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ARCHITECTURAL BRIDGE CONSEQUENCE

A Capstone Experience/Thesis Project

Presented in Partial Fulfillment of the Requirements for

the Degree Bachelor of Science with

Honors College Graduate Distinction at Western Kentucky University

By

Jennifer Gaiko

*****

Western Kentucky University
2015

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ABSTRACT

The architectural significance of bridges is indisputable. Often bridges are accredited to engineers for their transportation and functional needs; however, bridges are so much more than fundamental. The cultural significance and identity of bridges, iconic historic perspectives, influences of composition and function, style and architectural relevance and so much more are all elements that begin to shift the perspective and purpose of architectural bridges to that of a meaningful architectural symbol. Bridges impact the world, the countries they represent and the communities they inhabit. The relationship between bridges and architectural consequence is proven by the idea of iconography and practical application.

Keywords: identity, iconography, composition, function, style, purpose, architectural consequence

Dedicated to my family and Hank

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Finally, thank you to my family and Hank, to which this thesis is dedicated. Without your constant love and support, none of this would be possible. I can only hope that I have made all of these individuals proud of the accomplishments that I have been able to achieve while at Western Kentucky University.

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CHAPTER 1

INTRODUCTION

The British politician Winston Churchill once said: “We shape our buildings; thereafter they shape us” (“Architecture Quotes”). Not only do buildings “shape” us every day, but they also speak of the time and place for which they were built and strive for timelessness, according to the famous architect Frank Gehry (“Architecture Quotes”). Timelessness and constant impact within our daily lives; this is exactly what architecture can bring us. “…We see each building reflect the story of time, and how that interaction of culture wished to project itself to the future…[architecture] persists through our infrastructure from bridges to public spaces and even the very layout of our cities themselves…one could consider architects as being the arbiters of our future history…” (Shah, 1). If architects are the crafters of our future, then we must investigate what exactly can be seen in the structures they create; bridges are a great example of an architectural structure to investigate. By exploring, we can see specifically the cultural significance and identity, iconic historical perspectives, influences of composition and function, and style and architectural relevance of famous bridges across the world. Through these bridges, we can see how architecture “reflects the story of time.”

CHAPTER 2

LITERATURE REVIEW: BACKGROUND AND THEORY

Cultural Significance and Identity of Bridges throughout Architecture

> "Everything that humans make begins, ultimately, with an idea: not, perhaps, those we think of as patentable—the kind cartoonists like to represent as a bulb flashing in a scientist's head—but as a guiding concept that, for example, tells a stonemason how to shape and place stone on stone to create an arch, which, as if by magic, makes it possible to defy gravity and make an opening in a wall" (Weston, 6).

Defying gravity, developing patentable ideas, and investigating ideas of elements in structure are all great concepts that began with a simple idea. Architecture is more complex than shelter and safety, more than basic stone and mortar, and more than function and context. When we look at the principle of architecture, it becomes clear that architecture is a very unique and multifaceted idea. More so, this broad range of architectural ideals can be broken down to become a compilation of simple ideas that must be investigated and discussed to determine functionality and purpose.

More abstractly, an adaptation of architecture and man's desire to create culture can be seen in George Bernard Shaw's quote from his *Man and Superman*: "The reasonable man adapts himself to the world; the unreasonable one persists in trying to

adapt the world to himself. Therefore all progress depends on the unreasonable man" (Hensbergen, iix). The adaptation of humanity on the world is left in the ruins and standing structures of architecture. We can see that an architect can become the "unreasonable" man that strives to adapt the world to him by creating architecture that functions as society needs and has a purpose that goes beyond construction of shelter from environmental elements. Man's desire to create culture begins with modest architectural ideas and expands to complex architectural structures.

In exploring the importance of architecture on our culture, an important aspect to consider is the cities architecture resides in. The prominent architect Richard Rogers stated in an interview by Vikas Shah that "cities are (also) great meeting places for people…cities meet to exchange grain, meat, to think and exchange ideas…" in order to survive (8). Cities must be designed effectively and efficiently to encourage the economic and cultural growth of the people within it and the people who come to explore it. A key factor in the trade and traveling focused cities of today, and of the past, has simply been water. If water could be overcome as an obstacle and counter intuitively used as an advantage, cities could thrive tremendously. One answer to this problem: bridges. If bridges can allow goods to be exchanged and services to grow, thrive, and become more efficient, society and culture can only improve as time forges on.

Furthermore, the Executive Director of the Pritzker Architecture Prize Martha Thorne stated: "Without a doubt, buildings are accepted by communities and imbued with emotions and the appreciation or disdain of people! They are included in the identity

of a people, city, or place" (Shah, 5). This cultural identity that buildings provide, and all structures such as bridges, is not always rational in the least bit. "…It's not just about an intellectual reading of architecture as a cognitive rational process, but also about the emotive dimension," according to the architect and educator Prof. Mohsen Mostafavi (Shah, 5). This "emotive dimension" creates a powerful connection and appreciation for the architecture that defines a certain culture. Moreover, "culture is experienced in the present time as the fluid gamut of structures that define our experience of living" (Shah, 1). Culture is everything in life; life is everything as a part of culture; and consequently architecture will always be a way of life and culture. Architecture not only caters to our worldly needs of life and cultural significance, but it also "allows us to assert our existence to ourselves to the extent that we are not just 'now' but are-in essence-forever" (Shah, 1). And yet, our legacy to life has forever been a part of us as we continually try to deny it and "wish to become eternal" (Shah, 1). Even though we subconsciously wish to be eternal, often we, in turn, begin to mirror possibilities of the eternal. For example, the author Branko Mitrović "asserts that according to Plato, *'…the 'things' of our world are reflections of shadows of eternal Forms or Ideas, which do not exist in space or time, but outside of it…'"* (Shah, 1). The structural element of bridges provide all of the advantages of economic responsibility, cultural identity, a definition of how we live, and the reflections of a people's desire to be eternal by being the icon and resource that cities and their inhabitants crave.

Iconic Historical Perspectives of Bridges

The idea of iconography is something that has developed over time; an icon can be anything that has gained recognition because of a moment or time in history, forever changing the perceptions and identity of a place and its people (Shah, 5). Icons can be any celebrity, cultural trend or tradition, religion, concept or tangible object, among others. When we look at cultural icons in modern society, it is clear that architecture has impacted culture and redefined architecture itself. The Sydney Opera House in Australia, the Eiffel Tower in Paris, the Colosseum in Rome, the Petronas Towers in Kuala Lumpur, St. Basil's Cathedral in Moscow, the Taj Mahal in India, and so many more architectural buildings across the world are arguably some of the greatest icons that have made their moment in history by continuing to define that moment in the modern age.

A perfect example of this architectural iconography began in 80AD when the first recorded example of London Bridge was constructed at the north end of the Southwark settlement, where the city of London arose ("The History of London Bridge"). This bridge then began a slow evolution that greatly impacted the historical image and perception of London. After the Roman bridge of Southwark, the

***Figure 2.1: London Bridge (*"London Bridge").**

next record of the London Bridge is dated to Danish invasions of Anglo-Saxon England when the bridge was pulled down during an attack. More timber bridges followed this tragic event, before a priest named Peter de Colechurch during the reigns of Henry II, Richard-the-Lionheart, and John built a permanent stone bridge in 1163. This Gothic bridge included a chapel in the original plans, but continued to be under construction for many years as houses and shops were added. In the 13th century when the unpopular Queen Eleanor of Provence misused the tolls of the bridge that were given to her as a present from her husband, King Henry III of England, the present version of the song "London Bridge is Falling Down – My Fair Lady" was composed from the old Norse saga. Through the rebel attacks of Jack Cade, the Great Fire of 1666, and the new architectural style adopted in the 18th century, London Bridge stood firm. Finally, a committee was appointed by Parliament to consider the condition of the bridge, and a design competition was held that allowed John Rennie's plans to be accepted and realized in 1825. Rennie's bridge didn't last long, however, as the weak foundation allowed the bridge to continually sink for the next eighty years. In 1968, the old bridge was famously sold to an American for $2,460,000 and construction of the new bridge by John Mowlem & Co. began ("The History of London Bridge"). With all of its history, it becomes clear that London Bridge is "fundamental to the identity and character of a place, [i.e. London. In this way a bridge is] unique and connects us with the past.

Bridges provide people with a sense of identity, history, and context for their own role in their community's story. Iconic elements act as landmarks for people outside the

area, making it easier for them to find and engage in the community" ("Preserve Symbols That Matter," 1). History is all about what the past has left behind, what we can relate to our ancestors, and what we can make our own as a personal identity and sense of character. London Bridge was not quite a matter of architectural achievement of beauty and prestige, but as Prof. Mohsen Mostafavi points out, beauty is always "in the eyes of the beholder!" (Shah, 5). To further this idea of iconography in architecture, the Royal Institute of British Architecture (RIBA) held the 2009 London Bridge Ideas Competition that strove to celebrate the anniversary of the 1209 AD inhabited bridge ("London Bridge 800: Design an Inhabited Bridge"). Architectural quality, inspiration and creativity, functionality, response to and understanding of the brief were the categories of judgment discussed in the RIBA article; these aspects allowed London Bridge to be deemed as such an important aspect of London to be classified as an icon ("London Bridge 800: Design an Inhabited Bridge"). Not many people in this world can deny that they have never heard of the famous song "London Bridge is Falling Down" or read about the famous bridge's whereabouts across the world; therefore establishing the London Bridge as a historical icon. Furthermore, this iconic element must be shifted in our minds from historic perspectives to the concept of preservation. "Preserving historic, iconic elements is not always economically feasible or practical, and sometimes it is simply impossible. But if the element in question…is socially significant to the neighborhood or community, we strive to preserve it" ("Preserve Symbols That Matter," 2). If London Bridge is an

icon of London and England, its history and engineering strength acts as a literal bridge between our past and our future.

If an icon can be anything that has gained recognition because of a moment or time in history, forever changing the perceptions of identity of place and people, the Roman world of architecture and art is another exceptional example. Roman architecture strove to be transformative and influential above all else; it strove to be powerful and it strove to leave a lasting imprint on the world. “The earliest of Roman art is generally associated with the overthrow of the Etruscan kings and the establishment of the Republic in 509 BC” where Roman art flourished until the beginning of the medieval era with the conversion of the emperor Constantine to Christianity in 330 AD (“Encyclopedia Roman Art and Architecture”). With this, we can see that the art was “traditionally divided into two main periods, art of the Roman Republic and art of the Roman Empire (from 27 BC on), with subdivisions corresponding to the major emperors or imperial dynasties.” The art of Roman history corresponds to Roman architecture when art principles were used in Roman architecture. The art and architecture can be characterized by various styles attributable to differing region tastes and the diverse preferences of a wide range of patrons’ conjunctively (“Encyclopedia Roman Art and Architecture”).

When historians and architectural enthusiast look back upon the Roman Empire, it is impossible to ignore the magnificent structures they left behind. The scale of Roman architectural ambition is superbly seen in the greatest aqueduct at Nimes, known as the Pont du Gard (‘bridge of the Gard’). Constructed about 20 AD, the gigantic structure is

purely practical. It is a section of a channel bringing water from the river Eure to the new Roman town of Nimes" (Gascoigne 2). Pont du Gard is a towering structure of three tiers of arches; it tests the principles of physics, while exemplifying the beauty of design and practicality. Ultimately, the aqueduct leaves a statement of superiority in knowledge of Roman culture and principles. The engineering principles of water transportation as well as the architectural beauty in the use of arches as minimal structure are intuitive and iconic. If Pont du Gard is an icon of Roman architecture and art, its history and amazing engineering strength acts as yet another bridge between our past and future.

***Figure 2.2: Pont du Gard (*Emanuele).**

Influences of Composition and Function

Architecture can be categorized into many ideas that reflect its character of change. According to Richard Weston, these ideas can be broken down into a few categories: basic elements of construction, social ideas and innovations, spatial types and meaning of organization, design/drawing techniques both practical and conceptual, and more abstract ideas that have guided explicitly or inexplicitly (6). To design a space with

purpose and therefore with strategic composition is a challenging task. But, to go beyond the ideas of basic function, that is when architecture and design become more complex than we ever could have imagined. Elements like the column and the beam, the wall, the door, brick, stairways, the arcade and naturally the idea of a bridge provide infinite possibilities for structure.

The concept of architecture far exceeds the simple concept of aesthetic beauty and branches out to function of a space and design when considerations of engineering are credited. Martha Thome demands architecture to "work with nature in terms of energy, light, and use of resources…it creates spaces that somehow go beyond functioning well" (Shah, 5). This idea that architecture has to be "more" in this day and age allows us to consider structure, materials, purpose, context, and function of a building much more fundamentally than we have in the past (Shah, 5). In addition, engineering concepts must crucially be considered in resources, especially in the case of public transportation, because "good design is good business!" (Shah, 7). If a space is well designed, architect Richard Rogers claims that "you can see the life of the people and

Figure 2.3: Millennium Bridge (Millennium Bridge.).

community expressed in architecture" and be positively affected because of it (Shah, 7). Most recently, this positive effect of architecture in engineering innovation can be exemplified in the London Millennium Bridge by architect Sir Norman Foster with sculptor Sir Anthony Caro and engineers Arup ("Millennium Bridge," BBC). This lateral suspension bridge was designed to be "a 'blade of light' across the Thames, 'an absolute [and iconic] statement of our capabilities at the beginning of the 21st century'" ("Millennium Bridge," BBC). This literal composition is realized when the bridge is illuminated at night to emphasize the "uniquely thin profile" that forms "a slender arc across the water," and spans "the greatest possible distance with the minimum means" ("Millennium Bridge," RIBA). Millennium Bridge's cutting edge design flaunted the new technological advances of the age, and yet was put under the microscope when a "wobbling" issue came into play. On the opening day in June 2000, as pedestrians began to walk across the innovative bridge, there was an obvious wobble. Engineers later "discovered that the sideways forces of the pedestrians' footsteps created a slight horizontal wobble" that would need to be fixed by dampening mechanisms ("Millennium Bridge," BBC). After nearly two years of testing and engineer evaluations, the pedestrian bridge was allowed to reopen in February 2002 ("Millennium Bridge, London"). This construction process is evidence to the new non-linear prospective that incorporates and intertwines all specializations of design and construction (Shah, 6). In the case of the Millennium Bridge, if the architect was left to solve this structural issue, the best answer to the problem might not have been realized; likewise, if the engineer had been in charge

of the aesthetic design of the bridge, the best look and concept of design might not have been chosen for the project. The whole idea of concept of engineering can be shifted back to the idea that "architecture is not truly the creation of an individual or collective for the purpose of research, contemplation or beauty, but had the purpose of responding to functional needs" (Shah, 3). Function: that is what engineering and architecture must achieve in the 21st century. Of course, "it's about using imagination to form, giving order, giving rhythm…to space," but the challenges of today might be larger than previously bargained for (Shah, 3). The issues of extreme urbanization, fast urbanization, climate change, resource limitations, and so much more will force Architects to rethink and reevaluate the priorities of building with sustainable engineering concepts.

Moreover, change is something that can characterize all things in this world. "…Every age thinks it's making the environment more human, but changes are always reflected" (Shah, 4). Reflected through what exactly, that is the question. Naturally, the answer comes when we look upon culture, icons, and traditions within a society. Through this exploration of architecture, the demands of society can be seen to shift from need to statement and further to function. London Bridge began in Roman times as a simple need for transportation, for society, for the people. However, as time goes on, we see the Tower Bridge built as a statement of British imperial power, and Victorian ideals-and so the ideals and culture of a society begin to be seen in a whole new light. Finally, this change of identity within British society is exemplified through the building of the Millennium Bridge. This bridge demanded a need for pedestrian comfort, innovation and

design that complicated a cycle of change in architectural ideals. The architectural cycle shows that all concepts evolve from need; London Bridge was built in a time of basic transportation need, while the Millennium Bridge was built in a time of functional pedestrian need. And yet, as these basic concepts reoccur, the details and poetry of modern design and power of construction have become evident.

Style and Architectural Relevance

A famous architect named Frank Lloyd Wright once said, “Every great architect is – necessarily – a great poet. He must be a great original interpreter of his time, his day his age” (“Architecture Quotes”). It is interesting when the contents of this quote are employed within the context of this time, this day, and this age. Architects are considered to be poets that interpret the world as it is and maybe even lead the world into the future. Most predominantly, modern architecture has proven to be a compilation of all architectural styles before it. Customs, techniques and concepts are all used to shape architecture as they always have, but also to form new designs and projects. The idea of using what is of our past is interesting, but especially so when architectural relevance and style concepts of the current age are merged along side it. When past and present architecture are studied and reflected upon for what each has brought, the combination of both seems to show the most striking ideas.

Martha Thorne put it best when she said this: "…the most important architecture is the innovation of building and construction, or buildings that have pushed the discipline to get us to think about our environment in different ways, or just incredibly beautiful buildings that have lifted the human spirit in addition to housing our activities and our lives" (Shah, 3). Architecture has so many varied functions and ideals that vary from each person and perspective that graces its name. Culture, however, often chooses to see architecture in its truest form: historical beauty.

Figure 2.4: Me at Tower Bridge

To begin, the realms of architecture are greatly exemplified in a time of the World Columbian Exposition of Chicago in 1892, a time of economic depression in the United States in 1893, a time when the famous Reichstag Building is constructed in Berlin in 1894, and most importantly, a time when construction on the Tower Bridge was begun (Zavada). This great bridge came about when, "in the 19th century, the East End of London became so densely populated that public

Figure 2.5: Tower Bridge

need mounted for a new bridge in the east of London Bridge" ("Bridge History"). The explicit need for a new bridge drew competition, design, and great Architects from all over the world; London had become a capital of great industrial and imperial power and, therefore, demanded a great bridge that represented the architectural and governmental power of an empire. Although this seems simple, "at the heart of this discourse comes an even more fundamental realization. Architecture does not manifest itself, it is not a natural process such as the growth or movement of the oceans, and it begins with the mind conceiving a question, rationalizing the context, understanding the ethics and ends with the imagining of a solution" (Shah, 10). Developing this new display of British imperial power was the beginning of "the mind conceiving a question;" "rationalizing the context" began when the construction considered did not disturb the current traffic of the city; "understanding the ethics" came about when architectural taste selected from the now fashionable Gothic image London had previously been chosen for the House of Parliament; and "ends with the imagining of a solution" was realized when Sir Horace Jones, along with John Wolfe Barry, offered the design for Tower Bridge as a solution ("Bridge History"). Tower Bridge in London is simply an architecture wonder; "when it was built…it was the largest and most sophisticated bascule bridge ever completed" ("Bridge History"). Sophistication, along with pure beauty proved to captivate not only London dwellers, but also the world. Most curiously, when it comes to particular architecture throughout the world, there often is simply a quality of majesty that hits home for the people that are all around it (Shah, 4). Through majesty, innovation, or the

simple fulfillment of purpose, it is clear that Frank Lloyd Wright was correct when he claimed “every great architect is-necessarily-a great poet. He must be a great original interpreter of his time, day his age” (“Architecture Quotes”). Sir Horace Jones was a poet of his time that succeeded to enthrall the British Empire and its people who identified with the Victorian values imbued within Gothic architecture through his architecture.

Conclusion of Literature Review

Architecture is truly what “really provides the symbolic ideas of habitation and-broadly-serving the humankind,” according to Prof. Mohsen Mostafavi (Shah, 3). Symbolism and service: two concepts that intertwine quite significantly when considering architecture and perception. If a structure symbolized service to mankind when London Bridge began, this service would be directed toward the obvious need for society. Likewise, service in symbolism would have shifted when the Tower Bridge was constructed as a means of statement and power to serve the ego and domination of an empire. Finally, symbolism transformed service once again when the Millennium Bridge was constructed for the people as convenience and demand prevailed, while also providing a statement of innovation. More profoundly, the idea that through service, society creates exactly what it needs interacts with Winston Churchill’s idea that “we shape our buildings; thereafter they shape us” (“Architecture Quotes”). Furthermore, the impact of architecture is seen when culture begins to accept and imbue emotions of appreciation when structures reflect the “identity of a people, city, or place” (Shah, 5).

Structures then begin to use this “sense of identity, history and context” to establish iconic elements that “act as landmarks for people outside the area, making it easier for them to find and engage in the community” (“Preserve Symbols That Matter,” 1). In addition, all of these considerations must include the concepts of engineering and the “purpose of responding to the functional needs” of a place and its people (Shah, 3). And yet, “at the heart of this discourse comes an even more fundamental realization. Architecture does not manifest itself, it is not a natural process such as the growth or movement of the oceans, and it begins with the mind conceiving a question, rationalizing the context, understanding the ethics and ends with the imagining of a solution” (Shah, 10). Architecture’s impact on society is simply profound in every way, and through iconic bridges, we can see how structures begin to “reflect the story of time” and provide the link between the influential past and optimistic future.

CHAPTER 3

METHODOLOGY

The literature review discussed the connections of bridges and architecture through the story of the bridges of London and architecture across the world. Using this review and exploration of architecture, the principles of iconography and historical presence were applied to a bridge design project.

The American Institute of Architects clearly identifies and explains the five phases of design of the architectural design process. These five concepts are excellent in the introduction and explanation of how the hypothetical and experimental design of a bridge was composed. In the article, phases were designed for the benefit of a client working with an architect to simplify the process of architectural design; here the description is used with Thesis readers in mind for explanation. The five phases begin with phase one—originate—that instigates discussions of thought and exploration with the explicit identification of a need. Phase two—focus—defines the scope, features, purpose, functionality, and feasibility of a project. Here the vision is defined and a programming phase begins that explores needs, defines space and site specifications, and finally a concept for the final structure. Phase three—design—is the phase where shape is given to a vision with constant review and revision. Concepts are transformed into precise drawings in all perspectives, layouts and forms. Phase four—build—is the physical construction of a project with the aid of a contractor. Timetables, materials,

financial plans and more become a big part in this long process. Phase five—occupy—is the final phase of the cycle that begins when the building is completely constructed and occupants inhabit the structure ("The Five Phases of Design"). Because the proposed design in the proceeding bridge project is hypothetical as a part of undergraduate research, only phases of origin, focus and design are explored.

Design Program: Origin and Focus

The project is called the Saint Louis Pedestrian Bridge. The bridge is designed to be in Saint Louis, Missouri and will serve as a connection between the Jefferson National Expansion Memorial (the Gateway Arch) and Mississippi River Overlook at Malcolm Martin Memorial Park.

Figure 3.1: The Gateway Arch, Perspective

Figure 3.2: Mississippi River Overlook

Mr. Robert Moore, a historian for the National Park Service, was contacted via email in regards to the site selection area of the Gateway Arch and feasibility of the project as a whole. Mr. Moore stated this:

"The Gateway Arch and its associated landscape are a National Historic Landmark as well as a National Park Service area. Our goal is to preserve the site as much as possible in the way it was planned by Eero Saarinen and Dan Kiley. Interestingly, in the original design competition of 1947-1948, there was a prohibition on creating new bridges across the river, but some architects, most notably Walter Gropius, designed one anyway. The jury summarily rejected any concept plan that included a new bridge of any sort. Many great designs were rejected simply because they included a footbridge across the river! (The competition drew 172 entries).

Figure 3.3: Arch Adjacent Greenways

In the 2010 competition for the revitalization of the Arch grounds, this type of idea surfaced once again but was rejected. It had been discussed in 2008 in conjunction with the park's General Management Plan" (Moore).

However, he also stated that "in terms of an architectural project, of course, you can design whatever you like," no matter the feasibility of the site (Moore). It is important to begin with this viability note to emphasize the conceptual designs and hypothesis of the proposed bridge project. The designed bridge may not be possible because of the

National Park Service, but it is evident that architects have long regarded the need and desire for a footbridge at the base of the Gateway Arch.

Three important notes must further be made in regards to the importance and pertinence of the bridge design and location choice of Saint Louis, Missouri. First, it is important to acknowledge the architectural accomplishments of Walter Gropius as a respected architectural mind that supported the addition of a bridge. Gropius was the founder of the Bauhaus, a renowned architectural mind who worked in the office of Peter Behrens (who also worked with Mies van de Rohe and Le Corbusier at other times), was known for his pioneering work of modern architecture and even worked as a professor of architecture at the Graduate School of Design at Harvard ("Walter Gropius"). If Walter Gropius, an established architectural mind, recognized the need for a pedestrian bridge in his designs submitted during initial competitions of the Jefferson Memorial, then this Saint Louis Pedestrian Bridge is also justified. Second, the East Side of Saint Louis is a topic of great controversy and skepticism. The East Side of Saint Louis once flourished at the turn of the century with railroads playing a major role; factories and jobs were plentiful as well. In 1959, the National Civic League named East Saint Louis an All-American City, honoring its culture of civic excellence and cooperative spirit in all parts of business, life and government ("East St. Louis: One City's Story"). However, industries began to abandon the city shortly after this in search of greater economic opportunities; with an inactive government and a shrinking tax base on top of economic downfall, the city began to dive into poverty. The East Side of Saint Louis is a great

opportunity and place of economic growth and redevelopment for the city of Saint Louis as a whole. A community college center, Metrolink stop, youth center, shopping centers, a public library, town home units and more have already begun development in East Saint Louis in recent years. East Saint Louis is a land of opportunity; with the connection of the Saint Louis Pedestrian Bridge, growth and redevelopment will truly begin to unfold. Finally, it is important to note the foundation of the Saint Louis Pedestrian Bridge and the embodiment of the memorial Eero Saarinen designed: the idea of a gateway. Original criteria for the Gateway design competition called for an architectural memorial of some type, even reproductions of the types of buildings found in Old Saint Louis (Leonard). Judges had a “prohibition” of sorts, as Moore stated, on any sort of bridge crossing the Mississippi. With the Saint Louis Pedestrian Bridge design scope of a gateway, the judges may begin to see the benefits of the extension of the Gateway Arch in a pedestrian bridge.

Saint Louis’s identity and cultural icon is often named as the iconic Jefferson National Expansion Memorial that was built in the 1960s. The icon will forever hold it’s own as a symbol of exploration and American history, but the new bridge will further extend the experience of the Gateway Arch, Gateway Arch trail and Malcolm Martin Memorial Park overlook to enrich Saint Louis in many ways ("St. Louis Gateway Arch Grounds Project | CityArchRiver 2015."). The bridge will create a pedestrian attraction, encourage tourism, and expand the oasis greenways of Saint Louis. Finally, this bridge is a connection between the urban and rural green spaces of Saint Louis: it hints at the urban

identity of the arch in shape, but links pedestrian green spaces and entrance spaces with gardens on both east and west ends.

Design inspiration stems from a Christian biblical story of Moses splitting the Red Sea. “Moses stretched out his hand over the sea, and all that night the Lord drove the sea back with a strong east wind and turned it into dry land. The waters were divided.” {Moses} Exodus 14:21. This verse was chosen because of the inspiration of site in the bridge at the foot of the Gateway Arch. In Exodus 14, the story begins in Egypt when God sent devastating plagues that Moses asked for in order to persuade the Pharaoh of Egypt to let the Hebrew people go free from slavery (Zavada). God proved this faithfulness and love for the Hebrew people by freeing them from slavery instilled by Pharaoh. Moses led the people out of Egypt and into freedom, but the King quickly changed his mind and sent his best chariots to recapture his slaves (Zavada). The Israelites seemed to be trapped with the Red Sea on one side, the mountains on the other and Pharaoh’s chariots quickly approaching (Zavada). Moses answered the fear of the people with this: “Do not be afraid. Stand firm and you will see the deliverance the Lord will bring you today. The Egyptians you see today you will never see again. The Lord will fight for you; you need only be still” (Exodus 14:13-14). The angel of God appeared in the form of a pillar of cloud and stood between the Hebrew people and the Egyptians (Zavada). Moses then stretched his hands out over the sea and the Lord created a strong wind that parted the waters of the Red Sea and turned the sea floor into dry land overnight (Zavada). With a wall of water to their left and to their right, the Israelites fled

through the Red Sea and to freedom. Once the Israelites were safely on the other side, God commanded Moses to stretch out his hand again and the seas rolled back to cover the Egyptian army that was in pursuit (Zavada). This image of a wall of water on each side of the Hebrew people as they walked across the Red Sea creates an image of a pathway, a gateway and a bridge to freedom. From here inspiration was found in a symbolic gateway that would stand firm in the ideals of the Jefferson National Expansion Memorial as a monument symbolizing a city's role in westward pioneering.

Figure 3.4: The Gateway Arch

Furthermore, the cultural significance of the bridge stems from the connection and encouragement of pedestrian tourist activity as a haven in an urban setting. With this in mind, the design perspective and concept is centered on urban design, the iconic continuance of the Jefferson National Expansion Memorial, as well as the idea of "evolution" as a conceptual inspiration word.

Components that were included in the design of the bridge are as follows: a walkway wide enough for many wheel chairs to cross simultaneously (six foot width minimum), a running path on one side with a single lane (three foot width minimum), a

bike path on one side with a double lane to allow for travel in both directions (each five foot width, eight to ten foot width altogether), a garden entrance at each side of the bridge, and areas to lookout over the water and city from many vantage points along the bridge (Mid-Ohio Regional Planning Commission). A total width of the bridge was determined to be at minimum twenty feet to allow all walking, running, and biking paths to be included.

Consideration of the number and weight of visitors that would grace the bridge each day was made. Statistical factors are as follows: 6,400 visitors can visit the Arch each day, the population of St. Louis is approximately 2,810,000 people with a population growth of 4.16 percent each year, and St. Louis hosts more than 21 million tourist visitors each year ("Best Place to Live in St. Louis Metro Area, Missouri."). The estimated population of the bridge at maximum occupancy is 5,000 people. An average weight of individuals in the United States is 180.85 pounds, making the total visitor maximum weight approximately 204,250 points (“Body Measurements”). Additionally, code assembly space is five square feet per person, defining the bridge to be roughly 25,000 square feet in area.

Figure 3.5: Eads Bridge with MLK Bridge Behind

The Bridge will be located over the vehicular road on the West (Expansion Memorial) side and railroad tracks on the East (Overlook) side of the Mississippi River.

Mississippi River details at Bridge proposed location include the following: normal top water speed at three miles per hour, depth 12-15 feet (with 80 feet of mud before bedrock), and the Missouri River meets the Mississippi about 15 miles to the north of the site.

Additionally, the Eads Bridge is located North of the proposed site. The Eads Bridge was built in 1874 and links the banks of the Mississippi for road and rail transportation ("James B. Eads and His Amazing Bridge at St. Louis"). At the time of construction, Eads Bridge was the longest-spanning arch bridge in the world and serves pedestrians, bicyclists, vehicles, and Metrolink light traffic today ("James B. Eads and His Amazing Bridge at St. Louis"). The Eads Bridge carries approximately 8,100 vehicles daily, has an overall length of 6,442 feet, a clearance below of 88 feet, and is an arch bridge with almost no height ("Eads Bridge").

South of the proposed site is the Poplar Street Bridge, constructed in 1967, that houses eight lanes of Interstate 55, Interstate 64 and U.S. 40 highways ("Poplar Street Bridge"). The Poplar Street Bridge is approximately 2,164 feet in length, 104 feet in width, has a clearance of 92 feet below, and has almost no height as well ("Poplar Street Bridge").

Figure 3.6: Poplar Street Bridge

Finally, north of the Eads Bridge is the Martin Luther King Bridge that opened in 1951 as a cantilever bridge ("Martin Luther King Bridge"). The Bridge has three lanes of Route 799, has a total length of 4009 feet, a width of 40 feet, a vertical clearance of 19.4 feet and a clearance below at 98 feet ("Martin Luther King Bridge").

All of this site research strove to determine appropriate dimensions of a constructible bridge in Saint Louis. The Saint Louis Pedestrian Bridge will have a vehicular road height clearance above the bridge of 20 feet, the railroad below height clearance needed on the East will be 18 feet, the riverboat below bridge clearance will be 100 feet, and the length of the proposed bridge is approximately 3,300 feet.

Next, the Gateway Arch details were considered in great length in order to develop site analysis and begin design of a symbolically connected bridge. The Jefferson National Expansion Memorial is 640 feet tall and wide, which amounts to approximately 64 stories tall if each is 10ft (National Parks Service). A viewing area is at the top of the Arch and can hold up to 160 people at one time (National Parks Service). The Arch is designated to sway up to 18 inches and withstand an earthquake; however, it takes 50mph winds to move the top 1-½ inches (National Parks Service). There are a series of lightning rods on the top of the Arch that are grounded directly into the bedrock with an insulated interior that is able to withstand hundreds of lightning bolts each year (National Parks Service). Construction between February 1963 and October 1965 amounted to cost $13 million (National Parks Service).

Finally, climate considerations are as follows: average temperatures range from

21.2°F in January to 89.8°F in July, average precipitation ranges from 2.14 inches in January and 4.11 inches in May, at the top of the Arch visibility can extend up to thirty miles, and fog and hazy morning commonplace in St. Louis ("Climate for St. Louis, Missouri.").

Figure 3.7: Concept Sketch #1

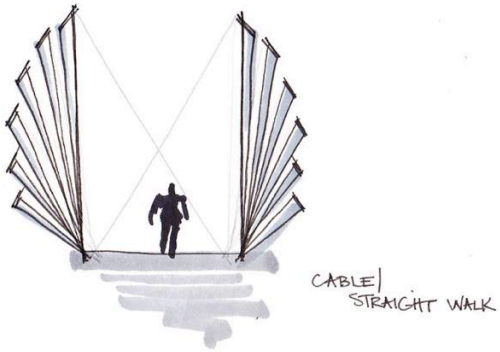

Figure 3.8: Concept Sketch #2

Design

Design began with conceptual sketches with pen and ink that demonstrated the experience of the bridge. The shape of the Gateway arch, a triangle, was extruded vertically to develop a gateway inspired by Moses's splitting of the Red Sea. Consideration was made on how the extruded triangular elements could be structural and architectural simultaneously; structural cables were added for support. Next, consideration for elevation views were made to taper from the center of the bridge

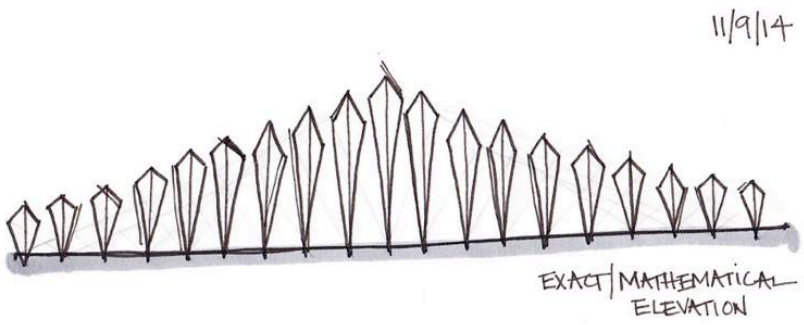

Figure 3.9: Concept Sketch #3

in order to create a gradual experience of the water splitting as one walks across the bridge. The main architectural design and experience would be located at the center of the bridge; the Millenium bridge came into play with inspiration and engineering reason here.

Next, site development and placement of the bridge needed to be graphically communicated to ensure all site research worked together to support the location of the proposed bridge. First, a pen and ink drawing was made to show the general environmental elements of the site: roads, greenery, buildings, river and boat locations, railroads, among others (as seen in Figure 3.10).

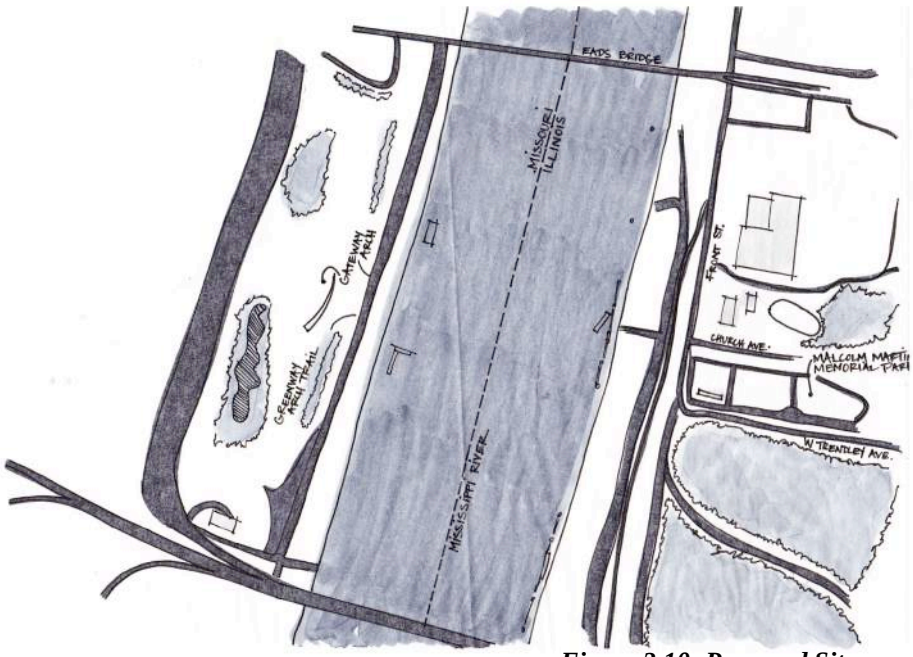

Figure 3.10: Proposed Site

Next, the access views (see arrows) and river flow considerations were added to the original environmental drawing. Most importantly, as seen in Figure 3.11, the bridge is placed on the site with an entrance on the west in the Greenway Arch Trail Park and an entrance on the right in the Malcolm Martin Memorial Park.

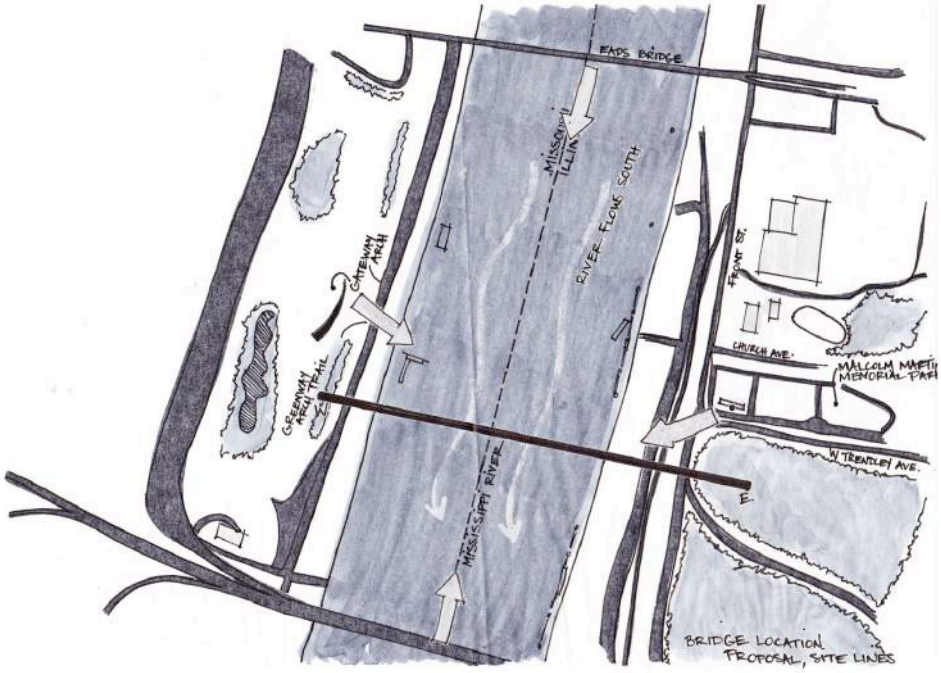

Figure 3.11: Proposed Site with Bridge

Finally, all considerations were reduced in opacity to showcase the climate considerations of the region in relation to the bridge as can be seen in Figure 3.12. The dry month of January produces 2.14 inches of rain, while the wet month of May produces 4.11 inches; Saint Louis averages 46.06 inches of rain annually. Canadian cold air masses blow from the north, while the Gulf of Mexico moist air blows from the south. Note once again that the Mississippi River runs southward. Finally, important viewpoints to consider for the

proposed location include viewpoints from the Gateway Arch, Gateway Arch trail, Malcolm Martin Memorial Park overlook, Eads Bridge to the north and Poplar Street Bridge to the south.

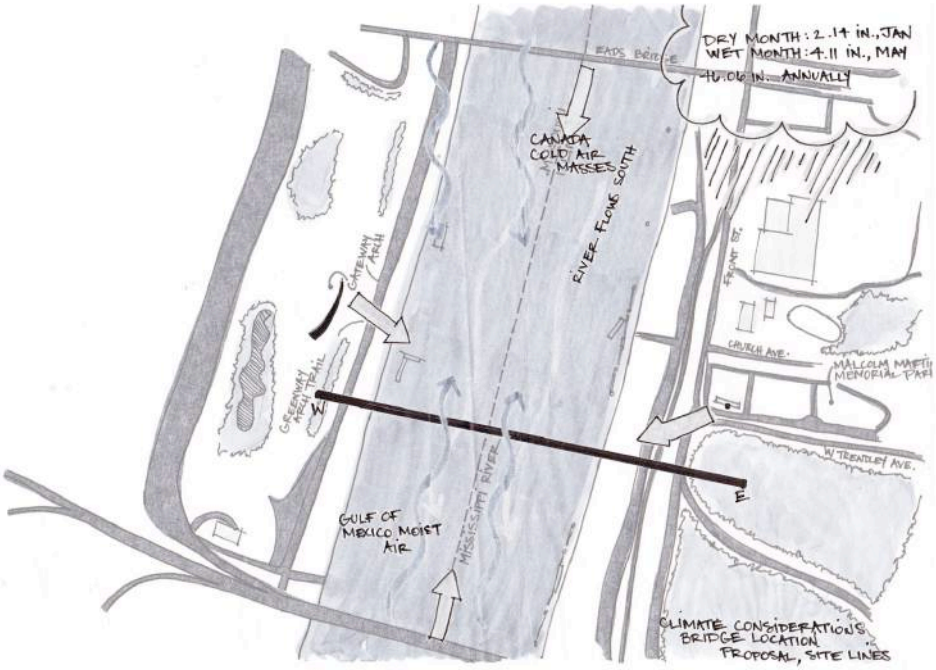

Figure 3.12: Proposed Site View Points and Climate

Renderings of the bridge were then constructed and modified to showcase site and inspiration implications. The bridge was designed to directly relate to literature review topics and ideals to strive for an iconic bridge. With this in mind, the bridge provides economic responsibility with community contributions to tourism and public spaces, cultural identity with the incorporation of extrusions of the arch itself in the main architectural skeleton, a definition of how we live with the reflection and contribution to

green spaces of entrance gardens in an urban setting, and reflection of the eternal in the concept of Moses' splitting of the Red Sea.

Figure 3.13: Bridge Overview

Figure 3.14: Sub-Bridge Structure

Compositional renderings, with engineering practices and models in mind, show considerations of the past and present in the bridge. It provides a sense of identity, history, and context for the community of Saint Louis, Missouri with the language of concept. Moses' split the Red Sea as a gateway to freedom from slavery. Similarly, this bridge leads to the gateway to the West. Composition and function are evident in the ribbing and structural implications of the Millennium bridge in basic concept.

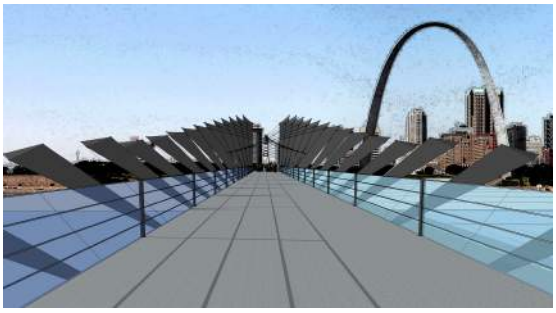

Figure 3.15: Bridge Walking Experience

Figure 3.16: Bridge Pedestrian Focus

Lastly, the experience was exemplified in architectural relevance. The use of triangular extrusions of the arch and slender cable systems along with glass and steel

railings create an architectural extension of the iconic Gateway Arch. See Figures 3.15 and 3.16.

Figure 3.17: Bridge Entry

CHAPTER 4

RESULTS

The nature and purpose of this project strives to shift the perspective and purpose of the architecture of bridges as mere transportation systems to a meaningful architectural and cultural symbol. My effort contributes to the way we view communities and countries, the way we function, and the way architects themselves view the design and importance of bridges. It shows students an idea of iconography and practical application to show a relationship between bridges and architectural consequence. With this in mind, the project metaphorically bridges into a community reaction portion that investigates the meaning of bridges through the eyes of architectural professionals, engineering professionals, and students to compare the results of research, personal application and how these are viewed.

The procedure begins with the completion of a preliminary questionnaire that gathers general demographics and questions regarding existing architectural impressions from professional and student participants. Questions observed the level of familiarity participants regarded themselves to have in basic architecture and engineering principles. Participants then defined what architecture means to them and observed what bridge perceptions they believed. These bridge perceptions included the following statements: bridges are simply transportation devices, bridges can be attributed to primarily engineers, bridges can be attributed to primarily architects, bridges are neither

engineering nor architecturally based, bridges have major cultural significance, bridges are historical icons, bridges have major influences of composition and function, and bridges have stylistic and architectural relevance. Participants were also initially asked what impacts bridges can have on society: economic, cultural, eternal significance, relevance to trade and commerce specifically, and emotional. Next, icons and architectural icons were defined and identified respectively; culture and history were also expressed and related to one another. And finally, architectural components were listed and participants were asked to check all that they believed to be relevant to architecture. All of these questions, as a part of the initial questionnaire, strove to explore the honest and uninfluenced perspectives students and professionals regarded towards bridges in relation to architecture and their level of architectural expertise.

The community reaction procedure then allowed a PowerPoint presentation to be viewed without verbal confirmations, as some were administered electronically, that summarized the basic ideas of the literature review and methodology previously presented. After the presentation, a second questionnaire was taken to ask the following: if perspectives of architecture itself were changed, if impressions and perspectives of bridges shifted, if the statements of bridge perspectives listed above had changed, if the impacts of bridges on society listed above had changed, and finally if bridges are icons of our modern world. Community research was conducted through the regulations of Western Kentucky University's Institutional Review Board.

Questionnaire Results Represented Graphically and Analytically

Gender: 13 Men, 5 Women

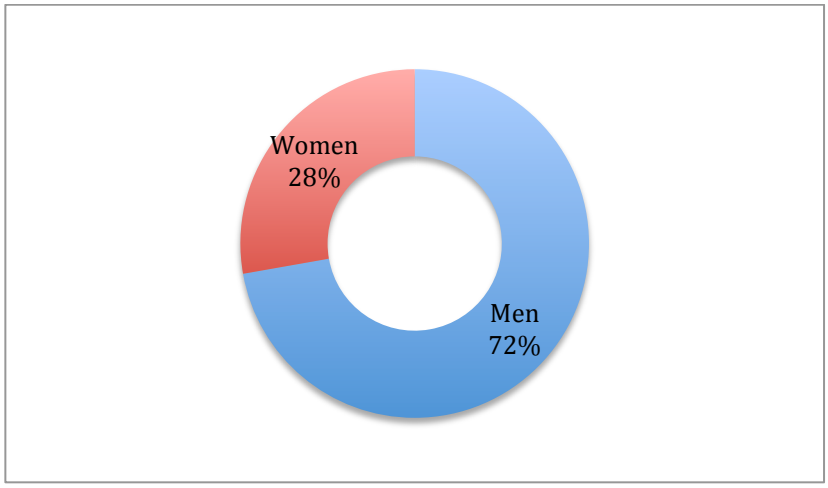

Figure 4.1: Gender Demographic Donut Chart

1. Occupations:

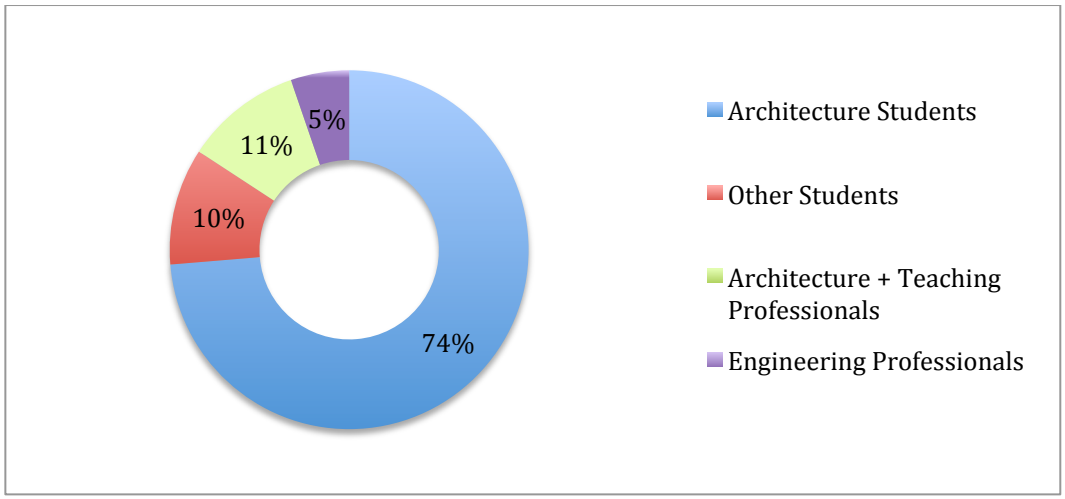

Figure 4.2: Occupation Demographic Donut Chart

Before Presentation, Part One (Labeled "a" Questions)

2a, 3a. Familiarity with principles:

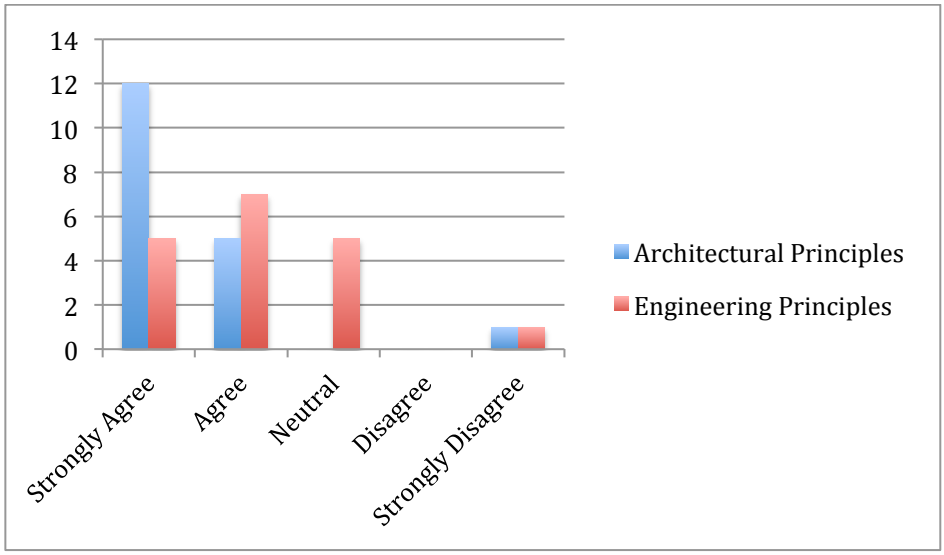

Figure 4.3: Principle Familiarity Comparative Column Graph

4a. Notable descriptions of what architecture means to participants:

- Building and designing structures and art to serve a purpose and enhancing creativity, learning and innovation.
- Architecture to me is an expression of today's society. It is an art form that correlates aesthetic appeal and functionality.
- Architecture is the art of creating space embodied with spirit and coupled with function. I have dedicated my professional life to the pursuit of excellence in design. The path thus traveled has provided the training, experience and tools necessary to realize this goal. As a practitioner of a multidimensional discipline and social art, I rely on the evolution of my

methodology and the subsequent application for the cultivation of a positive contribution to our built environment.

- It is the image of society and culture. It's how we identify who we are.

7a. Notable definitions of an icon in participant's perspective:

- Something that provokes feelings.
- Something that stands out above the rest and holds meaning.
- Something that helps captivates
- Something or someone that is characteristic of and a symbol of a culture, time, group, or place.

8a. Participants consider any pieces of architecture icons? 100% Yes. Pieces considered architectural icons:

- Eiffel Tower
- Statue of Liberty
- Sears Tower
- Pyramids of Giza
- Golden Gate Bridge
- Roman Coliseum
- Cherry Hall
- Empire State Building

9a. Notable responses of what in modern society defines our culture:

- Movement
- Values, traditions, symbols, language, etc.
- Beliefs and actions of people related to everyday living (food, religion, clothes, activities, music, what we spend our money on, language, history); the things that are most important to the people living in that society.

10a. Notable considerations of history as a part of culture: 17 Yes, 1 No.

Why:

- Without history there would be no culture. Past experiences shape the present, and because of that culture is always changing and evolving.
- Everything has some form of historical context. We can use it to prevent repeating errors.
- It is our understanding of history that is part of our culture.

11a. Elements considered architectural components:

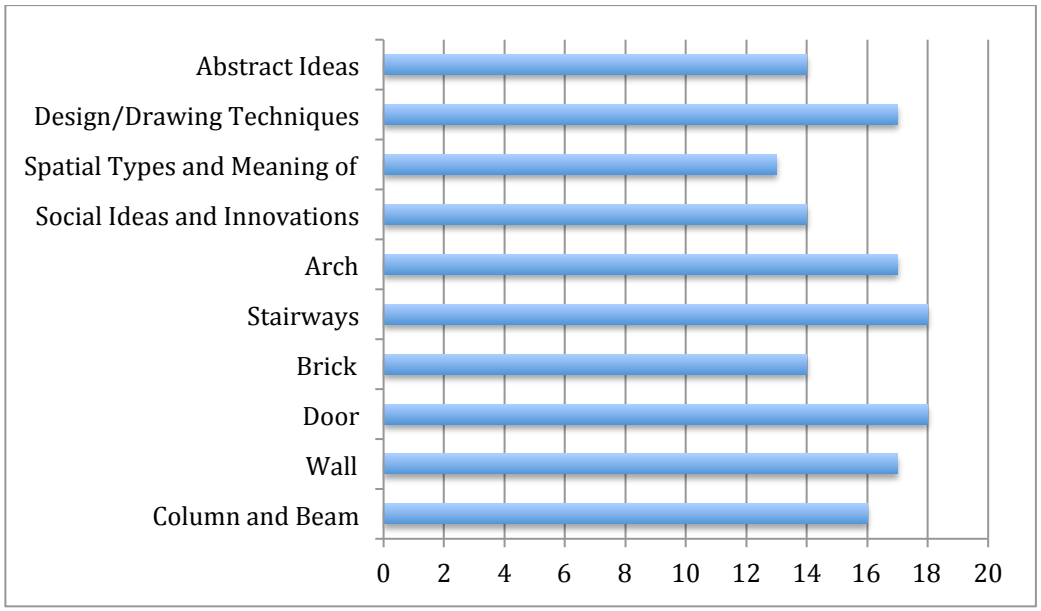

Figure 4.4: Architectural Component Element Bar Graph

Comment included for other: Anything can be architecture because it has to be designed and crafted for use and has to fit codes and regulations.

5a, 3b. Initial vs. Final impressions and perspectives of bridges:

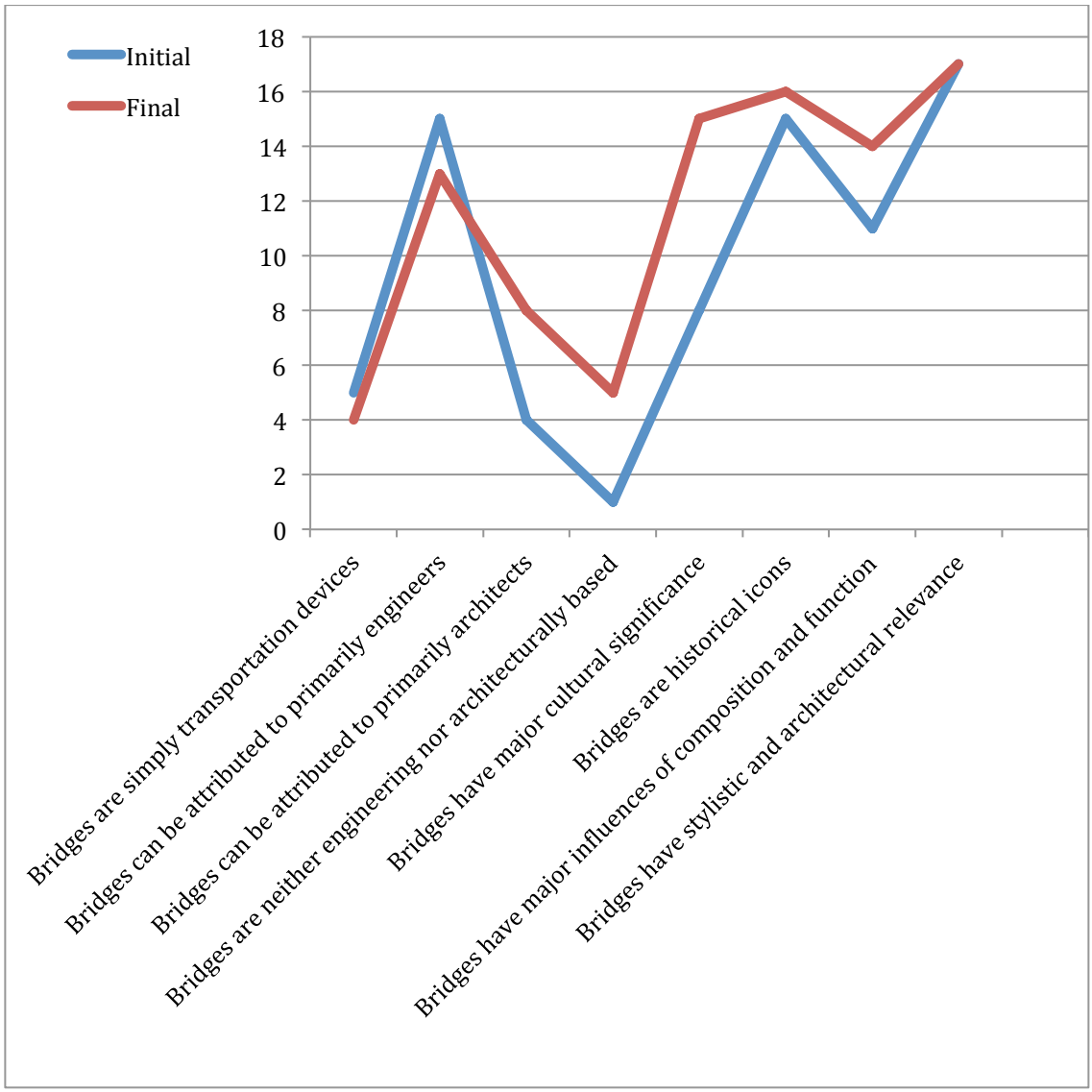

Figure 4.5: Impressions and Perspectives of Bridges Line Graph

6a, 4b. Initial vs. Final perspectives of impacts bridges have on society:

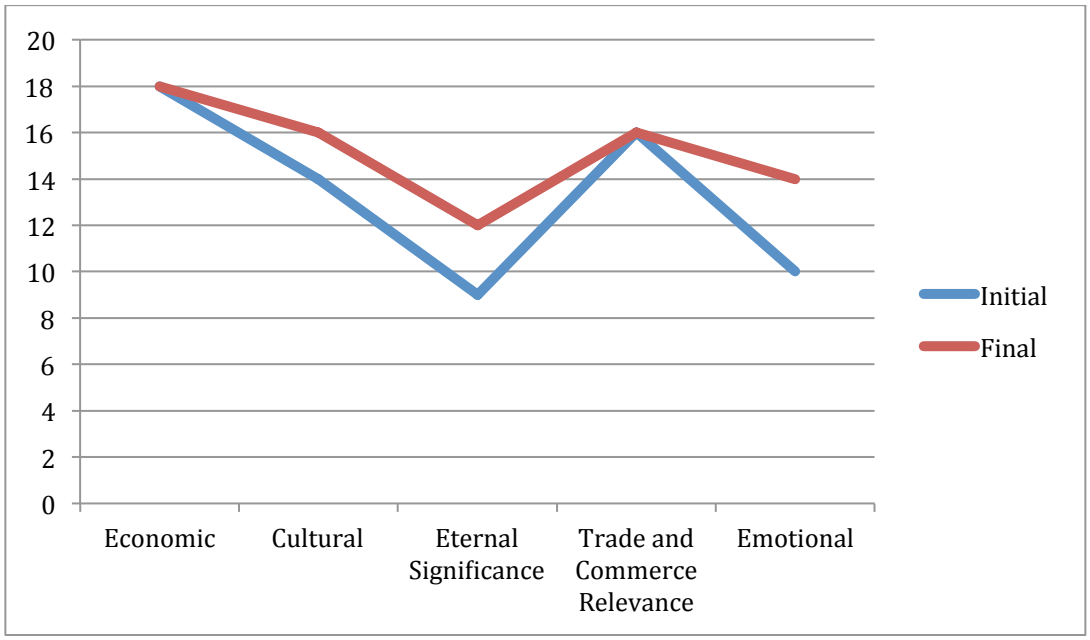

Figure 4.6: Perspectives of Bridge Societal Impacts Line Graph

After Presentation, Part Two (Labeled "b" Questions)

1b, 2b. Perspectives after presentation changes:

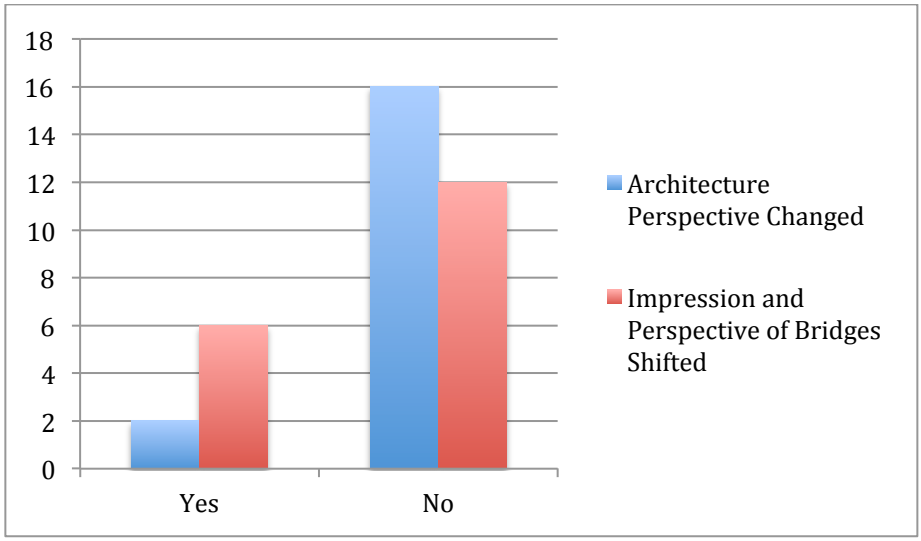

Figure 4.7: After Perspectives Comparative Bar Graph

Comment included for perspective of architecture changed: Bridges are structures as well but they never came to mind when thinking of architecture.

Notable comments included for impression and perspective of bridges shifted:

- Realization of the cultural significance and meaning behind bridge function.
- The portion of the Red Sea does open up a different discussion on what is a bridge.

5b. Believe bridges are icons of our modern world:

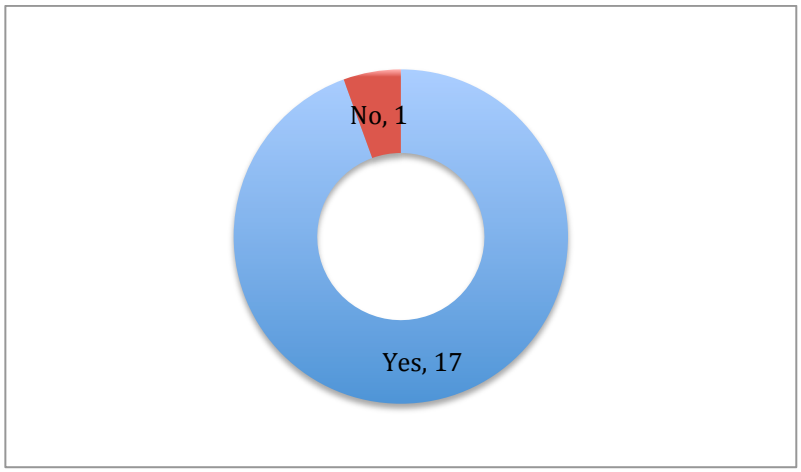

Figure 4.8: Bridges as Icons Donut Chart

Notable comments on why bridges are icons:

- Bridges are more important than ever in the age of global economy. We now need to be more connected than ever and bridges can display, share, and celebrate diverse cultures around the world.
- Easily recognizable and attributed to specific places or events.

- I think bridges can be icons of our modern world if they are built with a community's needs and culture in mind, not just built for transportation purposes. Some but not all; the bridges that have become icons possess the intangible beyond just function; they capture our imagination as they inform us of the spirit of place (*genius loci*), they have become an essential essence of our times. These include the Brooklyn Bridge, the Golden Gate, Eads Bridge and the like; conversely, most highway bridges (simple overpasses = transportation devices) do not rise to the level of iconography.
- Norman Foster said, "Useful things can be this beautiful. They innovate, they transport, and they make this world accessible.

CHAPTER 5

DISCUSSION/CONCLUSION

The purpose of this research was to test the following hypothesis through literature review and the design of an icon: bridges have architectural significance that stand on cultural significance and identity, historical and iconic ideas, composition and function, and style and relevance to architecture. The goal of this research was to investigate the current perspective and purpose of bridges from simple transportation structures to meaningful and influential architectural symbols. To determine whether this hypothesis was supported or rejected, a community reaction survey and presentation were administered.

Results from the community reaction survey revealed a limited demographic of primarily male participants that are currently architectural students. Levels of familiarity of architectural and engineering principles were determined; most participants felt strongly about architectural knowledge, while the majority of participants only felt they knew an agreeable level of engineering knowledge. The majority of participants were architecture students; this is why perceptions might have varied. Next, descriptions of what architecture means to participants were collected; descriptions were varied, but most centered on concepts of purpose, aesthetic creativity and innovation, societal expressions, and identity. This question revealed the purpose of architecture to match with that of the hypothesis. If bridges can be determined as structures in architecture, principles of

iconography and influence can reasonably be applied. Subsequently, the concept of an icon was defined in a similar fashion. Icons were defined to be a clear symbol of culture that provokes feeling and captivates its beholders. Here participants were also in line with the hypothesis of this research: icons are made to be something of an expression of culture, and as architecture is a part of culture, architecture can be determined as iconic. Architecture can also be determined as iconic with the unanimous consent in participants that there are many pieces of architecture in this world that are icons. The Eiffel Tower, Sears Tower, the Pyramids of Giza, the Golden Gate Bridge, and even WKU's Cherry Hall were all named as examples of architectural icons. Culture was then investigated to see what it includes in modern society. Participants defined modern society cultural influences to curiously include movement, values, symbols and language, as well as things in general that are important to people in a society. The hypothesis left a vague inclination of culture, but as described in the literature review, culture can be all things that contribute to life of a society. Participants once again align defined concepts with that of the research hypothesis. The participants, similarly, connected history, to culture. History and culture were defined to form a contingent relationship based on context in order to allow learning and improvements for the future. Finally, to wrap up the initial screening process of architectural and bridge knowledge, participants were asked to identify architectural components; ideas of design/drawing techniques as well as forms of stairways and bricks were three of the most commonly identified elements of architecture

among participants. Contrastingly, the idea of spatial types and meaning of organization was the least commonly identified to be architectural in nature.

Comparison was key when administering a before and after survey of architectural knowledge and reaction. The first comparative concept observed was the impression and perspective of bridges. Arguments for attribution of bridges to architects, bridge cultural significance, and composition and function considerations were all positively influenced by the presented research. However, attribution of bridges to engineers and the acknowledgment of bridges as neither engineering nor architecturally based both increased after presented research. Concepts of bridges as simple transportation devices and stylistic and architectural relevance were unchanged; bridges were not highly regarded as simple transportation devices initially, but bridges were commonly said to have stylistic and cultural relevance from the beginning. No matter the change of opinion throughout this comparison, it is evident that cultural significance, historical iconic perspectives, components of composition and function, and style and architecture relevance are all considered important for participants.

The second comparative concept observed involved the perspectives of bridge impact on society in relation to economic, cultural, eternal significance, trade and commerce, as well as emotional factors. Perspectives of cultural, eternal significance and emotional impacts were all positively influenced by the presentation. Economic and trade and commerce relevance were unchanged, however, they were both regarded highly from

the beginning of the survey. These results support the hypothesis ideals that link bridges to ideas of economics, culture, eternal significance, trade and commerce, and emotion.

Finally, overall assessments were made to consider the impacts, if any, the architectural research presentation made on views. Architecture and bridge impressions were assessed; not many overall perspectives were changed, but this can be viewed as a factor of the experienced and knowledgeable architectural demographic of participants. Participants had established views of architecture and bridge consequences coming into the community reaction research. Comments of changed perspectives as well as provocative thought based on the Red Sea conceptual development were presented from participants in support of research perception deviations. The belief of bridges to be icons of our modern world was the closing assessment. Seventeen out of eighteen participants confirmed that bridges were icons of the modern world. Bridges were said to be a cultural connection, easily recognizable, and more if they are built with a community's needs and culture in mind.

Norman Foster once said, "Useful things can be this beautiful. They innovate, they transport, and they make this world accessible," as quotes from a participant. Here is where the conclusive argument can be found. A bridge is a useful and innovative engineering and architectural solution to transportation, iconic and historical needs of society. However, this distinction of bridges as architectural icons can be simplified to the purpose of construction and purpose of architecture itself. Bridges that can be classified as icons go beyond function in the purpose and form of place that it is built and

designed upon to become iconography. A purpose exposes iconic significance for transformational bridges as well as architectural iconic bridges. The hypothesis was supported, but modified in form as well. Bridges can have architectural significance, they can stand on cultural significance and identity, they can have historical and iconic ideas, they can have compositional and function implications, and they can have style and relevance to architecture. Bridges can only be iconic architectural structures if they are founded upon principles of creativity and the spirit of place (*genius loci*), as introduced by a participant, that strive to develop a purpose far beyond transportation needs. The goal of this research was to investigate the perspective and purpose of bridges from simple transportation structure to a meaningful and influential, architectural symbol. Research showed that perspectives of bridges were dependent upon the purpose for which they were built. Many bridges within our society, like Tower Bridge or Millennium Bridge, clearly demonstrate connections with architectural iconography. Bridges are, in fact, icons of our architectural world.

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APPENDIX

COMMUNITY REACTION QUESTIONNAIRE

Western Kentucky University Honors Thesis Questionnaire
Investigator: Jennifer Gaiko
Email: jennifer.gaiko031@topper.wku.edu
Department: Architectural & Manufacturing Sciences

Date: _____

Sex: ___M ___F

1. What is your occupation?
   □ Student
   Major: _____
   Professional Engineer
   Specific Occupation: _____
   Professional Architect
   Specific Occupation: _____
   Teacher
   Department: _____

Before Presentation, Part One:

2. Would you consider yourself familiar with basic architectural principles? For example: scale, proportion, form, etc.

   Strongly Agree Agree Neutral Disagree Strongly Disagree

3. Would you consider yourself familiar with basic engineering principles? For example: problem solving, line, moment of inertia, etc.

   Strongly Agree Agree Neutral Disagree Strongly Disagree

4. What does architecture mean to you?

5. What is your initial impression and perspective of bridges? (Check all that apply.)
   Bridges are simply transportation devices.
   Bridges can be attributed to primarily engineers.
   Bridges can be attributed to primarily architects.
   Bridges are neither engineering nor architecturally based.
   Bridges have major cultural significance.
   Bridges are historical icons.
   Bridges have major influences of composition and function.
   Bridges have stylistic and architectural relevance.
   Other: _____

6. What impacts can bridges have on society? (Check all that apply.)

Economic
Cultural
Eternal Significance
Relevance to trade and commerce specifically.
Emotional
None of the above.
Other: _____

7. What is an icon in your perspective?

8. Are there any pieces of architecture that you would consider icons?
No
Yes

If so, which?

9. What in modern society define our culture?

10. Do you consider history as a part of culture?
No
Yes

If so, why?

11. Which of the following do you consider architectural components? (Check all that apply.)
Elements of Construction:
Column and Beam
Wall
Door
Brick
Stairways
Arch
Social Ideas and Innovations
Spatial Types and Meaning of Organization
Design/Drawing Techniques
Abstract Ideas
Other: _____

After Presentation, Part Two:

1. Has your perspective of architecture itself changed?
   No
   Yes

   If so, why?

2. Has your impression and perspective of bridges shifted?
   No
   Yes

   If so, why?

3. Which of these statements do you now believe to be true: (Check all that apply.)
   Bridges are simply transportation devices.
   Bridges can be attributed to primarily engineers.
   Bridges can be attributed to primarily architects.
   Bridges are neither engineering nor architecturally based.
   Bridges have major cultural significance.
   Bridges are historical icons.
   Bridges have major influences of composition and function.
   Bridges have stylistic and architectural relevance.
   Other: _____

4. What impacts do you now believe can bridges have on society? (Check all that apply.)
   Economic
   Cultural
   Eternal Significance
   Relevance to trade and commerce specifically.
   Emotional
   None of the above.
   Other: _____

5. Do you believe that bridges are icons of our modern world?
   No
   Yes

   If so, why?