Project 3 – Group 8

User Analysis

User Group: Children from many nationalities and cultures.

Expressed Needs:

* To communicate with other children.
* To have fun.

Felt needs:

* To be able to express themselves fully, to communicate their experience of the world.
* To be understood, even by others who do not speak their language.
* To feel enabled and empowered to do something they haven't done before.

Special Considerations:

* Children may not be able to read well or at all so the interface must use primarily graphics and audio, not text. Also, children must be able to use the interface without reading any instructions. If help is required, there should be an option to read the help aloud.
* Children expect instant results to their actions and frequent feedback.
* Depending on the age of the child, they may not understand certain abstract concepts.
* Children may immerse themselves fully in any metaphor the interface may use and expect the metaphor to behave exactly like the real-life counterpart.
* Young children are not as coordinated as adults. On-screen targets need to be larger and further apart to allow for inaccuracy.
* Children have a preference for direct manipulation-type interface controls.
* Because they are from many cultures and nationalities, interface components need to be as universally recognizable as possible.

User Characteristics	
Age Group	6-12 years
Sex	Both male and female
Culture	Various
Physical limitations	Because they are children, the users will all be much smaller than an average adult. They have smaller hands and have less dexterity and less physical endurance than an adult. Some of the children may have physical limitations such as wheelchair use or limited movement. Children will be of varying heights and have varying reach.
Educational Background	Elementary school or less. The children may not know how to spell or read more than a few basic words.
Computer/IT use	Some of the older children may be very comfortable with computers and other technology, but the youngest will have almost no experience with them. It is unlikely even the most experienced children will have a sophisticated understanding of how computers work.
Motivation	The children will likely be motivated to use the system because they will be curious and will want to make new friends and communicate with other children.
Attitude	The children should feel curious, engaged, and entertained by the system. If the system does not engage and entertain them, the children are likely to lose interest and stop using it.

Task Analysis

Goal: For one user to communicate with another user across a distance without a shared spoken or written language.

Sub-Tasks:

1. Create a self-identity (an avatar)
    a. Choose eyes, ears, nose, mouth, and optional expression.
2. Find symbols that express the idea the user wants to communicate.
    a. Say or type the desired word.
    b. Select the best symbol from the list of results.
3. Compose the symbols into a message.
    a. Drag a symbol onto the message area.
    b. Find and drag another symbol onto the message area. Choose to either associate the new symbol with the previous to form a compound idea, or not to associate the symbols indicating they are separate thoughts.
4. Send the message to another user.

Task Characteristics	
How much does the task vary?	The actions stay essentially the same, but the specific message created will vary each time.
How often is the task done?	The task as a whole is done infrequently. The system is intended as a novelty toy, not as a regular form of communication. However, children will frequently do the sub-task of finding and selecting a symbol.
What skills or knowledge are needed for this task?	Children will need to be able to recognize pictures and understand that they represent real things. Children will need to be able to classify things into categories. For instance, they will need to understand that a dog, a parrot, and squirrel are all animals. They also will have to be able to understand the concept of speaking with someone who is in a different physical location from them.
How is performing the task affected by the environment?	Children may be easily distracted by other people and events around them. If the system is used in a public place, such as an International Children's Festival, there will need to be appropriate sized chairs or steps to allow children of various heights to use the interface. Also, if the system is in a public, there may be significant surrounding noise. Any audio feedback from the system will have to be adjusted to an appropriate volume or there will need to be ear phones.
How time critical is the task?	The task itself is not time critical. However, children will lose interest if they if the task takes too long to complete.
Are there any safety or security risks?	Yes. Parents will be very concerned about protecting the identity of their children and

	shielding the children from any inappropriate content. The system should go to significant lengths to ensure that no one can use it to exploit or take advantage of the children.
Is the task done in groups or alone?	The youngest children (5-8) will most likely have an adult supervising them while they are doing the task. Older children (9-12) may do the task alone or with an adult. Curiosity may lead other children - siblings, classmates, or friends - to cluster around the child involved in the task and offer input or try to participate as well.
Will users be switching between tasks?	Barring distractions, the children will not be switching between tasks.

Task Object	Attributes	Actions
Message	Symbols with associations Sender Receiver	Create Edit View Save Send Receive
Avatar(s)	Name Picture - hair - eyes - nose - mouth - color for all	Create Edit View Save Use
Symbol	Icon Meaning Sound (optional) Associated symbols	View Select Edit Save
Sender	Avatar Language	Create Edit View Save

Revisions:

We originally planned to represent the child receiving the message (Receiver) as well. To simplify the interface, we decided that all messages would either be displayed on a large public screen if this UI is used at a museum or fair. Or, if the UI is used in a less public space, the system will directly connect two users randomly and let them send messages back and forth.

We also added an associative property to all the symbols to carry more semantic meaning. So, now, for instance, the symbol for sandwich could have some association with Ben's avatar, to mean that Ben had or ate a sandwich.

Use Cases

Essential Use Case

User Purpose	System Responsibility
Indicate native language	Modify interactions to user's preferred language.
Understand what the application can do.	Show/teach children what they can do.
Express a sentence or idea.	Allow the expression of a wide range of ideas. Combine atomic elements of the idea (i.e. words) in a way that carries the child's intended meaning. Display a representation of the child's idea.
Communicate their idea to another child.	Send a language-independent representation of the idea to another child.

Concrete Use Case for Our Interface

User Action	System Response
Say or select preferred language. Confirms	Greet child in appropriate language. Display quick animation explaining how to use the system.
Watches tutorial Confirms	Displays and reads instructions in selected language
Create a self-representation (avatar) • Select eyes • Select nose • Select mouth • Select hair • Sets color for above • Confirms	Show the results of each change immediately. Save the avatar and display it for use in the sentence creation area.
REPEAT • Find an icon by searching or browsing • Place icon in message UNTIL idea is complete	Show icon in message where user placed it. Automatically scroll message area if current working area gets too full. Create word association if required
Send message	Confirm message sent. Return to "Choose Your Language" screen.

Design Rationale

INTERACTION

The primary form of interaction with our interface is through using a single button mouse, specifically through clicking and two forms of dragging and dropping. Both standard and sticky (click to start, click to stop) drag and drop would be implemented any time a drag and drop is required.

This action was deemed simple enough for children to use[1]. Having both where the system detects a prolonged click (duration determined by a usability test) would allow more advanced users to comfortably use the interface.

Drag and drop was also deemed the most important because it is immediately interactive, where the children can watch the icon they selected go exactly where they desire. This should help the child feel fully in control of the creation process.

If an icon is dropped on top of another icon on the canvas, the two icons will become associated. This can vary the image placement. The shift would not be great enough to make the child feel like they were not in control so much as the icon was simply auto-snapped which is fairly common in children's software. Also, by dropping an object on another is an intuitive way to do association of words.

The program will also interact with the user by reading every prompt and piece of text on the screen to the child. This is so that the child is not required to be literate to use the software. In addition to this, there will a piece of speech recognition software so the user can simply speak instead of having to click specific buttons on the interface. Clicking buttons could be difficult if the user cannot read. The user may also use the search function by saying what they are looking for instead of typing.

There is only one place the user can type and that is in the search field. This was added for several reasons. First of all, it would be consistent with any previous computer use, which at least in this country is beginning at younger and younger ages. It also allows for more complicated input from the user. Lastly, it is a simple failsafe in case the vocal recognition breaks or cannot understand a given word.

The last form of interaction is clicking on buttons. Again, this was retained mostly to be consistent with any previous computer use. Since buttons are simple to understand or at least quickly learn it should not be an issue for total novices. Also, buttons will have no text on them, instead having what are hopefully international symbols.

---

[1] http://hci.usask.ca/publications/2005/HCI_TR_2005_02_Design.pdf

FIRST SCREEN (LANGUAGE SELECTION):

The primary purpose of the first screen is language selection. Though there are very few parts of the interface have any printed text, what little there is and the speech recognition require it. On the system side of things, the default language(s) would be preselected by whoever installed the interface and can easily be changed so that there would not necessarily be a bias towards English.

The opening screen also had to be enticing enough for a child to want to use it. In addition to being visually appealing, there would be music looping through the background, interspersing languages throughout in order to prompt children who cannot read to respond to the spoken word. The default languages would also be looped through in this way.

TUTORIAL SCREEN:

The tutorial screen shows a quick demo on how to use the functionality in the main interface. This demo has a visual component as well as instructions. The instructions are both displayed and read aloud for the user. There is a single button to continue on towards the main screen.

The purpose of this screen is to demonstrate how the interface is used. Hopefully this will not be required, but since the machine is in a booth, a manual is not an option. Therefore, the only real choice is a tutorial screen

AVATAR CREATION:

The avatar creation page is to more tightly connect the user with the task at hand. It makes the story telling more personal and is essentially the signature.

The avatar is the method for dealing with proper nouns, specifically names. It allows the user to create a digital representation of his or herself; in an icon based system, the avatar is a signature. The first avatar created is the representation of the user and is drawn differently on the main screen. After the initial creation, when the page is accessed again it is to create additional people as required.

As for how the screen itself behaves, each element of the face can be customized not only in shape but color to allow the user to express his or herself however they wish. The important factor is to stress identity more than visual accuracy. In addition to all this, creating an avatar in a Mr. Potato Head or Mii manner is fun. Lastly, the face will be randomly generated each time a new one is created to avoid racial or cultural bias in the default.

The user can cycle through different hair, nose, mouth, and eyes using the arrow keys on either side of each item. When modifying the color, the user either drags the color off the color palette or clicks first on the color and then on the part modified (clicking anywhere else cancels. When a color is selected, the mouse cursor will change to indicate selection.

Also, as the mouse hovers over different areas, a selection ring will appear around those areas, denoting what the color will apply to when dropped.

The idea of using webcam pictures was considered, but abstract cartoons were deemed more appropriate for children to be sending out into the world.

The completion button is constantly updated with the current version of the face. Upon clicking the button, the entire creation page shrinks into the "new avatar" button on the main page in a similar effect to Apple's genie in OS X.

MAIN SCREEN:

The main screen is the primary part of the interface used to create the letters. In an attempt to make things as simplistic as possible, it has the minimum number of items in it while still remaining functional.

The primary goals when designing this was simplicity. Framing the canvas on all four sides, or even just two sides, makes the canvas appear larger than if there were hovering objects on top of the canvas; by creating a frame, nothing is obscured. The frame also anchors the canvas a little better, making dragging and dropping to and from it a bit simpler.

Search Bar:

The search field is primarily to search the icon dictionary for tags on images. The field is small in order to suggest that the length of input should be small, probably one word. The search button should mimic whatever icon is placed on the console to use the vocal recognition search. The search field is also right next to and grouped with the results to make it perfectly clear where the results of a search show up.

Search results:

After completing a search, the results show up in this portion of the main screen. The most relevant/common answer is in the center and larger than the other icons. This is so that both left to right and right to left based languages can read the results in the same way. The size of an icon directly relates to its relevance. Having the more common and relevant icons larger means that they are easier to use based on Fitt's Law.

When the user mouseovers an icon, it expands/grows. This behavior looks similar to the Mac OS X Dock's behavior. The purpose of this is to explicitly show which icon is selected, along with making the selected icon easier to use. If the user hovers over an icon for a period of time, the icon moves up and to the right to imply that it can be grabbed (up and into the hand cursor).

Lastly, both the search results and avatar bar a directly touching the canvas to make dragging and dropping easier.

Canvas:

The rectangular shape is to imply that the letter or story is more like a drawing and less like a linear sentence. Kids as a rule do not necessarily organize thoughts linearly, so should not be forced into creating linear messages. The canvas is an infinite scrollable area so there is no limit to how much can be created. This allows the user to create almost anything they can think up within reason.

The canvas has very wide scroll buttons to allow easy use of them no matter where the mouse is coming from.

See SENTENCE CREATION for more information on interacting with the canvas.

Trash:
The primary purpose of the trash panel is to allow the user to delete icons. Since coordination is not the greatest in children or they may suddenly change their mind, allowing them to delete previously placed icons is critical. The bin is large so that deletion is both easy and obvious.

Avatar List:
In the human experience, people are more or less the most important aspect. The avatar system allows the child to easily represent themselves and their friends; it is the equivalent of names in an icon based system. Every time an avatar is created in a session, it is saved for quick reuse. The primary avatar (first one created, the child's) is within a diamond to make it slightly more unique than the others.

The new avatar button is fairly universal. The shining rays of something new seems to be a concept reflected across many cultures, and due to international communication, the "?" mark is common enough to be used without being confusing. The button itself simply reopens the create avatar screen, doing a reverse genie effect from where it started.

Toolbar:
The toolbars primary functionality is to send the message once finished. This is why the send button is in the prominent location of lower right. The send button prompts the user to confirm send. This is because after being sent, the software resets itself, so is on par with a save and exit.

The button to the left of the sent is clear screen. This button is to allow a quick reset without recreating avatars; it deletes every icon on the canvas. Like the send button, the clear screen has a dialog box/audio confirmation question before working.

Lastly, on the toolbars far left side is the icon definition display. This prints the meaning behind the last icon placed or the current icon selected. This provides feedback on choices the user made. It is also a point of reference, marking the last word used before the train of thought got derailed. Lastly, it could possibly teach the kids new words as well as provide some cultural education (such as learning about sushi from the sushi icon.)

SENTENCE CREATION

Sentences are constructed on the canvas and are loosely associated ideas within a bubble or aura. Upon dropping the first icon, an aura is created around the icon. This "aura" represents where the user can drop additional icons in order for them to be contained within one sentence (chunk.) As additional icons are added to the sentence, the aura expands.

If the first icon dropped is not a noun then the system waits for the first noun to create the subject of the sentence. This noun is surrounded by a ring to denote that it is more important or unique than other nouns in the chunk. To add additional subjects (ie Ann and Tim,) the user needs to simply drop the other subject on top of the first. The second is then autosnapped into its proper place.

From here, any icon can be dropped within the aura. The two most common are verb icons and noun icons. Verbs that take direct objects can be paired with nouns, either by dropping the noun on the verb or vice versa. This is not required, but can make the sentence a little clearer to read. The verb is always in the back while the nouns stack on top. The lack of a verb implies "to be" or "to have." Anything dropped outside the aura creates a new sentence.

The final element of sentences is a state. A state is a property specific to a given noun or verb; a state is an adjective or adverb. An apple, for example, would have color while a place would have the time/duration the user was there. A more common example of a state would be any and all emotions applied to avatars. States are dragged and dropped on the icon they modify, and directly change the look of the icon instead of creating a new one. The exception to this is if the state can stand on its own, such as nighttime or raining. In these cases, if dropped on the aura but not on another icon (or one which doesn't take it as a property) it is just created as a standard icon.

The primary goal of this sentence structure was to prevent as much pre-thought as possible. Kids, as a rule, generally don't think a lot before they write. To accommodate for this, a naturally flowing interface was needed, where positioning and order of words do not matter. The only things assumed were that subject comes before all other elements. When researching other languages, this seemed to be a fairly common theme.

There are many reasons to have this structure. First of all, the grouping and word associations attempt to make the message clearer, but by making them optional the interface is easier to use. Since requiring association would make tasks much more difficult and harder to learn, it seemed like a better idea to have it be an advanced feature.

The idea behind the aura and the canvas is to give the child an infinite area in which to tell their story however they want. Order and absolute positioning play no role in this

interface, only the distance and associations between objects. This was to allow full creative control over the message body itself.

The addition of states was an attempt to make icons easier to understand. Instead of pairing a green swatch with an apple icon, a green apple is simply displayed. Not only does this allow for a more dynamic experience, but on both the sender and receiver side of things this feels cleaner and more natural.

The only other major choice was the verb/noun pairing. This seemed the easy way to avoid confusion between which verbs apply to which nouns without having to create a separate sentence per verb. Creating separate sentences would mean that certain thoughts would no longer be as tightly connected.

METRICS

LAYOUT UNIFORMITY:

Language Selection:

$N_c = 2$
$N_h = 2$
$N_w = 2$
$N_t = 2$
$N_l = 2$
$N_b = 1$
$N_r = 2$
M = 8
Answer = 25%

Tutorial:

$N_c = 2$
$N_h = 2$
$N_w = 2$
$N_t = 2$
$N_l = 2$
$N_b = 2$
$N_r = 1$
M = 8
Answer = 25%

Avatar Creation:

$N_c = 8$ (each face field, color selection, avatar, commit button, shuffle button)
$N_h = 4$
$N_w = 5$
$N_t = 6$
$N_l = 5$
$N_b = 8$
$N_r = 3$
M = 14
Answer = 50%

Main screen:

$N_c = 7$ (search, search results, toolbar, canvas, avatar, new avatar, and trash)
$N_h = 4$
$N_w = 5$
$N_t = 4$
$N_l = 4$
$N_b = 4$
$N_r = 4$
M = 14
Answer = 60.7%

TASK VISIBILITY:

Language Selection:

S = 2
v_i = 1,1
Answer = 100%

Tutorial:

S = 2
v_i = 1,1
Answer = 100%

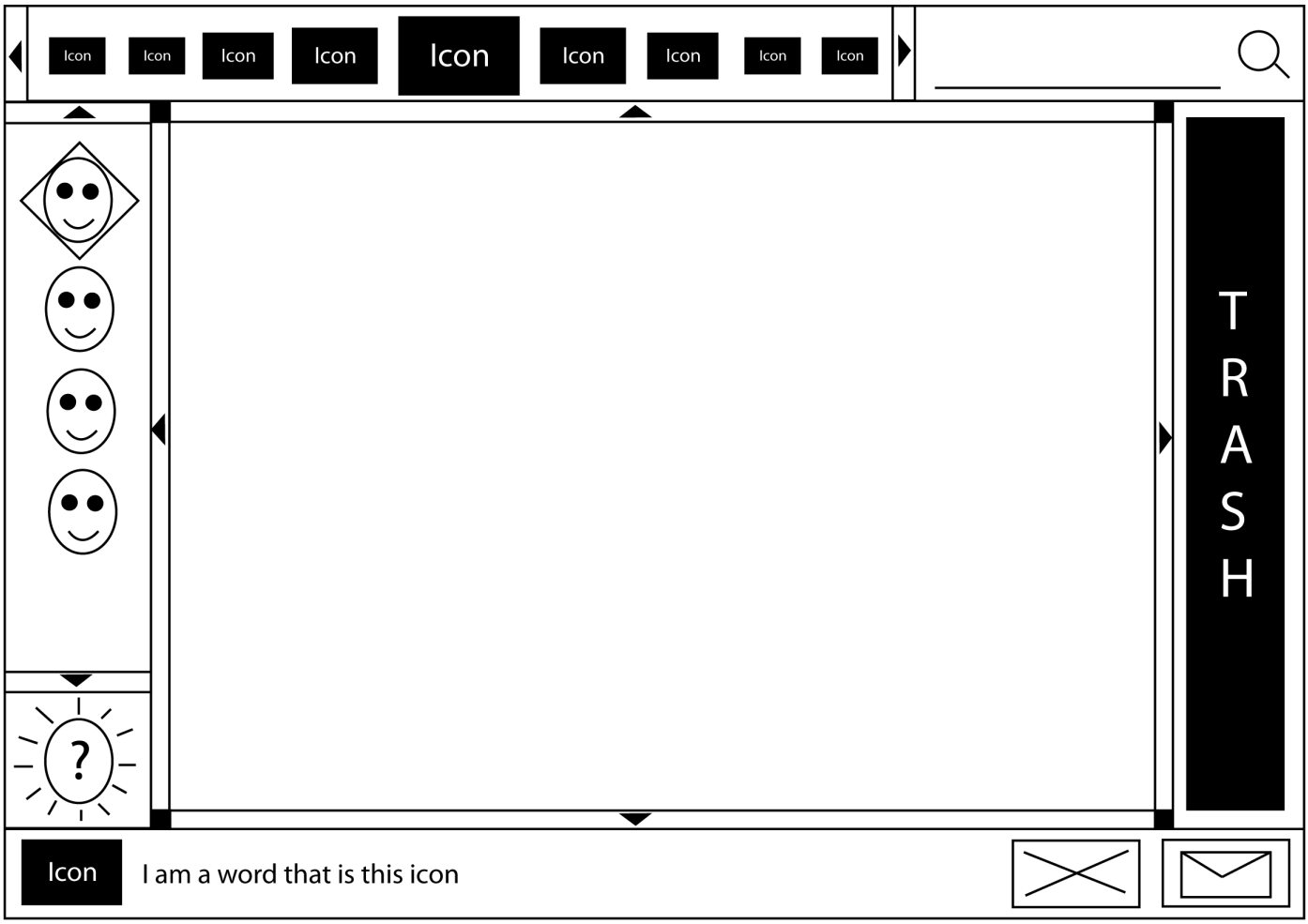
Avatar Creation:

S = 6
v_i = 1,1,1,1,1,1
Answer = 100%

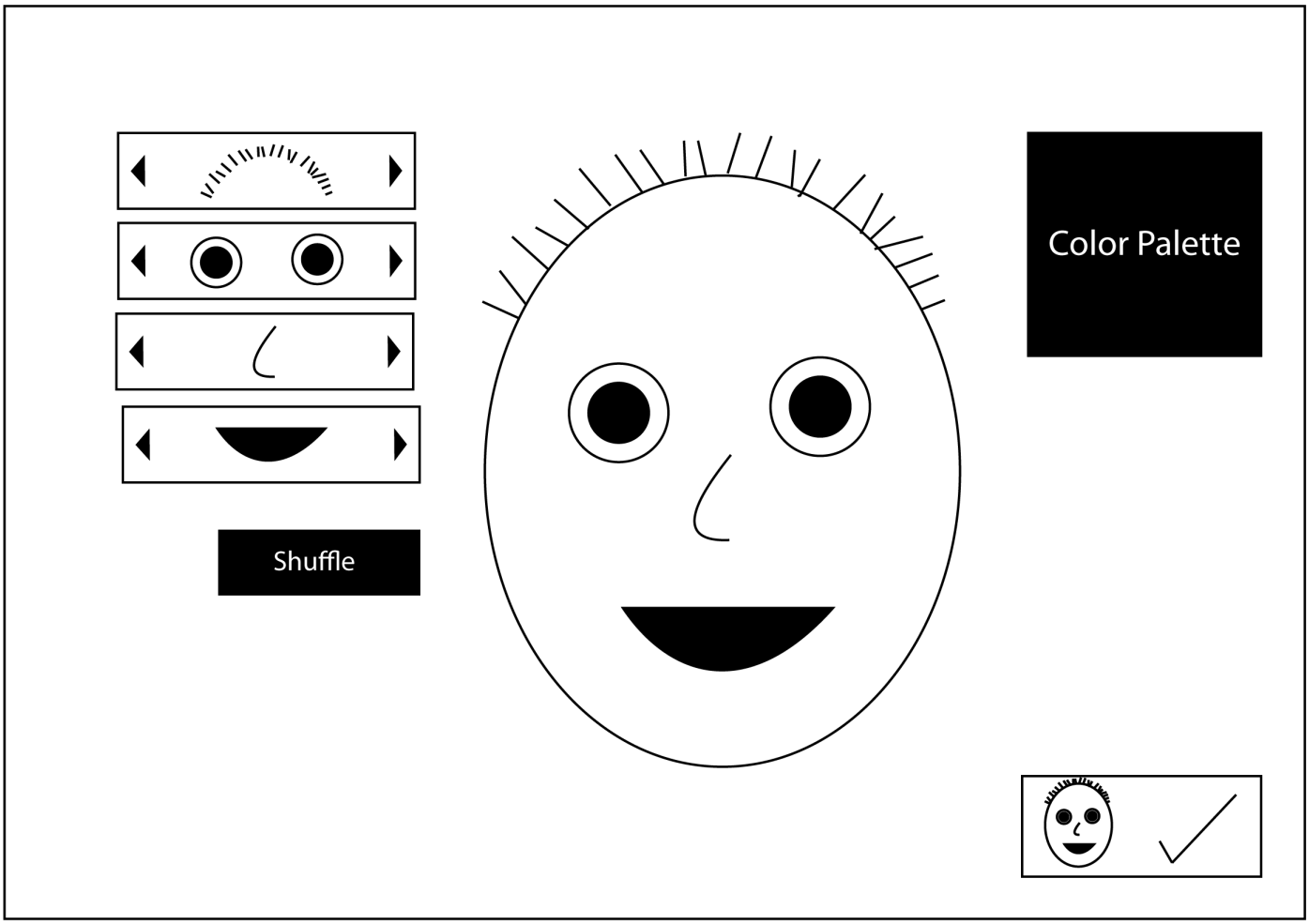
Main screen:

S = 7 (create new avatar, use avatar, find icons, use icons, delete icon, send message, confirm send)
v_i = 0.5,1,1,0.5,1,1,1
Answer = 85%

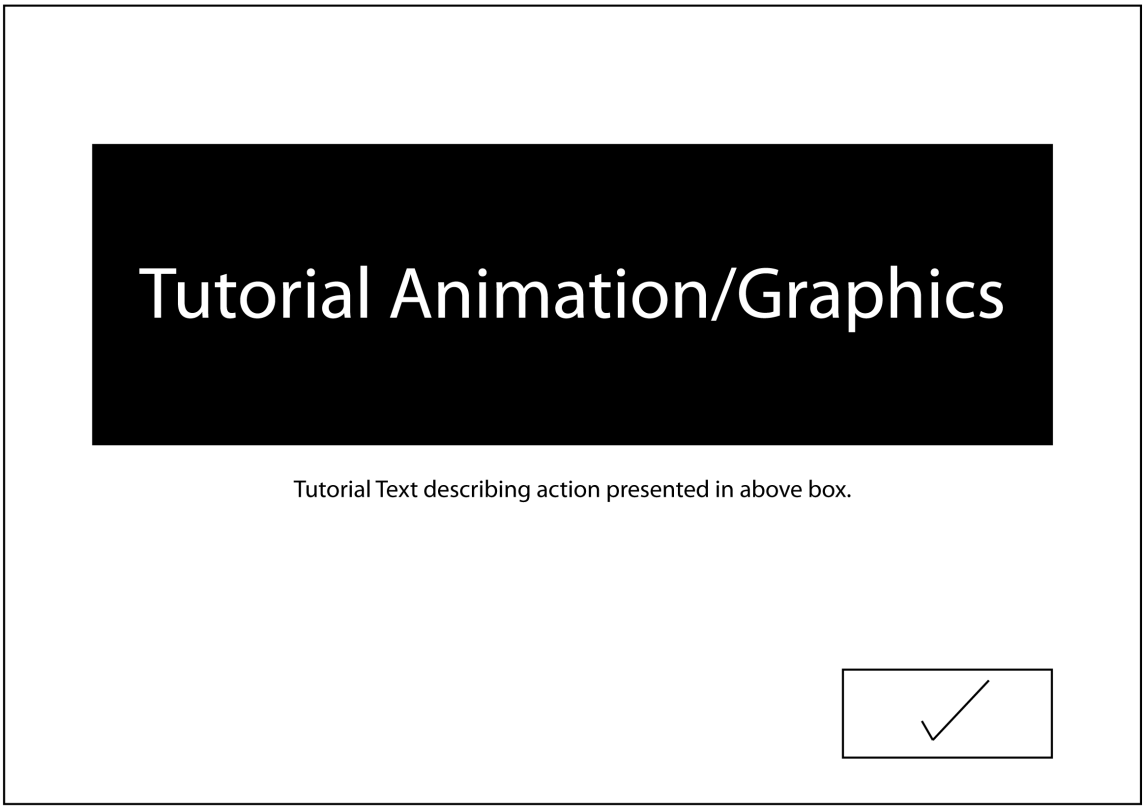
For the following 4 designs, each screen is in a conceptual/rough layout. If it were implemented, it would be fully functional. A black rectangle with white text denotes that there would be a graphic there to better represent the item in question, but that graphic is not simple enough to convey with only a few basic shapes.



MAIN SCREEN



AVATAR CREATION PAGE



TUTORIAL SCREEN

LANGUAGE SELECTION SCREEN