Semiotic Observations: An Experimental Study

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Abstract

A research study was done in SUNY Oswego with semiotics in interfaces, including mobile email applications. There are discussions over whether labels for symbols and signs are helpful in interfaces. There are also different ways to interpret signs. Daily use and exposure to technology may also influence interpretations. Volunteers were asked to rate the ease and appeal of email interfaces with different signs and indications of meaning. Axure was used displayed three emails prototypes based mobile email interfaces. Mix reactions to the signification for the "composing email." in terms of difficult ease and appeal in each prototype. The "compose" button without a label did not have as much ease as the button labeled in plain letters in one of the prototypes. The interpretation of the "send" buttons for had more favorable ratings in each prototype and had appeal with a picture sign present.

General Terms

Measurements, Performance, Experimentations, Human Computer Interactions.

General Terms

Semiotics, Signs, Symbols, Memes, Memory, Linguistics.

Literature Overview

Semiotics is often called the study of "signs" and how one thing can "stand for" something else (Sherson, 1999). Speech, imagery, and something through one of the five senses can signify or alert meaning to someone. A lot of people interact with signs every day, even without realizing it. The word "tree" can refer to what looks like what some people call a tree. Smoke can indicate fire or cigarette. A pleasant smell from the kitchen can inform a resident that something is cooking or perhaps overcooking. Traffic lights can direct drivers when to pass an intersection, with an attempt to prevent collusions. Jewelry might signify wealth, beliefs, fashion sense, culture, or personality depending on the material or design. People observe signs when driving a car, playing a video, typing a computer document, or cook with an appliance. Some people will look at a layout, like a map or a website, and understand how the layout works they understand and memorize how it works. Information is sometimes automated from previous tasks. Users on the Internet interact with the concepts and representations of different things; usually things generate signs (O'Leary, 2013). Art of Memory and Renaissance curiosities may have been influenced with the images (Codognet, 2005). The set up and design of the images could help organize information and their importance. Images would help people remember something important, such as rooms to a house (Codognet, 2005). Images were also helpful for people that were illiterate. Memory aids with using websites and interfaces. Users can learn quickly when images have conventional meaning. When images are organized and user friendly, it is easier for a user to navigate. Having the same symbols used appropriately can help the user recognize the interface better. Having a hypertext be blue and some distinguishable, can inform the user of a new "path" to jump to.

In the past there have been different ways of deciphering signs. Charles Sanders Peirce (Innis 1985, P. 1) felt that a sign could be an icon, index, or symbol. Icon would possess the character which renders it significant. Index could signify something else or is connected to the original meaning. But when

removing the connection, the index may not have as much meaning or even lose meaning (i.e. smoke from fire, bullet hole signifying a gunshot). Symbol itself loses the character which renders it a sign if there were no one to interpret. Such is any utterance of speech which signifies what it does only by virtue of its being understood to have that signification.

For Ferdinand de Saussure (Innis 1985, p. 24), the use of language can have a big impact on semiotics. Language is connected to a community of speakers. Calling something a "tree" is a sign for the item identified as such. There has to be a relation between a sign, signified, and signifier. The meaning of language and sign also depends of the messengers and the community exposed to the sign.

Susanne Langer (Innis 1985, p. 87) implied that presentation can influence a sign. Roland Barthes (Innis 1985, p. 190) felt that of a sign can change when removed from its original setting; something the colors and language can change the meaning of a sign. Umberto Eco (Innis 1985, p. 245) examined myths and metaphors along with language. Eco also observed the games of Swedish stall-bars with very busy diagram). Something can be retraced itself into a "field of nation" or sometimes a sequence of binary choices (Innis 1985, p. 245).

Emoji's are not always known as central topic in internet communication (Danesi, 2016). However, an emoji can be a "sign" or signification for something else. Each emoji has something that makes it distinctive from some of the other emoji's. Resembling someone's face or a popular use of a "smiley face", the curves of the lips, shape of the eyes, and color of the face can reveal a person feels in a text messenger. Some people do not have a yellow face, but his or her face can turn red if angry or embarrassed. To make the face distinguishable (or different from the angry face), the kinky or devil emoji is purple with point horns (Danesi, 2016). Most of the emoji's indicate a messenger's emotions and feelings. Some emoji's can show a person's interest or activities, such as paw prints or a car. Some people use fruit and vegetables as substitute for something more explicit. Some may use a certain messy emoji while under the impression that it resembles chocolate ice cream.

Not all websites use standard emoji's, but may use images to despite emotions and conditions. When an image is relatable, it can be easier to understand. Using images instead of language is also common in this digital age.

Culture influences the mind and possible ways to define oneself. The role of language can influence thought as well (Bownds, 1999).

Some symbols and objects have a different meaning to different people. A candle could just be a candle to one person, but to another person it could signify hope, item to light a room, a religious piece, or something used on someone's birthday cake. It could relate to V. N. Volosinov's two elements of expression: the inner something which is expressible, and its outward objectification for others or oneself (Innis 1985, p.51).

Aaron Koblin looked over the different ways sheep are viewed and used in the market. Sheep can be viewed as followers in religious teaching and assorted stories. Sheep have been used for wool, milk, meat, and even cloning (Koblin, 2006). It can be interesting how there could be much discussions, depictions, and contributions revolving around a simple animal.

Koblin mention the novel *Le Petit Prince* (The Little Prince) in one of his sheep market essays. A little boy asked a pilot to draw a sheep for him and criticize the appearance of each sheep. The pilot handed over a picture of box implying the sheep hidden inside. With a 'view outside the box,' it could suggest that there could be different goals and objectives guiding his process (Koblin, 2006). Also in the original book, the pilot in his younger days drew a picture of boa that swallowed an elephant. Although the original message (from the pilot) illustrated something that could scare people, many of his elders viewed the image as a harmless hat (De Saint-Exupéry, 2018).

Internet "memes" are not traditional signs but can delivery some messages with a similar meaning. A cognitive meme can be habits, skills, behaviors, accents, or stories that are copied from person to person by imitation (Blackmore, 2017). Some memes can be like genes inherited through language or passed from brain to brain (Blackmore, 2017).

Internet "memes" have become a popular part of social media since the beginning of the 21st century. A lot come and go. When shared with enough people, the meaning of a meme can be recognizable like a traditional sign. But there would still be people that do not the meaning let alone the original origin of the media. The original pictures usually have a different story from the recreation of the meme, but usually follow the same theme if shared correctly. For example, the Shiba Inu "Doge" in real life was rescued by a caring Japanese Kindergarten teacher. Over the internet, with comic-san text, the photo of her dog posing is surrounded by words including "so, such, much, wow." Usually the dog is reimaged by strangers; even the dog's face is photo-shopped into cakes. In some cases, memes with any Shiba Inu will do (Marino, 2015). The message and setting changes, but impact is more interesting when the have a common theme.

There are different "memetic radicals" such as spreading, transforming, and imitating (Marino, 2015). The proper memes has text that needs to be transformed to be meaningful to the user and may require transformation of the source text to exist (Marino, 2015).

When using an image with a linguistic message, anchorage is a frequent function from a Roland Barthes form of thinking (Innis 1985, p. 198). Sometimes from a Roland Barthes style of thought, a meme can be sign with a different meaning when removed from its original context. Some "memes", both in language and over the Internet, is used and understood by others for many years (Marino, 2015). Other memes are forgotten, not used as frequently, or simply just die. The idea of a house signifying the home page of select websites is an idea used and shared among others over the years, even though some families live in apartments and other buildings. The image of a floppy disk is used to signify a "save" action like the computer item in the past, even though some younger users may have not seen or used a physical floppy disk. Some of the "winning" memes in general either stay with society and become contagious, while others fads fade away (Blackmore, 2017).

The design of an interface itself can change the interpretation of a sign or influence decision making. With a good memory and a better design, goals are easier to achieve. When the design makes tasks more forgettable, actions are not as successful. Short term memory (STM) retains much of the most recent experience; some is retained automatically and retrieved with little effort (Norman, 2013). Most of long term memory (LTM) has information that is not as recent. Sometimes when regaining past memories, it can be like gathering bits and pieces as oppose to exact recordings (Norman, 2013).

For example, when creating a website interface, a good design may not require the user to pause and ponder the meaning of a function, symbol, or sign present. A decent web design would help the user remember where he or she is, and inform the user what page is displayed currently (Krug, 2014). Sometimes a banner, a title, a picture, or change of display could inform the user where he or she is while viewing a website. Sometimes when a Web Designer creates a website, the user approaches it in a different manner. What is displayed on the front page of a website might be different from visitors are searching for when visiting the website (Krug, 2014). For a website, one has to realize what it to be necessary and what may not be necessary. Sometimes a simple web design is easy to understand than website with too many "needless" words (Krug, 2014). It is helpful when a creator of an interface or message goes over what a user could be thinking when visiting a website. A good design would be helpful to the users and inform them where they are.

Slips and mistakes interfere with completing tasks. Simplifying things could make tasks easier to remember. Convenience can help with perform task better. There also human error. Interlocks help prevent users from making easy mistakes, such as opening a running microwave or the user being ask to "save" changes when close a computer document.

Cognitive scientist Don Norman critiques some poor designs, including doors and inventions. He implies that if a simple door has labeled instructions, then it indicates a poor design. If something that is required to be used often is not visible, then it may be a poor design (i.e. stripe door blending in with a striped wall). If something is designed well, a user may remember how to use it after learning about it or using it

the first few times (Norman, 2013). Perhaps with a good design, one does not need to be a rocket scientist to use an invention or control panel.

Motivation and interests can influence memory and reaction to one's environment. There can also be interferences with memory and forgetting when using a device or interface. Elizabeth Loftus in the past felt that people may not store information when they did not really want to remember in the first place (Loftus, 1980). Short term memory can last for seconds and sometimes a human being handles multiple activities. Information also does not get stored when a person does not pay enough attention, making information retrieval difficult (Loftus, 1980). A modern day American penny has numerous key features, images, and words many spenders would recognize. However, each person (at least in studies) recalls different features from memory (Loftus, 1980, pp.74-75).

If an applicate or device is used repeatedly, the icons' functions can become more recognizable. It is debatable if labels are helpful or just "needless." Not everyone needs to be told twice what something does. But if a sign is not universal, would it be difficult for the user to understand without any labels.

METHOD
Participants
Many of the volunteers had connects to the Oswego college and had origins from various countries. Some of the participants included young adults early in the study. Older participants also volunteered in the study. Some responded to emails sent out to Human Computer Interaction students from their professors. Emails were also sent to people outside of the college campus. Later, messages with a link on Facebook were posted to "friends." Colleagues and aquatints willing to volunteer for the survey had URL link sent to their e-mails.

All the participants had to be at least 18 years of age. Disabilities and pregnancy status were not stated. Participants were encouraged to perform the survey on a personal computer and not a mobile device since the URL links to the Axure prototype had to be cut-and-paste to new window tabs.

Design
There were three interactive prototypes uploaded by Axure that resemble a popular e-mail application. One is the "original" email where the action buttons consist of symbols or signs. The second had labels added to the action buttons next to the symbols. And the third had words without pictures, signs or any other symbols.

Independent variable (IV) would be three e-mail prototypes created with Axure. *Dependent variables* (DV) would involve the users' rating and satisfaction of each prototype. This would be *with-in subjects*, as each user would use and critique all three prototypes.

Originally the IV was between two website prototypes about the human brain, but this idea was later changed to e-mail prototypes. The Axure brain prototypes originally included one with a navigation with plain text (https://wpyag3.axshare.com/#g=1&p=home) and a prototype with images added to the navigation bar (https://vshlvk.axshare.com/#g=1&p=home).
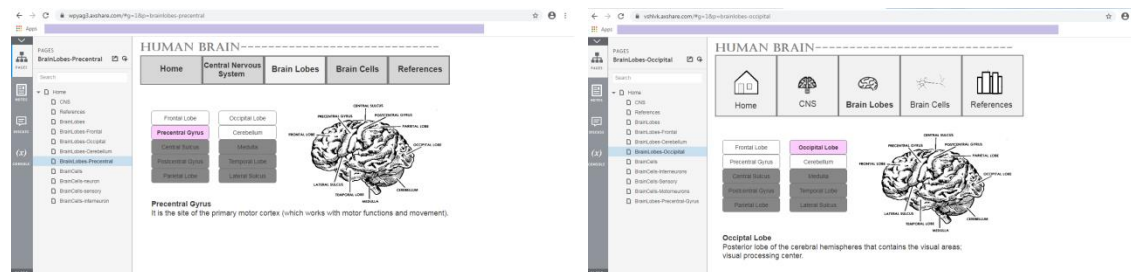
Screenshot of Brain Interface Axure prototypes with plain navigation (left) and navigations with pictures (right). Information referenced from *Biology Mind Origin Structure: Origins and Structures of Mind, Brain and Consciousness* (Bownds, 1999).

For the semiotics research using the email prototypes, the hypothesis was that the first prototype with just symbols would be more difficult to understand than the second prototype with labeled symbols or the third prototype with plain labels.

There was an alternative hypothesis that the third prototype without only words would be *less appealing* to users than the other prototypes.

The hypothesis would be focused on the three prototypes, although the users were asked about signs presented on desktop emails and the mobile version of YouTube.

Materials and Programs
On a desktop computer preferably, participants would answer some survey questions created with *Qualtrics*. Participants would also observe screenshots and interact with three imitations of mobile email applications created with Axure RP 8. Because the survey had URL links that had to be cut-and-paste into new window tabs, volunteers were encouraged to complete survey and tasks in personal computer, as opposed to small mobile devices. Active Internet was required for the procedures and tasks.

Procedure
The participants would click on a link for the *Qualtrics* survey. There a brief description of the survey and text box for "consent" with the volunteer's name. Their names of the volunteers are kept anonymous and not shared with the public. This survey was designed so any volunteer can take the survey without the need to meet the conductors of the experiment in person. Volunteers for this experiment were advised to take the survey on a personal computer due to the prototype links getting cut and paste into new window tabs.

Each volunteer was asked personal questions, such as age, gender identity, nationality, and first language. Among 28 users, at least 21.4% of the users were between the ages of 23 - 29, and about 50% users were above the age of 45 years of age in this experiment. About 21.43% of the users were between 30 – 45 years of age, and 7.14% were between 18 – 22 years of age. Almost 42.9% of the volunteers identified themselves as male, and almost 53.5% of the volunteers identified themselves as female, while one volunteer selected "other." At least 81% of the users had English as their first language. There was a plan to ask for highest level of education, but it was not included in this survey. Users in this experiment were asked if they check emails on personal computers or mobile devices. 88.89% of 27 users check emails on a desktop computer, while 88.29% of 28 users check emails on a mobile device.

When users were asked about their knowledge about "semiotics," there were different reactions. 25% claimed to know very little, 32.14% knew a little about semiotics, 35.71% knew a good amount, and 7.14% knew an expert amount. Users were also asked how they each knew about "memes." 21.43 % did not know much about "memes", 39.29% knew a little, 32.14% knew a good amount, and 7.14% knew an expert amount. After answering the questions, the next page of the survey briefly described the meaning of semiotics. On the same page, there a cognitive description to define memes as well as how people identify with memes shared on the Internet:

"Semiotics" is the study of signs. There different ways of identifying signs, symbols, or indications. The meaning of a sign depends on the messenger, the listener, or evening the setting. There is not one way to identify a sign. Some symbols can have a deeper meaning to one person than another.

The symbols on technology are signs. The images glowing on the dashboard of car are signs. Words in the human language can be signs.
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"Meme" in cognitive science is a 'cultural gene' that can be shared and imitated through language and behaviors. Meme is a non-biological form of replication sent from one brain to another brain. A foreign accent, fashion styles, and some music tunes can be memes.

Over the Internet, a "meme" can be edited and shared through social media pages and search engines. Sometimes a meme can be an image or video. Popular memes include "Doge," Fry from "Futurama" asking questions, "Hamster dance" Web-page, "Charlie bit my finger" video, and happy birthday memes with people's name.

The next portion of the survey after the page break, informed the volunteers of the upcoming tasks. The volunteers were to be shown pictures with signs and symbols. The volunteers would rate how they feel about the present symbols.

The first image was a screen shot from a YouTube video presented on a mobile phone (SIMI TV, 2019). The users would rate (on a five point scale) if they each thought the meaning of symbols were "very poor" or "very good." Signs include "Thumbs Up" for liking a video, "Thumbs Down" for disliking a video, "Arrow" for sharing (with the word "Share"), "Down Arrow" (with the word "Download"), The "save" plus sign image, and the play "triangle" above the video screen to resume playing. The users were not asked the subscribe bell or profile image.

For the screen shot image of the YouTube video present on a touch phone, the "play" triangle was such a recognizable sign that at least one volunteer attempted to use to "play" a video. 53.85% thought that the triangle was "very good" symbol for play.

The screen shot of YouTube video was taken on a mobile phone July 2019. With the exception of multiple relocations of the comment sections and other updates, the symbols on the application were very similar to YouTube application in January 2020.
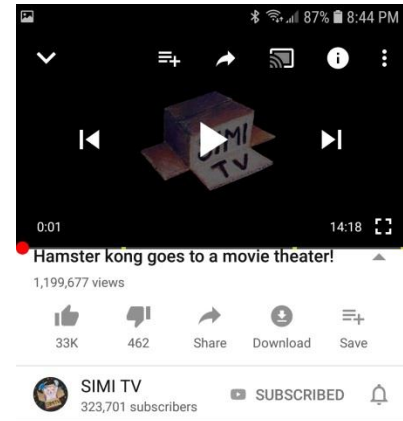
| Question	Very Poor		Poor		OK		Good		Very Good		Total
"Thumbs Up" for liking a video.	0.00%	0	3.85%	1	23.08%	6	34.62%	9	38.46%	10	26
"Thumbs Down" for disliking a video.	0.00%	0	3.85%	1	23.08%	6	34.62%	9	38.46%	10	26
"Arrow" for sharing ("Share").	0.00%	0	7.69%	2	38.46%	10	23.08%	6	30.77%	8	26
"Down Arrow" ("Download").	7.69%	2	7.69%	2	30.77%	8	30.77%	8	23.08%	6	26
The "save" plus sign image.	3.85%	1	23.08%	6	50.00%	13	15.38%	4	7.69%	2	26
The play "triangle" above the video screen to resume playing.	0.00%	0	3.85%	1	15.38%	4	26.92%	7	53.85%	14	26

Percent rating of symbols and signs in YouTube (SIMI TV 2019) screenshot.

Answering questions about symbols in the YouTube image and screen shots of email interfaces may have required scrolling up and down since the images and question not side by side.
After answering question about the YouTube symbols, the volunteers had to answers questions for the first of three versions of the email prototypes. After this portion of the survey, a few volunteers were having difficulties answering the proceeding questions.

The first prototype required the volunteer to copy and paste the provide link to a new window (https://8mp0hb.axshare.com/#g=1&p=home). Each user was requested to *push the present icon to compose "new" email. With out typing a message or sender, "send" the email.*
The prototype is actually a screen shot of Gmail from a mobile device (taken in 2019). The "plus" sign (+) for creating and composing emails in the bottom left corner was a creation of Google. The "plus" sign does not include the words "compose," "create" or "new." The next page does not have words for "attachments" or "send." On the second screen of the prototype, the page that resembles a "new" email after clicking on the "plus" sign has a paperclip and a paper airplane. A message on the third screen would appear to inform the user that a "message" was sent and continue the survey. Since this was a prototype, no real emails were sent but select buttons function the same way.
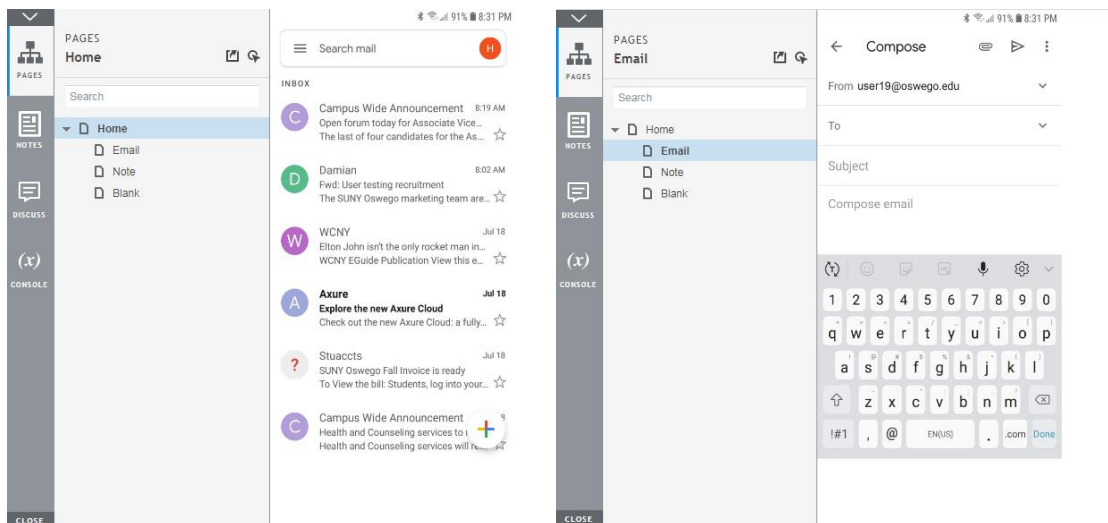
Screenshot of first part of the first prototype (left) and the screenshot of the email composition in first prototype (right).

On a five point scale, the users were asked if they each thought the buttons for the colorful "plus" sign (+) in the bottom of the screen (for composing email) and the "paper airplane" (for sending an email) were very hard or very easy. They were also asked on a five point scale the appeal of the two signs.

The second prototype required the volunteer to copy and paste the provide link to a new window (https://1u577l.axshare.com/#g=1&p=home). This prototype had the "compose" button edits with the words "Compose Email" were written over a faint "plus" sign on the first screen and the "paper airplane" symbol included the word send on the second screen. Tasks to" create" and "send" were similar to the first version. It was later implied that the compose button was not responding correctly for at least two users.
On a five point scale, the users were asked if they each thought the buttons for the faint "compose" button in the bottom of the screen (for composing email) and the "paper airplane" with the word "send" (for sending an email) were very hard or very easy. They were also asked on a five point scale the appeal of the two signs.
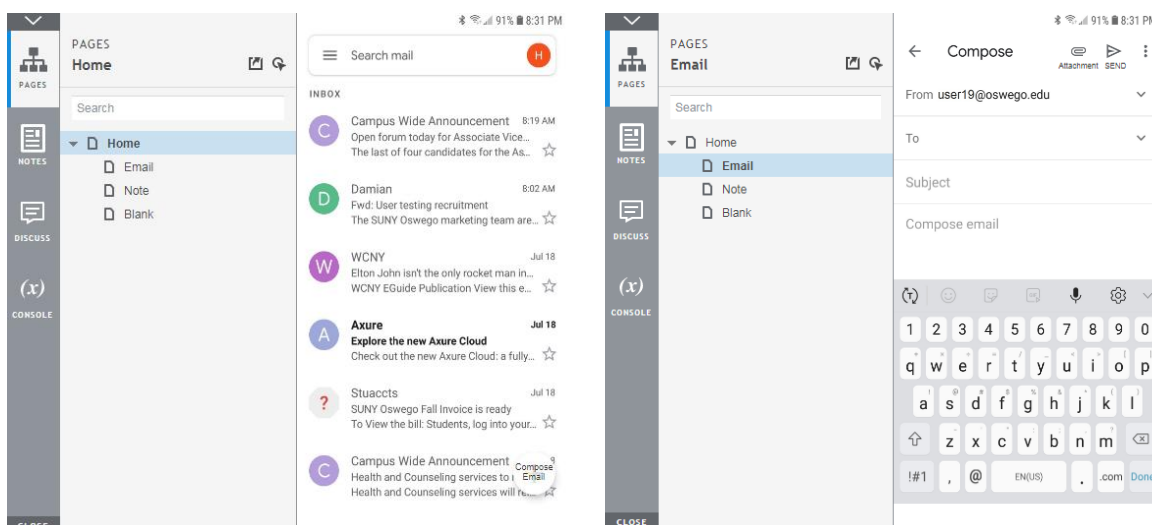
Screenshots from second Axure prototypes that features labels along signs for functional buttons.

The third version of the prototype also required the volunteer to copy and paste the provide link to a new window (https://iug3dm.axshare.com/#g=1&p=home). A square-like box was edited into the bottom of the screen with plain words that said "COMPOSE EMAIL". The second screen in the third prototype had not symbols of paper clips or paper airplanes. This screen included boxes with plain words including "SEND." On a five point scale, the users were asked if they each thought the buttons with the words "COMPOSE EMAIL" (for composing email) and the word "SEND" (for sending an email) were very hard or very easy. They were also asked on a five point scale the appeal of the two signs.
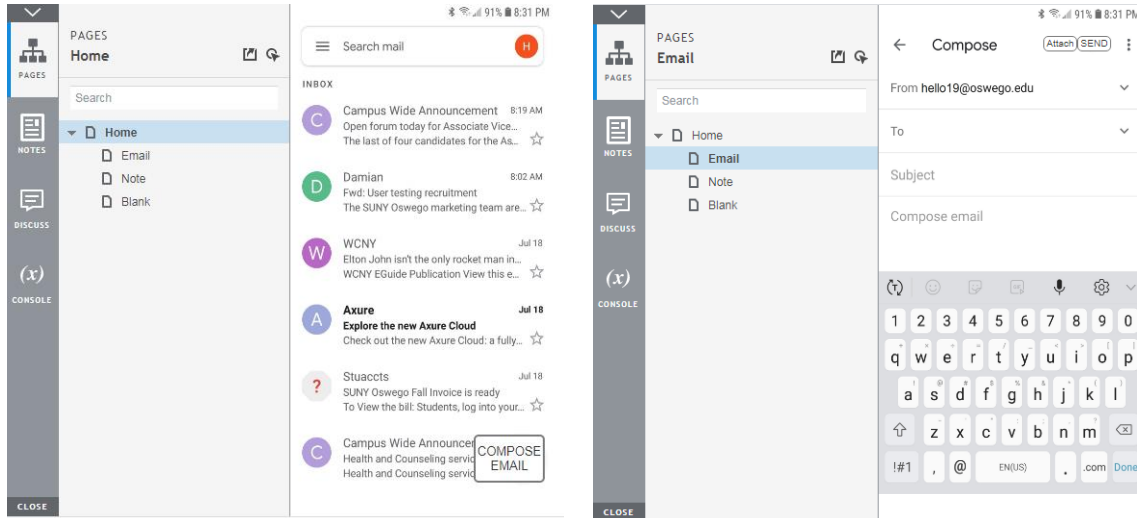
Screenshots from third Axure prototypes that feature plain text in functional buttons.

The volunteers the also a few more questions and examples were given. After interacting with the email prototype based off the mobile application, volunteers were shown a print screen of Google's email from a desktop computer. The colorful "plus" sign is presented on the same button labeled "composed." Volunteers were asked to rate the signs as poor or good.
A similar was shown of Yahoo email design. Volunteers were asked to rate theses signs as poor or good. At least one user selected "I do not know" for the "Compose" button on Yahoo which had no symbols.
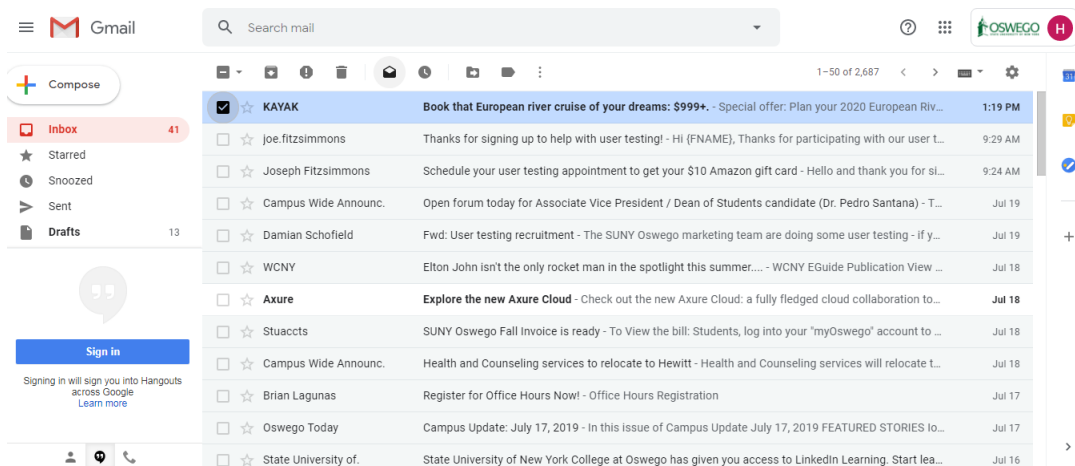
Edited screenshot of Gmail presented to users.

Question	Very Poor		Poor		OK		Good		Very Good		I do not know		Total
"Compose" button	0.00%	0	9.09%	2	13.64%	3	31.82%	7	45.45%	10	0.00%	0	22
Octagon with "!" means "Report as Spam"	4.55%	1	31.82%	7	27.27%	6	22.73%	5	13.64%	3	0.00%	0	22
Trash can means "Delete"	0.00%	0	0.00%	0	13.64%	3	22.73%	5	63.64%	14	0.00%	0	22
Navigation List on the left side	0.00%	0	4.55%	1	4.55%	1	45.45%	10	45.45%	10	0.00%	0	22
The design of this page	0.00%	0	0.00%	0	22.73%	5	40.91%	9	36.36%	8	0.00%	0	22

Rating for Gmail interface, when users were asked what they thought *of the following* signs.
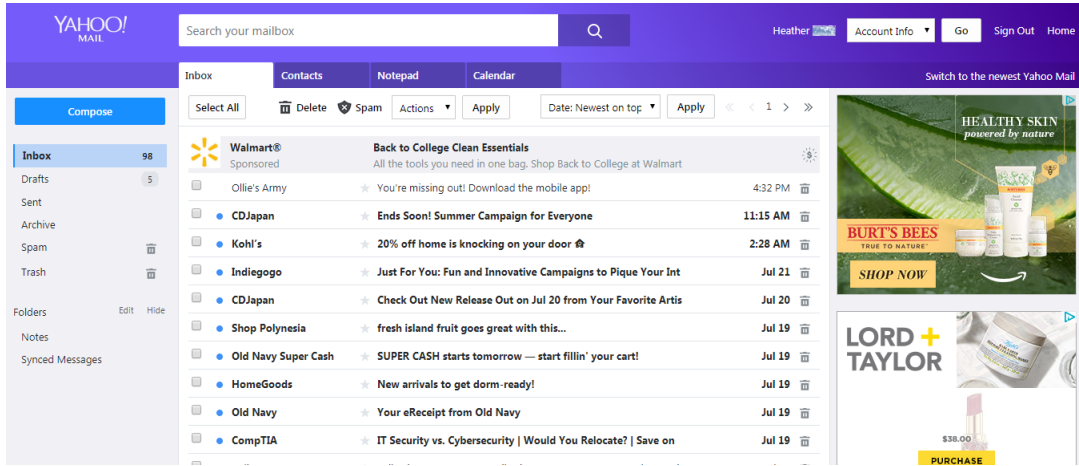
Edited screenshot of Yahoo! presented to users.

Question	Very Poor		Poor		OK		Good		Very Good		I do not know		Total
"Compose" button	0.00%	0	9.09%	2	27.27%	6	40.91%	9	18.18%	4	4.55%	1	22
Shield with "x" means "Spam"	0.00%	0	4.76%	1	33.33%	7	23.81%	5	38.10%	8	0.00%	0	21
Trash can means "Delete"	0.00%	0	0.00%	0	22.73%	5	36.36%	8	40.91%	9	0.00%	0	22
Navigation List on the left side	0.00%	0	0.00%	0	27.27%	6	36.36%	8	36.36%	8	0.00%	0	22
The design of the page	0.00%	0	9.09%	2	40.91%	9	36.36%	8	13.64%	3	0.00%	0	22

Rating for Yahoo! interface, when users were asked *what did* they *think of the following* signs.

Measures – *ratings and details of the three prototypes*

Qualtrics depicted that around 37 people were responding to the survey. However it was at least 28 users that started to give answers to questions in the survey and input their names into the consent box. The number of responses diminished to about 21 or 22 users when they were asked to rate "signs" found in the prototypes. A majority of the volunteers opened a link to the survey and performed the tasks on their own. Two of the volunteers were supervised while completing the survey and tasks. While supervising one of the volunteers, there were difficulties with finding the "compose" button in the first prototype. Since the prototypes did not open automatically, users had to open the prototypes in new windows.

There were a lot mixed reactions to the "compose email" buttons in the first and second prototypes. The send buttons in each of the three prototypes lean more towards favorable ratings when it comes to "ease."

For the *first* prototype, users were asked to rate the "use" of the "colorful" plus sign on the first screen and the "paper airplane" on the second screen.

Question	Very Hard		Hard		Neither		Easy		Very Easy		Total
Colorful "Plus" sign (+) in the bottom of the screen	13.04%	3	21.74%	5	8.70%	2	43.48%	10	13.04%	3	23
"Paper airplane" for sending an email (screen 2).	0.00%	0	0.00%	0	18.18%	4	54.55%	12	27.27%	6	22

The minimum for the "colorful" plus sign was 1 with a maximum of 5. Standard Deviation was 1.28, Variance was 1.65, and that was with a 23 count. Mean was 3.22.

The minimum for the "paper airplane" was 3 with a maximum of 5. Standard Deviation was 0.67, Variance was 0.45, and that was with a 22 count. Mean was 4.09.

The users also asked for the "appeal" for the two buttons.

Question	Very Unappealing		Unappealing		Neither		Appealing		Very Appleaing		Total
Colorful "Plus" sign (+) in the bottom of the screen	12.50%	3	12.50%	3	16.67%	4	33.33%	8	25.00%	6	24
"Paper airplane" for sending an email (screen 2).	0.00%	0	8.33%	2	25.00%	6	50.00%	12	16.67%	4	24

The minimum for the "colorful" plus sign was 1 with a maximum of 5. Standard Deviation was 1.32, Variance was 1.75, and that was with a 24 count. Mean was 3.46.

The minimum for the "paper airplane" was 1 with a maximum of 5. Standard Deviation was 0.83, Variance was 0.69, and that was with a 24 count. Mean was 3.75.

For the *second* prototype, users were asked to rate the "use" of the "compose" button and "send" button." Many users found the "paper airplane" as "easy" or "very easy." The ease compose button varied between "very hard" and "easy."

Question	Very Hard		Hard		Neither		Easy		Very easy		Total
Circle in the bottom of the screen that says "Compose email (Screen 1)	27.27%	6	18.18%	4	9.09%	2	27.27%	6	18.18%	4	22
"Paper airplane" labeled "Send" (screen 2).	4.55%	1	9.09%	2	9.09%	2	50.00%	11	27.27%	6	22

The minimum for this compose button was 1 with a maximum of 5. Standard Deviation was 1.5 and the Variance was 2.26. The count changed to 22. Mean was 2.91.

The minimum for the "paper airplane" with label was 1 with a maximum of 5. Standard Deviation was 1.06 and Variance was 1.12. The count was also 22. Mean was 3.86.

The users also asked for the "appeal" for the two buttons.

Question	Very Unappealing		Unappealing		Neither		Appealing		Very Appealing		Total
Circle in the bottom of the screen that says "Compose email (Screen 1)	45.45%	10	18.18%	4	9.09%	2	22.73%	5	4.55%	1	22
"Paper airplane" labeled "Send" (screen 2).	9.09%	2	13.64%	3	13.64%	3	54.55%	12	9.09%	2	22

The minimum for the compose button's appeal was 1 with a maximum of 5. Standard Deviation was 1.35 and Variance was 1.81, with a 22 count. Mean was 2.23.

The minimum for the appeal of the labeled "paper airplane" was 1 with a maximum of 5. Standard Deviation was 1.11 and Variance was 1.24. The count was still 22. Mean was 3.41.

For the *third* prototype, users were asked to rate the "use" of the "compose" button and "send" button."

Question	Very Hard		Hard		Neither		Easy		Very Easy		Total
"Compose" button	0.00%	0	0.00%	0	4.76%	1	42.86%	9	52.38%	11	21
"Send" button	0.00%	0	0.00%	0	15.00%	3	40.00%	8	45.00%	9	20

The minimum for this "compose" button was now 3 with a maximum of 5. Standard Deviation was 0.59 and Variance was 0.34. The count for this was 21. Mean was 4.48.

The minimum for the "send" button was 3 with a maximum of 5. Standard Deviation was 0.71 and Variance was 0.51. The count for this was 20. Mean was 4.3.

The users also asked for the "appeal" for the two buttons.

Question	Very Unappealing		Unappleaing		Neither		Appealing		Very Appealing		Total
"Compose" button	14.29%	3	23.81%	5	23.81%	5	23.81%	5	14.29%	3	21
"Send" button	9.52%	2	14.29%	3	33.33%	7	28.57%	6	14.29%	3	21

Although the "send" button third prototype was easy to understand, there were mixed reactions to the "appeal" of the email application's appearance.

The minimum of the appeal for the "compose" button was 1 with a maximum of 5. Standard Deviation was 1.27 and Variance was 1.62. This count for this was 21. Mean was 3.0.

The minimum for the appeal of the "send" button was 1 with a maximum of 5. Standard Deviation was 1.15 and Variance was 1.32. The count was 21. Mean was .3.24.

Measures *- compassions and rating in percentage*

Ease of using "compose" button

	Very Hard	Hard	Neither	Easy	Very Easy
Type 1: Colorful "Plus" sign (+)	13.04%	21.74%	8.70%	43.48%	13.04%
Type 2: Circle labeled "compose"	27.27%	18.18%	9.09%	27.27%	18.18%
Type 3: "COMPOSE" button	0.00%	0.00%	4.76%	42.86%	52.38%

Ease of using "send" button

	Very Hard	Hard	Neither	Easy	Very Easy
Type 1: "Paper Airplane"	0.00%	0.00%	18.18%	54.55%	27.27%
Type 2: "Paper Airplane" with label	4.55%	9.09%	9.09%	50.00%	27.27%
Type 3: "SEND" button	0.00%	0.00%	15.00%	40.00%	45.00%

The appeal of the "compose" button

	Very Unappealing	Unappealing	Neither	Appealing	Very Appealing
Type 1: Colorful "Plus" sign (+)	12.50%	12.50%	16.67%	33.33%	25.00%
Type 2: Circle labeled "compose"	45.45%	18.18%	9.09%	22.73%	4.55%
Type 3: "COMPOSE" button	14.29%	23.81%	23.81%	23.81%	14.29%

The appeal of the "send" button

	Very Unappealing	Unappealing	Neither	Appealing	Very Appealing
Type 1: "Paper Airplane"	0%	8.33%	25.00%	50.00%	16.67%
Type 2: "Paper Airplane" with label	9.09%	13.64%	13.64%	54.55%	9.09%
Type 3: "SEND" button	9.52%	14.29%	33.33%	28.57%	14.29%

Measures - *number of rating* (from 24 volunteers)

Ease of using the "compose" button

|	Very Hard	Hard	Neither	Easy	Very Easy	NO ANSWER
Type 1: Colorful "Plus" sign (+)	3	5	2	10	3	1
Type 2: Circle labeled "compose"	6	4	2	6	4	2
Type 3: "COMPOSE" button	0	0	1	9	11	3

Graph for the ease of the "compose" button
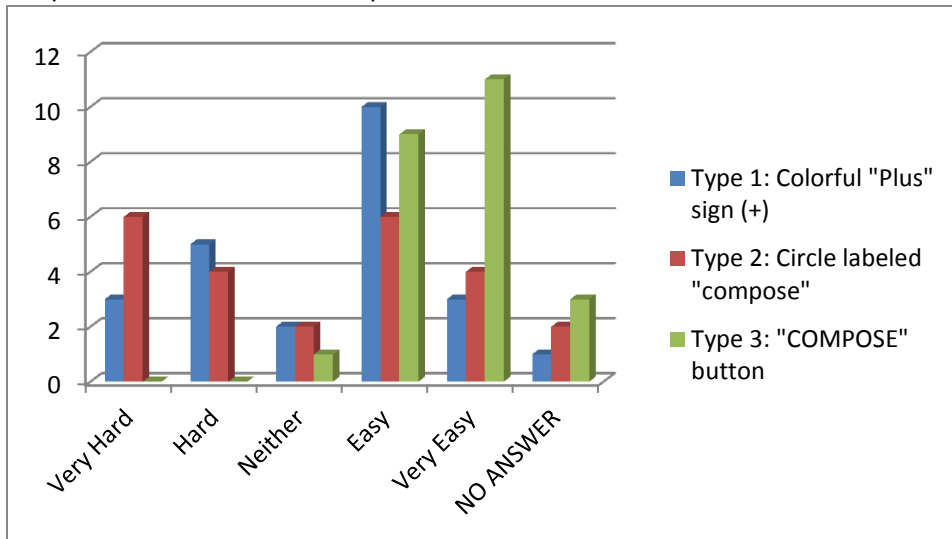
Ease of using the "send" button

|	Very Hard	Hard	Neither	Easy	Very Easy	NO ANSWER
Type 1: "Paper Airplane"	0	0	4	12	6	2
Type 2: "Paper Airplane" with label	1	2	2	11	6	2
Type 3: "SEND" button	0	0	3	8	9	4

Graph for the ease of the "send" button
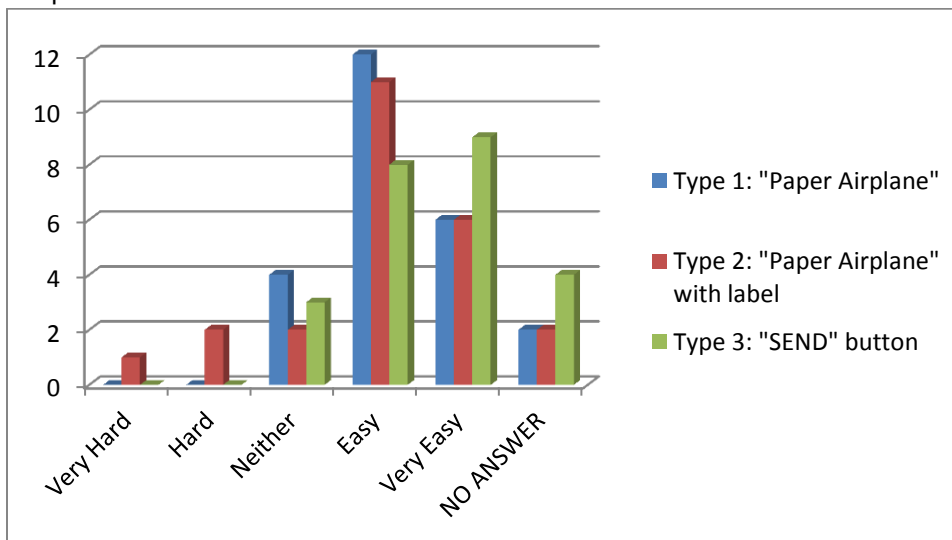
The appeal of the "compose" button

|	Very Unappealing	Unappealing	Neither	Appealing	Very Appealing	NO ANSWER
Type 1: Colorful "Plus" sign (+)	3	3	4	8	6	0
Type 2: Circle labeled "compose"	10	4	2	5	1	2
Type 3: "COMPOSE" button	3	5	5	5	3	3

Graph for "compose" button appeal
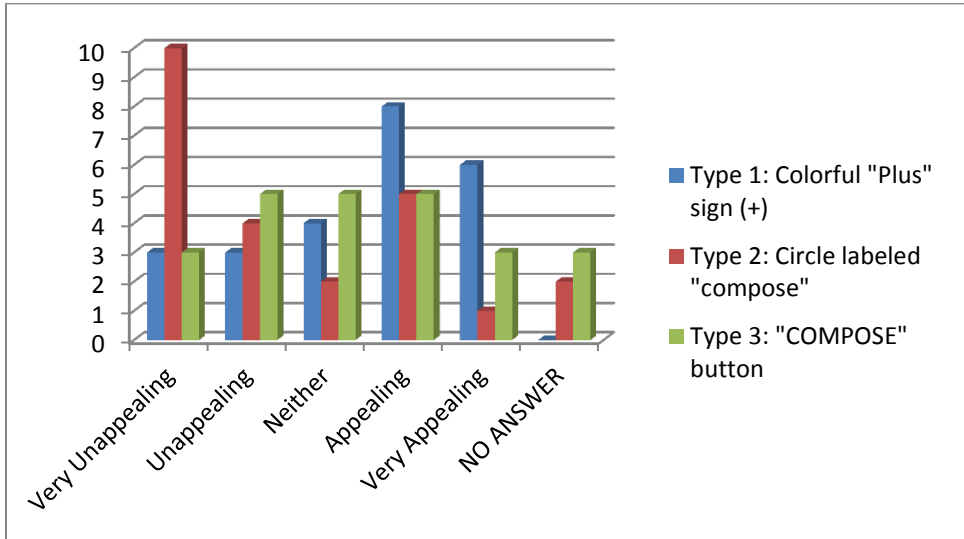
The appeal of the "send" button

	Very Unappealing	Unappealing	Neither	Appealing	Very Appealing	NO ANSWER
Type 1: "Paper Airplane"	0	2	6	12	4	0
Type 2: "Paper Airplane" with label	2	3	3	12	2	2
Type 3: "SEND" button	2	3	7	6	3	3

Graph for "send" button appeal
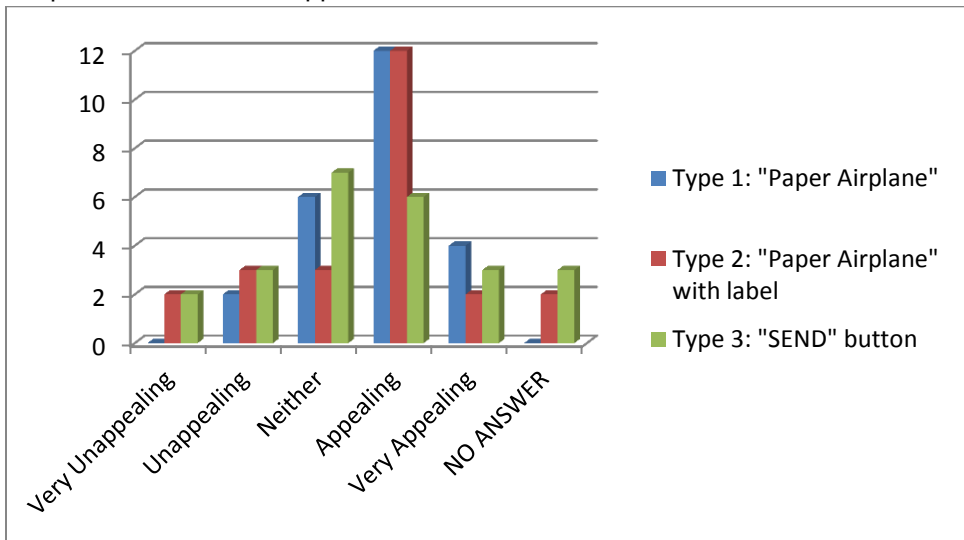
For the semiotics research using the email prototypes, the hypothesis was that the first prototype with just symbols would be more difficult to understand than the second prototype with labeled symbols or the third prototype with plain labels. In the results, the ease of the "compose" button in the first prototype and second prototype was rather difficult. The first prototype was still more difficult than the "compose" button in the third prototype with plain letters, which many users found easy to understand. The "send" button was not too difficult to understand in any of the three prototypes. The second prototype with the send label under the paper airplane created difficulty with 2 or 3 users.

The alternative hypothesis was that the third prototype without only words would be *less appealing* to users than the other prototypes. The appeal for the "compose" button in all three prototypes had mixed responses. The third prototype for compose had decent appeal compared to the second prototype. But the appeal for the "send" button in the third prototype was mild and not as appealing as the first two prototypes.

RESULTS AND DISCUSSIONS

Everyone reacted to the survey different. One user had a lot of difficulty understanding what had to be done. One potential user over 50 years of age did not finish claiming in person that she could not do the survey and did not know what to do with the instructions. Another user apologized for not understanding the questions, instructions, or the purpose of the survey. However, at least one user found the instructions easy to follow and understand One user was confused with the use of the word "compose" for creating new emails, since the verb "to compose" is could widely be used with musicians composing music. Another user understood the meaning the signs in the Google Gmail due to familiarity or regular use of the application.

At least two users could not get the get the buttons or links in the second prototype to function popularly. It is possible that the sizing of the hyperlink spot may have not been big enough in the prototype. One of the user felt that "Words with the icon are better than having to hover to see the function."

One user comments: "As I have a lot of experience with the interfaces that were used, my answers may have been biased by what I am used to. Generally speaking, presenting icons without any text is appealing as it negates the 'cluttered' feeling brought about by including the text. However, within the yahoo interface, the text did not make it feel cluttered and felt more natural."

Regardless of which prototype was favorable, users had more difficulty interpreting the button to start new emails than the buttons for sending them. The shape of the button and letter size might have influence the rating of the compose buttons. Many users understood the meaning of the send button in the first two prototypes regardless of labels. Perhaps if there was a thick border around sign than the "compose" would grab more attention. Paper airplane in bright blue may have grabbed more attention that rainbow plus sign hiding in the bottom right corner. Plain letters were fairly easy to understand for some users, although the appeal of the appearance was put in risk.

Possible Future Works

Is similar project could be done in the future, it would probably be more affordable to provide screenshots of interfaces as oppose to having an interactive page created with application with Axure RP 8. For other projects, Axure had a lot of quick and easy benefits, but perhaps that was with projects where the students interacted with volunteers and other classmates in person. Cutting and pasting the web link to the URL for each Axure prototype required some effort as oppose to just critiquing images with signs and symbols. There are concerns for volunteers that do not understand the tasks and symbols in the prototype, especially when there are not operators in the space to offer direct assistance. These tasks were part of rather long survey. A shorter could be an idea in the future, but it is helpful for the researcher to get as much information as possible.

Cropping of still images and screenshots could be more efficient in future projects. The YouTube image had a variety of semiotic meanings and symbols, but the paragraph of the video description was not necessary for the questionnaire.

Video games have different forms of semiotics through imagery and sound. The change of music can signify a change of mood in various forms of storytelling, but that is debatable. Perception and testing through other media could be taken into consideration in the future. Deciding on which media takes some thought. But a study like that could also blend into immersion or engagement.

More experimentation with signs and memory would be interesting. There can be more to discover with cognitive science and proper design. Although the diversity of the participants was decent for the small group included in the experiment, a bigger group of volunteers of different backgrounds and ages would be helpful when the chance is given.

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