American Sign Language: an influence on graphic design problem-solving

Allison Ucci

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American Sign Language: An Influence on Graphic Design Problem-Solving

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Thesis Documentation
Graphic Design MFA Program
School of Design
College of Imaging Arts and Sciences
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May 20, 2008
This thesis study is dedicated to
those whose support guided me to this journey,
those whose encouragement saw me through it,
and those who believe in me and will inspire me as each new journey begins.

Special Thanks
Deborah Beardslee, Bruce Ian Meader and Gerry Bateman
for their constant encouragement.

Virgílio, Ahmad, and Sarah for their genuine support in and out of 3510.
Abstract

In American Sign Language (ASL), variables of communication such as volume, tone, emotion, and emphasis are represented through the deliberate use of these variables which include: handshape, location of the sign in proximity to the human body, movement, direction, and repetition. ASL imposes strict rules of how and when to use each of these variables. Together, the rules and variables create a language of communication that is of equal value to spoken language. Similarly, these attributes currently exist in graphic design message making. The alternation of one or all variables in design can also result in an entirely new idea. By comparing how these variables are used in both ASL and graphic design, differences in execution will provide a new opportunity to further implement ASL as an influence on a design solution for the deaf and hard of hearing.

This thesis shows how essentials of ASL can be studied and translated to use as new influences on graphic design problem-solving. This approach will focus on design problem-solving for deaf and hard of hearing audiences by identifying specific situations in which intended communication is often unclear or misunderstood. Ideally, hearing audiences will also benefit from these new approaches. Final applications were placed in the local airport, in which the space of the environment was represented directly through the graphic design solutions presented.

Key Words
American Sign Language
Graphic Design
Deaf Life
Visual Communication
Information Design
# MFA Thesis Committee

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This section will explain in detail the goals of this thesis, including the problem statement, relevance and importance, explanatory diagram, outside areas of study, and key questions. With these areas of planning, the scope of the study, the audience, and the problem are all addressed. From this, the organization and breakdown of this topic will be clearly defined.
Project Definition

Problem Statement

Deaf and hard of hearing individuals frequently experience a loss of important information related to understanding sounds, such as spoken words, heard by the hearing world. Many of the cues derived from these sounds come from attributes which cannot be solely translated through words. In American Sign Language (ASL), variables of communication such as volume, tone, emotion, and emphasis are represented through the deliberate use of these variables, which include: handshape, location of the sign in proximity to the human body, movement, direction, and repetition. ASL imposes strict rules of how and when to use each of these variables. Together, the rules and variables create a language of communication that is of equal value to spoken language. Similarly, these attributes currently exist in graphic design message making. The alternation of one or all variables in design can also result in an entirely new idea. By comparing how these variables are used in both ASL and graphic design, differences in execution will provide a new opportunity to further implement ASL as an influence on a design solution for the deaf and hard of hearing.

The premise of this thesis is that these essentials of ASL can be studied and translated to use as new influences on graphic design problem-solving. This approach will focus on design problem-solving for deaf and hard of hearing audiences by identifying specific situations in which intended communication is often unclear or misunderstood. Ideally, hearing audiences will also potentially benefit from these new approaches.
Relevance and Importance

American Sign Language provides examples of how sound, tone, emotion and many other factors are interpreted visually. In many situations, these interpretations can be as vital as the original sounds. Deaf and hard of hearing individuals often miss ‘how’ spoken words are expressed and this results in a range of consequences, from misunderstanding the tone of a song to missing the urgency of a hospital announcement. This thesis project seeks to employ the attributes of ASL to complement existing graphic design problem-solving strategies. ASL principles and variables will be intentional influences on design solutions with the goal of conveying ideas and information more clearly to identified audiences.

Airports

Most airports are set up as vast open areas with little visual aid besides wayfinding, which causes confusion amongst travelers.

Important announcements such as cancellations and delays made verbally are poorly communicated.

Hospitals

Important verbal information in hospitals is usually not presented visually.

Hospital areas are locations where important information is lost due to a hectic environment.
Explanatory Diagram

Communication Modes

American Sign Language

Meaning
Concept
Substance

Semantic

Content
Ideas
Feelings

Syntactic

Emotion
Intensity
Direction
Handshape
Orientation

Weight
Position
Grid
Intensity
Emphasis

Pragmatic

Visibility
Speed
Lighting
Angle

Visibility
Speed
Lighting
Legibility

Shape
Placement
Emphasis
Proximity of Parts
Orientation in Space
Repetition
Direction

Pr ximity of Parts
Orientation in Space
Repetition
Direction

Content
Ideas
Feelings

Semantic

Shape
Placement
Emphasis
Proximity of Parts
Orientation in Space
Repetition
Direction

Audience

Deaf,
Hard of Hearing

Hearing

Design Solution

Clear Communication

Miscommunication
Selected Key Questions

1. Which communication situations are commonly frustrating for the deaf and hard of hearing?

2. How can these situations be categorized and organized?

3. How do variables in ASL (handshape, location, movement, repetition, direction) affect the meaning of what is being said in terms of tone, volume, and intensity?

4. How can ASL variables and rules be employed or improve graphic design problem-solving?

5. What characteristics of existing graphic design solutions already employ variables of ASL?

6. If an ASL variable is identified as being potentially helpful, which graphic design considerations could be intentionally influenced? How?
Associated Areas of Study

**Semiotics**
The study of signs and symbols as elements of communicative behavior; the analysis of systems of communication, such as language, gestures, meaning, form, and function.
*Source: Dictionary.com*

**Visual Literacy**
A group of vision-competencies a human being can develop by seeing and at the same time having and integrating other sensory experiences.
*Source: ivla.org*

**Communication Studies**
The study of the ways in which a message or idea can be given and received. Some categories are visual communication, verbal communication, written communication, and so on. Communication does not necessarily have to include words or languages, but can be purely visual information of images.
*Source: Dictionary.com and About.com*

**Psychology**
The study of the mind and mental processes, especially in relation to behavior. Two relevant fields of psychology in this study are cognitive and social psychology. Cognitive psychology focuses on how the human mind receives and interprets impressions and ideas. Social psychology examines how the actions of others influence the behavior of an individual.
*Source: Medterms.com*

**American Sign Language**
A complete, complex language that employs signs made with the hands and other movements, including facial expressions and postures of the body, used primarily by people in North America who are deaf.
*Source: Medterms.com*

**Signed Languages**
Languages that use manual communication, body language and lip patterns instead of sound to convey meaning and simultaneously combine hand shapes, orientation and movement of the hands, arms or body, and facial expressions to fluidly express a speaker's thoughts.
*Source: Wikipedia.com*

**Deaf Education**
The different ways in which the deaf and hard of hearing can be educated in terms of communication, oral (voice only), manual (sign language only), or a combination (voice and sign language), to study their effectiveness and to understand the learning process of the deaf and hard of hearing.

**Deaf Theater**
The study of motion and sign language as a translation of emotion and storytelling and serves a dual purpose: deaf culture entertainment for deaf audiences, and education about deafness and sign language for hearing people. When deaf theater began, it was deaf people performing for deaf audiences; today it has deaf and hearing together.
*Source: About.com*

**Linguistics**
The discipline that studies the structures, acquisition, and histories of human languages around the world.
*Source: uta.edu*
In this thesis study, it is imperative to consider the findings of others in relative studies. Only after considering these studies is it apparent what has been done and what has been left untouched. Precedents here reflect work and studies done prior to this thesis study and whose contributions provide a foundation upon which to build new connections. Precedents may be directly or indirectly related to parts of this thesis in order to show past connections and lay foundations for new ones.
Judith Wilde is an instructor at The City University of New York at Kingsborough Community College and creative director of Wilde Design. Richard Wilde is chairman of the Graphic Design and Advertising Departments at the School of Visual Arts in New York City. *Visual Literacy* is a collection of various students’ solutions to design problems with constraints that help stimulate the creative process and maximize successful communication. In each activity, a problem is given along with a set of limitations and requirements that the student designer uses to create an effective solution. The power of these tools are demonstrated further through the use of all design components discussed in this thesis study (shape, placement, emphasis, orientation in space, proximity of parts, repetition, and direction). Example problems below show how changing one element can alter the final version and resulting communication of each solution. Several exercises were chosen as having the strongest examples that support the use of variables studied in this thesis study.

**Black Square Solutions**

Students were given the assignment of using only four black squares to represent the word being described. Students were constrained in color and shape (black and white squares), but allowed to manipulate size, placement, emphasis, orientation, and proximity to achieve the communication goal at hand.

![Black Square Solutions](image)

**Sound Solutions**

Many everyday objects such as a clock or typewriter make very distinguishable sounds. Here, students were asked to represent these sounds in a visual way. Through the use of repetition, placement, emphasis, etc., these pieces offer unique and sometimes abstract representations of non-visual ideas.

![Sound Solutions](image)
**Life and Death Solutions**

Students were told to create a design solution to successfully communicate the concept of life and death, collectively. Here, there were no limitations to variable use as long as the message was accurately portrayed. The selected examples illustrate the use of shape, placement, orientation and so forth to represent contrasting concepts.

![Life/Death Solution 1](image1.png) ![Life/Death Solution 2](image2.png) ![Life/Death Solution 3](image3.png)

**Significance**

The work done in *Visual Literacy* shows how powerful the design decisions can be when they are manipulated for a specific communication goal. This thesis study focuses on the use of graphic design variables compared with the same variables used in ASL. In this respect, *Visual Literacy* is an important precedent because it shows what experimentation has already been done with graphic design variables. Design components such as the ones used in these solutions are an important focus in this study.
While researching precedents for this study, it was important to find disciplines in which American Sign Language has influenced a field of study. Since the purpose of this thesis is to find new ways in which ASL can have a greater influence on graphic design, a parallel research study would be the influence of ASL on other communication channels. One such channel where ASL has proved to have a tremendous influence is poetry. In researching this field, it was clear that what is generally a spoken or written form of expression usually does not yield a visual solution that creates an image in the listener’s mind. ASL has found ways to mirror elements unique to poetry such as stanza, alliteration, and rhyme in order to create this visual picture. These important aspects of poetry often have a great effect on the significance and meaning of a poem. They are also elements that are expressed through vocal cues or typographic cues on paper.

In the text *Analyzing Sign Language Poetry* by Rachel Sutton-Spence, the use of repetition, movement, and other features of ASL are examined to illustrate how they translate rhythm, rhyme, and meaning into poetry. Specifically, repetition in signed poetry is a tactic that is used for multiple purposes. Repetition is used to create patterns for both conceptual and aesthetic purposes. This can highlight unique relationships that exist between words or ideas in a poem for greater significance to the viewer. Similar to graphic design, repetition in signed poetry does not always mean the repetition of a sign that is identical to the original. Repetition can mean repeated handshape, orientation, location, or movement of a sign to help create rhythm within a poem. Specifically with repetition of location, sign language poems can take advantage of the location of signs in space to create visual patterns and contrasts, just as elements are used in space in visual arts (Sutton-Spence 37). The signer carefully selects signs that specifically create desired aesthetic results. While the meaning of a poem can lie within the words, there are often multiple ways in sign language to represent one word or idea. Along with segments of repetition, timing and movement combine to create the tempo a poem follows.

Spoken poetry is known to consist of rhyme, assonance (a rhyme in which the same vowel sounds are used with different consonants in the stressed syllables of the rhyming words), alliteration (the beginning of two or more stressed syllables of a word group either with the same consonant sound or sound group), and consonance (a simultaneous combination of tones conventionally accepted as being in a state of repose). Sign language poetry uses handshape, location, and movement to reflect the structural elements of poetry. Sutton-Spence explains that there are four main categories of movement that can be manipulated to create the poetic rhythm found in spoken poetry:

1. Hold emphasis (long pause, subtle pause, strong pause)
2. Movement emphasis (long, short, alternating, repeated)
3. Movement size (enlarged movement path, shortened movement path, reduced movement path, and accelerating movement path)
4. Movement duration (regular, slow, or fast)
Symmetry and Balance

One powerful ability of sign language poems is that the signer can deliberately select a sequence consisting entirely of two-handed signs that create perfect symmetry for a visually pleasing effect (Sutton-Spence 55). Similarly, one-handed signs can also be selected for asymmetry to create an interruption during the poem. Symmetry has long been associated with the beauty of an object and is often desired in visual forms such as ASL poetry.

Significance

How sign language has affected other fields of study plays an important role in the investigation of employing ASL in graphic design for greater communication benefits for deaf and hard of hearing individuals. Although there are many other fields upon which ASL has had an influence, poetry is one form of non-visual communication that has been impacted by the visual nature of signs. It is important to understand how these signs are able to translate non-visual elements of speech and the one-dimensional element of writing. The study of sign language poetry is the study of bringing a fixed, unmoving form of communication to life through the human body. Similarly, this thesis study concentrates on how to bring the visual form of ASL into design. Poetry is usually communicated either through writing or sound. When spoken, aspects of the voice are manipulated to communicate a certain meaning. The study of ASL poetry shows how a non-verbal form (ASL) has adapted itself to implement the elements found in poetry (assonance, consonance, alliteration, etc.). By understanding how poetry has been modified in order to be represented through ASL, the potential for graphic design to be adapted in a similar way has been clearly demonstrated.
This collection of essays seeks to establish both direct and indirect connections between gesturing and language through a collection of essays supporting the topic. In one important essay entitled *Language from faces: Uses of the face in speech and in sign*, Ruth Campbell claims, “The human face is the most visible and best modulated of our human signaling systems” (57). She argues that most people read into facial expression to a great degree, with every tiny movement given meaning or a purpose. In addition, people can see and read the face from far away and at many angles. This allows nonverbal cues expressed by the face to be interpreted by anyone who is within visible reach.
In another essay by Robert M. Krauss and Uri Hader entitled *The Role of Speech Related Arm/Hand Gestures in Word Retrieval*, the authors seek to explore the gesturing process from the mind to the hand. Krauss and Hader trace the specific message from its original formulation in the brain to the movement or gesture. They argue that in the gesture production, “origin precedes the formulation of the speaker’s communicative intention” (103). Therefore, before the speaker even knows what he or she is communicating, the gesture process has already begun. The diagram on the previous page shows that the gesture production process comes in three stages of development. In the first stage, the speaker forms a representation from long-term memory of an object or an idea. In the second stage, the speaker takes this representation and selects features to imitate visually. In the final stage, the speaker uses the key features being communicated and translates them into abstract movements with velocity, direction, and contour. These abstract movements result in a visual gesture. An example given in the text is of the speaker gesturing to visually aid the description of ‘a big cake,’ in which the speaker follows the three stages. First, the speaker recalls an image or representation of what a cake looks like from memory. Then the speaker selects what features of the cake (round, tall, small, thick, etc.) are important to communicate. Third, the speaker initiates movement to visually describe the cake; if the cake is round, the speaker may use an index finger downward in circular motions to indicate the shape of the cake.

**Significance**

Some of the essays in *Gestures, Speech, and Sign* prove to be important precedents in this thesis because they trace many roots of gestures and signing. Specifically, Krauss and Hader’s essay breaks down the process of gesture creation and implementation. Understanding the path that gestures and signs follow in the mind assists in understanding how they are formed. By identifying the brain’s process of sign formation, the use of ASL variables can be rationalized and examined logically. After understanding how and why they are used, they can be used in graphic design as a new approach to problem-solving.
In her book *Language from the Body*, Sarah F. Taub disputes the linguistic theory that form is separate from meaning by analyzing signed languages. In signed languages, three-dimensional relationships between words and concepts are crucial to clear communication and cannot be represented by the one-dimensional medium of sound. Unlike spoken languages, signed languages have more potential for iconic expressions (signs which visually represent the object or idea being signed) over a broad range of basic conceptual situations. The metaphor in *ASL* serves as a visual representation of the communication of objects moving between people. Metaphors let iconic signs through the hands have abstract meanings and explain hard-to-grasp concepts. In the word 'concentrate' the hands begin at the sides of the brain (where thoughts originate) and move forward to come together to a shared space (showing the narrowing and focusing of the brain). Unlike English, where the word 'concentrate' has no meaning between the sound and the concept, in *ASL* the metaphor is expressed in literal terms. Taub recognizes the implementation of a sign as a three-part process:

1. **Image Selection**
   Beginning with a concept that needs linguistic representation

2. **Schematization**
   Pulling out the important details of the image that should be represented. In this process, everything not necessary is removed; only the details important in *ASL* are retained.

3. **Encoding**
   Selecting a physical form to represent each piece of the concept

Single parameter metaphors are ones that combine more than one metaphor, and also combine both metaphorical and pure iconicity (Taub 115). An example of a single parameter metaphor in *ASL* is the way past, present, and future are communicated: utilizing the space ahead of the signer represents the future (example: ‘next week’). The present is shown through the use of space on the body (example: ‘this week’). Finally, the past is signed through the space behind the signer (example: ‘last week’).
Double Mapping

Metaphors in ASL involve what Taub calls Double Mapping. This means that the metaphors used in ASL show a relationship between the concrete (the sign) and the abstract (the concept being communicated). There is also a relationship between the concrete image used to symbolize the abstract idea and the variables that are used to communicate it, including handshape, orientation, location, and movement.

Significance

Sarah Taub’s work in Language from the Body is an important precedent for this thesis study because it provides analysis of the visual roots of American Sign Language. It explains how complex ideas are translated into ASL for easy understanding and shows the process of sign formation from the signer’s mind through his or her hands. Exploring the sign formation process that is directly related to how those who use ASL learn and understand their surroundings reveals ways in which process can be used to employ ASL in graphic design. To use parts of a sign as an influence on design, one must understand the rendering of ASL, including the up front thought process. This book also studies how signs can visually represent abstract and intangible ideas or concepts in a simplified form. By removing the complexity and arbitrariness found in spoken languages, ASL translates thousands of words into meaningful forms. The same kind of translation can be used to further integrate principles of ASL into graphic design so that this immediate meaning behind complex ideas is represented successfully.
Research

For this thesis, there were several areas of research focus: graphic design, exhibition design, space and human movement, American Sign Language, and nonverbal communication. Graphic design is a focal point in this study to discover what problem-solving solutions exist related to using attributes of ASL in design and what has yet to be explored. American Sign Language was researched to understand its history, linguistics and structure, as well as its influence on deaf life. Nonverbal communication was chosen to understand the natural process in which people use gesturing and how much body language impacts all forms of communication. The combination of these topics all proved relevant to this thesis study and aided in its development.
Research

Graphic Design Variables

Shape

All graphic design solutions use shape/form to some degree. For this thesis, all the examples demonstrate how shape is deliberately used to create a message in graphic design.

Substitution

One way in which the use of shape is executed is through substitution. Substitution can be defined in this study as the replacement of an object with another for heightened meaning. For example, a butter advertisement uses a post-it to replace the butter on a corn cob. This decision provides a two fold meaning: the post-it represents a different object (the butter) through shape and color, and the purpose of a post-it implies 'Don’t forget the butter.' The example of restroom signage on the right is a strong example of how replacing one shape with another will drastically change the resulting communication.

Focal Point

In this example by Lester Beall, shape and color have been used to create a focal point in the overall composition. To support the product and service of the Rural Electrification Administration, a light bulb was used as the dominant element in design arrangement. The visual hierarchy established in this composition allows the lightbulb to be presented as the primary feature. In this case, shape plays a critical role in representing a unique, well-recognized object that is important in the meaning of the poster.
Placement is a key element in graphic design that is used for many purposes. One key reason in this thesis research is how designers use placement to reinforce a key message and how placement is used in order for one object to represent another.

Reinforcement

There are many ways in which placement can be used in graphic design to aid the message-making process. An example of this is how the following design solution uses the location of the type for the purpose of reinforcement. To exemplify reinforcement in an ad for annual checkups for both men and women, the designer strategically places the text over the parts of the body which need to be checked. Since the information specifically refers to parts of the body, the text is most effective when placed there, reinforcing the message.

Placement can also be used for the purpose of representation. This occurs when one object is used to represent another, and the replacement is a deliberate decision of the designer. In the bottom left example, a heart has replaced the man’s head. It is clear to the reader that the heart is out of place, but the actual location of it in the composition supports the designer’s message. By placing the heart where the brain is, ‘The Wisdom of the Heart’ is made literal.

In the ‘Bone Appetit’ advertisement, the placement of the food replaces the spine, but also reinforces the location of the spine, giving strength to the message. The ad is trying to convey that what you eat can strengthen your bones. By placing the food over the spine, the designer is saying your bones are what you eat, so choose carefully.
Emphasis

Emphasis is often used for some form of exaggeration, whether it be to over or understate a concept or message. Emphasizing a specific feature of the design arrangement also creates a visual hierarchy of primary and secondary information, controlling which attribute dominates the composition. Emphasis may also be used more subtly, with a less obvious influence on the message.

Exaggeration

As an example of exaggeration, a poster by Milton Glaser highlights a recognizable feature of Bob Dylan. Using Dylan’s hair as the prominent feature, Glaser used unrealistic colors to emphasize the wildness of the hair. Since the portrayal of Dylan’s hair is evidently abstract, Glaser successfully exaggerates the most recognized feature of Dylan, which allows for the other aspects, such as the details of his face, to be minimized.

Subtle Enforcement

The designer can also emphasize an element through less obvious decisions, such as placement. In this political propaganda poster, the size and placement of the American figure and the American flag emphasize the country’s authority. Uncle Sam is noticeably the largest component in the arrangement and is placed high above the soldiers, expressing that he is ‘above’ them in power. While the size and placement are not exaggerated out of proportion, how they are arranged in the composition gives more meaning than what is first perceived.
**Orientation in Space**

In this thesis, orientation refers to the orientation, rotation, or angle of an object or idea in the space on which the composition exists. The orientation in space can be manipulated to change the viewer’s vantage point or relationship to the object. Orientation can also be used for the purpose of personifying a non-human object to create a powerful message.

**Observation**

The advertisement below for prostate cancer awareness exemplifies the variable orientation of an object in the composition. By rotating the hand so that it points to the viewer, the designer is solidifying the message that every male is at risk for prostate cancer. Not only does the handshape used reflect details of the prostate examination that men are familiar with, but by rotating the hand so it points at the viewer suddenly makes the ad more personal. Instead of just ‘someone’ needing to worry about prostate cancer, the viewer needs to worry about it. The use of orientation here helps show the severity of the consequences if ignored.

**Personification**

The series of two ads for Wolfschmidt’s Vodka below shows the relationship between objects where the orientation creates a sense of personification of these non-human objects. In the first ad, the vodka bottle is seen upright and talking to the tomato, attempting to persuade it to join him in drink-making. In the second ad, the vodka bottle has been changed in orientation to lay next to the orange, begging it to take him back after the orange found out about his relationship with the tomato. In the first ad, the vodka is seen as tall and confident, whereas in the second ad it is shown as weak and desperate by lying alongside the orange.
Proximity of Parts

Proximity refers to the distance between the elements of a graphic design composition. How close or how far apart the elements are can create focus points or isolation, and can even create a relationship between parts of the design that do not exist otherwise. In other words, proximity can be manipulated to create a relationship between elements that are not normally connected.

Show Relationship

In a poster of a woman singing, the designer places two unrelated objects, the woman and the musical scale, in very specific locations so that together they result in a single idea. Separate, they only represent a woman and a music scale, but when placed close together the objects create a story of the woman singing the notes.

Create Distance

In two-dimensional graphic design, proximity of parts can create an illusion of three-dimensional field and space. This allows for a certain amount of implied physical distance to exist between parts of the composition. The example on the bottom left is a strong case of creating distance through proximity of the baseball and the human. The viewer will feel that the ball is directly in front of him or her, while the person is far back in distance. The use of scaling also helps create distance; if the ball were the same size as the person the design would not have the same effect.

Isolation

Isolation can be formed by placing one element apart from the rest in a composition, through the use of a more distant proximity. In the example using newspaper clippings below, by repeating a long line of continuous newspaper headings and finally setting one apart, the message is given value. The ad indicates a long history of dominance of one award series, urging more people to submit their work to break the pattern and have a new winner.
Repetition in graphic design can be found in several forms. One form of repetition is repeating an object or element with exact duplication. There also is repeating, or mimicking, the idea of an object or element without duplicating it exactly. It can be used to show the mass or degree of a situation, and to add onto an original idea to modify and create a brand new concept. Each of these three types of repetition are described below with visuals to aid.

In the spread below, the design is split into two sections. The designer Bradbury Thompson uses repetition of shapes on the right side of the spread to mimic the shape and organization of the gears on the left. The gears themselves are not repeated, but rather color circles are used to imitate the concept of the gears.

In the bottom left example, the Reeses peanut butter cups are duplicated exactly, changing only their placement in the composition. They are repeated in this annual report as a clever (although perhaps unoriginal) way to show the mass of the specific element being observed (free cash flow). In this example, the meaning behind the object is not being changed, and the mass of peanut butter cups represents the cash flow of the company in mass.

In the bottom right example, Brainsells created an identity mark through the use of repeated dollar signs. This repetition is strong not only because repeated dollar signs means more money, but the use of more elements together modifies the original symbol: a dollar sign now creates the shape of a brain, which is essential to the name of the company.
Direction

For this thesis research direction in graphic design has been found in a more indirect manner than several of the other variables. Direction may imply distance between objects, or create depth in the composition as a whole. It can also be used to direct the viewer through the design solution.

Draw Attention

Direction is used indirectly in graphic design in many situations. In the first poster below, direction is implied through the arrangement of elements. The gun held by the deer draws the viewer's eye straight off the page to provide a focal point, which creates visual hierarchy. Through this manipulation, the designer can directly control the sequence and dominance in which the reader views information. This ordering can have a direct effect on the understanding of the message being conveyed.

![Ministry of Sound, London Advertisement, Steve Payne](image1)

Imply Direction

In the below left example from Rural Electrification Administration, the use of arrows as a secondary element in the composition are obviously indicating direction. Although the direction of water through a faucet is assumed as common knowledge, the arrows reinforce the function of the faucet. To the right, the bullet hole in the logo of Wham not only implies movement, but it is evident that the bullet came from behind the logo in a direction towards the viewer.

![Rural Electrification Administration 1937 Poster Advertisement, Lester Beall](image2)

![Wham Brand Identity, Jeff Leak and Giles Woodward](image3)
Type and Image: The Language of Graphic Design by Philip Meggs provides several overviews of studies that have influenced the field of graphic design as well as original views on elements of design. While he focuses on the relationship between the type and image in a single composition, he touches on many areas that have been studied in this thesis such as space use, proximity and repetition, and so on.

**Gestalt Principles**

Meggs introduces two important studies that are relevant to this thesis in his book. The first are the Gestalt Principles, which he describes as a configuration of structures with properties not derivable from the sum of its individual parts. The idea of Gestalt has its roots in theories by Johann Wolfgang von Goethe (German writer), Immanuel Kant (German philosopher), and Ernst Mach (Austrian philosopher) of Germany. These principles include similarity, continuation, closure, proximity, and figure and ground. The declarations of the Gestalt Principles assist graphic designers in understanding how humans perceive information and visuals. By acknowledging these concepts, the designer can manipulate imagery and typography in order to construct a visual communications gestalt, which the audience can understand quickly and easily.

**Communication Theory**

The second study Meggs explains in his book is Shannon and Weaver’s basic theory of communication. This can be summarized as an information source that produces the message of raw information to be transmitted. Each communication model is composed of a transmitter, a channel, distortion (noise source), and the receiver (destination). The transmitter or encoder transforms the information to be sent into a signal that is suitable for the channel. The channel is the medium upon which the encoded signal is transmitted to the receiving point. Anything that interferes or causes ‘noise’ in the transmitting process can be considered distortion. After moving through the channel, the information is then sent to the receiver, the destination, which translates the signal back into the original message or approximation of it. The receiver processes the message in a form that is understandable. The response of the receiver is the feedback that gets sent back to the sender. When studying two separate methods of communication (ASL and graphic design) it is important to consider how they transmit messages, and through what medium or channel they do so. While graphic design can be channeled through print, digital, three-dimensional, and so forth, ASL is channeled through the signer’s body and hands. In either kind of communication, how the message is encoded and received is entirely up to the person in control (the designer and the signer). Furthermore, the received outcome can vary based on who creates the message and what unique style the designer or signer has.

**Organizing the Design Space**

Meggs observes many aspects of graphic design that have also been attributed to ASL in this study. Just as ASL poetry (please see page 15) can deliberately use symmetry and balance for a given effect, so can graphic design. Symmetry can be defined in design as well-proportioned and balanced parts, while asymmetry is the lack of proportion between the parts of the whole, or the lack of symmetry (Meggs 76). Asymmetry is the dynamic equilibrium or the creation of order and balance between unlike or unequal things (76).
Repetition and rhythm are also mentioned in *Type and Image* and are worth exploring to see how they compare and contrast for use in ASL (please see page 15). According to Meggs, repetition is “repeating similar forms in a consistent spatial relationship and creating an overall pattern of equal weight.” In comparison, rhythm is “repeating similar element with a variety of forms or spatial intervals and creating variety in repetition” (Meggs 97).

In terms of space use, graphic design is normally thought by the public to be a two-dimensional form, while ASL is always three-dimensional. Meggs argues that, “although graphic space is usually fixed and two-dimensional, it should not be thought of as being static, for eye movement generates energy and motion as it traces a kinetic linear path upon a surface” (69). This statement is of high relevance to this thesis study because it narrows the gap between ASL space use and graphic design space. It helps explain how ASL and graphic design already exist as parallel as possible and will serve as a foundation of how to further implement the influence of ASL space into design solutions for maximum clarity in communication for the deaf and hard of hearing.

*Type and Image* covers many topics relevant to not only graphic design, but also all forms of communication, including ASL. Meggs provides a summarized explanation of many psychological studies that contribute to understanding how the human eye and mind work. This information is used first hand in this thesis study because the topic specifically addresses how information can be conveyed clearly to the deaf and hard of hearing through design attributes. Meggs also contributes insight on the graphic design version of many ASL components such as space, repetition, symmetry, and rhythm. Through the use of design variables along with important research studies such as the Gestalt Principles and communication theory, graphic design elements can be manipulated to mirror how the same attributes are used in ASL.
In his book, *The Elements of Graphic Design*, Alex White focuses on three areas that prove important to this thesis study. The use of space, the seven design components (such as unity, balance, and symmetry), and page architecture are used, along with design variables (font, image, size, cropping, etc), for effective communication. White argues that the use of space, and more specifically white space, in a composition “attracts readers by making the page look accessible, unthreatening, and manageable” (7). In addition to this, design elements are always viewed in relation to their surroundings, whether this is another element in the composition or the page boundaries themselves. Only when an object is placed within a space is that space defined. Until an element is placed in a framal reference, little about that space can be determined (White 15). More importantly, space connects elements and emphasizes movement and direction of the reader’s eye across the page and can determine in what order the viewer acquires information in the composition.

### Space

White describes space with figure and ground relationship options including stable figure and ground, reversible figure and ground, and ambiguous figure and ground. In stable figure and ground, forms are seen in an unchanging relationship of having been placed in front of their backgrounds. This implies a front/back relationship between elements. In reversible figure and ground, the two components can be seen equally. It is a balanced relationship where neither one takes position in front or in behind the other. In the third relationship, ambiguous figure and ground, elements may be in both the foreground and background simultaneously (White 18–19).

### Unity

To further define space in graphic design, White explains how certain decisions in design can yield more universally understood communication. With the use of asymmetrical space comes the suggestion of motion and activity. Once space is used asymmetrically it becomes active space. There is also the use of white space as symbolic space, in which white space represents concepts of quality, solitude, cleanness, calmness, and purity (White 39).

Of the seven design elements mentioned in *The Elements of Graphic Design*, a few stand out in relation to this thesis study. White examines the use of unity as the first component and explains how the composition parts with unity are being used so they appear to belong together rather than to be thrown randomly next to each other. The element of unity here requires that the whole be more important than its parts (White 57). With unity, proximity of parts is the easiest way to achieve this relationship, with items close together being related and elements far apart being separate.
Dominance and Hierarchy

A second aspect that White observes in the design composition is dominance. To achieve this, emphasis of a specific focal point is given and competition among elements is reduced (White 63). Along with dominance, hierarchy is important to design solutions because it guides the viewer’s eye across the elements on the page in order of importance. Hierarchy can be defined as organization of information in a ranking order with levels of importance. Without dominance or hierarchy, the viewer is forced to do more work than is needed and more interpretation than is necessary. The user is also given more room for misinterpretation, which oftentimes is not the desired goal in the design solution.

Page Architecture

The last area that White covers that pertains to this thesis is the study of what he calls page architecture. This refers to the way in which the space of the design composition is used in comparison to how architects use space every day within the environment and as well as the space within the structure. One important fact is how architectural volumes are created as either a solid (space displaced by mass) or a void (space contained or enclosed by planes) (White 79). In architecture, solids are the buildings that make up the space, while voids are the spaces defined by those solids. Along with this, there are three kinds of space used in architecture and in graphic design: simple, standard, and complex. Sequencing of information is also found in both architecture and graphic design. This plays a similar role to hierarchy in determining the order information is retrieved. The order of information gathering in graphic design can play a crucial role in understanding the message.
Exhibition Design David Dernie

In *Exhibition Design*, David Dernie focuses on the use of space with supporting examples of various exhibits found in the world. He explains that there are two kinds of space used: narrative space and performative space.

**Narrative Space**

Narrative space is any use of space that offers to communicate a story through the arrangement and display of elements. These are often static displays, to be looked at and read but not to be touched. Dernie explains that there are three stages to narrative space use. The first stage entails the strategic planning of the story or theme being told. In the second stage, the artifacts are grouped in a way in which they strongly reflect and support the theme. In the last stage, the design of more detailed arrangement within each room is considered. All parts of this process yield the total experience for the viewers so they can hear and feel the story being told. One example of an exhibition that successfully uses narrative space is the Holocaust Exhibition in Washington DC, which was designed by Ralph Applebaum Associates. Its use of space attempts to allow the visitors to experience what prisoners in concentration camps during World War II dealt with daily. Through the use of artifacts, graphics, and displays the visitor is able to come as close as possible to the actual experience of the Holocaust. The image below exemplifies this, with piles of victims’ shoes that were recovered from the execution areas of the concentration camps within the reach of the viewer. This puts the audience so close with such personal objects, which makes the experience much more real.

![The Holocaust Memorial Museum, Ralph Appelbaum Associates](image)

**Performative Space**

Performative space is often different from narrative space in that the visitor is invited to interact and engage with the exhibition. This method is “visitor-focused and is carefully attuned to the user experience,” explains Dernie. Furthermore, “the focus is on the relationship between the active user and the fabric of the installation.” While in narrative space focus is placed on fixed elements in the exhibition, performative space emphasizes motion and activity. One example of performative space given in this book is the Orange Imaginarium at Explore At-Bristol in the United Kingdom. Here, the problem was communicating the high technology and potential of wire-free technology to four–sixteen year olds in a stimulating way. A solution was to use performative space so that visitors could engage themselves completely in this technology and discover what it has to offer by feeling, hearing, and seeing.
Along with different kinds of space use, strong decisions related to graphics, color, sound, and graphic placement are imperative to successful user experience in exhibition design. Graphics of all kinds aid in the visitor's total experience and depend on the successful use of type, image, and color. Along with visual design units (type, color, images, etc.), lighting is a vital aspect to any exhibition design. Lighting is often controlled and gives each exhibition a unique effect. In many cases, how damaging the light might be to an artifact is considered. Lighting for an exhibition can never be assumed to be the same as other indoor conditions such as in an office or factory. As Dernie states, "lighting conditions affect the way in which an exhibition structure is perceived, the effectiveness with which it communicates, the rendering of form and colour, and the legibility of the graphics" (136).

Like light and visual design elements (typography, image, color, etc.), sound can also be used to enhance the experience of the visitor. A largely underestimated aspect, "Sound remains an underexplored aspect of the exhibition experience" (Dernie 163) due to one major issue: sound is very hard to contain. It has to exist and remain in certain areas of the exhibition and fade out when not needed. Regardless, many exhibitions feel that the contribution of sound is worth the effort to make the visitor's experience the fullest it can be.

The study of these 'elaboration' attributes in exhibition design shows an important parallel that design has with ASL. An important aspect of this thesis is how extra emphasis variables in ASL such as nonmanual cues can alter the communication. While these attributes are not the signs themselves (or the design, in exhibition design), they often have a profound effect on how the information is perceived.

**Elaboration Variables**

Graphics, Lighting and Sound

Lighting as a dramatized element in exhibition design.
*Giorgio Armani Exhibition, Robert Wilson*

The power graphics and color have on a display.
*Hayward Gallery, London*
Space and Human Movement

Hall devotes a large amount of his study to the use of space in both the human and animal worlds. He also draws attention to the human receptors, including the eyes and ears. Hall addresses these receptors of information by comparing the two, claiming that the unaided eye picks up a large amount of information within 100 yards compared with auditory signals heard by the unaided ear: eyes can be 1,000 times more effective at picking up information than can ears (41). Beyond this, Hall argues that visual space has an entirely different character than auditory space. Visual information tends to be less ambiguous and more focused than auditory information. This shows potential for a visual solution to a problem to surpass a verbal one in terms of effectiveness.

Hall mentions three considerations when studying space. The first is touch in which visual spatial experiences are interwoven, Young children are trained to coordinate touch with a visual reference. Therefore they cannot be separated. The second is that tactile space separates the viewer from the object, which leads to the third consideration, that visual space separates objects from each other. Tactile and visual senses are two channels of information and when using both simultaneously, perception is enhanced.

Hall argues that there are three kinds of human space. Fixed feature space denotes things organized spatially, such as in the Western household where every room is separate and has a specific purpose (kitchen is to cook, bedroom for sleeping, living room is to entertain, etc.). Those who live without this organization are people who "live in 'constant state of confusion' and are those who fail to classify activities and artifacts according to a uniform consistent or predictable spatial plan" (Hall 97). Fixed feature space also serves as a mold by which many behaviors are formed. Semi-fixed space defines space that is designed to force people to act a certain way, such as seating arrangements in a crowded restaurant that force people to remain within close proximity. Informal spatial space is the third kind, and is essential to understanding culture. This includes the distances maintained when encountering others. These distances are of an outside awareness. How people feel towards each other is a decisive factor in the distances they maintain. For instance, if someone is angry with another person, he or she will remain closer than normal and will tend to shout.

All spaces vary from culture to culture, and Hall studies how space is used across different groups and how people respond to the environment around them.

Significance

Edward T. Hall’s book The Hidden Dimension, along with the study of personal space, is relevant to this thesis study because they focus strictly on space and the meaning space has on communication. Space is imperative in both ASL and graphic design and just as Hall observes, space use varies from purpose and group. Those who use ASL have trained their minds to look at space differently than someone without the knowledge of the language. The way in which they use the space around their body is a form of communication that they and other ASL users understand. To make this significant in design to assist the deaf and hard of hearing, how that space is used needs to be understood. Since the difference in space use between ASL and graphic design is a vast one, careful study of this topic will aid in understanding how to better use space in design solutions.
American Sign Language

Before the 1800s, a person who was deaf was seen as a hopeless case in terms of education. In a time when religion and the word of God were necessary for one's morality, those who could not communicate were considered lost causes. However, there were a few individuals in history who saw this as a challenge, and worked toward a method of educating the deaf. Some chose signs and visual cues to educate, while others worked on speech and speech reading. Within the parameters of this thesis, speech and speech reading prove to be unnecessary for discussion since the focus is on how the deaf and hard of hearing communicate specifically through ASL, a visual language that can be compared to graphic design as a new inspiration.

The book Significant Gestures: A History of American Sign Language by John Tabak was used for a concise version of the history of ASL. The furthest into history Tabak goes is to the French in the 18th century. With many sign languages existing around the world, ASL is said to be most closely derived from French sign language. One notable individual was Charles Michel de l’Epee, who was a member of the Catholic Church. l’Epee worked to organize the French system of signs and employ a sense of grammatical structure in order for the language to be teachable. In this process, l’Epee “did not so much repair the language used by the deaf of Paris as he did ruin it. Appending his extensive set of grammatical signs to the indigenous sign language of the deaf probably made the resulting sign system incomprehensible to many native signers” (Tabak 19). Regardless, this ‘repairing’ of French Sign Language was one of the first steps toward creating a formal language of signs that could be used in deaf education throughout Europe and would eventually spread to the United States, allowing ASL to be formed.

A second notable figure in the development of ASL is Thomas H. Gallaudet, the founder of the first school for the deaf in the United States. Gallaudet started his experience with ASL in Paris, France in the company of the French cleric, Roche Amboise Sicard, who was also the successor of l’Epee. Sicard offered to educate Gallaudet on sign language as a method used in deaf education. Gallaudet studied with Laurent Clerc, a deaf man who had studied under Sicard and worked in Sicard’s institution. After realizing the length of time it would take to learn sign language and how to teach it, Gallaudet offered Clerc a position at the Hartford School, which Clerc accepted. In return for teaching Gallaudet fluent sign language, Gallaudet taught Clerc English. Back in Connecticut, Clerc lobbied the United States Congress to approve government funding for the Hartford School, which was granted. On April 15, 1817, The American Asylum for the Deaf and the Dumb (now called the American School for the Deaf) opened in Hartford as the first school for the deaf in the country (Tabak 23).

Establishing the school for the deaf in America was only a small step in the creation of ASL. Gallaudet was fascinated by the ‘natural language of signs,’ which he believed all people around the world possessed and used (Tabak 25). In addition, Gallaudet was one of the first to recognize the importance of non-manual signs such as facial expression, eye gaze, and body language in the signed language of the deaf. He believed there was little if no distinction between signs and gestures. From Gallaudet’s findings and the signs the deaf already used in the United States, ASL was created as a language that had its own linguistic structure and grammar.
**American Sign Language Users**

Which communication situations are commonly frustrating for the deaf and hard of hearing?

While no two deaf individuals share the exact same frustrations, there are many situations in which deaf and hard of hearing people commonly find themselves confused because they have missed important information. Even after surveying a small sample of five deaf and hard of hearing individuals it is evident that there are a wide range of shared situations in which information is lost.

There are ways to categorize these situations based on magnitude, location, time, etc. By further understanding the range of frustrations, it will be clearer as to which situation would be the most beneficial for the final application of this thesis. Many of the deaf and hard of hearing find it hard to enjoy daily activities the hearing take pleasure in effortlessly, such as listening to music or watching television. In these two examples, much of what is being communicated is not actually in the words themselves, but in additional cues such as tone, volume, pitch, and emphasis. Some situations, however, prove to have more severe consequences, such as announcements in airports or hospitals. Notably, these are situations where even those who can hear often have trouble clearly understanding or communicating.

Direct interviews were conducted with a sampled population of deaf and hard of hearing participants to identify and define situations that are frustrating for them. Below are the responses from the five sampled deaf and hard of hearing individuals who were asked what situations were frustrating to them.

**Subject 1**

1. TV shows or movies: sometimes there are no subtitles or captions.
2. Listening to music: can't determine who sings most of the time, cannot understand words, but can understand sounds.
3. Airport: cannot hear announcements.
4. Face to face communication: hard to communicate with people who doesn't know ASL.

**Subject 2**

1. Social events: difficult to lipread multiple people at once.
2. Computer games: narrations usually don't have subtitles.
3. Restaurants: some only call by name during wait time.
4. Tours: hard to hear the tour guides.

**Subject 3**

1. Work: trying to understand coworkers when they talk quietly among each other.
2. Event Speakers: trying to understand when there is no interpreter or closed captioning.
3. At home: hearing noise while being alone.
4. Going to the movies: movies that I want to see but no closed caption.
5. Music: hard to understand lyrics to music.
6. TV: shows with no closed captioning.
7. Announcements: in various places such as airport, mall, etc.
American Sign Language Users Continued

Subject 4
Hard of Hearing
1. Airplanes: cannot hear the emergency instructions, or boarding time. Need to actually inform someone at the desk so they can help
2. Trains and Subways: missing important announcements about delays and stops
3. Movies/TV: frequently miss the tone of voice and misinterpret the dialogue
4. Live sporting events: cannot hear announcers to understand plays
5. Tour Guides: miss information that is spoken
6. Church: never took up going because there was no way of learning

Subject 5
Hard of Hearing
1. Items with sound: greeting cards, toys, etc.
2. Dangerous situations (such as construction sites): nervous that important announcements will be missed
3. Emergency vehicles: often do not hear sirens for firetrucks and ambulances, therefore do not pull over until last minute.

Significance
By understanding these frustrating situations, potential solutions can be designed in order to benefit the deaf and hard of hearing. From these responses, many situations stand out because they were mentioned multiple times. The outcome of this thesis study will attempt to focus on one set of frustrations for the deaf and hard of hearing. Design solutions with ASL considerations in mind will be created in order to assist communication goals.
How do variables in American Sign Language (handshape, location, movement, repetition, direction) affect the meaning of what is being said in terms of tone, volume, and intensity?

This important key question is answered through wide research of many elements of ASL which prove to have potential for further connections in this thesis study. Through this research section, it will be made evident how variables in ASL affect the content of what is being communicated.

One important text imperative to this research component is *Linguistics of American Sign Language* by Clayton Valli and Ceil Lucas, which does not provide theories about American Sign Language, but attempts to draw attention to the language’s unique structure and principles. The authors introduce fundamental areas of ASL study: phonology, morphology, syntax, semantics, and the use of the language. This text is based on the idea that ASL is a linguistic inquiry that is dynamic and flexible, not frozen or static. This book outlines the major rules and variables that shape ASL. It explains in depth many rules that are followed in the language, and fully describes how ASL uses factors such as space and time. The text opens with a fact that is crucial to this thesis study: ASL, like any spoken language, is a true language. Valli and Lucas outline the basic qualifications of ASL that make it a language:

- It has a means for coining new symbols
- It has an infinite number of messages that can be communicated
- More than one meaning can be assigned to an ASL utterance
- The roles of addresser and addressee can switch
- Signers must pay attention to their ASL output and make corrections
- At least part of ASL must be learned
- ASL can be used as a metalanguage (a language that can be used to describe languages); one can have a discussion about ASL in ASL.

One of the most essential areas covered in this source is the structure of ASL itself. The authors include many important contributions to the study of ASL formation, which breaks down the language into its smallest parts. William Stokoe was a major researcher of ASL. Stokoe created the Stokoe System, which was the first complete system used to describe signs (Valli and Lucas 26). His research strived to prove that ASL is in fact a true language of equal value to any spoken language. The authors place great significance on this contribution, emphasizing that, “Before Stokoe, signs were thought of as unanalyzable wholes with no internal structure” (26). Stokoe was able to explain the internal structure in a few important ways. First, he proved that all signs can be broken down into three parts: location, handshape, and movement. The various combinations of these three parts, or parameters, create a vocabulary as vast as any spoken language. In addition, like any other language, the parts by themselves are meaningless; it is when they are combined that meaning is made. By showing this, Stokoe proved how ASL fills the requirements of a language by having phonology (the smallest meaningless parts of a language, which in the case of ASL would be each parameter such as handshape, location, and movement that by themselves carry no significance, but when combined create useful words) and morphology (the smallest meaningful parts of a language, which in ASL would be each sign).
In the above, six of the eighteen handshapes of the Stokoe system are shown. In written form, these six handshapes are represented by a letter or number from which they can be translated. An open hand is categorized as the ‘5’ hand, a flat hand is represented by the letter ‘b,’ a curved hand is shown through the letter ‘c,’ and so on. When analyzing parts of ASL, these written representations are used to illustrate which handshape is being used. Stokoe carries on this system to categorize location of sign on the body, and movement of the sign.

**Significance**

The work done by William Stokoe is vital to this thesis study because without the structure of ASL dissected, it would be impossible to understand the rules of ASL’s components. With the organization of Stokoe’s thinking, ASL can be further dissected in a manner that it can be implemented into other visual systems such as graphic design. The elements of ASL that Stokoe isolated (handshape, placement, and movement) can be translated into graphic design using existing variables such as size, color, proximity, and so forth. Knowing how and why each variable is used is critical to finding new inspiration for introducing ASL into graphic design problem-solving.
While Stokoe’s study of the linguistics of ASL is vital in understanding the structure of the language, several observations have been further added that are important in this thesis study. One notable observation is that signs can be broken into two distinct categories, arbitrary and iconic. Arbitrary is used to define signs in which the actual form does not reflect the physical characteristics of the thing or activity it represents. Iconic is used to describe the opposite: signs in which the form used has actual meaning behind the representation (Valli and Lucas 5). An example of iconic signs would be the signs for ‘boy’ and ‘girl,’ in which the placement and handshape directly relate to items which were at one time closely used distinguish the two. The word ‘boy’ is used with the dominant hand gripping the brim of an imaginary baseball cap, and ‘girl’ is signed to indicate the string of a girl’s bonnet.

Arbitrary and iconic signs used in ASL are important to understand because signs that are iconic always have strong reasons behind the formation of the signs. By breaking down each individual feature of the sign, how each part relates to the iconic imagery of the object can be studied and possible further employed into representation for that object in graphic design solutions.

A second additional observation made to the structure of ASL is that along with Stokoe’s three parameters (location, handshape, and movement), signs also use orientation and non-manual signs. At this point, there are five major parts that make up a single sign. There is a significant importance placed on the use of non-manual signs, as the authors state, “Many signs in ASL require a non-manual signal in order to be produced correctly” (Valli and Lucas 21). An example supporting this statement is the phrase, which in ASL is signed ‘John home.’ With the addition of different non-manual signs, the phrase is given different meanings. With the contribution of raised eyebrows, ‘John home’ becomes ‘Is John home?’ With the motion of shaking the head in negation, this phrase becomes ‘John is not home.’ Finally, with the nodding of the head in agreement, this phrase becomes ‘John is home.’ Clearly, the incorporation of non-manual signs in ASL can be imperative to the understanding of the signs themselves.

After observing the use of ASL in normal conversations between the deaf and hard of hearing, it is clear that non-manual signs serve as the translation for many verbal cues in spoken languages, such as emphasis, tone, emotion, and volume. Therefore, this variable in ASL serves as an important factor in this thesis study.
Because non-manual signs vary in formation from signer to signer, it is much more complicated to analyze this variable compared to others such as handshape or location. Each signer will use non-manual signs differently and will express them in different ways depending on individual characteristics. Still, research has been done to specifically break down all the possible non-manual signs used in ASL. Along with this, there are specific rules that explain when a certain non-manual sign is used.

The Timeline

One important aspect of ASL that controls the use of space is the timeline. The timeline is the space behind, in front of, and the space in which the body lies to indicate past, present, or future tense. The timeline allows the form of the sign to remain the same, but the area in which the sign takes place varies, and determines the actual tense of the word.

Other Uses of Space

Since the intentional use of space exists in both ASL and graphic design, it is significant to understand how each uses this variable. According to *The Linguistics of American Sign Language*, there are six key functions of space in ASL.

1. **Articulatory**
   The location of the sign may have no meaning in the sign itself. The space is used to indicate phonological contrasts.

2. **Morphological**
   The verbs are modified to represent actual space. For example, in the phrases, ‘I give to you’ or ‘You give to me,’ the direction of the sign determines who is doing the action and who is receiving the action.

3. **Referential**
   When a location in space can be associated with a nominal (a given name, person, place, or thing). For example, pointing to an area in space is used to relate to the nominal.

4. **Locative**
   The use of space to provide a location of an object or person in a three-dimensional space.

5. **Signer’s frame of reference**
   The signer will use space according to his or her own perspective. An example of this would be if the signer was indicating how tall someone was, they would describe the height from his or her point of view.

6. **Narrative perspective**
   When the signer uses space to switch between roles in storytelling. The signer can use all or only one of the following to indicate the switch: body shift, eye gaze, and head shift.
Space in ASL is equally as important as space in graphic design. The exploration of how space is used in ASL is critical in comparing and contrasting the two areas of study. Only through this comparison can a new way to employ ASL in graphic design be found. Elements that both areas share need to be further analyzed to understand what makes the elements unique. The use of space in ASL and graphic design differs; one uses real time space and time, while the other uses two-dimensional space. This difference provides the potential for a new link to be made between ASL and graphic design.

**Classifiers**

The role of a classifier in ASL is very important for the understanding by the receiver. A classifier is a specific handshape that is used in the same way to represent several objects of similar meaning. For example, if a signer was describing driving a car, to indicate the presence of the car the signer would use the ‘3’ handshape. Similarly, if the signer was describing a motorcycle or a bicycle, the signer would use this same handshape. In all three of these examples, the ‘3’ handshape is a standard classifier for all objects that can be considered vehicles. Valli and Lucas identify seven classifier handshapes used in ASL; a few that hold the most potential in the synthesis stage of this thesis study are explained below.

1. **Whole Entity Morphemes**
   Handshapes that refer to an object as a whole, such as a car, animal, or person.

2. **Surface Morphemes**
   Handshapes that represent thin surfaces such as wires, narrow surfaces, or wide surfaces.

3. **Instrumental Morphemes**
   Handshapes that indicate the holding of objects, which also explain to the receiver how the object is handled.

4. **Depth and Width Morphemes**
   Handshapes that represent the depth and width of different objects, such as tree trunks.

The use of classifiers in ASL greatly aids clear, effective communication. While it is not always necessary or easy to use separate signs for very similar objects or ideas, classifiers remove confusion from a conversation. Along with simplifying groups of objects, classifiers provide easily recognizable forms to the signer and the viewer. In graphic design, there are many cases in which designers follow a similar rule: if two elements are so similar in size, alignment, placement, etc. that little distinction can be made, it is more effective to make them equal. A bridge of this tactic to ASL would be the use of classifiers in design solutions.
**Subject/Object Agreement**

The order of words in **ASL**, largely the placement of the subject, object, and verbs in a sentence are unique to **ASL** just as in many languages. A research study done by Liddell and Johnson shows how the subject and object agreement in **ASL** is very clear compared to within the English language. In English, the subject/object agreement is evident only through word ordering, and the verb itself gives no information about the subject or the object. In **ASL**, this agreement communicates information about both the subject and the object. An example would be seen in the use of verbs mentioned earlier, such as ‘give,’ where the direction of the sign tells the receiver who the subject and object are. The information is contained in the location of movement and/or the orientation of the sign. Consider the phrase, ‘I give him.’ In **ASL**, there is no need for the words ‘I’ or ‘Him,’ as the beginning and end point locations of the verb indicate who gave to whom. Unlike spoken languages, **ASL** shows the connection between the subject and verb, and the action between the two can be visually seen.

The subject/object agreement and temporal aspect in **ASL** helps signers do more with less. Rather than adding signs that would only add to the confusion of the viewer, this particular principle in **ASL** helps the signer make the most of one sign. Additional information comes from using the same sign in various ways, changing the meaning completely.

**Temporal Aspect**

Temporal aspect is information that tells us how the action of the predicate is performed. Research done by Klima and Bellugi shows how a verb or activity can be never-ending, frequent, drawn out, or intense (Valli and Lucas 107). An example used is the word ‘study,’ which is signed by holding the hand in one place, but moving the fingers in a wiggling motion. In the standard position, the word has no additional meaning except what the word ‘study’ means in the particular context. Klima and Bellugi show that when specific movements are added, the degree of the word changes. By moving the hand in a circular motion, the word ‘study’ becomes ‘study continuously.’ In this example, the additional movement shows the action of the verb in relation to time without adding unnecessary signs or words (Valli and Lucas 108). This is also an example of inflection, which is the term for a morpheme that adds new information without adding more signed words. An amazing ability of **ASL** is that it can express thoughts or ideas with the elimination of many words that are used in spoken languages. It visually creates relationships between elements such as the subject and object of a sentence and not only describes this relationship, but shows it as well. An essential visual element in **ASL**, subject/object agreement has a great potential for minimizing elements in graphic design message-making and also for strengthening relationships between individual elements.

The word ‘study’ in American Sign Language
Several examples of deaf theater (motion and sign language as a translation of emotion and storytelling) were analyzed to illustrate the expressive nature of **ASL**.

A brief description of some key works are provided and the value is explained.

Mr. **V** is a brief, two minute deaf film which is understood by all, deaf and hearing. Through the actor’s two fingers portrayed as a person, a story is easily told. By giving his hand characteristics of a human body through actions and timing, the actor is able to express complex concepts that involve emotion with no sound, no signs, only body movement. This film clearly shows how the expression through the body can represent something usually explained verbally.

The film sequence begins with a human hand, which is a representation of the human body as a whole, including emotions. Through the use of movement and timing, the character is given human characteristics that the audience can identify with, such as attraction to another individual. The ‘person’ in the film comes into contact with a female and initially both show shy attraction to one another, and soon embrace in a romantic manner. Through the use of body language, the audience can recognize and associate with the emotions being revealed.

Clips from Mr. V
The work of well-known deaf actor, Bernard Bragg, exemplifies the expressive nature of American Sign Language. In his one-man show titled, *Theatre in the Sky*, Bragg performs humorous skits that are understood by hearing and deaf, regardless of their signing ability. The effective communication through expressive gestures, body language, and facial expressions allows emotions of all kinds to be translated to the audience. *Theatre in the Sky* is produced by the National Association of the Deaf and the World Federation of the Deaf.

**Theatre in the Sky**  
*Actor Bernard Bragg 2007*

**Significance**

The study of deaf theater is an important one. Various examples of deaf films and role playing demonstrate how expressive ASL can be. Through watching and understanding this expressive form of art, it is clear that many auditory aspects lost to deaf and hard of hearing people are communicated visually. Such audio aspects include tone, emotion, emphasis, intensity, and urgency. Deaf theater clearly demonstrates how users of ASL translate these vocal cues. Through this, it is clear how ASL can be a further influence to employ these cues in graphic design problem-solving.
Facial Expressions

The majority of this research on facial expressions provides a few important findings toward this thesis. The face is capable of sending messages and communicating emotion, reactions, and information. A second finding is that the complexities of the face make it hard to provide consistent feedback (Knapp 285). While several rules in reading facial expressions reveal the portrayer's thoughts and emotions, many are a result of an overlap of rules, which can be read in different ways.

Eye Behavior

While the eyes are not as obvious in expression as the face as a whole, according to Knapp, they are capable of several activities:

1. **Opening and closing the channel of communication**
   - Through eye gaze, the beginning and end of a conversation can be determined.
   - When eye contact is made between two people, the channel of communication is opened.
   - When eye contact is broken, the channel is closed.

2. **Regulating the flow of communication**
   - By using eye gaze, one can determine who speaks next. When eye contact is made, many people treat this as a requirement to converse.

3. **Monitoring Feedback**
   - When eye contact is made, it very often is done to receive comments or criticism from someone.

4. **Expressing Emotion**
   - Knapp includes a study of eyes and emotion by Paul Ekman, in which a series of eyes were studied with various facial expressions of emotions. The eyes were isolated from the rest of the face to study individually. From this study, several distinct characteristics were found, such as position of eyebrows, actions of the eyelids, and so on. From the combination of eye movements, several common emotions were detected easily, including surprise, anger, sadness, etc.
Communicating the nature of interpersonal relationships

Different relationship conditions resulted in different eye gaze patterns showing that the connection between two people can be evident solely though eye gaze.

Distance

Gazing can increase or decrease the distance between two people. Through making eye contact, the physical distance can seem shorter than it really is because a connection has been made.

Vocal Cues

The final topic Knapp covers that is relevant to this thesis study is vocal cues. Here, Knapp addresses the long-standing question of how things are said. Most people are aware that cues such as volume, speed, emphasis, intensity and many others can indirectly change what is being said. A phrase said sarcastically has a completely different meaning than one that is said seriously. An excellent example Knapp uses on the vocal cue of emphasis shows how the words’ context changes with emphasis of different words in this sentence: ‘He’s giving the money to Herbie.’ The following shows each word being emphasized, and what the resulting context of the message is:

1. He’s giving this money to Herbie
   He is giving the money; nobody else

2. He’s giving this money to Herbie
   He is giving, not lending, the money

3. He’s giving this money to Herbie
   The money being exchanged is not from any other source, it is this money

4. He’s giving this money to Herbie
   Money is the unit of exchange, not a check or anything else

5. He’s giving this money to Herbie
   The recipient is Herbie, not Eric or Bill or Rod

(Examples taken from Nonverbal Communication in Human Interaction, Mark L. Knapp page 323)

Knapp also provides a very useful organization chart connecting the key vocal cues to many common emotions people express daily. This chart is important in this thesis study because it breaks down each emotion based on loudness, pitch, timbre, rate, rhythm, and inflection (Knapp 346). These are just several examples of spoken variables which need to be visually translated in ASL, and also in graphic design.

Significance

Although much research has been done on nonverbal communication, the studies focusing on the face and eyes can be compared closely to the non-manual signs (see page 41) of ASL, which are an imperative aspect of the language. The research done on vocal cues is of importance to this thesis research because it shows how vital the control of one’s voice is in conveying a spoken message. The loss of understanding vocal cues can devastate the clarity of communication in the deaf and hard of hearing populations. Examples of this confusion range from moderate to profound consequences. Not understanding a specific vocal cue such as sarcasm is an example of a situation with low consequences. Miscommunications in emergencies such as an evacuation announcement are situations with profound consequences.
Gesturing is a key component of body language and nonverbal communication. While on the surface it is obvious that people use natural gestures to assist in spoken communication, David McNeil argues that gesturing is far more important than simply aiding speech. In his book *Hand and Mind: What Gestures Reveal about Thought*, McNeil proposes the theory that gesturing actually impacts thought, and can alter and affect the thought process. He argues, “Gestures are not fixed, they are free and reveal the idiosyncratic imagery of thought” (1). This theory gives gestures a vital position in human communication. Speech, along with gestures, forms a cohesive performance that makes up communication. Placing this level of significance on gesturing magnifies the power nonverbal communication including ASL, can have. It also supports the theory that gesturing is a natural, universal, and spontaneous aspect of daily communication and is understood by people all over the world. Therefore, gesturing plays a key role in clear communication among groups. From this, the potential for ASL to be employed in graphic design solutions for clear communication and be beneficial solutions becomes more evident.

McNeil makes a simple observation to classify gestures into five distinctive categories. It is evident from ASL research mentioned earlier that there are some similarities in the ways gestures and ASL can be grouped.

1. **Iconic**
   When the gesture has a close relationship with what is being said. The imagery produced through gesturing closely resembles the action being described.

2. **Metaphoric**
   Pictorial gestures present an abstract idea rather than a concrete object or event.

3. **Beats**
   Gestures in which the hand or hands move along with the rhythmic pulsation of speech.

4. **Cohesive**
   Gestures that connect parts of what is being said to a shared theme.

5. **Deictic**
   Gestures that involve pointing to draw attention to a person (‘he’, ‘she’, they’ etc.), a thing, or general reference to a space (‘over there’)

Many people may assume that ASL is a form of gesturing and fail to realize the main distinction: natural gesturing is spontaneous and unplanned, while ASL follows a strict structure that dictates the message. Natural gestures are also often performed subconsciously, while the use of ASL is very deliberate. All the sources found on gesturing help support the assumption that whether or not someone uses sign language as a form of communication, gesturing is almost always used to communicate clearly. With this vital aspect of communication, it is important to understand how gestures can exist alone as well as incorporated into ASL for comparison.
Synthesis

The synthesis process of this thesis seeks to not only organize researched material, but also to make evident significant connections between ASL and graphic design. Various methods of organization will also allow for new potential connections to be identified. It is difficult to compare and contrast ASL and graphic design because even though they both use similar variables, they use them differently. ASL depends on the use of three-dimensional space, while graphic design can exist in two-dimensional form (such as a poster) in a three-dimensional medium (such as a room). Through the use of organizational methods such as matrices, parallels between the two topics of this thesis can be further analyzed and understood. Each matrix (pages 51–62) strives to organize selected material so that the links between ASL and graphic design are clear. For this purpose, a wide range of examples were chosen to exemplify each variable used in both ASL and graphic design.
Synthesis

Matrix A Variable Use in Graphic Design

How can ASL variables and rules be employed to improve graphic design problem-solving? What characteristics of existing graphic design solutions already employ variables of ASL?

**Purpose**

The purpose of this matrix is to cross reference graphic design and ASL in terms of which variable is used to control the message or meaning of what is being said. Each example will have one primary variable, and some will also have a secondary variable. Each variable is further split into subtopics, which will explain the variable’s purpose for being used. By isolating each variable and purpose, it will be easier to employ ASL and graphic design. The matrix will allow close comparison of the two communication methods, and will further reveal any missing connections.

**Criteria**

When more than one variable is used, one was chosen as the dominant variable (most important to the resulting message) and one as the secondary variable. In each example the variable is used to change the meaning of the visual. There are seven variables chosen for this study and each variable further breaks down to describe the purpose of variable use in each example (see pages 22–28).

<table>
<thead>
<tr>
<th>Shape</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitution</td>
<td>One shape is used to substitute for another to alter meaning.</td>
</tr>
<tr>
<td>Focal Point</td>
<td>Shape is used to create a focal point.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Placement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representation</td>
<td>An object or element is used to replace another.</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>An object or element is placed strategically to reinforce the message being conveyed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emphasis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exaggeration</td>
<td>An object or element is overexaggerated.</td>
</tr>
<tr>
<td>Subtle Enforcement</td>
<td>An object or element is subtly enforced.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Orientation in Space</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personification</td>
<td>An object or element is given different orientation, which allows for it to have human characteristics.</td>
</tr>
<tr>
<td>Alternation</td>
<td>The change in orientation of an object or element allows it to become something other than what it is.</td>
</tr>
<tr>
<td>Observation</td>
<td>The orientation of an object or element is changed to allow it to be seen from an unexpected angle.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proximity of Parts</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolation</td>
<td>An object or element is isolated for meaning.</td>
</tr>
<tr>
<td>Show Relationship</td>
<td>How close or how far apart elements are allows a relationship that does not normally exist to be created.</td>
</tr>
<tr>
<td>Imply Distance</td>
<td>How close or far apart elements are creates implied distance.</td>
</tr>
</tbody>
</table>
**Repetition**

*Show Mass* By repeating an element, a larger mass or volume is created.

*Revolutionize* By repeating an element, a different composite element is created.

*Mimic* The essence of an object or element is repeated rather than the actual object itself.

**Direction**

*Imly Direction* Actual direction is implied through the composition or sign.

*Draw Attention* Direction is used to focus the eye on a particular aspect.

## Matrix A Variable Use in Graphic Design

<table>
<thead>
<tr>
<th>Design Examples</th>
<th>Design Variables Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer</td>
<td></td>
</tr>
<tr>
<td>Pool</td>
<td></td>
</tr>
<tr>
<td>Shopping Bag</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td></td>
</tr>
<tr>
<td>Vodka</td>
<td></td>
</tr>
<tr>
<td>Wham</td>
<td></td>
</tr>
<tr>
<td>Brainsells</td>
<td></td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
</tr>
<tr>
<td>Celebration</td>
<td></td>
</tr>
<tr>
<td>Dylan</td>
<td></td>
</tr>
<tr>
<td>Gears</td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td></td>
</tr>
<tr>
<td>Newspaper</td>
<td></td>
</tr>
<tr>
<td>Westvaco</td>
<td></td>
</tr>
<tr>
<td>Candy</td>
<td></td>
</tr>
<tr>
<td>Checkup</td>
<td></td>
</tr>
<tr>
<td>Post-it</td>
<td></td>
</tr>
<tr>
<td>War Bonds</td>
<td></td>
</tr>
<tr>
<td>Feet</td>
<td></td>
</tr>
<tr>
<td>Cancer</td>
<td></td>
</tr>
</tbody>
</table>

- Dominant Variable
- Secondary Variable
Matrix B Variable Use in American Sign Language

**Purpose**

This matrix follows the same organizational structure as Matrix A (please see page 52). Instead of graphic design examples being categorized by the seven attributes (shape, placement, emphasis, orientation in space, proximity of parts, repetition, and direction), ASL examples are used here. Words are paired together in order to narrow down those chosen for observation. In each pair, one of the seven variables is responsible for changing the meaning of the word. The other variables remain consistent across the two signs. This will allow for specific signs to be cross-referenced to graphic design examples that can be compared and contrasted.

<table>
<thead>
<tr>
<th>ASL Examples</th>
<th>Design Variables Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer/Dry</td>
<td></td>
</tr>
<tr>
<td>Yours/Mine</td>
<td></td>
</tr>
<tr>
<td>Mom/Dad</td>
<td></td>
</tr>
<tr>
<td>Next/Last Week</td>
<td></td>
</tr>
<tr>
<td>Far/Very Far</td>
<td></td>
</tr>
<tr>
<td>Girl/Everyday</td>
<td></td>
</tr>
<tr>
<td>Plane/Fly</td>
<td></td>
</tr>
<tr>
<td>Deaf/Dorm</td>
<td></td>
</tr>
<tr>
<td>Tomorrow/Yesterday</td>
<td></td>
</tr>
<tr>
<td>Which/Car</td>
<td></td>
</tr>
<tr>
<td>Name/Train/Short</td>
<td></td>
</tr>
<tr>
<td>Good/Bad</td>
<td></td>
</tr>
<tr>
<td>Family/Class/Group</td>
<td></td>
</tr>
<tr>
<td>Know/Don’t Know</td>
<td></td>
</tr>
<tr>
<td>Busy/Very Busy</td>
<td></td>
</tr>
<tr>
<td>Tired/Exhausted</td>
<td></td>
</tr>
<tr>
<td>People/Place</td>
<td></td>
</tr>
</tbody>
</table>

● Dominant Variable
**Matrix C** Cross-Referencing Graphic Design and ASL

**Purpose**

The purpose of Matric C is to provide a visual cross-referencing guide that combines Matrices A and B (see pages 51–53). In the pages to follow, each variable will indicate visual examples of both graphic design and ASL in order to show how both implement the same attribute for the same purpose. From this comparison, the focus is on how the variable is executed as opposed to Matrices A and B, which only show which variable is executed. Upon comparison, aspects of ASL that do not currently exist in graphic design are brought to the forefront. These segments of ASL can then be further studied and incorporated into graphic design for the ideation phase of this study.

**Goal**

The goal of this matrix is to clarify the differences between ASL and graphic design based on the use of variables found in both disciplines. This study strives to discover how a new influence from ASL can be brought into graphic design for clear communication to the deaf and hard of hearing audience. By isolating the differences between how the variables are used, the way in which ASL uses variables can be adapted for use in graphic design.

Matrix C is composed over pages 55–62.
### Matrix C

#### Purpose
What is the variable used for?

#### Methodology
How is the variable executed?

#### ASL Influence
What features of ASL can be influential to new design?

<table>
<thead>
<tr>
<th>Substitution</th>
<th>ASL</th>
<th>GD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please, Sorry</td>
<td>Using changes between basic handshapes to signify different words.</td>
<td>Replacing an existing shape with another changes the concept or meaning of the element.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Focal Point</th>
<th>ASL</th>
<th>GD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweetheart</td>
<td>Handshape is used to reflect a meaningful element, and serves as the major focal point in the execution of the sign.</td>
<td>Using shape creates a focal point in the composition.</td>
</tr>
</tbody>
</table>

**ASL Influence**

Use of initial letter to distinguish between words of similar concepts without changing more than needed. Example of this would be signs for groups of people in general, ‘class,’ ‘family,’ and ‘team’ all have same movement, placement, proximity, direction, etc., but the specific meaning is revealed with the letter used. All three groups are similar in concept and therefore share many of the same characteristics.

**ASL Influence**

ASL handshapes can imitate literal objects and concepts through a high degree of simplifying. The sign for ‘sweetheart’ is creating an abstract representation of a heart while also being placed over the heart on the signer’s body as a meaningful focal point.
**Matrix C**

**Placement** The arrangement of parts or elements

<table>
<thead>
<tr>
<th>Representation</th>
<th>GD Replacing an element with a different one that clearly does not belong as an original part of the element or image.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>While many cases of placement through representation were found in graphic design, not a significant number of ASL examples could be found for comparison.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reinforcement</th>
<th>ASL Signs are placed accordingly to reinforce meaning, many times using already known reference points on the body that are consistent in ASL.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>ASL can take very similar words that are related in meaning and through only changing placement, the word changes. Similar to shape ASL makes only minimal changes to make the best use of ten fingers. The signs for ‘mother’ and ‘father’ are only separated through placement of the hand on the forehead or chin. These two zones are also standardized areas for male and female, therefore reinforcing the gender difference.</td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td><strong>GD</strong> Placing text, image, or other elements strategically to strengthen main concept or idea.</td>
</tr>
<tr>
<td><strong>Mother</strong></td>
<td><strong>Father</strong></td>
</tr>
</tbody>
</table>

---

56 Synthesis
### Matrix C

<table>
<thead>
<tr>
<th>Exaggeration</th>
<th>ASL</th>
<th>GD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tired</strong></td>
<td>Uses nonmanual signs, speed, and duration to overexaggerate the meaning or degree of a word.</td>
<td>Uses elements such as size, color, form, and proximity to exaggerate in an unrealistic style.</td>
</tr>
<tr>
<td><strong>Exhausted</strong></td>
<td>ASL relies almost completely on non-manual signs including: <strong>eye brow movement</strong>, <strong>eye gaze</strong>, <strong>mouth movement and body movement.</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subtle Enhancement</th>
<th>ASL</th>
<th>GD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>President</strong></td>
<td>Emphasis is given through the use of other variables such as handshape and placement to enhance the meaning of the word.</td>
<td>Using size, placement, proximity, color, etc. to reinforce meaning in a composition in a quiet, but effective manner.</td>
</tr>
<tr>
<td></td>
<td>To emphasize by subtly enhancing an element, ASL can use placement of the hands. While the sign itself works independently from placement, the <strong>location on the body</strong> usually represents even more meaning of the sign than without. In this example, the sign for ‘president’ is signed on the highest part of the body, to signify authority and power.</td>
<td></td>
</tr>
<tr>
<td><strong>Matrix C</strong></td>
<td><strong>Orientation in Space</strong> Rotation of an element</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Personification</strong></td>
<td><strong>ASL</strong> Hands are given human characteristics through motion and handshape. The classifier handshape for person or animal uses this orientation to imitate the real element. <strong>GD</strong> Rotation of an element in 2-D or 3-D space to give it human characteristics.</td>
<td></td>
</tr>
<tr>
<td><img src="image1" alt="Person classifier" /></td>
<td><img src="image2" alt="Animal classifier" /></td>
<td></td>
</tr>
<tr>
<td><strong>Alternation</strong></td>
<td><strong>ASL</strong> Rotation of the hands alters the meaning of the sign. Can be done to mimic an actual object or idea, or to make various words with same handshape. **The idea of simplicity and <strong>reusing</strong> signs with a slight change in variable is one that allows ASL to utilize the tools available. How can an object in graphic design be altered just enough to distinguish it from the original and yet be made meaningful to make the most of simplicity?</td>
<td></td>
</tr>
<tr>
<td><img src="image3" alt="People" /></td>
<td><img src="image4" alt="Place" /></td>
<td></td>
</tr>
<tr>
<td><strong>Observation</strong></td>
<td><strong>ASL</strong> Rotation of the hands can give new viewpoints, can show possession and pronouns. <strong>GD</strong> Through rotating or reflecting an element, it is seen from a different viewpoint than normal. **When looked at from different angles, the hands on the signer’s body will represent different viewpoints. An open hand on the signer’s chest represents <strong>possession</strong>, and the same handshape facing the viewer immediately represents a different viewpoint.</td>
<td></td>
</tr>
<tr>
<td><img src="image5" alt=" Mine/My" /></td>
<td><img src="image6" alt="Yours/Your" /></td>
<td></td>
</tr>
<tr>
<td>Matrix C</td>
<td>Proximity of Parts</td>
<td>How close or how far elements are</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><strong>Isolation</strong></td>
<td>ASL</td>
<td>Use of single element and proximity from body to create isolation and minimizes number of parts in the focal point.</td>
</tr>
<tr>
<td></td>
<td>GD</td>
<td>Placement of an element alone or away from other elements to isolate it from the rest of the composition.</td>
</tr>
<tr>
<td><strong>Show Relationship</strong></td>
<td>ASL</td>
<td>How far apart or close parts of a sign are represents the distance relationship of the concept being signed.</td>
</tr>
<tr>
<td></td>
<td>GD</td>
<td>Placement of two or more elements creates a relationship between them. Instead of a women and a music scale, the proximity shows the music is being sung by the singing women.</td>
</tr>
<tr>
<td><strong>Create Distance</strong></td>
<td>ASL</td>
<td>3D space is used in scale to show how far or close elements are.</td>
</tr>
<tr>
<td></td>
<td>GD</td>
<td>Size and proximity are organized to create an illusion of depth and distance.</td>
</tr>
<tr>
<td><strong>By minimizing</strong></td>
<td></td>
<td>the number of parts in a sign along with placing it far away from the signer’s body, isolation is created. In this sign for 'alone' the concept of the word is represented through a singular element that works alone and placing it away from the body.</td>
</tr>
<tr>
<td><strong>To show actual relationship between two parts of a sign, the signer can move them closer or further apart.</strong></td>
<td></td>
<td>Almost all signs like this have direct meaning behind the proximity. The sign for 'separate' shows two elements beginning in one location in space and moving further apart.</td>
</tr>
<tr>
<td><strong>ASL creates distance through real, three-dimensional space that reflects actual distance on usually a scaled, but accurate, version of space.</strong></td>
<td></td>
<td>The only medium signs are channeled through are the signer’s hands. Signs are presented in real space with no barrier between the signer and viewer.</td>
</tr>
<tr>
<td>Show</td>
<td>Repetition Repeating elements or concepts</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Mass/Degree</strong></td>
<td><strong>ASL</strong> Repeating a complete sign in the same location to show degree or intensity of an action. ‘Busy’ once means busy, while repeating the sign means ‘very busy.’ <strong>GD</strong> Repeating an element as an exact duplicate of the original to show mass. Placement changes in the repeated element. <strong>ASL</strong> uses repetition of the same element in the same movement duplicating the original exactly. The repetition of ASL also includes using the same area in space over and over as opposed to moving a duplicate of the element to a new part of the signer’s body.</td>
<td></td>
</tr>
<tr>
<td><strong>Modify</strong></td>
<td><strong>ASL</strong> By repeating a sign, it becomes a completely new word or idea, sometimes completely unrelated to original word. <strong>GD</strong> Repeating exact duplicate of original element but placement and arrangement will create a entirely new idea. <strong>In order to utilize a limited number of handshapes and movement combinations, repetition of a sign can mean an entirely new word.</strong> In the case of the sign ‘girl,’ when repeated becomes ‘everyday,’ which is a completely unrelated word.</td>
<td></td>
</tr>
<tr>
<td><strong>Mimic</strong></td>
<td><strong>ASL</strong> Repetition of a sign imitates the object or concept that it stands for. <strong>GD</strong> Element is repeated in the composition, not necessarily an exact duplicate of original. <strong>Repetition in ASL is obviously done through movement,</strong> and in many cases such as the word ‘plane’ the repeated movement imitates the movement of a plane in real life.</td>
<td></td>
</tr>
<tr>
<td>Imply Direction</td>
<td>ASL Direction is implied and even represented literally through movement of the hands</td>
<td>Through the use of the <strong>timeline</strong> in ASL, direction can be implied, not only in terms of actual direction but also in terms of time. The timeline is divided into three zones: Past, present, and future. By moving a sign behind or ahead of the body, time can be implied through direction.</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Next Week: Hand moves forward in space" /></td>
<td>GD Imply direction through arrangements of elements, ordering and sequence. Arrows are used here to show the directional flow of water</td>
<td></td>
</tr>
<tr>
<td>Draw Attention</td>
<td>ASL To draw attention to a location in space, ASL uses clear distinguishable handshapes, nonmanual signs, and movement to aid direction</td>
<td>By using signs with a minimal number of focal points for the viewer to focus on and through <strong>eye gaze</strong> to assist the viewer, the attention can be manipulated and guided to a specific area in space.</td>
</tr>
<tr>
<td><img src="image2.png" alt="There/Her" /></td>
<td>GD The ordering of elements in a composition draws the eye in a specific direction. The gun in this composition guides the viewer's eye to a specific area in the composition</td>
<td></td>
</tr>
</tbody>
</table>
Matrix D Pragmatic Features of Signs

The goal of this matrix is to provide better organization of ASL signs. It provides a structure that groups each sign based on several pragmatic features such as location, movement, number of hands, level of abstraction, and so on. Organizing signs according to their pragmatic features will ensure that a wide range of signs are selected for this study. Words were chosen to represent a wide range in movement, degree of abstraction, location on the body, and use of non-manual signs. While Matrices A–C (please see pages 51–61) focus on the purpose and execution of variable use in both graphic design and ASL, the matrix below is only for ASL and is meant to represent a range of signs, from simple to complex according to variables listed.

Matrix D Pragmatic Features of Signs

<table>
<thead>
<tr>
<th>ASL Examples</th>
<th>Design Variables Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer / Dry</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Yours / Mine</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Mom / Dad</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Next / Last Week</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Far / Very Far</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Girl / Everyday</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Plane / Fly</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Deaf / Dorm</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Tomorrow / Yesterday</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Which / Car</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Name / Train / Short</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Good / Bad</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Family / Class / Group</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Know / Don’t Know</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Busy / Very Busy</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>Tired / Exhausted</td>
<td>![Matrix Example]</td>
</tr>
<tr>
<td>People / Place</td>
<td>![Matrix Example]</td>
</tr>
</tbody>
</table>
LATCH Organizing Situations for the Deaf and Hard of Hearing

How can these situations be categorized and organized?

Earlier, research answered the key question, which communication situations are commonly frustrating for the deaf and hard of hearing? While considering the question of organizing these situations, it is important to remember that “The organization of information is one of the most powerful factors influencing the way people think about and interact with a design” (Lidwell 84). For this reason, the use of brainstorming methods such as Richard Saul Wurman's LATCH model prove to be relevant to this thesis study.

Chairman and creative director of the TED Conferences, Wurman is an information architect who focuses on technology, entertainment, and design. In his book, Information Architects he presents the design solutions of 20 colleagues who have mastered the skill of presenting clear information. From this, he developed the LATCH method of organizing information (by location, alphabet, time, category, and hierarchy) in order for it to have more value by establishing a beneficial hierarchy of information. Location is chosen when the information compared comes from several different sources or locales. For large amounts of data, organizing by Alphabet is easy to organize and search. Time is the best form of categorization for events that happen over fixed durations such as meetings and schedules. Category is a kind of organization often used for goods and industries. Finally, Hierarchy organizes by magnitude. From small to large, least expensive to most expensive, by order of importance, etc., continuity is to be used if weight or value needs to be assigned to the information. By taking the situations where deaf and hard of hearing individuals often find confusion, and organizing them by Wurman's five categories, the most significant way to organize the information can be identified.

<table>
<thead>
<tr>
<th>Location</th>
<th>Situations that occur inside/outside</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>That occur at home/work</td>
</tr>
<tr>
<td></td>
<td>That occur in public/private</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alphabetically</th>
<th>By name of situation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>By audience involved</td>
</tr>
<tr>
<td></td>
<td>Reverse alphabetically</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Time of day situation occurs in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency with which situation occurs</td>
</tr>
<tr>
<td></td>
<td>Duration of situation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Gender specific</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age group specific</td>
</tr>
<tr>
<td></td>
<td>Educational situations</td>
</tr>
<tr>
<td></td>
<td>Entertainment situations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hierarchy</th>
<th>Consequences: severe to mild</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>People affected: few to many</td>
</tr>
<tr>
<td></td>
<td>Range of forgiveness</td>
</tr>
<tr>
<td></td>
<td>Recreational to necessary</td>
</tr>
</tbody>
</table>
To organize by most valuable category, hierarchy (or magnitude) was chosen and frustrating situations were more specifically organized in order of severity of consequences due to lost communication (please see pages 37 and 38 for frustrating situations).

<table>
<thead>
<tr>
<th><strong>High Priority</strong></th>
<th><strong>Severe Consequences</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplanes/airports</td>
<td></td>
</tr>
<tr>
<td>Trains and/subways</td>
<td></td>
</tr>
<tr>
<td>Dangerous situations</td>
<td></td>
</tr>
<tr>
<td>Hospitals/medical situations</td>
<td></td>
</tr>
<tr>
<td>Emergency vehicles</td>
<td></td>
</tr>
<tr>
<td>Legal matters</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Medium Priority</strong></th>
<th><strong>Some Consequences</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Restaurants: Waiting time</td>
<td></td>
</tr>
<tr>
<td>Communication with non-ASL users</td>
<td></td>
</tr>
<tr>
<td>Social time with many hearing people</td>
<td></td>
</tr>
<tr>
<td>Church</td>
<td></td>
</tr>
<tr>
<td>Tour Guides</td>
<td></td>
</tr>
<tr>
<td>Educational environment</td>
<td></td>
</tr>
<tr>
<td>Doorbell/knocking on door</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Low Priority</strong></th>
<th><strong>Minimal Consequences</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching TV shows or movies with no captions</td>
<td></td>
</tr>
<tr>
<td>Listening to music</td>
<td></td>
</tr>
<tr>
<td>Computer games that narrate</td>
<td></td>
</tr>
<tr>
<td>Live Events</td>
<td></td>
</tr>
<tr>
<td>Sound items including sound</td>
<td></td>
</tr>
<tr>
<td>Internet material with sound</td>
<td></td>
</tr>
</tbody>
</table>

**Significance**

Using brainstorming methods such as Wurman’s LATCH model will aid in the ideation process of this thesis. While there are hundreds of situations that exist, only one most beneficial to this study will be chosen for the final application. It is important that all situations are considered with the same importance. The use of LATCH method to categorize situations will ensure that a range of problematic situations are considered, from ones with minimal to severe consequences. When brainstorming possible applications, design solutions appropriate for different situations will be considered. This will illustrate how the solutions derived from this study can apply to a range of frustrating situations.
This section includes the process of integrating the research and synthesis into potential applications that will solve the problems of confusions and frustrations for the deaf and hard of hearing in troublesome situations. In this section, exploration across various situations will take place, and a depth of investigation for each solution will show all possible variations for each solution considered including final applications which are later tested and evaluated with the appropriate audience.
# Ideation

## Potential Situations Considered for Application

<table>
<thead>
<tr>
<th>Location</th>
<th>Visual Example</th>
<th>Common issues for the deaf and hard of hearing</th>
</tr>
</thead>
</table>
| Airport    | ![Airport Image](image1.png) | - Cannot hear announcements for delays, cancellations and gate changes  
- Usually open space with signage only to direct to facilities  
- Often deaf and hard of hearing need to ask for assistance from hearing people  
- Cannot hear the emergency evacuation procedures on planes |
| Subway/Train | ![Subway/Train Image](image2.png) | - Cannot hear announcements for updates, stops or delays  
- Crowded space, hard to find information  
- Maps lay out general order of stops but do not indicate which is next  
- Most updated information is instantaneous |
| Tour       | ![Tour Image](image3.png) | - Loss of relevant information, little knowledge gained beyond visuals  
- Trouble following tour, easily lost if not paying attention  
- If interpreter is present, difficult to focus on both the exhibit and the signer |
## Potential Situations Considered for Application

<table>
<thead>
<tr>
<th>Location</th>
<th>Visual Example</th>
<th>Common issues for the deaf and hard of hearing</th>
</tr>
</thead>
</table>
| Hospital                  | ![Hospital Image](Photo from stock.xchng) | • Cannot hear name being called for appointment  
• Need easy wayfinding to crucial areas such as emergency room and information desk  
• Important announcements communicated verbally are lost |
| Restaurant                | ![Restaurant Image](Photo by Allison Ucci) | • Cannot hear name being called for available table  
• Cannot hear specials, which are usually communicated verbally  
• Trouble asking waiter/waitress questions in order to select items |
| Construction or Evacuation Site | ![Construction Image](Photo from stock.xchng) | • Cannot hear alert or warning sounds usually involved in evacuation methods  
• Loss of information regarding safety  
• Announcements of evacuation procedures are not clearly communicated |
Ideation

Final Location Greater Rochester International Airport

**Why the Airport?**

After investigating potential applications for the airport, subway/train, tour, hospital, restaurant, and construction site, the airport environment was chosen for the final application. Research gathered from samples of deaf and hard of hearing people showed this is by far one of the most frustrating situations. Unlike hospitals or tours, communication at airports is usually in the form of mass communication such as generic announcements to travelers, which are lost on the deaf and hard of hearing. It is also an environment in which time plays an important factor. When feeling rushed, needing outside help for communication will only add to the traveler’s stress. The goal of assisting the deaf and hard of hearing at the airport is two-fold. There needs to be a useful way to transmit verbal messages, such as those in announcements, through graphic design. There is also a need for deaf and hard of hearing visitors to exert independence, which would allow them to visit and use the airport with little or no help from others, instead of placing them in a verbal communication setting resulting in communication barriers. The Greater Rochester International Airport was chosen as a specific testing because Rochester, NY has the largest per capita deaf population in the United States (www.wikipedia.org). Further, Rochester is home to internationally recognized programs for the deaf at the National Technical Institute for the Deaf, a college within The Rochester Institute of Technology.

From these two important goals, potential design solutions and applications were brainstormed. Specific situations were considered where direct verbal communication is used, such as announcements made over a loudspeaker, announcements at the security checkpoint, and boarding calls at the gate. To address the issue of independence at the airport, issues such as wayfinding and navigation were considered. The final situations within the airport environment were chosen for the applications: general and specific navigation and addressing issues at the security checkpoint.

Terminal layout of the Greater Rochester International Airport, Rochester NY
Potential Application A Directory

*Method of ASL space use as an influence to help create independence at the airport for the deaf and hard of hearing travelers.*

**Description**

ASL is able to use the space around the signer’s body to represent the real environment in which the signer exists and to which the signer is referring (please see page 42). This important feature of ASL allows the viewer to signal aspects of his or her surrounding in a clear, logical manner. The design application for this thesis study direction also uses the influence of space in ASL to assist the deaf and hard of hearing in an environment where they need maximum independence in order to avoid unnecessary communication issues. The below example seeks to show how important destinations within an airport can represent the actual airport itself. Through a scaled-down version that uses signage to portray important destinations such as bathrooms, gates, exits, etc., the viewer can easily see their relationship to one another in space. Within each design component of this direction, variables such as proximity of parts and emphasis will be employed.
**Potential Application B** Security Map Sequence

Use of space to visually assist with direct verbal communication that is not available to deaf and hard of hearing people.

**Description**

The lack of access to direct verbal communication proves to be a major factor in frustration for the deaf and hard of hearing at the airport. There are several specific situations in which direct communication is lost that were considered for this thesis phase, including events at the security checkpoint, announcements for boarding calls, and general airport announcements. In this application attempt, specific verbal information would be translated visually using the influence of ASL space. The design solution would exist in the airport space while employing the use of space in ASL. The chosen frustration for this example of direct verbal communication is in the security checkpoint line. Information communicated here is controlled and does not vary from person to person. The solution to this problem can exist in a form that does not need to be updated or changed frequently.

![Security Map Sequence Diagram](image)

This application would show the space used in the security line as well as which activities are performed at specific points in line.

**Execution**

The design solution can exist two-dimensionally or be implied three-dimensionally. It could also be communicated partially three-dimensional, and/or actual three dimensional. In all cases, a priority would be to portray the real environment of the airport. An initial sign will be positioned at the beginning of the checkpoint line that will not only indicate the path the visitor will take through the line, but at what points in line they should prepare for different actions that are often verbal. To correspond with this, additional signs will exist within the line of the checkpoint reminding the visitor of each action he or she will be asked to take. Whether or not the visitors choose to perform each task where the sign is located, they will have been informed of what to expect.
Potential Application C: Wayfinding Signage

Method of ASL space use as an influence on indirect communication loss for the deaf and hard of hearing.

Description

This potential application addresses the issue of indirect communication loss. Indirect communication loss is defined here as any situation in which a deaf or hard of hearing visitor needs to seek out help from a hearing person, resulting in verbal communication. Wayfinding at the airport provides a great deal of information to visitors, and confusing directions will result in the visitors (hearing, deaf, or hard of hearing) having to confirm information with a hearing person for clarity. Unlike the hearing individuals, deaf and hard of hearing individuals do not have the luxury to communicate easily with others who do not know ASL or who are not familiar with conversing with someone who cannot hear. Through better wayfinding, deaf and hard of hearing individuals can exert more independence navigating the airport.

Execution

The below example shows how this application would strive to eliminate confusion that currently exists in wayfinding in various locations, including airports. Many people are simply used to the abstract ways in which arrows can indicate forward, backward, and diagonal motion through up, down, and angled arrows. With this application, signage direction will be represented through horizontal arrows, but rotated around a central vertical axis in order to use the space to guide the user in the correct direction. The direction would be portrayed not only through the graphics on the sign (arrows) but also through the orientation of the sign itself (sign panels would be rotated to point in the real direction of the pathway).

The signage will navigate the visitor through the airport by using dimensionality found in ASL.
Potential Application D

*Use of classifiers as an influence on design solutions for evacuation purposes.*

**Description**

In *ASL*, a classifier can be described as a standardized sign to describe how an object or person moves and is located in space along with physical characteristics of the object (please see page 43). Through a high degree of simplification, these allow for quick and clear recognition by the viewer. How can these goals also serve a purpose in graphic design problem-solving along with other attributes that are currently used in *ASL*?

In this potential design application for the airport, simplified representations of objects would be incorporated, along with their location in space and how they exist, performing similar functions as classifiers in *ASL*. Along with this, considerations related to repetition, proximity of parts, and exaggeration would be used to establish a sense of pattern and recognition for the user.

This example of evacuation signage indicates where important destinations in a building are located such as the stairs, exits, fire escapes, and fire extinguishers. Exaggerating visual elements in the signage would provide directness, and an established set of ‘rules’ would increase understanding and provide clarity as the viewer is exposed to the design solution.
Implemented Applications and Process

From the previous potential applications, three were chosen to design and implement at the Greater Rochester International Airport. Application A (Dimensional Directory), Application B (Security Map Sequence), and Application C (Directional Signage) were finalized to be tested in the actual environment with the intended audience.

In the following pages, each application is first explained in more detail, including strengths, location in the airport, and fabrication details. Then, each application is shown in stages: initial brainstorming and variations, initial digital layouts, and finalized solutions (which were used in the intermediate evaluation). All applications were designed with the influences of space and variable use in ASL.
Goals and Development of Application A Dimensional Directory

**Goals**

There are two main goals with the design of the airport directory: to provide an accurate representation of the environment to the viewer by using ASL space as an influence, and to execute the use of design variables in a meaningful way. With emphasis, color, proximity, typography, and placement in mind, a directory will be designed to show how destinations in the airport exist in space, and in relation to one another. One strength of ASL is the ability to use reference points in the space around the signer's body in order to 'map out' large locations, such as a room. The signer has the ability to create a small version of the 'room' in front of his or her body, and then create a mental picture of where objects are located. This concept is used directly in the application of a three-dimensional directory for the airport, except the destinations will take a graphical form, creating the visuals for the viewer.

**Strengths**

There are many strengths to this application. It strongly employs the use of space that is found in ASL by using elements such as proximity, size, and placement to represent three-dimensional space to portray a larger environment. The Greater Rochester International Airport currently has no directories, and other airports researched (including Newark International Airport, NJ and Salt Lake City International Airport, UT) have flat two-dimensional directories, which do not accurately represent the layout of the airport in relation to where the directory is being viewed.

**Fabrication**

Since this application is meant to give an overview representation of the airport, it will be most successfully located in general areas, such as the ticketing area or baggage claim. It will assist viewers immediately upon entering the airport and will include all destinations and important locations that would normally be found in a directory. These general areas are also ones that exist in wider hallways or sections of the airport and therefore may have the most space available for a larger installation.

**Location**

While the directory as a whole will represent the shape of the airport environment, each individual destination will exist as a separate part of the whole. With this tactic, destinations such as gates would be set up in the directory to show how far apart they are, and where they are located in reference to other locations. This use of space strives to provide a sense of familiarity to the viewers, so while navigating through the airport they achieve an independence from outside assistance, and therefore unnecessary communication. Each kind of destination at the airport (gates, restaurants, security, etc) would be designed and printed on individual panels and arranged in an area at the airport (possibly on the floor with large kiosk-like installations or on a table with smaller graphic components). The arrangement of these on a smaller scale would be organized accurately to represent how they are arranged in the permanent space of the airport.
Variations of Application A | Dimensional Directory

Initial Sketches

Initial Digital Layouts

Gate A9
Gate A5
Gate A1

Concourse A
Security
Ticketing

Gates A1-A11
Concourse A
Gates A1-A11
Security
Concourse A
Gates A1-A11
Ticketing
Ticketing
Ticketing
To help organize the destinations at the airport, locations were broken down and grouped into categories. Currently, the Greater Rochester International Airport terminal map (please see page 68) uses dozens of colors as a key to each specific destination. In this application, Restrooms, gates, airline ticketing counters, food and shops, and later security were all considered major categories. To further aid the viewer, a symbol system was brainstormed to represent each category. Since the overall priority of this application is not a symbol system, they were created in a discreet, systematic manner. The communication goals for each group are described below:

**Restrooms**: Privacy, enclosed

**Gates**: Gateway, entrance

**Airlines**: Ticketing area

**Food/Shops**: Gifts, magazines, books

The final design was chosen to represent either the counter or the doorway of each category.
Finalized Design

The final design uses the created symbols inside each unit of the application. The units as a whole reflect the goal and concept of space use of asl. A few selected samples of different destinations are shown below as well as an overall layout of all elements together as one final design solution. The space of the individual units work together to represent the environment of the airport. The design decisions within each unit attempt to reflect the use of color, typography, exaggeration, and proximity to further implement asl variables.

Each of the five categories for the Dimensional Directory

Final layout of Dimensional Directory, as a whole.
Goals and Development of Application B  Security Map Sequence

Goals

As stated earlier, the security checkpoint is one of the many situations at the airport in which the traveler must rely on verbal communication, and is sometimes assisted with visual communication, depending on the airport. The goals of this application includes providing the viewer with an overview layout of the security line, showing which tasks need to be completed at what point in or before entering the security line. It attempts to use selective information, providing the user with only the information he or she needs to know at a specific place in the security line sequence. For example, if the user is at a point in line where he or she needs to supply an airline ticket and photo identification, any task that has already been completed would be visually depicted as subordinate.

Strengths

With this application, the major benefit to the deaf and hard of hearing is that they will have a graphical representation of verbal instructions. While verbal instructions would most likely be provided by airport workers, the design solution will allow for the user to gain a good understanding of what will be asked of them in line, omitting much of the current confusion.

In addition, using the influence of space in asl, this design application attempts to use compositional space in the layout to mirror space in the airport environment. Along with space, variables such as proximity, exaggeration, and distance are manipulated to graphically represent the environment as accurately as possible.

A second strength of this application is that it focuses and reduces the information that the viewer receives. After researching the tasks to prepare for in the security line (submitting prohibited items, and objects needing to be scanned), it is clear there is a complexity of details important for the audience to know. By grouping this information into stages, the viewer can more easily digest this overwhelming amount of information. To remove more potential confusion, the design solution strives to eliminate any information the viewer does not need to know at specific points in the security line. A strong visual hierarchy is used to clarify the flow of information, thereby minimizing the viewer's effort.
Variations of Application B  Security Line Sequence

Initial Sketches

1. Secure all liquids
2. Remove metal items and secure
3. Electronical devices out of cases
4. Shoes, belt, jacket removed

Initial Digital Layouts

- Secure all liquids
- Remove metal items and secure
- Electronical devices out of cases
- Shoes, belt, jacket removed

- Devices out of cases
- Remove metal and secure
Variations of Application B Security Map Sequence Continued

Development

Main Security Map that outlines the line and tasks at each location.

Smaller panels that will be located in the security line to remind visitors of each task performed.
The final solutions shown on pages 81–84 reflect several key goals of the Security Map Sequence application. The panels highlight which task the viewer is at in line, and minimizes all other information. By retaining all information on the panel at each checkpoint, the viewer can see what is next and what has been completed.
Variations of Application B Security Map Sequence Continued

Finalized Design
Panel 2

Please discard from carry-on prior to entering security check area.

- Knives
- Scissors
- Razor Blades
- Box Cutters
- Flares
- Ammunition
- Ice Picks
- Sporting Goods
- Fire Arms
- Tools

Please place the following in a secured 3oz container prior to entering security check area.

- Beverages
- Shampoo
- Toothpaste
- Hairspray
- Gels
- Lotions
- Liquid Makeup
- Baby Formula

Please remove the following items and place in container provided at security counter.

- Personal Items
  - Shoes, belt, jacket, and carry-on
  - Jewelry
  - Cameras, batteries, and electronic devices

Please make your identification or passport (for international flights) and boarding ticket accessible for security to check.

Please remove the following items and place in container provided at security counter.

- Personal Items
- Shoes, belt, jacket, and carry-on
- Jewelry
- Cameras, batteries, and electronic devices

- Electronic Devices
- Camcorder, MP3 player, cell phone, and personal computer

- Metal Items
- Change, keys, and jewelry

- Ticket and Identification
- Please make your identification or passport (for international flights) and boarding ticket accessible for security to check.
Variations of Application B Security Map Sequence Continued

Finalized Design
Panel 3

Ticket
and Identification

Personal Items
Please remove the following items and place in container provided at security counter

Personal items
- Shoes, belt, jacket, and carry-on
- Electronics
- Concealed, MRI-prone, cell phones, and personal computer
- Metal items
- Change, keys, and jewelry

Liquids and gels
Please place the following in secured 3oz container prior to entering security check area

Beverages
Soap and shampoo
Gels
Liquid makeup

Prohibited
Please discard from carry-on prior to entering security check area

Knives
Scissors
Razor blades
Box cutters
Flares
Ammunition
Ice picks
Sporting goods
Tools

Please make your identification or passport (for international flights) and boarding ticket accessible for security to check
Variations of Application B  Security Map Sequence Continued

**Finalized Design**

Panel 4

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**Personal Items**

- **Ticket and identification**: Please make your identification or passport (for international flights) and boarding ticket accessible for security to check.

- **Liquids and gels**: Please place the following in secured 3oz container prior to entering security check area:
  - Beverages
  - Toothpaste
  - Gels
  - Liquid Makeup
  - Shampoo/Conditioner
  - Hair Spray
  - Lotion
  - Liquid Soap

- **Prohibited**: Please discard from carry-on prior to entering security check area:
  - Knives
  - Razor Blades
  - Scissors
  - Box Cutters
  - Ice Picks
  - Sporting Goods
  - Fire Arms
  - Ammunition
  - Baby Formula

Please remove the following items and place in container provided at security counter:

- **Shoes**
- **Belt**
- **jacket**
- **Carry-on**
- **Jewelry**
- **Camcorder**
- **MP3 player**
- **Cell phone**
- **Keys**
- **Change**
Goals and Development of Application C  Directional Signage

Goals

Similar to Application A (Dimensional Directory), this design solution strives to help deaf and hard of hearing visitors navigate through the airport effectively. This solution mimics the path an ASL user would use to direct someone to a specific area. For example, if an ASL user was directing someone to a location, they would sign according to the path needed to reach the destination. The signer could indicate turning left or right, maneuvering around turns, and so on, by using the space around his or her body. The signage in this application will apply this method directly in order to instruct users within the terminal.

Strengths

One benefit of this signage solution is it will eliminate the use of abstract arrows that currently exist in airport wayfinding. Abstract arrows are currently used in the airport to direct people right, left, diagonal, and ahead. This application will use a realistic representation of direction and space to direct visitors within the environment. It also will provide the most specific wayfinding possible for this location, mimicking turns and curves, while also implying distance. It uses an approach toward explanations that is used in ASL, and will provide deaf and hard of hearing travelers with a highly accurate descriptive means of navigation.

Location

One potential weakness to this application is it can easily be overly complicated to the viewer. For that reason, this design solution will be most successful in specific areas of the airport such as the gate terminal (which is a smaller area with few turns), rather than a general area (where many intersections and destinations exist). The gate area provides a simple, specific layout where the signage can indicate distance without becoming confusing.

Fabrication

The sign will be constructed using appropriate materials that can accommodate showing turns/curves in the airport environment. The number of horizontal panels will vary based on location. The length of each horizontal panel will vary to indicate distances from the sign to various destination.

Due to the security at the airport, this application was not allowed to be tested in the gate area, which was the most suitable location. To test the solution, it was adapted to work in the general area of the airport near the ticketing counters. This area is vast and open where such a sign can easily get lost (please refer to pages 97–99 for the evaluation phase of this application).
Variations of Application C  Directional Signage

Initial Sketches

Initial brainstorming sketching that reflect dimensionality, emphasis, and proximity of parts.
Variations of Application B Directional Signage Continued

The Directional Signage application was specifically designed for the gate area of the Greater Rochester International Airport. Due to security reasons, this was not a possible location for testing. For this reason, it was decided instead of testing the application made for the gate area anywhere else, it would be more effective to reformat the design for a general area of the airport. Below is the initial form the signage appropriate for the gate terminals. Since this was used only for ideation and planning, graphics were created and a digital model developed, but was not tested. The redesigned version follows on page 89.
Variations of Application C  Directional Signage Continued

Initial Digital Layout A
for Gate Area

This system of design decisions uses size and proximity of parts to exaggerate the distance to certain destinations. The text size between the first and second gate panels attempts to illustrate that Gate A1 is closest and the rest are further away. The distance between the text and the arrows also try to show that the gates are closer than the restrooms and food/stores.

![Diagram of Initial Digital Layout A](image)

Initial Digital Layout B
for Gate Area

Repetition and size for emphasis are used in this system to achieve a clear understanding of location and distance of airport destinations. While the text size remains consistent, the size of the arrows indicates how far away certain gates are. Gate A1 is being shown as the closest with only one large arrow. In contrast, the remaining gates have multiple arrows becoming smaller, showing that those destinations are further away.

![Diagram of Initial Digital Layout B](image)

Initial Digital Layout C
for Gate Area

This system attempts to represent the distance of each gate in relation to one another. In the airport, the gates are not spaced with equal distance, and this inconsistency is being represented through proximity of parts. The two versions here show one with text size unchanged throughout, and one where exaggeration is given to the gate that is closest.

![Diagram of Initial Digital Layout C](image)
As mentioned earlier, the gate area could not be used for testing in this study. To compensate, the initial design goals were developed for a more general area of the airport, the airline ticketing area. A digital version of the model as well as the graphics that were placed on each horizontal panel is shown below.
Intermediate Evaluation

With the strongest solutions that resulted from ideation, each of the applications was tested in a realistic environment with a sample from the actual target audience to evaluate the success. From evaluation, the strengths and weaknesses were revealed for each solution. With this feedback, the applications will be further revised for implementation.
Out of the three design applications for this thesis study, this one proved to be the most widely understood and best received. The evaluation for this design included questions about the overall concept and specific questions about the airport layout to see if the design variables were successfully executed. When asked questions with a right or wrong answer such as ‘which gates are furthest away?’ all 11 participants answered correctly. When asked if the directory allowed them to feel more familiar and comfortable with the airport environment, 10 replied yes. There were several confusions about the colors used; two shades were hard to distinguish from one another. There was also confusion about which airport destinations shared a common space. The correct answer to this was the airline ticketing counters, and it was indicated by grouping them together as one unit rather than separating them as was done with the food, shops, and gates. 8 participants answered this incorrectly.
Photo Documentation Application A  Dimensional Directory

Setup of Directory

Directory shown in airport environment

Participants observing the Directory
Evaluation Results Application A  Dimensional Directory

1. From the directory you observed, how many “categories” do you see?
   - 3
   - 4
   - 5
   - 2

2. Are the chosen colors easy to distinguish from one another?
   - Yes
   - No

3. Based on the design, which two destination points are related to each other?
   - Personal Services and Security
   - Gates and Airlines
   - Airlines and Security
   - Gates and Food/Shops

4. Which airline is furthest away from you?
   - jetBlue
   - US Airways
   - Northwest
   - Continental

5. Out of the following, which two gates are furthest away from you?
   - A7 and A8
   - A5 and A6
   - A3 and A4
   - A1 and A2

6. What side of the terminal is Gate A1 located in reference to where you are?
   - Right
   - Left

7. Which destinations share a common area in the airport?
   - Airlines
   - Gates
   - Food and Shops

8. Does the directory help you feel comfortable and familiar with the airport layout?
   - Yes
   - No
The analyzed evaluations show that some of the major goals were achieved, but finer details were not successfully communicated to many participants. Overall, 10 of the 11 surveyed felt this application would greatly help the deaf and hard of hearing travelers. When asked if it was clear, according to the security map sequence, where an activity would be performed, 9 said yes, 1 replied no, and 1 did not answer. Results from specific right or wrong questions revealed that even though the overall concept was well received, there were weaknesses in the design execution. Many people were confused about which security task was first and which was last. The representation of the airport space on the composition needs to be refined so that it is more accurately represented, with a clear beginning and end.
Setup of Security Map Sequence

Photo Documentation Application B

Participants Observing Security Map Sequence

Security Map Sequence in airport environment
Evaluation Results Application B  Security Map Sequence

1. How many activities should you be prepared for going through the line?
   - 3
   - 4
   - 1
   - 2

2. Which security check should you complete prior to entering the actual line?
   - Liquid and Gels
   - Personal Items
   - Ticket and Identification

3. Which security check is completed last?
   - Prohibited Items
   - Personal Items
   - Liquid and Gels
   - Ticket and Identification

4. Is it clear along the line where you will be asked to complete an activity?
   - Yes
   - No

5. You will enter the security line immediately after completing which activity?
   - Personal Items
   - Liquid and Gels
   - Ticket and Identification

6. Is the text readable and easy to know what task you should be completing?
   - Yes
   - No

7. The order (first to last) of the checks is evident through which design change?
   - Location on security line map
   - Change in color
   - Change in font

8. Overall, did the security line panels help you understand what and when you will need to do?
   - Yes
   - No

9. Would a set of maps that explain when and what you should prepare for make you feel more comfortable in the security line with verbal instructions?
   - Yes
   - No
The results of the participants’ responses show that the design solution for this signage may or may not assist the deaf and hard of hearing in navigating the airport. When asked if the style of signage would provide clearer understanding of navigation, half said yes, while the other half said no. In contrast, the results of the evaluation show that the style of signage clearly accomplished its goal. When asked to navigate to the restroom with the signage for reference, all stated it was a clear representation. When asked if the length of the horizontal panels help describe the distance of a destination, 9 said yes. The design variables were very successful in use, and the overall concept of the sign provided a good model of the airport space, but the idea itself was only well-received by half. This shows there is still much potential to develop and revise the solution for a more appropriate area such as the original intended gate terminal.
Photo Documentation Application C  Directional Signage

Site location of Directional Signage

Directional Signage

Directional Signage
Evaluation Results Application C Directional Signage

1 Which two destinations are the closest to you according to the sign?
- Restrooms and Security
- Security and Information
- Restrooms and Airfield
- Airfield and Information

2 Do the colors provide good contrast and text that is easy to read?
- Yes
- No

3 Based on the design, the Security Check are is located where?
- Towards information and to the right
- To the right
- To the left
- Towards the Airfield and to the right

4 Is the text large enough to read from a distance?
- Yes
- No

5 Please walk to the restrooms. Was the sign a clear representation of how to get to this specific space in the airport?
- Yes
- No

6 To get to the restrooms, what direction will you need to walk in?
- Straight ahead
- Towards Security Check, and go right
- Towards the airfield, go left, then right

7 Which two destinations are closest to you and how can you tell?
- Security and Restrooms, text and arrows close together
- Information and Airfield, text and arrows close together
- Restrooms and Airfield, text and arrows far apart
- Information and Security, text and arrows far apart

8 If this style of signage was used throughout the airport, would you feel directions to be more clear and understood?
- Yes
- No

9 Do you feel the length of each sign panel helped you understand the distance it takes to reach each location?
- Yes
- No
Implementation

Feedback gathered from the Intermediate Evaluation is integrated into the following final design solutions. Based on evaluation results, the designs have been revised and modified to eliminate any confusions, and have replaced ineffective initial design decisions with stronger, more efficient ones.
From the intermediate evaluation, it is clear which design decisions were successful and which were not understood quickly or easily enough. Overall, the Dimensional Directory was the best understood, both in concept and in visual design. The general layout of the airport was clear, as well as the proximity and relationship of destinations to each other in the overall space. However, decisions such as color confused some participants for two reasons. The colors between personal services and security were too similar in hue and, since the gray was used for both gates and airlines, this led some respondents to believe they were the same category of destination in the airport.
**Implementation** Security Map Sequence

While the overall idea of the Security Map Sequence was understood and liked by almost all respondents, many of the design details were confusing according to the results. One problem was understanding where the security line began and ended according to the map. There needs to be a more evident indicator of the start of the line. In addition, there were complaints about the size of the text, which needs to be increased. An introductory panel was added, that would be located at the start of the Security Line Sequence. This panel will serve as a summary of the tasks to be performed in line.
Implementation Directional Signage

Revisions

The Directional Signage application was well-received in terms of navigational goals. When asked about locations of destinations represented by the sign, most participants understood where they were being directed. However, when asked about the overall approach of the sign, half responded that the format would not necessarily help them if implemented throughout the airport. A potential solution to this problem is to establish a site for this sign that is most suitable for readability and clarity. If the application is to be adapted for the ticketing area (where it was tested), the solution needs to be considerably larger in proportion to the space.
Retrospective Evaluation

The findings from the Intermediate Evaluation led to the revised design solutions that were implemented. Through further evaluation, the goals of this thesis study were again tested for efficiency.
The phase of retrospective evaluation allowed for identification of major problems with the initial design to be refined for an application that was more successful. It also helped to isolate major issues after smaller details were revised. In this study, two important aspects of the design were being tested: the overall concept of each solution, and the finer details of which they are composed. While both were critical, priority was placed on the concept because with a failed idea, success would be difficult even with the best use of detailing. It was proven with both the intermediate and retrospective evaluations that the concept behind all three solutions was clearly communicated. It is also evident after the retrospective evaluation that some of the smaller design decisions will continue to need revision to reach their most effective forms.

This study provided a foundation for two forms of visual communication to exist together. After careful research, synthesis, and ideation, it is the opinion of the author that aspects of American Sign Language were successfully introduced into graphic design for more meaningful communication for deaf and hard of hearing individuals. The solutions represent critical attributes of ASL, identifying their strengths, weaknesses, and areas for future refinements.

In the synthesis phase of this thesis study, it was clear that one critical attribute of ASL that exists differently in graphic design was space, which is one of the most important considerations to both. Therefore, it was a crucial task to represent the use of space of ASL in graphic design solutions. Ultimately, all three of the applications accomplish this with varying levels of effectiveness. Based on feedback from ASL users, the Dimensional Directory and the Directional Signage applications reflect the strongest use of space in ASL. While the original concept of ASL space use in graphic design was a critical goal to attain, it is well-reflected in the final result. The Directional Signage is an excellent example of this strength. If an ASL user was asked how to reach a destination in the airport, the signer would use the space around the body to ‘trace’ or ‘draw out’ the path needed. The signage resulted in a realistic representation of this mapping while contributing a new execution of space in graphic design wayfinding.

While the three applications can easily be adopted for other environments where wayfinding and information design is important, there are still many frustrations of the deaf and hard of hearing that this study was not able to be addressed in the time period allowed. It became evident early in the ideation phase that one of the largest frustrations is one-on-one communication between a deaf or hard of hearing individual and a hearing person. It proved more difficult to establish graphic design solutions in situations that included communication in restaurants, tours, hospitals, etc., where information varies by the minute.
Future Refinements
Certain applications require more revision than others. The Dimensional Directory and Directional Signage both would require refinements scaled at full size (both applications were adapted at a smaller size in order to fabricate and transport). The directory refinements will include many more destinations and further simplification, and grouping will be required. Many versions of the signage will be needed in order to address and replace all signage in the appropriate areas at any airport. The Security Map Sequence would require further revisions to clarify the sequence of checkpoints, as well as the organization of large quantities of information. Only a limited amount of information was represented through the solution. Consultation with airport security would be needed to prioritize items and objects allowed on the airplane.
Evaluation Results of Application A Dimensional Directory

1. Do you feel the space of the airport is well-represented through this directory?
   - [ ] Yes
   - [x] No

2. Are the chosen colors used easy to distinguish from one another?
   - [x] Yes
   - [ ] No

3. Based on the color used, which two destination points are related to each other?
   - [ ] Personal Services and Security
   - [ ] Gates and Airlines
   - [ ] Airlines and Security
   - [x] Gates and Food/Shops

4. Which destination is furthest away from you?
   - [x] Gates
   - [ ] Airlines
   - [ ] Food and Shops
   - [ ] Security

5. What side of the terminal is Gate A1 located?
   - [x] Right
   - [ ] Left

6. Does the directory help you feel familiar and comfortable with the airport layout?
   - [ ] Yes
   - [x] No

7. Please take a look at the symbols provided. Are the chosen symbols easy to distinguish from one another?
   - [ ] Yes
   - [x] No

8. Please circle which symbol representations were confusing to you?
   - [ ] All
   - [ ] None
   - [ ] Security
   - [ ] Gates
   - [ ] Airlines
   - [ ] Personal Services
   - [x] Food and Shops
Evaluation Results of Application B  Security Map Sequence

1. How many activities should you prepare for in the line?
   - 3
   - 4
   - 1
   - 2

2. Which security check should you complete first?
   - Liquid and Gel Check (blue)
   - Personal Items Check (purple)
   - Ticket and Identification Check (green)
   - Prohibited Items Check (red)

3. Which security check do you complete last?
   - Prohibited Items Check (red)
   - Personal Item Check (purple)
   - Liquid and Gel Check (blue)
   - Ticket and Identification Check (green)

4. Is it clear where along the security line where activities are performed?
   - Yes
   - No

5. Is it clear which task is focused upon in the line?
   - Yes
   - No

6. The order (first to last) of the checks is evident through which design change?
   - Location on Security Map
   - Change in color
   - Change in font

7. Overall, would panels such as these help organize verbal information to know at the security line?
   - Yes
   - No

8. Would a set of maps that explain when and what you should prepare for make you feel more comfortable in the security line when there is verbal instructions?
   - Yes
   - No
Evaluation Results of Application C Directional Signage

1. Which two destinations are the closest to you according to the sign?
   - Restrooms and Security
   - Security and Information
   - Restrooms and Airfield
   - Airfield and Information

2. Do the colors provide good contrast and text that is easy to read?
   - Yes
   - No

3. Based on the design, the Security Check area is located where?
   - To the right
   - To the left

4. To get to the restrooms, what direction will you need to walk in?
   - Straight ahead
   - Towards Security Check, and go right
   - Towards the airfield, go left, then right

5. Which two destinations are closest to you and how can you tell?
   - Security and Restrooms, text and arrows close together
   - Information and Airfield, text and arrows close together
   - Restrooms and Airfield, text and arrows far apart
   - Information and Security, text and arrows far apart

6. If this style of signage was used throughout the airport, would you feel directions to be more clear and understood?
   - Yes
   - No

7. Do you feel the length of each sign panel helped you understand the distance it takes to reach each location?
   - Yes
   - No

8. Please review the image of the original signage. Do you feel the new signage is more informative and effective?
   - Yes
   - No
Dissemination

How this study was shared with others, and other potential meaningful ways in which it could be further broadcast to appropriate audiences. These audiences have the expertise and power to further implement the final applications in real-life environments.
To fulfill a requirement in the thesis process, MFA candidates present their topic and thought process through an exhibition in the Bevier Gallery at the Rochester Institute of Technology. This thesis topic was summarized carefully in a series of wall panels that explain the thesis process to date: problem statement, precedents and research, synthesis, ideation, and potential applications.

The conceptual layout and organization of information and related panels in the exhibit was intended to reflect the frustrations upon which this study was built. The floor space consisted of two parallel walls of panels with a single perpendicular panel interrupting the flow (please see view 'A'). This single panel outlined the frustrations of the deaf and hard of hearing. This panel was intentionally positioned in the middle of the research and solutions panels. The overall arrangement of panels was established so that when entering the space from the front of the gallery, the visitor would first see the introduction and problem statement panels (please see view 'B'), then frustrations of the deaf (please see view 'C'), followed by the proposed solutions.
Dissemination of Thesis

The process of this thesis was presented to first-year graduate students in the MFA Graphic Design program at the Rochester Institute of Technology on May 8, 2008. The purpose of this sharing session was beneficial to both current thesis students as well as to first-year students. It was also an opportunity for the second-year graduates completing their thesis to organize and explain their process to others, while familiarizing first-year students with the overall process they will complete next year. Commentary and questions of student graphic designers also allowed for outside perspective on the thesis study.

Thesis Sharing Session

For future dissemination, there are several ways in which this study can be further shared with appropriate audiences. At a time when many airports, including the Greater Rochester International Airport, are exploring digital means to assist the deaf and hard of hearing (including international visitors), this study will introduce to areas of mass transportation (airports, trains, bus, etc.) the use non-digital methods and design solutions that can be more cost effective and clearly communicated. Consideration should be given to the sharing of this information with the Federal Transit Authority in order to work closely with the regulations of design in airports and mass transit situations.


Transit Authority

As a major organization involved in environmental graphics, Society of Environmental Graphic Designers (SEGD) will be a strong source for potential dissemination of this study. Since the use of space in an environment is a direct goal of this thesis, this community will be a beneficial group to share information obtained in this study and receive feedback. Evaluation by SEGD will also allow comparisons to similar design techniques that may exist.

http://www.segd.org (accessed May 19, 2008)

Society for Environmental Graphic Design

The intended audience of this study are deaf and hard of hearing individuals who are considered persons qualified for additional assistance in many situations. For this reason, those involved with the enforcement of the Americans with Disabilities Act (ADA) will assist in implementing beneficial graphic design to aid the deaf and hard of hearing community in areas of mass transportation.

http://www.ada.gov/ (accessed May 19, 2008)

Americans with Disabilities Act Enforcement
Conclusion

Final thoughts about this thesis study, the process, and what was learned from the experience. How did the project parallel with beginning expectations? How did the study develop and grow into the final application, and what would be done differently?
Conclusion

Final Reflections

When this thesis topic was first chosen, the aim was to help deaf and hard of hearing individuals in troublesome situations. How this would happen through graphic design was not immediately known. After considering meaningful ways that would allow the topic to become more focused, the suggestion to look into how the deaf and hard of hearing communicate best in all situations was a definite influence on subsequent thesis work. Since ASL and graphic design are both visual languages, it appeared beneficial to explore the similarities and potential influences each discipline could have on one another.

Although many people are actively searching for ways to make communication easier for the deaf and hard of hearing, this study developed into a more creative approach that was implemented in practical ways. While many existing solutions involve the use of newer interactive technologies, this project focused on the strength, appropriateness, and potential of more traditional design mediums.

When comparing graphic design and ASL, it was initially noticed that they both use similar variables. This was the foundation for setting up the two disciplines in a parallel manner for easy comparison. Although there are many variables used, the seven chosen (shape, emphasis, placement, orientation in space, proximity of parts, repetition, and direction) were selected based on the importance they have in ASL. They were later adapted and discussed within the field of graphic design. Initially, it was assumed that one or more variables used in ASL would not be found in graphic design, and that the final application would attempt to introduce brand new attributes from ASL into design. While collecting and organizing examples, it was realized that all seven variables exist in graphic design, but how they are implemented is different. This discovery served as the basis for ideation and the final application, in which variable use in the graphic design solutions mirrored variable use in ASL.

In addition to the goals mentioned above, this study attempted to bring one of the major elements of ASL into graphic design: the use of dimensional space. The final design applications for this study all use the space within the graphic design composition as well as the environment around the solution in comparable ways with how ASL would use the space around the signer’s body. In addition, non-manual signs and the influence of classifiers were also major considerations. It was expected at one point that three different attributes of ASL would be equally employed across the final design solutions. However, all three final solutions included the use of ASL space as the major element, with influences from non-manual signs and classifiers as secondary priorities.

Graphic design is a field in which solutions exist in many two-and three-dimensional forms. While much has been explored in the area of design and communication, this study examined how graphic design can make the best use of the environment surrounding a solution. Many airports use common approaches and formats in their design solutions (flat two-dimensional maps and signage, abstract arrows to indicate direction, etc.) to describe the environment to their visitors. The three applications in this study exemplify how design solutions can use the environment in less common or expected ways to more effectively define and employ the spaces for their audiences.
Conclusion Continued

One of the most challenging aspects of this study was formulating a strong, meaningful comparison between two fields not currently related in order to highlight potential influences and benefits. The use of space was one of hardest aspects to compare in this study, but the basis for the ideation process was founded upon the realization that this consideration exists differently in graphic design and ASL. Without space, ASL does not exist and cannot be effective. Although space is acknowledged in graphic design problem-solving, the influences of ASL further enhanced and uncovered methods toward using space for clear communication.

Over the course of this thesis study, many important personal realizations were made, as a student and as a designer. The overall topic of this thesis was once thought to be a very abstract idea, and the practicality of the concept itself was not immediately seen. Looking back on the final applications, as well as the overall process, not only do the applications seem logical and realistic, but the potential for other meaningful graphic design solutions is evident. To know how to assist deaf and hard of hearing individuals with communication, it was as simple as understanding how they communicate already, and using this as an inspiration for new graphic design solutions. From this awareness, the most important lesson learned is not to dismiss any influence, concept, or idea because it seems too different or unlikely. Often times, the brightest ideas come from unexpected places.
Glossary of Terms

Terms were chosen from research and precedents that were not considered common knowledge and are defined here for the clarification.
Glossary of Terms

Defined Terms by Discipline

**Graphic Design**

*Asymmetry*
The lack of balance or symmetry in a graphic design composition, where elements and negative space have variation in size, proportion, and distribution for a more dynamic composition than that of static symmetry.

*Balance*
A state of equilibrium between design elements where a set of parts are displayed equally to others in the composition.

*Closure*
A space is not completely enclosed. If enough of the shape is implied, people perceive the whole by filling in the missing information.

*Continuation*
When the eye is compelled to move from one object and continue to another object.

*Dominance*
Where one element in a composition is treated with higher visual priority than the others, being the dominant element overall.

*Figure and Ground*
The eye differentiates an object from its surrounding area. A form, silhouette, or shape is naturally perceived as figure (object), while the surrounding area is perceived as ground (the background).

*Hierarchy*
A system of ranking in design, whether it be by typography or imagery. A principle that governs a clear structure of primary and secondary information to be displayed.

*Semantics*
The study of the overall meaning or message being conveyed in graphic design.

*Similarity*
Objects that look similar to one another are often perceived as a group or pattern.

*Symmetry*
The correspondence in size, form, and arrangement of parts on opposite sides of a plane, line, or point; regularity of form or arrangement in terms of like, reciprocal, or corresponding parts.

*Syntax*
The physical properties used to create the message in design: typography, color, size, placement, form, stroke, weight, etc.

*Unity*
A whole or totality, as combining parts into one.
**Deaf Education**

*American Sign Language (ASL)*

A visual-gesture language, having its own semantic and syntactic structure, used by deaf people in the United States of America.

*Combination Method*

An approach to deaf education that includes both the Manual Method and Oral Method.

*deaf*

Refers to the audiological condition of not hearing.

*Deaf*

Refers to the Deaf community as a culture rather then the physical, audiological condition of hearing loss.

*Hard of Hearing*

Refers to those who have some hearing, are able to use it for communication purposes, and who feel reasonably comfortable doing so.

*Manual Method*

A philosophy of deaf education involving the use of sign languages such as American Sign Language.

*Oral Method*

The theory or practice of teaching deaf people to communicate primarily or exclusively through lip-reading and speaking rather than signing.

**American Sign Language**

*Direction / Directionality*

The line along which anything lies, faces, moves, etc., with reference to the point or region toward which a sign is directed.

*Dynamic*

A sign in which the hand must use movement to be completed.

*Encoding*

Selecting a physical form to represent each piece of the concept.

*Image Selection*

Choosing an image that needs translation into ASL to represent a concept.

*Handshape*

A basic unit of a signed word, consisting of a handshape, palm orientation, and movement.

*Location*

A place on the body in which the hand is held during signing. Examples of locations are: forehead, lower face, upper body, lower body, arms, and neutral space in front of the body.
Movement
A particular manner or style of moving in relation to gestures.

Repetition
The act of repeating a movement or sign.

Static
A sign for which the hand does not move.

Schematization
Pulling out the important details of the image that should be represented. In this process, everything not necessary is removed; retaining only the details important in ASL.

Linguistics
The study of the nature, structure, and variation of language, including phonetics, phonology, morphology, syntax, semantics, sociolinguistics, and pragmatics.

Metonymy
A figure of speech that consists of the use of the name of one object or concept for that of another to which it is related, or of which it is a part. (Example: the saying 'count heads' to represent the literal action for 'count people').

Morphology
The patterns of word formation in a particular language, including inflection, derivation, and composition, as well as the study and description of such patterns.

Phonology
The study of the distribution and patterning of speech sounds in a language and of the tacit rules governing pronunciation.

Semiotics
The study of signs and symbols as elements of communicative behavior; the analysis of systems of communication as language or gestures.

Syntax
The study of the rules for the formation of grammatical sentences in a language and the study of the patterns of the formation of sentences and phrases from words.

Semantics
The study of meaning and the linguistic development by classifying and examining changes in meaning and form.
**Sound and Vocal Cues**

*Composition*
The act of combining parts of speech or elements to form a whole that yields meaning and understanding.

*Derivation*
To generate (one structure) from another or from a set of others.

*Emotion*
An effective state of consciousness in which joy, sorrow, fear, and hate is experienced, as distinguished from cognitive (the act or process of knowing) and volitional (the act of choosing) states of consciousness.

*Emphasis*
Something that is given intensity or force of expression to exaggerate a specific point.

*Inflection*
Modulation of the voice; change in pitch or tone of voice.

*Tone*
Any sound considered with reference to its quality, pitch, strength, source.

*Volume*
The degree of sound intensity or audibility; loudness.

**Poetry**

*Alliteration*
The commencement of two or more stressed syllables of a word group either with the same consonant sound or sound group.

*Assonance*
A rhyme in which the same vowel sounds are used with different consonants in the stressed syllables of the rhyming words.

*Consonance*
A simultaneous combination of tones conventionally accepted as being in a state of repose.

*Rhythm*
The movement or procedure with uniform or patterned recurrence of a beat, accent, etc.

*Stanza*
One of the divisions of a poem, composed of two or more lines usually characterized by a common pattern of meter, rhyme, and number of lines.
**Space and Senses**

*Intangible*
Something that is not capable of being physically grasped and does not have a physical presence.

*Narrative Space*
Space used in exhibition art where the artifacts and elements are designed and organized to tell a story to the visitor.

*Performative Space*
Space used in exhibition design where the artifacts and design are organized in such a way that invites the visitor to interact and perform.

*Spatial*
Existing within a form of defined space.

*Tactile*
Being able to touch, or involve the sense of touch.

*Tangible*
Something that can be perceived through touch; an idea or concept that is manifested into a physical object.
Bibliography

This section includes texts, articles, and prior studies that were used in this thesis study to aid the planning, development, and implementation of the investigation at hand. Sources are further grouped into relevant categories for clear organization by topic.
Bibliography

Citation of Works Used

**Graphic Design**


**American Sign Language**


|---------------------------------|-----------------------------------------------------------------------------------------------------------|
Appendices

Intermediate Evaluation Forms
MFA Thesis Exhibition Panels
Appendices

Appendix A  Intermediate Evaluation Forms

Please select the best answer to each question.

1. From the directory observed, how many "Categories" do you see?
   - a 3
   - b 4
   - c 5
   - d 2

2. Are the chosen colors used easy to distinguish from one another?
   - a Yes
   - b No

3. Based on the design, which two destination points are related to each other?
   - a Personal Services and Security
   - b Gates and Airlines
   - c Airlines and Security
   - d Gates and Food/Shops

4. Please draw a line to match the color you feel should associate with each location in the airport.
   - a Red Security
   - b Yellow Food and Shops
   - c Orange Personal Services (such as restrooms)
   - d Gray Gates and Airline Services

5. Which airline is furthest away from you?
   - a jetBlue
   - b US Airways
   - c NorthWest
   - d Continental

6. Out of the following, which two gates are furthest away from you?
   - a A7 and A8
   - b A5 and A6
   - c A3 and A4
   - d A1 and A2

7. What side of the terminal is Gate A1 located in reference to where you are standing?
   - a Right
   - b Left

8. Which destinations share a common space in the airport?
   - a Airlines
   - b Gates
   - c Food and Shops

9. Does the directory help you feel familiar and comfortable with the airport layout?
   - a Yes
   - b No

ASL User

☐ Yes  ☐ No
☐ Deaf  ☐ Hard of Hearing

DIRECTORY

1 2 3 4 5 6 7 8 9
Appendix A Intermediate Evaluation Forms

Please select the best answer to each question.

1. How many activities should you prepare for going through the line?
   a 3
   b 4
   c 1
   d 2

2. Which security check should you complete prior to entering the actual line?
   a Liquid and Gel Check
   b Personal Items Check
   c Ticket and Identification Check

3. Which security check do you complete last?
   a Prohibited Items Check
   b Personal Item Check
   c Liquid and Gel Check
   d Ticket and Identification Check

4. Is it clear where along the security line you will be asked to complete an activity?
   a Yes
   b No

5. You will enter the security line immediately after completing which security precaution?
   a Personal Items Check
   b Liquid and Gel Check
   c Ticket and Identification Check

6. Is the text is readable and is it easy to know what task you should be focusing on when arriving to each checkpoint?
   a Yes
   b No

7. The order (first to last) of the checks is evident through which design change?
   a Location on security line map
   b Change in color
   c Change in font

8. Overall, did the security line panels help you understand what and when you will need to complete tasks?
   a Yes
   b No

9. Would a set of maps that explain when and what you should prepare for make you feel more comfortable in the security line when there is verbal instructions?
   a Yes
   b No
### Appendix A Intermediate Evaluation Forms

<table>
<thead>
<tr>
<th>ASL User</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaf</td>
<td>Hard of Hearing</td>
</tr>
</tbody>
</table>

Please select the best answer to each question.

1. Which two destinations are the closest to you according to the sign?
   - a. Restrooms and Security
   - b. Security and Information
   - c. Restrooms and Airfield
   - d. Airfield and Information

2. Do the colors provide good contrast and is the text easy to read?
   - a. Yes
   - b. No

3. Based on the design, the Security Check area is located where?
   - a. Towards Information and to the right
   - b. To the right
   - c. To the left
   - d. Towards the Airfield and to the right

4. Is the text large enough to read from a distance?
   - a. Yes
   - b. No

5. Please walk to the restrooms. Was the sign a clear representation of how to get to this specific space in the airport?
   - a. Yes
   - b. No

6. To get to the restrooms, what direction did you need to walk in?
   - a. Straight ahead
   - b. Towards Security Check, and go right
   - c. Towards the airfield, go left, and then right

7. Which two destinations are closest to you and how can you tell?
   - a. Security Check and Restrooms, text and arrows are close together.
   - b. Information and Airfield, text and arrows are close together.
   - c. Restrooms and Airfield, text and arrows are far apart.
   - d. Information and Security Check, text and arrows are far apart.

8. If this style of signage was used throughout the airport, would you feel directions would be more immediately understood?
   - a. Yes
   - b. No

9. Do you feel the length of each sign panel helped you understand the distance it takes to reach each location?
   - a. Yes
   - b. No
Appendix B  MFA Thesis Exhibition Panels

American Sign Language as an Influence on Graphic Design Problem-Solving

Explanatory Diagram

Problem Statement
Deaf and hard of hearing individuals frequently experience a loss of important information related to understanding sounds, such as spoken words, heard by the hearing world. Many of the cues derived from these sounds come from attributes which cannot be solely translated through words. In American Sign Language (asl), variables of communication such as volume, time, emotion, and emphasis are represented through the deliberate use of these variables which include handshapes, location of the sign, proximity to the human body, movement, direction, and repetition. These strict rules of how and when to use each of these variables create a language of communication that is equal to spoken language. It is the presence of these rules that make essentials of aps can be studied and translated to use as new influences on graphic design solutions.

Relevance and Importance
American Sign Language provides examples of how sound, tone, emotion and many other factors are interpreted visually. In many situations, these interpretations can be as vital as the original sounds. Deaf and hard of hearing individuals often miss "spoken" words and this results in a range of consequences, from misunderstanding the true meaning of a song to missing the urgency of a hospital announcement. This thesis project seeks to employ the existing attributes of asl to complement existing graphic design problem-solving strategies.

Key Questions
1. Which communication situations are commonly frustrating for the deaf and hard of hearing?
2. How do variables (handshape, location, movement, direction) affect the meaning of what is being said in terms of tone, volume, and intensity?
3. How can one variable and rules improve graphic design problem-solving?
4. What characteristics of existing graphic design solutions already employ variables of asl?
5. If an aps variable is identified as being potentially helpful, which graphic design considerations could be intentionally influenced? How?

Associated Areas of Study

American Sign Language
A complex, complete language that uses signs made with the hands and other movements, including fixed expressions and postures of the body, and primarily by people in North America who are deaf.

Communication Studies
The study of the ways in which a message or idea can be sent and received. The study of signs and symbols as elements of communicative behavior and the analysis of systems of communication, such as language and gesture. This includes the study of how meaning is constructed and understood and how these branches interact, interpret, and make meaning from information presented in visual form. This is based on the idea that visual elements can be "read" just like written information.

Semiotics
A discipline that studies the structure, acquisition, and functions of human languages around the world. This field includes the study of semantics (the relation between parts of words and the things they refer to), syntax (the relation of parts to each other in formal structures that have meaning), and pragmatics (the relation of parts to their impact on those who use them).

Visual Literacy
Refers to a group of visual competencies a human being can develop by seeing and at the same time interpreting other sensory experiences. This includes the ability to interpret, negotiate, and make meaning from information presented in visual form. This is based on the idea that visual elements can be "read" just like written information.

Linguistics
The study of language, including its structure, acquisition, and functions of human languages around the world. This field includes the study of semantics (the relation between parts of words and the things they refer to), syntax (the relation of parts to each other in formal structures that have meaning), and pragmatics (the relation of parts to their impact on those who use them).

Appendices
Frustrations of the Deaf and Hard of Hearing

Airport
- Cannot hear announcements for delays, cancellations, and gate changes
- Difficulty understanding, navigating with a deaf or hard of hearing traveler
- Often, deaf and hard of hearing need to ask for assistance in the hearing
- No places to practice the emergency evacuation procedures

Subway
- Cannot hear announcements for updates, stops or delays
- Crowded space, hard to read announcements
- May be not heard unless visible or do not indicate which is a train
- Visual updates not visible to passengers

Restaurant
- Cannot hear name being called for available table
- Cannot hear specials, unless visually communicated over the microphone
- Touchless asking, without auditory presence in other times

Hospital
- Cannot hear someone calling for appointment
- Difficult to understand, and not aware of course and information
- Emperor announcements, common and deadly for hard

Tour
- Cannot hear about presentations, lost knowledge handheld receivers in enough
- Vacant delivering area, difficulty for deaf, hard of hearing
- Interpreter present, difficult to focus on the exhibit and the sign

Evacuation
- Cannot hear alert or warning sounds usually involved in evacuation methods
- Loss of communication, difficulty
- Announcement with visualized visual content provide an overview and

Appendices
Appendices

Precedents and Research

Visual Literacy
From Literacy by Judith and Richard Wilde is a collection of graphic design activities by students in attempt to create solutions to design problems with constraints that help exercise the creative process and maximize successful communication. In each activity, a main problem is given along with a set of limitations and requirements that the designer must follow in order to create an effective solution. Through the use of all design elements discussed in this thesis study: shape, emphasis, orientation in space, proximity of parts, repetition, and direction, these examples show how changing one element can alter the final communication of the composition. It also exemplifies the many ways in which variables can be engaged in design solutions for further clarity. Several exercises were chosen as having the strongest examples that support the variables studied in this thesis.

One exercise example is called ‘The Black Square Solution’. Here, students were given the task of using only four black squares to represent the word they assigned. Students were given the constraints of shape and color, but were allowed to manipulate size, placement, emphasis, orientation in space, and proximity of parts to achieve each specific communication goal.

Deaf Theater
‘Mr. V,’ a film by Wayne Betts Jr., is a brief, two minute deaf film which is easily understood by all—those who know ASL and those who do not. Through the actor’s portrayal of a person using just two fingers, a story is clearly told. By giving his hand characteristics of a human body through actions and timing, the actor is able to express complex concepts that involve emotion—with no sound or signs, only body movement. This film demonstrates how the movement, timing, and orientation can supply meaning, emotion, and tone to the body.

Various examples of deaf films and role playing demonstrate how expressive ASL can be. It is clear that many auditory aspects lost to the deaf and hard of hearing can be communicated visually. Such auditory aspects include tone, emotion, emphasis, intensity, and urgency. By understanding how users of ASL translate these vocal cues, we can better use ASL as a further influence to incorporate into graphic design problem solving.

Key Research Findings in American Sign Language: Classifiers
The role of a classifier in ASL is very important for the understanding of the receiver. A classifier is a type of sign that describes how an object or person moves and moves through space. For example, if a signer was describing a car, moving it on the road, the signer would use this handshape. In all three of these examples, the ‘3’ handshape is a standard classifier for all objects that can be considered vehicles. Through the use of this classifier, the signer can indicate how the vehicle moves through space and where it is located.

Nonmanual Cues
A second additional observation that has great importance in this study is the use of nonmanual cues which can be described as any additional movements of the body other than the use of manual signs made with the hands. These important cues include facial expression (eye gaze, eyebrow movement, lip movement), timing, and body language (posture, hand, head). Consider the phrase ‘Is John home?’ In this phrase, the ‘Is’ is signed ‘John home.’ Through the use of different nonmanual signs, the phrase is given different meanings. With the addition of lowered eyebrows and the body leaning forward, ‘John home’ becomes ‘Is John home?’ With the motion of shaking the head in negation, this phrase becomes ‘Is John not home?’ Finally, with the nodding of the head in agreement, the phrase becomes ‘John is home.’ Clearly, the incorporation of nonmanual cues can be imperative to the understanding of the signs themselves.

The Timeline
One important aspect of ASL that controls the use of space is the timeline. The timeline is the space behind, in front of, and the space in which the body lies to indicate past, present, or future tense. This timeline allows signs to remain the same, but the area in which the sign takes place determines the tense of the word.
Proximity of Parts

To show closeness or distance presented by a concept in American Sign Language (ASL), the signer can move their hands closer or further apart. Almost all signs like this have direct meaning behind the use of proximity. The sign for 'far' shows two elements beginning in one location in space and moving further apart. ASL creates distance through three-dimensional space that reflects actual distance through the use of a scaled version of space around the signer's body.

Repetition

In order to make the most use out of the limited number of handshapes in ASL, repetition is often used to change the meaning of a word without alternating other variables. In the case of the sign 'girl,' when repeated becomes 'everyday,' which is a completely unrelated word.

Repetition in ASL is also achieved through movement and in many instances the movement can be very literal. For example, the word 'plane' repeated imitates the movement of a plane in real life.

Direction

Through the use of the timeline concept in ASL, direction can be implied, not only in terms of actual direction but also in terms of time. The timeline is divided into three zones: past, present, and future. By moving a sign along the timeline, time can be implied through direction behind, in front of, or ahead of the body. This is exemplified through the phrase 'next week,' where the direction of the sign is ahead in space, indicating it is in the future.

By using signs with a minimal number of focal points for the viewer to focus on and through eye gaze to assist the viewer, the attention can be manipulated and guided to a specific area in space.

Emphasis

Emphasis through exaggeration in ASL relies largely on nonmanual cues including eyebrow movement, eye gaze, mouth movement, and body movement. In this example of 'tired,' the degree of tiredness is indicated through slouching the body, leaning forward, and mouth movement. While the sign itself remains the same, the difference between 'tired' and 'exhausted' relies solely on nonmanual cues. This presents an interesting opportunity to see how ASL emphasis can introduce something new to exaggeration in graphic design problem-solving.

Orientation in Space

Personification was found to exist in graphic design and ASL conceptually. While in graphic design many elements were found to give human characteristics through rotation, ASL had a similar technique. One way how ASL executes this is through certain classifiers, which only work when orientation is correct. For example, two fingers (a 'V') facing down represents how a person walks through space, while upright and bent they always represent an animal. There are dozens more classifiers which do not take on human attributes, but these few show a unique link between ASL and graphic design.

Shape

ASL handshapes can imitate literal objects and concepts through a high degree of simplification. The sign for 'sweetheart' creates an abstract representation of a heart while also being placed over the heart on the signer's body as a meaningful focal point.

Placement

ASL can take very similar words that are related in meaning and through only changing placement, the word changes. Similar to shape, ASL makes only minimal changes to make the best use of ten fingers. The signs for 'mother' and 'father' are only separated through placement of the hand on the forehead or chin. In order to create a standard, these two zones are well recognized areas for male and female, thus reinforcing the gender difference. It is because of this known standard that the placement alone is suffice in order for the two words to represent different words.

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This stage of development includes the process of implementing the research and synthesis into potential applications that will solve the design problem of clear communication for the deaf and hard of hearing in frustrating situations. From synthesis, where the creation of variables in both sign and graphic design was noted, new sets of which are signs and design variables noted. From here, major influences were carried over to ideation. Each matrix is a result of their own creation. This matrix is an attempt to show the major influences of each ideation and considered an influence on the final design. Through random juxtaposition, a potential solution is introduced in order to break new ground in the design world.

<table>
<thead>
<tr>
<th>Influence from ASL</th>
<th>Situations</th>
<th>Potential Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Classifiers</td>
<td>Airport</td>
<td>Standardized symbol to represent important elements for easy recognition and clarity through simplifying representation</td>
</tr>
<tr>
<td>Use of Nonmanual Cues</td>
<td>Tours</td>
<td>Representation of nonmanual cues either through symbols or exaggeration of design elements to their scale</td>
</tr>
<tr>
<td>Use of ASL Space</td>
<td>Hospital</td>
<td>Representation of space outside station to influence riders where they are, what stops are, and direction for the ride</td>
</tr>
<tr>
<td>ASL Variable Use</td>
<td>Subway/Train</td>
<td>Influence of classifiers to show proximity and other important factors in space</td>
</tr>
<tr>
<td></td>
<td>Evacuation</td>
<td>Pressure of paths, directions, repetitions, and emphasis to establish clear direction for the viewer</td>
</tr>
<tr>
<td></td>
<td>Restaurant</td>
<td></td>
</tr>
</tbody>
</table>
Influence of Space

Influence of Classifiers

In lay, a classifier can be described as a standardized sign to describe how an object or person moves and is located in space. Classifier signs are used in ASL to show how an object or person moves in space.

Through a high degree of simplification, classifiers are used to show the movement of an object or person within the space around it. For example, a classifier may be used to show how an object is being moved or located in space.

In this potential application, simplified representations of objects are incorporated, along with their location in space and how they move, just as a classifier does in ASL. Line work, the use of colors, and exaggeration are used to establish a sense of pattern and recognition for the user.

This example is of evacuation signage that indicates where important destinations such as exits, stairs, or fire extinguishers are located. The use of exaggeration elements such as arrows and colors will provide directness and an established set of rules will provide understanding to gain clarity as the viewer is exposed to the solution.