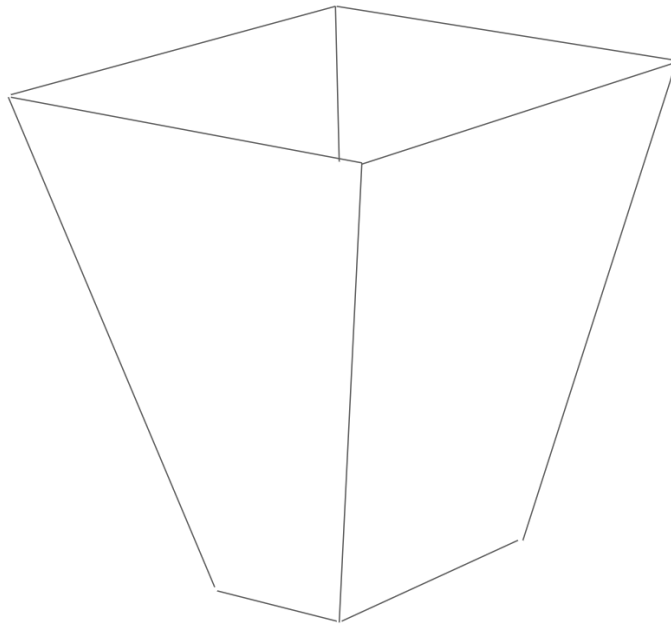
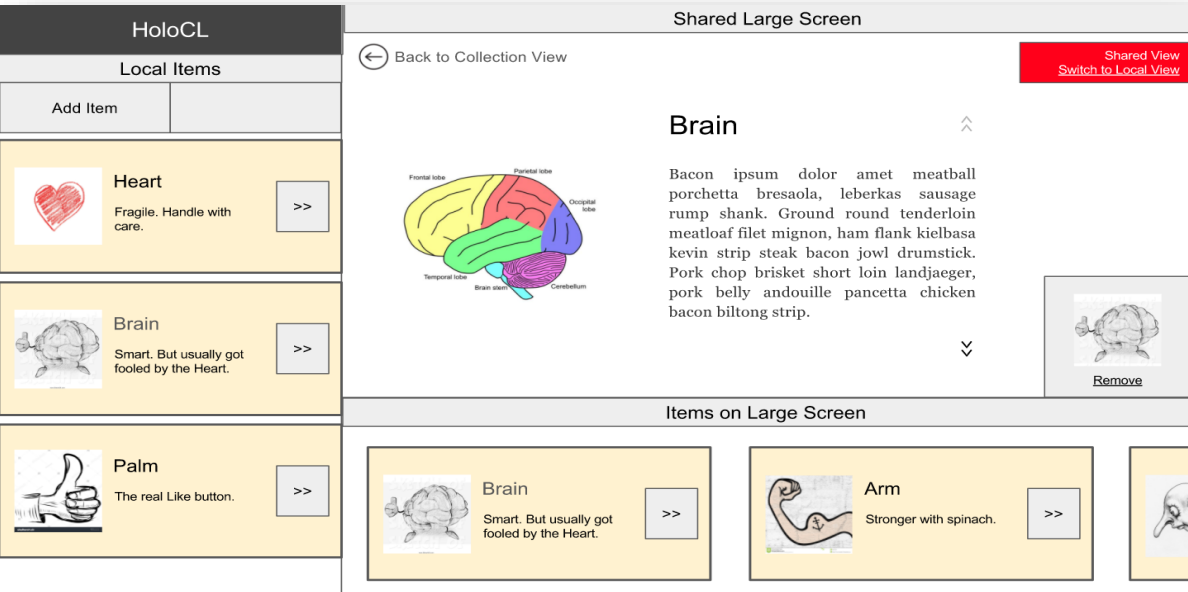Your task is to share the brain to the 3D projector.

1.5.3.2 SCREEN FLOW
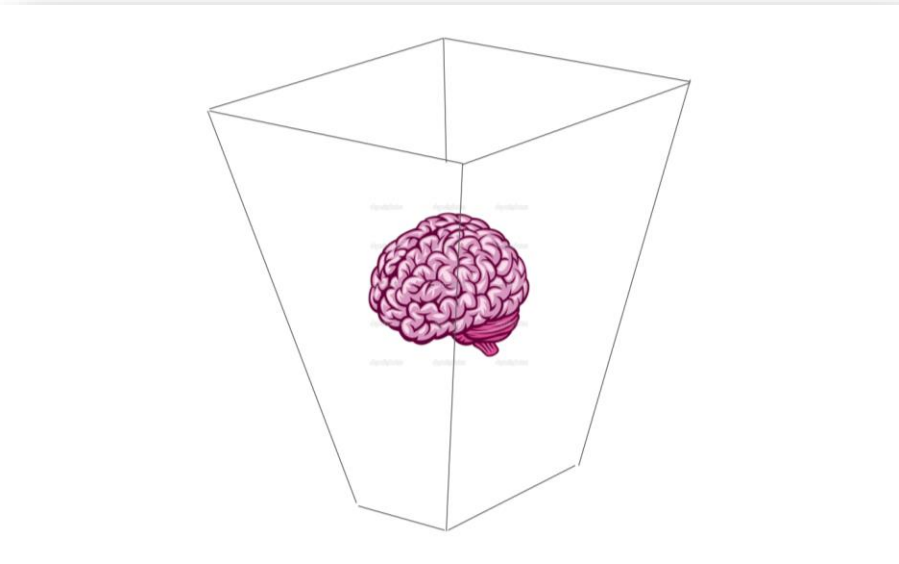
- ● STARTING POINT
  - ○ LOCAL VIEW

HoloCL

Local Items

Add Item

Heart
Fragile. Handle with care.
>>

Brain
Smart. But usually got fooled by the Heart.
>>

Palm
The real Like button.
>>

Shared Large Screen

Shared View
Switch to Local View

No Item

Items on Large Screen

Brain
Smart. But usually got fooled by the Heart.
>>

Arm
Stronger with spinach.
>>

○ **3D PROJECTOR**
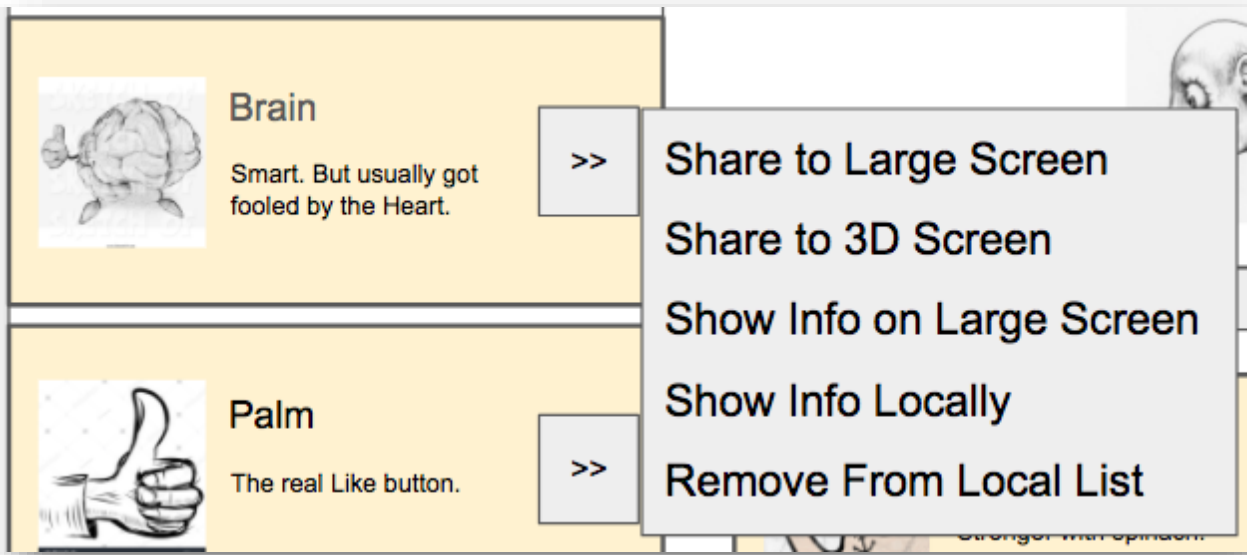
- **END POINT**
  - **LOCAL VIEW**

  - **HOLOGRAM 3D PROJECTOR**

- **POSSIBLE PATH(S)**
  - User drags the brain object from either *Local Items* or *Items on Large Screen* and drops it in the *3D Projector* area,
    Or
  - User selects *Share to 3D Screen* in the context menu

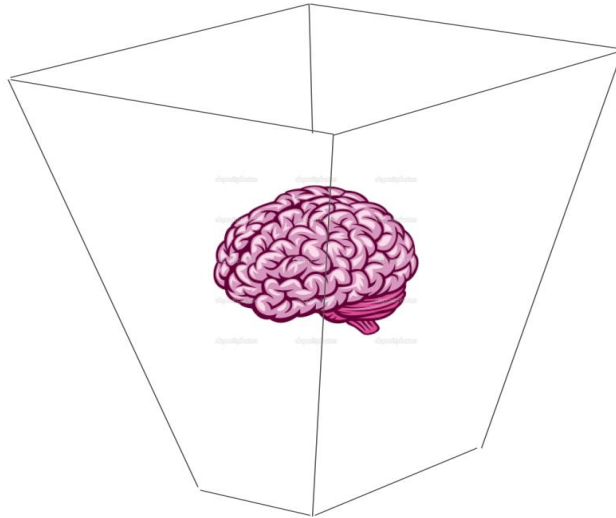## 1.5.4 TASK 4: ROTATE THE 3D OBJECT IN THE PROJECTOR

1.5.4.1 DESCRIPTION

After you have finished presenting the front part of the brain, you want to talk about parts in the back of the brain.
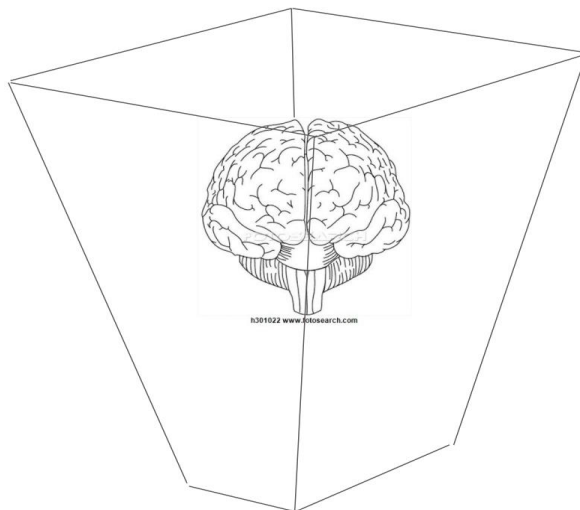
Your task is to rotate the 3D visualization of the brain in the projector until you can see its back.

1.5.4.2 SCREEN FLOW

- **STARTING POINT**

- **END POINT**

- **POSSIBLE PATH(S)**
  - User does hand gesture on the gesture sensor to rotate the 3D visualization.

EXPERT TIME ON TASK: 5 seconds:

1.5.5 TASK 5: VIEW DETAILED INFORMATION OF AN OBJECT LOCALLY
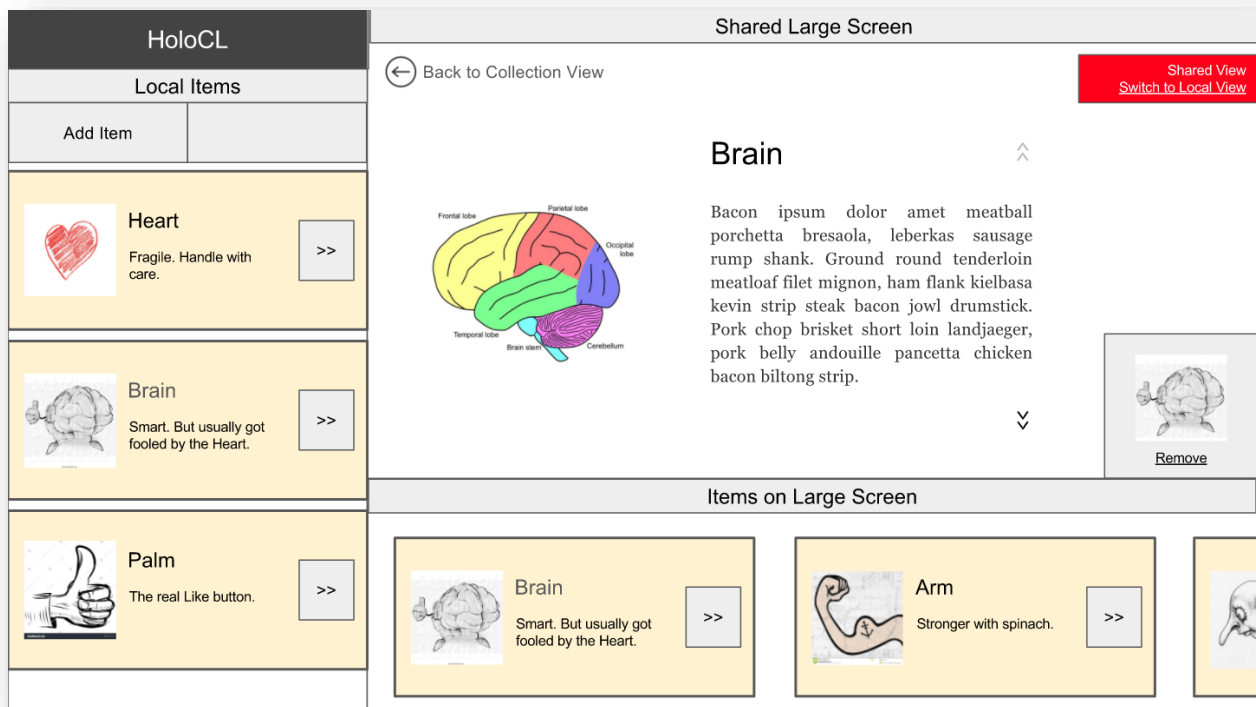
1.5.5.1 DESCRIPTION

After the brain report, you want to take a quick look at your other reports before sharing them to everyone.

Your task is to show information of the Heart locally in your computer so only you can see the detailed information.

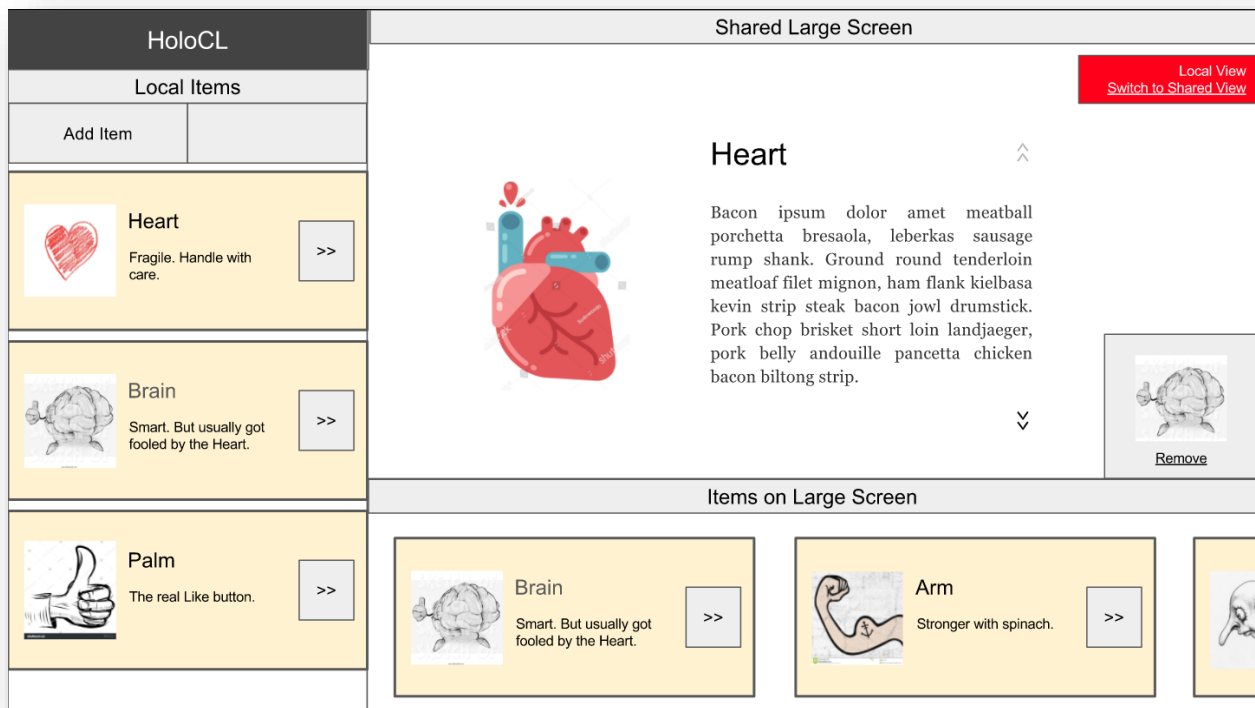After reviewing, please switch back to the Shared View.

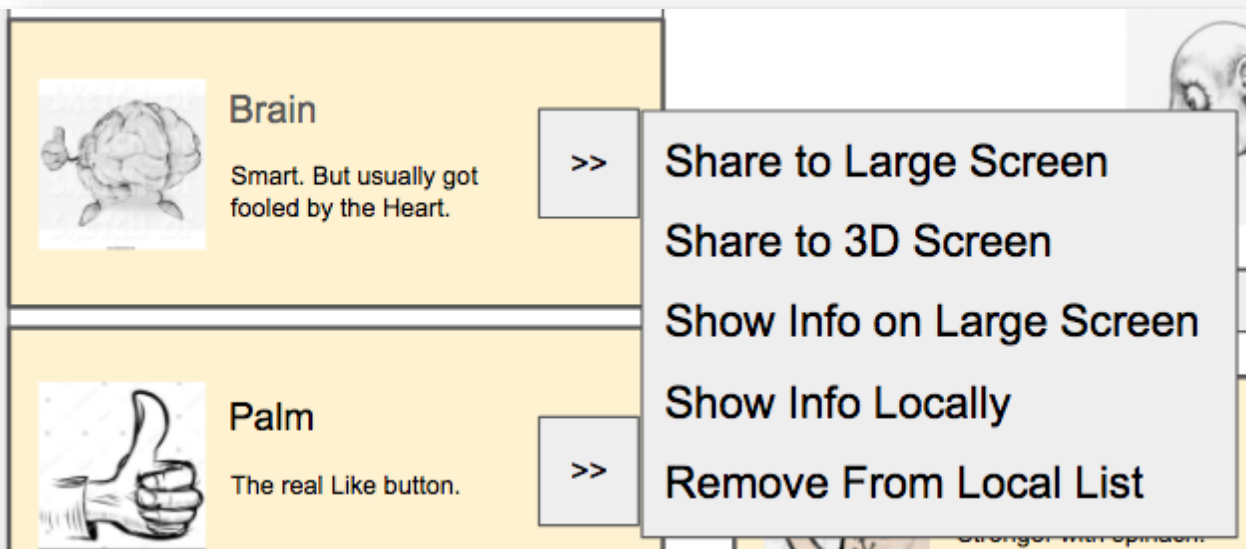### 1.5.5.2 SCREEN FLOW

- **STARTING POINT**

- **END POINT**: View the heart object in Local View

EXPERT TIME ON TASK: 5 seconds:

- **POSSIBLE PATH(S)**
  - User selects Show Info Locally in the context menu

1.6 OBSERVATIONS

TASK1

- All participants easily succeeded.
- All participants used the drag-and-drop of the item correctly in the first task, even though it is not informed.

TASK2

- 4 participants easily succeeded.
- One participant used a gesture when she was asked to display detailed information on a shared large screen.

TASK3

- All participants easily succeeded.
- Four participants used the context menu, and one participant used drag-and-drop.

TASK4

- Gestures were undiscoverable as users used different gestures while rotating.
- All participants were able to use gesture sensors when rotating 3D objects in hologram 3D projector.

TASK5

PART A:

- There was an opinion that the transition of the Local View-Shared View in the UI of the local computer was a bit confusing.
- One participant did not understand why the local list and shared list were separated in the UI of the local computer, but did the task correctly.

PART B

- All users except one user easily found the 'Back to Collection View' button.
- An unsuccessful user said she is not good at finding buttons on the screen in her real life.
- One user suggested to use a back-arrow symbol instead of '' for going back to shared view from local view.

OVERALL FEEDBACK

- The interface design and flow of the system were very natural and intuitive.
- The interactions were also very intuitive.
- The length and difficulty of each task was appropriate.
- Gestures will be made discoverable to the user for rotating and zooming object on system startup.