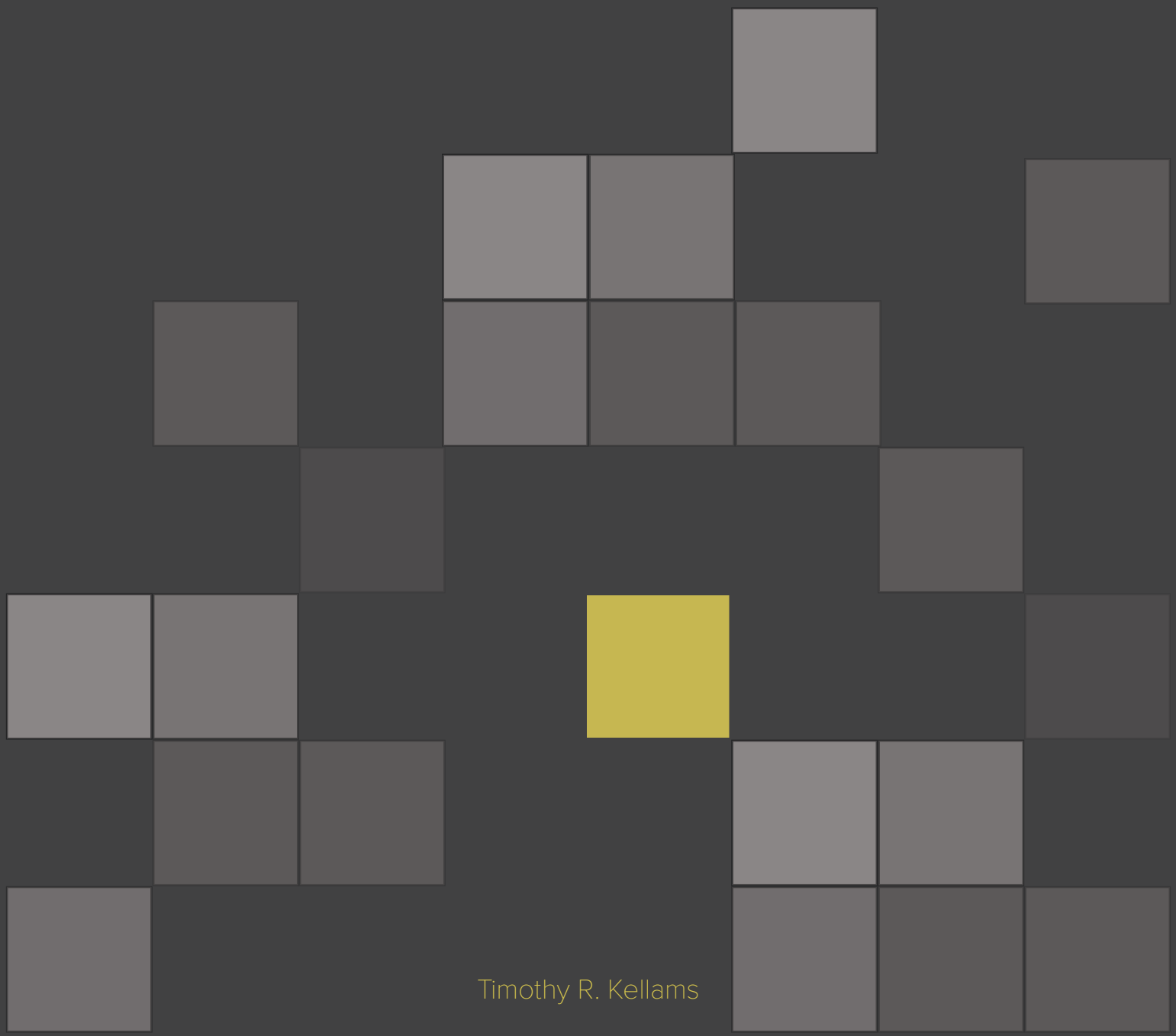
The Mind, the Narrative, and the City:

how narratives of space make place in cognitive maps



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The Mind, the Narrative, and the City:
how narratives of space make place in cognitive maps

by

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A REPORT

Submitted in partial fulfillment of the requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture and Regional & Community Planning
College of Architecture, Planning and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2017

Reviewed by:

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Abstract

Narratives of urban experiences influence understanding of space and urban form. Narratives give meaning to space, creating memories of places and helping to define an individual's cognitive map. The representation of narratives within cognitive maps impacts day to day activities, as well as, emotional, cultural, and social characteristics of one's self. Planners and designers play an important role in crafting narratives through the implementation of designs and policies that together shape urban form. This research investigates the relationship between spatial cognitive schemas and narratives within cognitive maps. Specifically, how college students develop and use narratives within their cognitive map to help with living in a new and initially unfamiliar place of residence. Through mixed method analysis of drawn individual cognitive maps, an online survey, and a group discussion, results show that different types of experiences within narratives influence the likelihood of it appearing within the spatial cognitive schema. The findings suggest that narratives created by peak emotional experiences contain a longer and clearer representation within cognitive maps because of their personal value. By better understanding the role of these emotional responses and their connection with urban form, design professionals can aim to frame projects toward influencing individual's lives. Understanding how individuals develop narratives of their new city may influence planning and design with the goal of creating urban projects that provide social and cultural significance through meaning of place.

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Acknowledgments

I would like to thank my family for their love and support as well as the faculty and staff of the Department of the Landscape Architecture and Regional & Community Planning for their time, effort, and guidance.

Major Professor:
Brent Chamberlain, Ph.D., Department of Landscape Architecture Planning and Regional & Community Planning

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Preface

Urban form and cognitive maps originally sparked my interest in childhood when I was becoming familiar with the spatial organization and experience of my hometown, Wichita, during car rides with my dad. Today, cognitive schemas and urban form still interests me, although from a different angle. My goal, as well as this report's goal, is to gain knowledge on how to design and plan urban forms that increase social and cultural capital by understanding the general public's cognitive map.

Definitions

Cognitive Maps (mental maps)

"...are mental representations of physical locations. Humans and animals use them to find their way and to help recall important features of the environment."
("Mapping: Cognitive Maps" 2015)

"A product of an individuals organized impression or representation of a spatial environment".
(Downs and Stea 1977)

Landmarks

"Landmarks may be defined in a number of ways, such as strategic foci towards or away from which one travels, intermediate foci on courses and routes that assist spatial decision making or significant physical, built, or culturally defined objects that stand out from their surroundings." (Golledge, 1999, 16)

Perception

"Perception is a learned communication process. In this context, perception means understanding of visual information"

(Schwalbach 2009, 13)

"People form images of other places, and how these images influence many decisions – including the one to move."

(Gould 1986, 17)

"Perception involves the gathering, organizing and making sense of information about the environment."

(Carmona 2010, 87)

"Perception is not a passive process of registration, but an active process of interaction between organism and environment."

(Kaplan et al. 1978, 36)

Narrative

"Narrative is a means of understanding and describing the world in relation to agency"
(Tilley, 1994, 15)

Navigation

"...is most frequently used to refer to the science of locating position and plotting a course for ships and aircraft"
(Golledge 1999, 6)

Network

"Routes connect places; often they overlap or cross, and consequentially they can be integrated into a network."

(Golledge 1999, 19)

"Paths or routes are represented as one dimensional linked segments or, after integration with other paths. "Along with landmarks, the spatial relations among them, and other spatial and non-spatial features of places, make up the remembered layout of an experienced environment." (Golledge 1999, 6)

"... configurations are considered to have more formal geometric (usually Euclidean) properties; they have the necessary robustness to allow trigonometric functions to be used to explain the spatial relationship embedded in the configuration; they can be described by metric and nonmeric geometries and topologies; and they provide a convenient form of summarization or generalizations about experienced features, places, and connections."
(Golledge 1999, 21)

Wayfinding

"... involves selecting paths from a network. For successful travel, it is necessary to be able to identify origin and destination to determine turn angles, to identify segment lengths and directions of movement, to recognize on route and distant landmarks, and to embed the route to be taken in some larger reference frame."
(Golledge 1999, 7)

"The ability to use cognitive and behavioral skills to find a way from an origin to a destination."
(Golledge 1999, 24)

Kevin Lynch's Five City Elements

**All quotes (Lynch 1960, 47-48)*

Paths

"Channels along which the observer customarily, occasionally, or potentially moves". An example of a path would be a sidewalk, street, trail, or even a river. Paths tend to be the most influential element in one's cognitive map. This is because people observe the city while on a path such as observing while driving on the highway.

Edges

"Linear elements not used or considered as paths by the observer". An example of an edge is a county or city line, a boundary of a development, and a shoreline. Edges can be thought of as a vertical element rather than a horizontal one. They are identified as the edged defining and connecting two regions.

Districts

"Medium-to-large sections of the city, conceived of as having two-dimensional extent, which the observer mentally enters "inside of," and which are recognizable as having some common, identifying character". Districts, along with paths, are the most common elements used in the creation of a mental map. One example of this in many cities is the "downtown" area.

Nodes

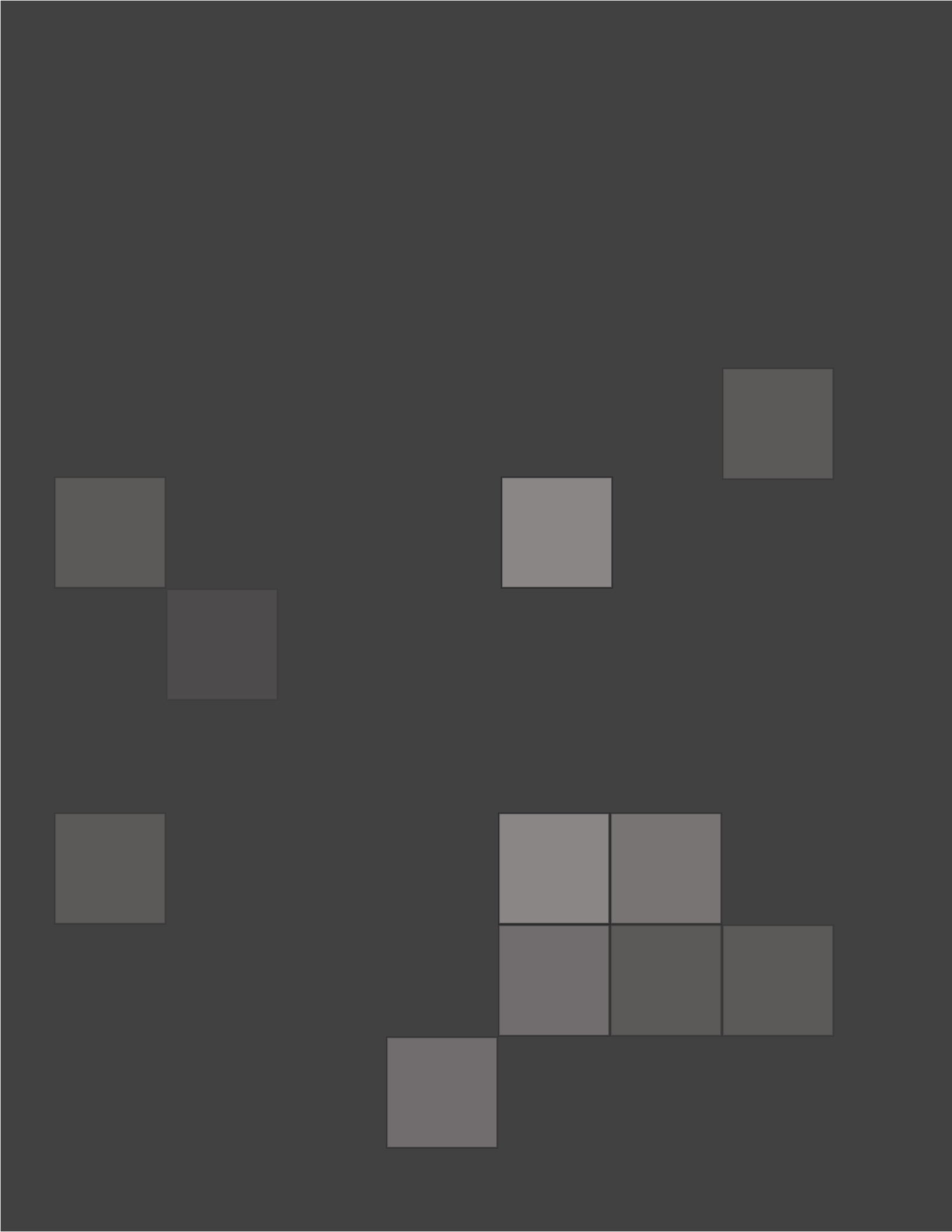
"Points, the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he/she is traveling". Nodes, also called cores, are points of concentration or conjunction. Nodes tend to be one of the main focuses or interests within a district. An example of a node would be a light rail station. A light rail station connects multiple tracks and interacts with various modes of travel like pathways and streets.

Landmarks

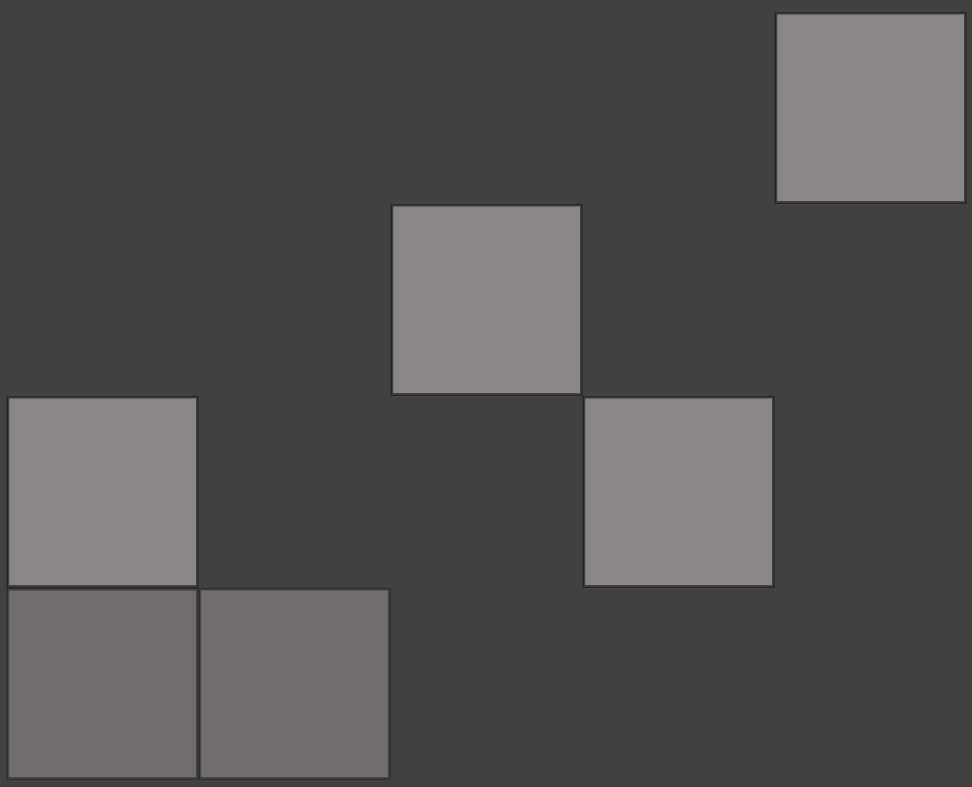
"A type of point-reference, where the observer does not enter within them, they are external. They are typically rather simply defined physical objects: building, sign, store, or mountain". An example of a landmark element is a lake. In downtown Chicago, Lake Michigan is used as a landmark. The lake is used to help pedestrians spatially navigate through a city. The lake is always toward the east of a city and helps people determine their orientation or direction of travel.

Keywords

cognitive maps, narratives, spatial cognitive schemas, experience, urban form, map visualization



Chapter 1: Introduction



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Our life experiences influence our understanding of the environment shaping our perceptions and reactions both consciously and subconsciously. In the natural and built environment, our life experiences are created through the combination of multiple events, leading toward the amalgamation of our own narrative or story of our interaction with the environment. Steven Corman (2013) states that narratives are made of multiple memories based on experience, big or small, that help provide pieces of information used to create a whole image or narrative. Narratives are created and influenced by the experiences we have within the natural and built environment. The narrative of a place contains a dialogue of consciousness paired with the experience and knowledge supporting the memory (Fisher, 1984). These narratives change how we view and interact with places and people.

Social place theories, such as Place Identity Theory and Place Attachment Theory, revolve around the idea of meaning of place, which is the recognition that places provide value and meaning to an individual (Jorgensen & Stedman, 2001; Hunziker, Buchecker, & Hartig, 2007; Ujang, 2010). Place attachment and social identity theory, among other theories, have revealed that humans have direct connections and relationships with places within the natural and built environment (Proshansky, 1978; Cronon, 1992; Potteiger & Purinton, 1998). Landscape architects and planners design places that utilize experiences of urban form to foster meaning and value. The design of urban spaces affect the lives of those who interact with it, ultimately influencing narratives which gives meaning to place. With the surge in urban migration (United Nations, 2014). urban design will play an increasing role in influencing the culture and narratives of citizens across the world – creating a design opportunity and challenge for planners and landscape architects.

One of the theories that has influenced planning for decades stems from Kevin Lynch's theory of the Five City Elements (paths, edges, districts, nodes, and landmarks). The theory posits that people cognitively code and spatially arrange the natural and built environment using these elements (Lynch, 1960; Rapoport, 1977). However, these five elements may not fully encompass meaning and value, because a cognitive map is also a union of narratives and a spatial cognitive schema, an abstract representation that contains relating spatial characteristics (Rapoport, 1977). Lynch's theory is applicable to understanding the spatial cognitive schema but may not represent the narratives tied to place.

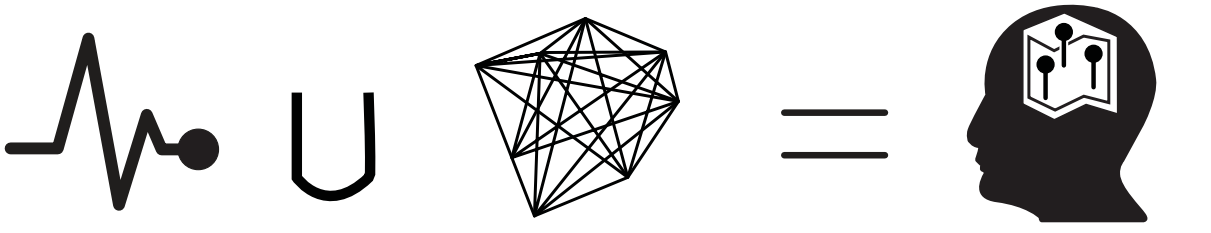


Figure 1.1: Topic Diagram. Shows union of narratives with a spatial cognitive schema to create a cognitive map

1.1 Research Question

Understand the connections between Lynch's theory and the formation of narratives is important in order to better understand how cognitive maps develop as a relationship between experiences and urban form. In order to better understand cognitive maps a broad question has been asked: What is the relationship between narrative and spatial cognitive schema within cognitive maps, if any? This relationship may influence the characteristics and representation of cognitive maps. Specifically, this research investigates the influence of experience on the relationship in an urban setting. In what ways does the experience of a city's urban form affect the relationship between narrative and spatial cognitive schema? Broadly, experience is influenced by the environment or setting, which have been designed or planned to some degree. How might urban design increase the quality of experience of urban form and value of place in cognitive maps? The experience of the urban environment can be designed or planned to transform spaces into places.

1.2 Study Site

The City of Manhattan, KS (Figures 1.2 & 1.3) has a number of factors that make it a good place to use cognitive maps to test the relationship of narratives and spatial cognitive schemas. First, Manhattan contains Kansas State University, which brings thousands of new students to a typically unfamiliar city each year. By default, the university becomes the landmark in their cognitive schema regardless of where they live in the city. Kansas State University typically requires students to live on campus for at least their first semester. This temporarily equalizes countless daily influences and routines among students across a magnitude of different socioeconomic classes. Second,

Manhattan has a range of topography and ecological elements such hills, valleys, creeks, and rivers. These elements tend to develop edges or landmarks within cognitive maps. For example, change in topography typically influences how an individual spatially understands elements of the city in their spatial cognitive schema because they must develop the space three dimensionally. These natural elements are used by many civilizations for cultural or spatial orientation reasons (Rappoport, 1977) Third, the city contains more than 50,000 people, which makes it an Urbanized Area as deemed by United States Census Bureau (US Census Bureau, 2010). Because of its current population, Manhattan can support many amenities and activates (zoo, movie theater, mall, box stores, etc.) that can be found in larger urban areas. Finally, Manhattan contains many different types, style, approaches, and time periods of urban form. For example, Manhattan contains a gridded street system, sprawl, areas of gentrification, and historic districts that evolved through different planning and design activities. This fairly common range of city planned urban form allows the study to look at how urban design and planning affects the spatial cognitive schema and narratives within cognitive maps.

This study will specifically focus on students on Kansas State University (KSU) in Manhattan, Kansas (The City). Manhattan is considered a "town and gown" city, meaning there this a close relation between KSU and the City of Manhattan government. In 2015, both CITI IO, a city and technology website, and Livability.com, a small to medium size city ranking website, named Manhattan the #1 College Town in the U.S. This is relationship, between the city and university, has a possibility of influencing the how an individual's cognitive map view and differentiate the two entities because of their ties to one another.

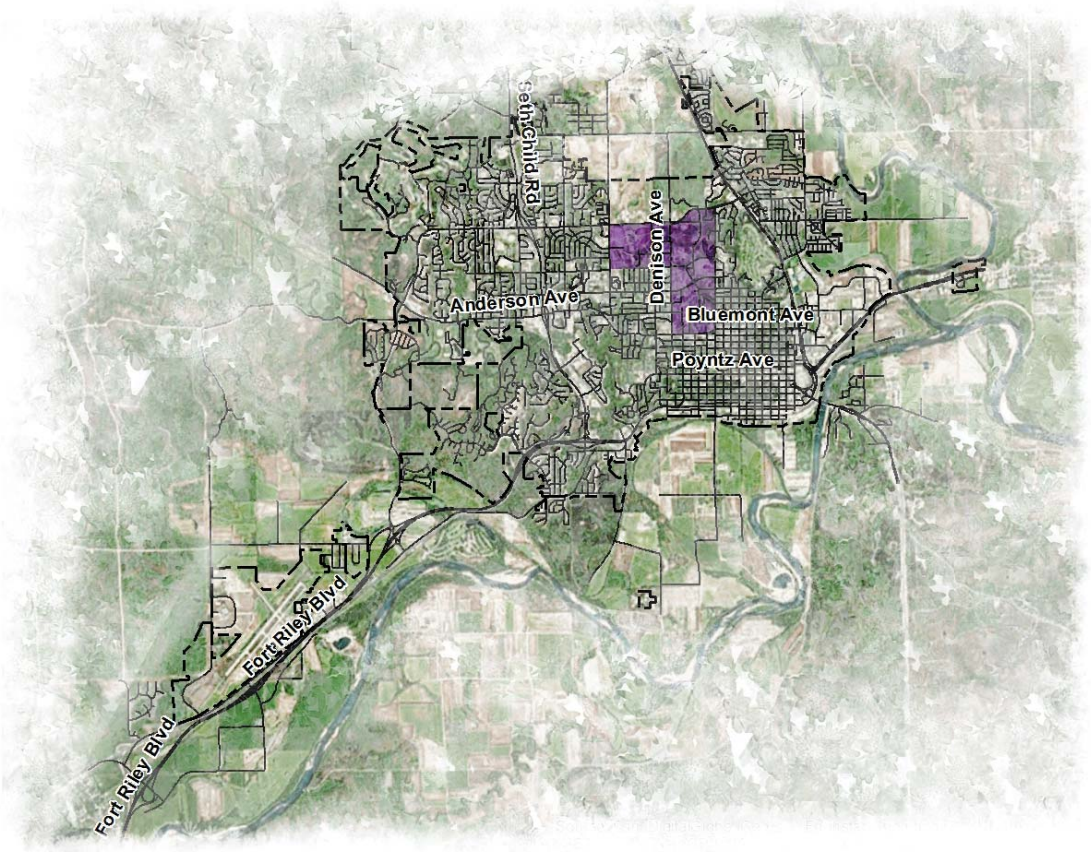


Figure 1.2: Map of Manhattan, Kansas with surrounding context (ESRI, 2016; City of Manhattan, 2016 adapted by Author) purple = Kansas State University

Figure 1.3: Main road map of Manhattan, Kansas (Kansas State Alumni Association, 2016)

1.3 Structure Overview

The content of this document is divided into sections of a literature review, the methodology used, the findings, a discussion, and a conclusion (Figure 1.4). A literature review was first conducted to gain a better understanding of existing knowledge and methods on the cognitive maps, cognitive narratives, and urban form. From there a Cognitive Map Research Study, containing three main parts cognitive map drawing, online survey, and group discussion, was conducted with 22 participants. Next, the data collected from the Cognitive Map Research Study was inventoried and taken through content and geographic information system analyses. The findings of the analyses resulted in a discussion, which is followed by a conclusion. These methods may be used for various urban locations or college towns.

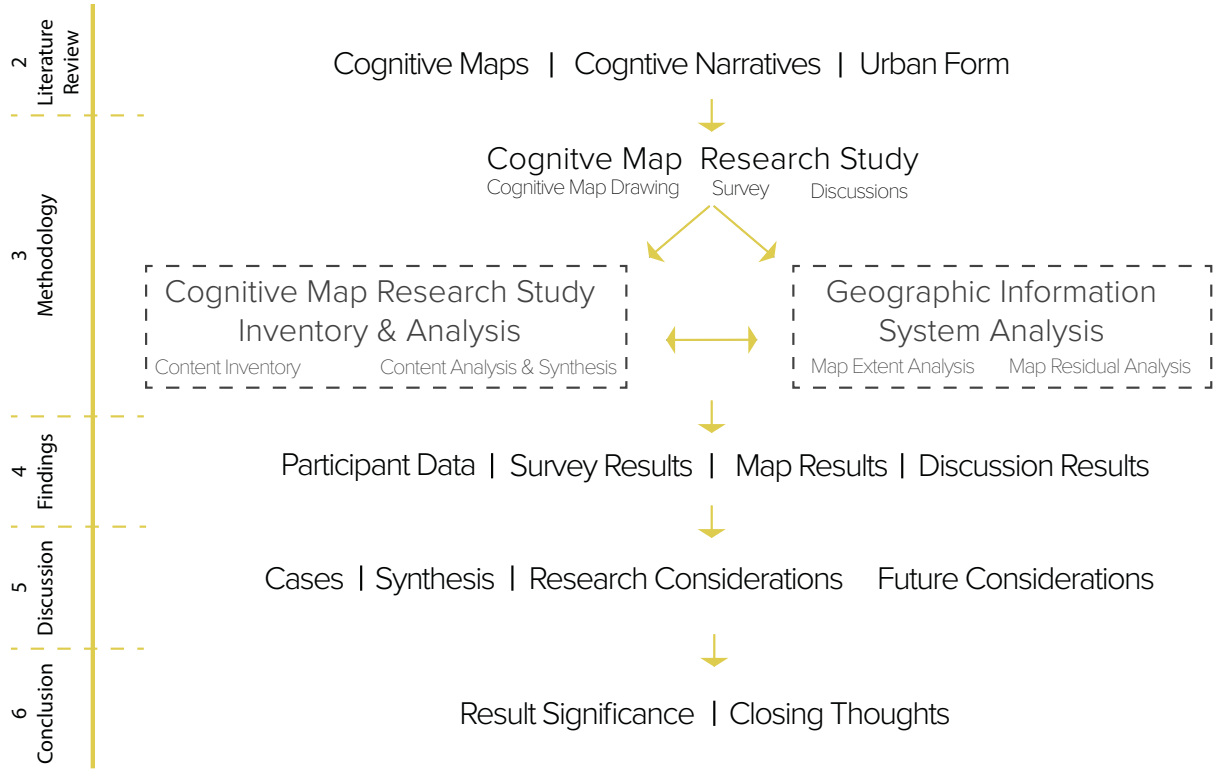


Figure 1.4: Structure Diagram. On left are the book chapters. The headings within each section refer to the subsections within each chapter

1.4 Informed Grounded Theory

The literature review was conducted through the lens of Informed Grounded Theory. Grounded Theory is used to strategically control the researcher's amount of knowledge on a subject (Thornberg, 2012). The idea is that the researcher will react naturally to situations. For example, if a participant discusses a notable park that they frequent it would be helpful for the researcher to comment their own opinions, but to encourage the participant to share their own opinions and experiences even though the researcher may be completely familiar with park. Being knowledgeable enough to have a conversation about the space may be helpful, but it may also hinder the research. If the researcher knows the location but doesn't know the details, then it may be beneficial to ask the participant for descriptive details to help communicate the meaning of the space. This theory keeps the researcher in the dark for a period of time to encourage genuine questions, responses, and reactions. In this research, Informed Grounded Theory was mostly used for qualitative data, such a interpreting places drawn in the cognitive maps. Use of the Informed Grounded Theory method helped to address the research question by giving the researcher the ability to approach the studied relationships with an open, yet educated mind.

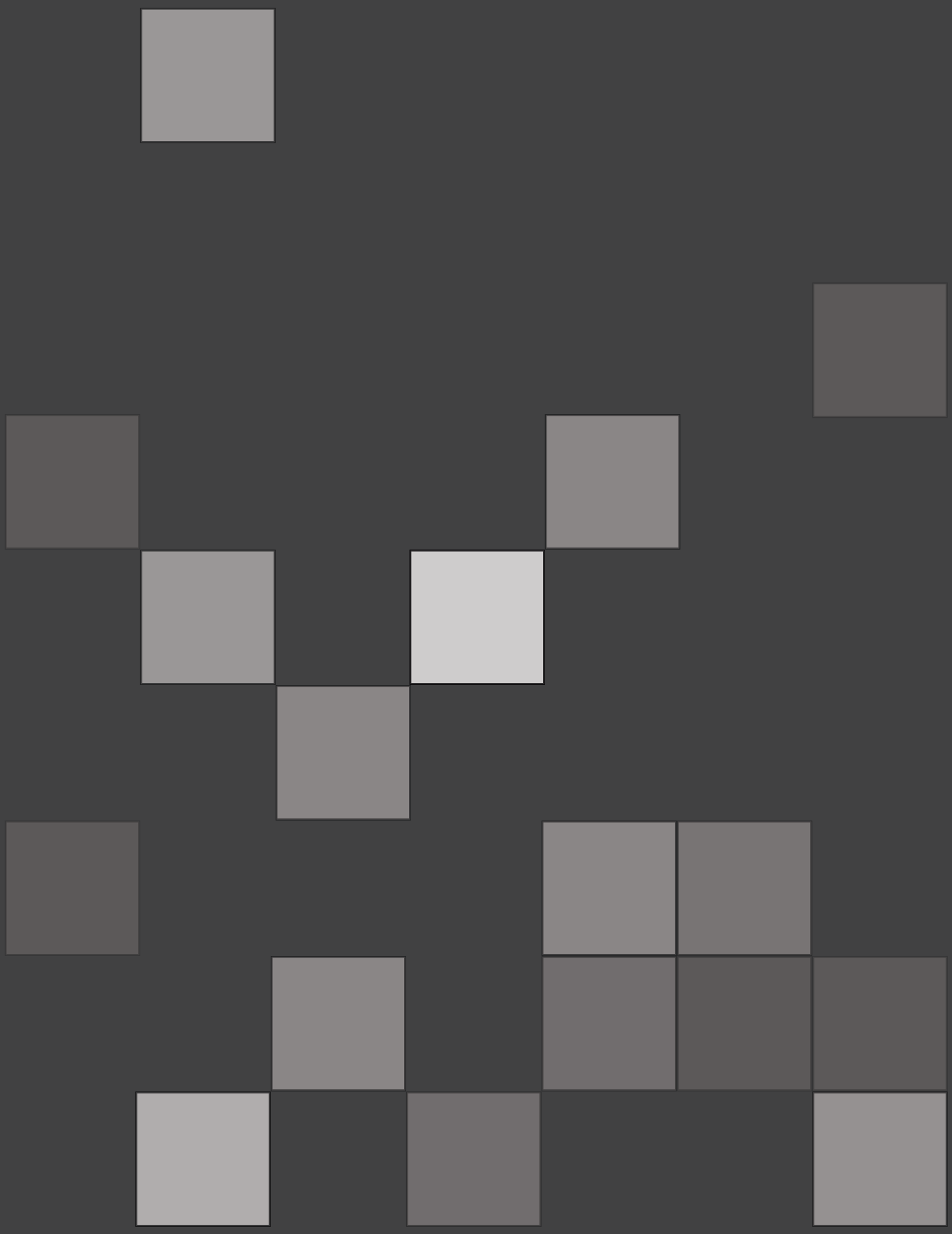
There are areas where the researcher, in this case the author, is fairly informed prior to this method. These include: city organization and elements, current college lifestyle, landscape narratives, map making, and Manhattan. It is not felt that prior knowledge of these areas significantly influenced the data collected on narratives and spatial cognitive schemas.

1.5 College Life

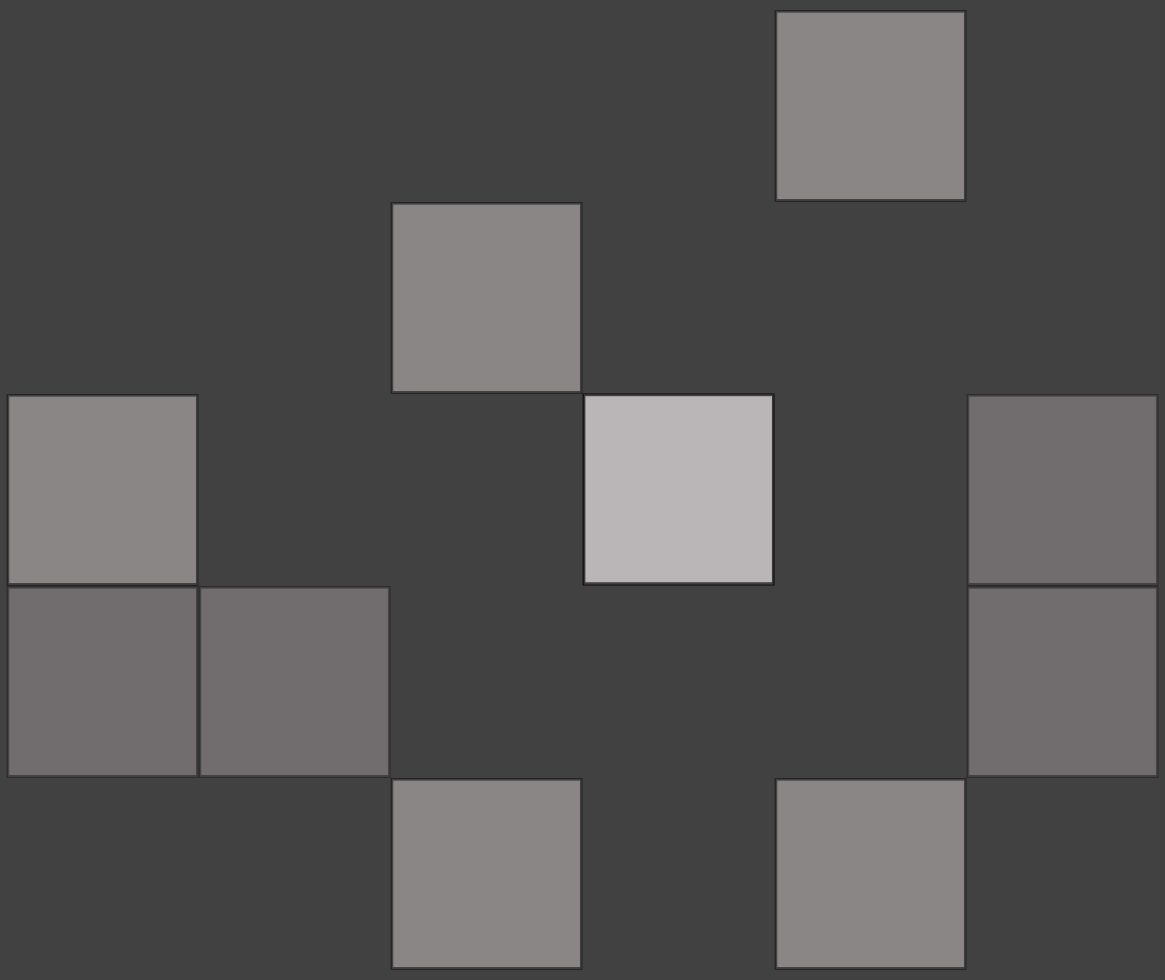
College life is an important topic to understand because it is a specific life style. Attending college is a much different life style and experience than working full time because of the different values and activities that are typically associated with that life style. For instance, in college most of the day is spent on campus, which typically includes traveling to multiple buildings for classes. This is a much different life style and personal narrative than most individuals. The college life style may have an effect on how one experiences life and which experiences anchor the development of shared narratives. If the city studied is a college town like Manhattan, Kansas, then it may have special spatial arrangements that have influenced the shape and network of the city. A few

examples of this may be college housing near campus, restaurant and entertainment districts nearby, and the expansion of the university's campus.

Due to social media, the current generation in college digitally interacts with each other more frequently then previous generations (Sweeney, 2006). There has been a strong association found between interaction on Facebook and three different types of social capital (Ellison, Steinfield, & Lampe, 2007). Other studies have found a "positive relationship between intensity Facebook usage and students' life satisfaction, social trust, civil engagement, and political participation." (Valenzuela, Park, & Kee, 2009). Their life narratives are mostly intertwined with the narratives of others regardless of distance or location. If fact, being is separate places may even encourage experiences to occur. For example, instant photo sharing or video chatting of a location or event may involve individuals that are miles away. Individuals are experiencing urban form second-hand through the sharing of photos and narratives on social media. People are developing narratives of space from other peoples lives. For example, if Person X shares a photo of a water fountain with a caption explaining how beautiful it was on social media and Person Y sees the photo, having never seen the water fountain before, has now experienced the water fountain second-hand and has cognitively tried to spatially place it. Narratives of urban form can be shared more easily than ever before through social media.



Chapter 2: Literature Review



2.1 Overview

Cognitive maps are constructed over time and are based on input from many variables such as culture, class, location, activity, frequency, etc. (Rapoport, 1977). According to Kevin Lynch, 1960, urban form and our cognitive maps are made up of The Five City Elements. These elements are: landmarks, nodes, edges, districts, and paths. It is believed that cognitive maps have a spatial component, which Amos Rapoport (1977), calls a spatial cognitive schema. If Lynch is correct, then Rapoport's theory that spatial cognitive schemas are comprise of the relationships between the Five City Elements is correct. Since Lynch's original publication, new research's expanded his theory to reveal that cognitive maps are not just spatial, but include experiences and emotion (Rapoport, 1977; Tuan, 1977; Kitchin, 1994; Tilley, 1994; Potteiger & Purinton, 1998). Place attachment and social identity theory, among other theories, have revealed that humans have direct connections and relationships with places within landscapes and cities, which can be called a narrative (Proshansky, 1978; Cronon, 1992; Potteiger & Purinton, 1998). A narrative is another component associated with the spatial cognitive schema. Broadly, these two components make up what Lynch calls cognitive maps.

Cognitive maps can be applied to social and cultural theories such as Social Identify Theory, which describes how citizens use commonalities, such as narratives, to identify ourselves (Jorgensen & Stedman, 2001; Hunziker, Buchecker, & Hartig, 2007; Ujang, 2010). One major commonality between some individuals is their location. Individuals sharing space, modes of transportation, amenities, and most importantly, experiences are thus more likely to have a shared identity. Experiences, as noted before, help define cognitive maps. If this is correct, then people with shared experiences should have similar components of their cognitive maps. The analysis of cognitive maps can indicate how people experience the Five City Elements of the urban network and develop narratives based on their experiences. The analysis may indicate how a city is perceived in total via the personalized urban network. Ultimately, individual narratives that are associated with urban form can be found within cognitive maps, which will provide insight on how cities are personally used by its citizens.

2.2 Cognitive Maps

Cognitive maps or mental maps are abstract representations of space and narratives created in one's mind. Amos Rapoport (1977), at the time a

Professor of Architecture and Anthropology at the University of Wisconsin - Milwaukee, states that these mental maps are representations of how one perceives, remembers, and analyzes their environment. The idea of the cognitive map was first developed by Edward C. Tolman; who tested how rats maneuver and remember space (Tolman, 1948; Eden, 1992; Kitchin, 1994). According to Roger Downs and David Stea (1977), cognitive maps are a representation of how individuals represent the environment and their personal relationships to people, places, and things (Axelrod, 1976;Carley, 1990; Tversky, 1993).

TABLE 1.1 | Geometric Components of Spatial Knowledge

Knowledge of spatial structure

Points	Lines	Areas	Surfaces
A. Landmarks as organizing concept	A. Lines as boundaries/ edges (e.g., Zannaras' perceptual neighborhoods; Lynch's districts)	A. Areas as 2-D spatial classification devices	A. Physical topography
Landmark identity		Regions	Slope or gradients
Landmark location		Neighborhoods	Continuities or breaks (erosion)
Landmark dominance		Communities	Elevation
		Urban places	
B. Landmark as navigation aid	B. Lines as routes	Arbitrary (political) districts	B. Density (population)
Landmark as choice point	Crow-fly distances and connections	Fragments in cognitive maps	Peaks and sinks in preference surfaces
Landmark as origin or destination	Over-the-ground connectors (paths)	Shape or pattern	Shape or pattern templates
Landmarks of route orientation node	Length (total and segment)	B. Areas as cognitive concepts	Easy or difficult to negotiate
Landmark as regional differentiating feature	Linearity or curvature	Superordinate frames (e.g., Reno versus San Diego)	
Landmarks as home bases (for path integrations or homing vectors)	Directionality to or from anchors	Containers of layouts of landmarks and points	
Landmarks as onroute choice points	Retrace constraints	Uniform regions	
Landmarks as priming features influencing expectations	Networks or connectivity	Nodal regions	
	Tools for experiencing learning		
	Methods of parsimoniously experiencing areas (e.g., search results)		

Table 2.1: Knowledge of Spatial Structure (Golledge, 1999)

There are many different terms that can be used for the concept of cognitive mapping since what is found in the mind is not exactly a map, but a representation of reality (Tuan, 1975; Downs & Stea 1977; Rapoport, 1977). Rapoport (1977) uses the term spatial cognitive schemas; because the representation in our mind is more of a schema or structuring system than a map. Spatial cognitive schema is related to the urban form of the city. However, it is generally accepted that cognitive maps consist of points, lines, areas, and surfaces (Table 2.1) (Appleyard, 1970, Golledge 1999). These characteristics are closely related to Lynch's Five City Elements. It has been determined that citizens use these components to shape how they view the city. The relationship between individual spaces is unique for each person (Rapoport, 1977; Kaplan & Kaplan, 1978; Potteiger & Purinton, 1998).

Cognitive mapping is primarily used to achieve one of two outcomes. The first is to understand where a spatial problem occurs. The second is to generate a frame a reference in order to understand our spatial environment. Essentially, cognitive mapping is used to find problems or learn more about how individuals analyze space or networks (Downs & Stea 1977; Rapoport, 1977).

2.2.1 Construction of Cognitive Maps

The development of cognitive maps; specifically, the spatial cognitive schema, can be seen as a hypothesis, as the individual is testing and cross-referencing elements spatially to filter new information and collectively further the clarity of their map, what Lynch calls increasing imageability (Figure 2.1) (Lynch, 1960; Neisser, 1967; Craik, 1970; Rapoport, 1977). Once a route or schema is adopted it may then be used as a partial mnemonic device to remember routes to specific locations (Tuan, 1975; Seagrim, 1967; Rapoport 1972; Rapoport, 1977). For example, a person driving to the store from their home may remember that they drive straight until they need to make a right turn at the second roundabout after the ugly yellow house on the corner of the same street that Jim used to live on. The points or devices used in order would be: the street that Jim lived on, the ugly yellow house, and right at the second roundabout. Instead of thinking about each point or intersection they are becoming more efficient by narrowing down the information they need.

Each feature or element in a city is viewed and identified differently by each citizen because their past experience, creates a range of different impressions developed by citizens (Rapoport, 1977; Schwalbach 2009). Gerrit Schwalbach (2009) believes that we don't see attributes individually but together to form a general idea and opinion about the location in question. Schwalbach is describing a method called chunking, used to categorize information to make it easier to remember.

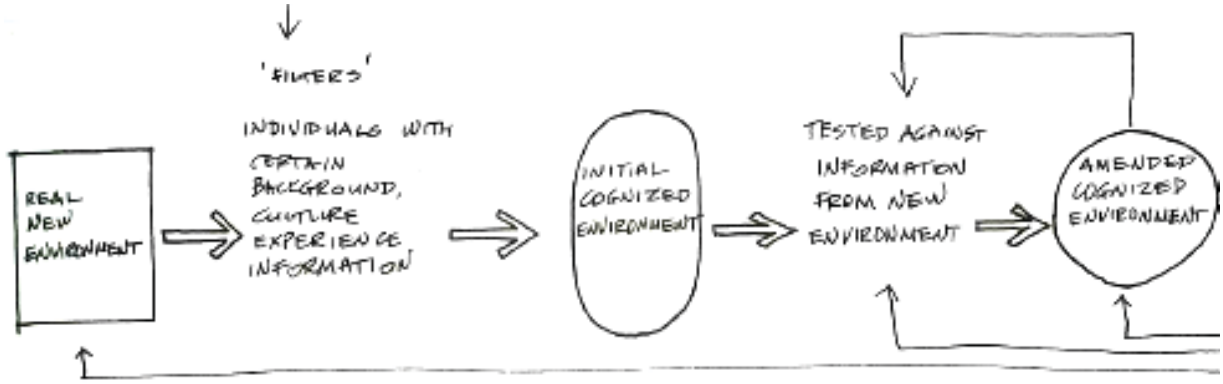


Figure 2.1: Example of Cognitive Map Structure (Rapoport, 1977)

Chunking can be used to organize locations in the urban environment (Appleyard, 1970; Ellard, 2009). These cognitive maps can be studied to determine how individuals view and understand something as large as a whole continent to something as small as a neighborhood (Gould 1986). Rapoport (1977) believes that chunking is used when a sense of homogeneity occurs. The mind uses this idea of chunking to create multiple cognitive maps with different degrees of scale, detail, and clarity within a larger cognitive schema (Rapoport, 1977). One could think of these smaller chunked cognitive map as part one section of a larger mosaic image but with organic edges (Figure 7).

Perception and spatial knowledge affect spatial behavior. According to Downs (1973), how humans behave spatially is dependent upon the individual's cognitive map of the environment. These spatial mental structures contain attributive values and meanings (Kitchin, 1994). Cognitive maps are highly used and contain information on how an environment is perceived and identified as well as its narrative. The order or sequence in which we experience new spaces shapes how each space is interpreted. If these statements are true, then our experiences of environments in our cognitive maps shape how we behave and interact with people, places, and elements.

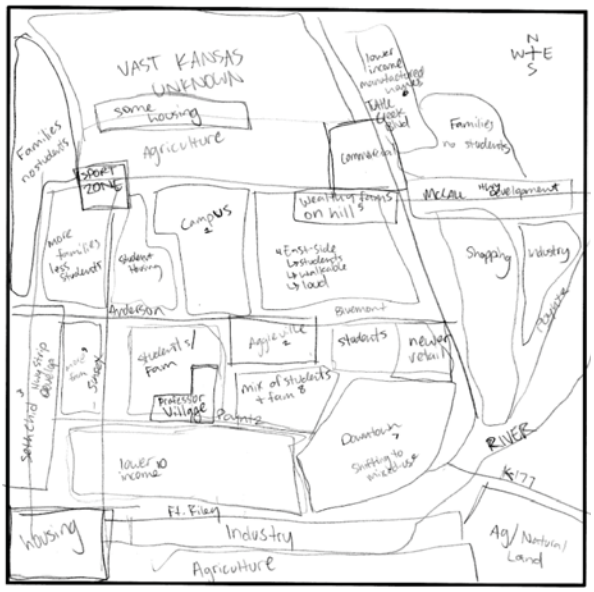


Figure 2.2: Example of a mosaic found in cognitive maps

2.2.2 Argument Against Maps

Maps are, in themselves, biased. The creator of a map controls what information they wish and do not wish to show the viewer. In many cases, people would like to see as much information on a map as possible so they feel they are getting the whole unbiased story. In terms of this research, bias found within cognitive maps provides more information about the creator than maps that attempt to be unbiased. Generally, maps contain opinions and stances. Once real elements are abstractly represented on a flat 2-dimentional surface they immediately lose many characteristics that compose them

(Lynch, 1960; Tuan, 1975; Rapoport, 1977). For example, if a house is drawn or mapped on a piece of paper, it loses many physical qualities, like the shape, volume, relation to the street, color, style, etc. In addition, the house will lose the qualitative information that adds meaning to the place like experiences and memories. Regardless of how much text is provided, not all mental and emotional characteristics associated with it will be revealed. Below is a quote from I Was A Savage by Prince Modupe, where he show shows his father a map of their village:

> "*My father thought the whole idea was absurd. He refused to identify the stream he had crossed at Bomako, where it is no deeper, he said, than a man is high, with the great widespread waters of the vast Niger delta. Distances as measured in miles had no meaning for him. ...Maps are liars, he told me briefly. From his tone of voice I could tell that I had offended him in some way not known to me at the time. The things that hurt one do not show on a map. The truth of a place is in the joy and hurt that come from it. I had best not put my trust in anything as inadequate as a map, he counseled. ...I understand now, although I did not at the time, that my airy and easy sweep of map-traced staggering distances belittled the journeys he had measured in tired feet. With my big map-talk, I had effaced the magniture of his cargo-laden heat-weighted treks" -*
> *(Modupe & Huxley, 1958*
> *Carpenter, 1972)*

As we see in the passage, history and emotion felt in the landscape cannot easily be shown on a map. It is impossible to fully visualize and represent a cognitive map, until technological advances occur. The only way researchers could completely represent a functioning cognitive map is to be within a person's mind. Until then, drawings and verbal discussions are used to understand cognitive maps and meaning of place (Appleyard, 1970; Rishbeth & Powell, 2013; Manzo & Devine-Wright, 2014).

Cognitive maps, as mentioned earlier, are more like schemas or outlines, which makes drawing them difficult because an interpretation of the schema is required to draw it. The individual must accept what information they feel is important to show on their drawn map. Aerial maps are commonly found in America due to technology and frequent use and view of maps in everyday life. Google Maps is an example of how common maps are seen and how they influence how we spatially perceive and mentally organize elements of the urban fabric. However, not all maps are flat or seen from a bird's eye/plan/

aerial views (Glass, 1998). In many places around the world people view and understand spatial elements differently (Gould, 1974; Rapoport, 1977). For example, Australian Aboriginals' cognitive maps did not include man-made physical barriers like fences and walls. Their maps did not use a series of foundational points like those of many westerners (Rapoport, 1977). Another example from Rapoport is in Lebanon, where their cities are constructed in areas or sections. Cultural aspects can be challenging to map, because it cannot be fully understood in a single image. Overall, maps do not share all information and it is key to identify where and how physical maps influence cognitive maps.

2.3 Cognitive Narratives

Everyone's narratives begin with the relationship between a variety of things including: stories, memories, perceptions, and experiences. Steven Corman (2013) states that narratives are made of multiple memories, big or small, that help provide pieces of information used to create a whole image or narrative. Remembrance is the process of confirming the understanding of an event or action (Tilley, 1994). In this case, the remembrance is spatially within the cities. Stories themselves tie communities together through the act of storytelling. However, stories do not provide the full details. Stories lack the information and connection to other stories and events to provide meaning. A story alone does not provide context of its relationship (Cronon, 1992).

Narratives are similar to stories but contain a deeper meaning and understanding through a connection to other stories (Cronon, 1992). The narrative of a place contains a dialogue of consciousness paired with the experience and knowledge supporting the memory (Fisher, 1984). Thus, understanding narratives will provide knowledge of connections to other stories and their impact on one specific story. Narratives can be seen as a mode of knowing, because the narratives must contain information of other articles to provide a relationship between them (Czarniawska, 2004). These connections to other articles gives narratives the ability to illustrate culture and daily lives. Narratives can even be site specific, which can influence how the site will be used (Kellman, 1998). This can be seen in other cultures where narratives shape actions; for example, in Native American cultures where specific sites were deemed scared due to a common belief in a narrative such as the historical location where spiritual ceremonies traditionally occur (National Congress of American Indians, 2017). Having narratives about landscapes is rather common

in many communities and cultures. Many landscape narratives provide historical or culture significance (Cronon, 1992; Potteiger & Purinton, 1998). Overall, narratives are based on relationships among environmental perceptions and experiences (Cronon, 1992).

2.3.1 Environmental Perception

Perception is how and why we form opinions and an understanding of objects, space, events, and experience (Rapoport, 1977). According to Matthew Carmona (2010), perception is about gaining information about the environment and mentally reacting to it. The perceived environment will greatly influence the memory or recollection of the experience (Rapoport, 1977). A simple example of this would be if you were going to lunch and had to choose to walk under a tree canopy or under scaffolding. Your perception of both the tree canopy and scaffolding would influence which route you took. For some, walking under the scaffolding would be interesting, while it may be unappealing for others. Perception may vary from person to person because of differing experiences leading up to the perception. The way we perceive our cities is influences our daily lives because it shapes what we know and how we react to new environmental perceptions (Rapoport, 1977; Salesses, Schechtner, & Hidalgo, 2013)

Human to environment relationships can play a huge role in how space is used and experienced (Ittelson, 1978). Understanding the human to environment relationship can help shape and guide design decisions. Jon T. Lang (1994) developed an example of this through a diagram of the personal needs that must be accomplished in order to satisfy cognitive needs (Figures 2.3 & 2.4). Human-environment relationships contain a number of different factors such as sensory, formal, symbolic, and intellectual aesthetics (Rapoport, 1977). The sequence and order of the environment will impact its aesthetics and perception (Lang, 1994; Potteiger & Purinton, 1998). These factors can be applied to the design of a variety of spaces such as streets, gardens, amphitheaters, plazas, and parks of all types (Whyte, 1980). Together these factors shape the experience of the user. “Physical and spatial sensations are both bodily and social experiences, making them the fundamental to all human experience” (Schwalbach, 2009). The personal physical interpretation of a space guides the human behavior and the narrative that accompanies it.

Aesthetics influence human behavior (Kaplan, 1987). William Ittelson (1978), suggests that

perceived environmental quality is reflected in quality of life. Thus, It is important to create and shape appealing spaces because of the natural human perception of a space's characteristics and the creation of internal dialogue in the mind (Cronon, 1992). A better understanding of how the micro-scaled characteristics of the built environment may lead to improving aesthetics and experience, which may in turn lead to more pedestrian activity, social street-level environmental engagement, and memorable experiences (Adkins et al., 2012).

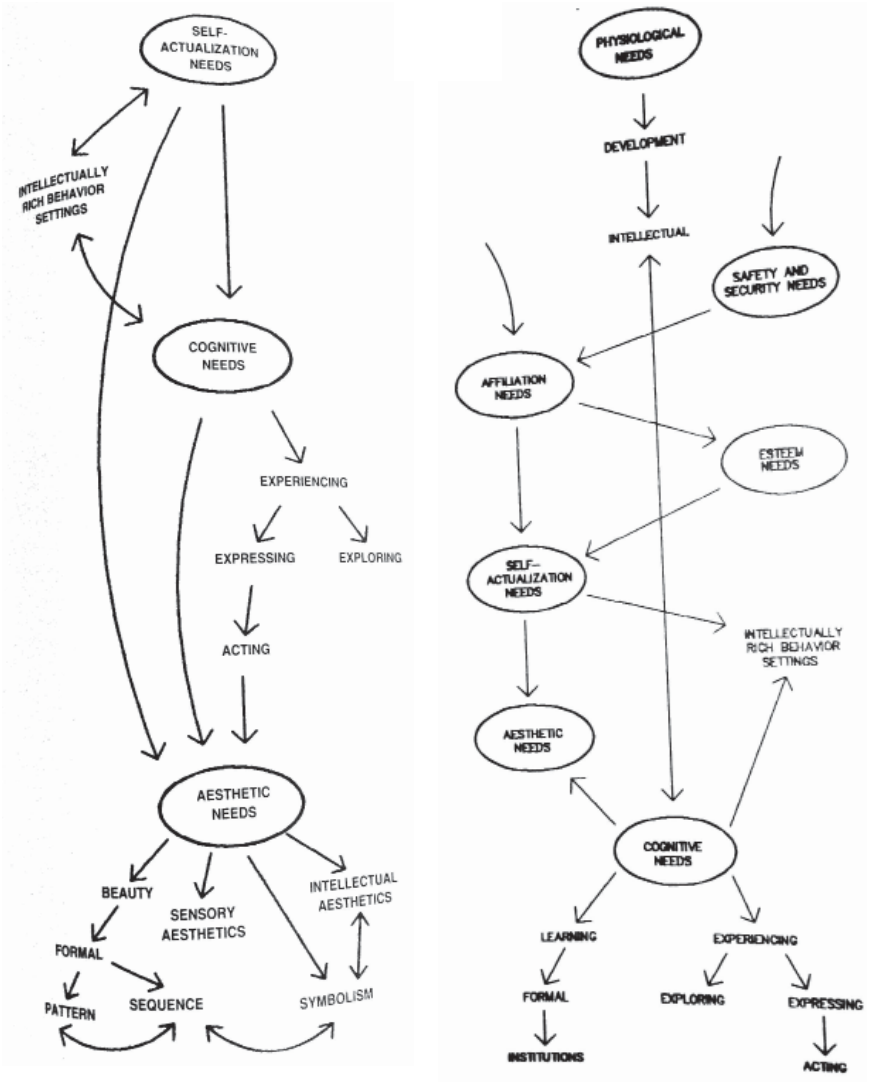


Figure 2,3 (Top): Cognitive Needs (Lang, 1994)
Figure 2.4 (Bottom): Aesthetics Needs (Lang, 1994)

Each experience and perception influence show the user thinks of a space. The user's thought of a space is important because it will be stored in the hippocampus of their brain, home to the cognitive map, which is used to help visualize and understand perceived spaces and their relationship to each other (O'Keefe & Nadel, 1979; Jacobs & Schenk, 2003). The hippocampus is most commonly associated with memory, specifically long-term (McNamara, Shelton, & Shelton, 2003). We can tell that experience has an effect on memory because those with schizophrenia will begin to forget about or lose connections with places that they are less familiar with. A personal place like home will provide a stronger spatial connection with am individual (Rapoport, 1977). Our memory and association with a place or area will influence how we act towards it in the

future. Humans are creatures of both adaptability and habit. We can see how that affects our cognitive maps based on travel. An example of this may be if you got mugged in an unfamiliar part of town near an iconic landmark. You may now avoid that location because you had a negative experience there. Our perception and experience of a space influence our memory - for good or bad. This is the same reason why a community may be hesitant to invest money toward redeveloping a dismal district of a city. Perception plays a major role in the eye of the public because it collectively shapes how a society views and understands space (Salesses, Schechtner, & Hidalgo, 2013).

2.3.1 Experience

Experience is what is lived and consciously remembered. Our experiences shape who we are and what we do (Ittelson, 1978). Our experiences can be directly tied to place (Tuan, 1977). When studying cognitive maps emotions need to be considered because emotions may be tied to various parts of the cognitive map through experience (Eden, 1992). The experiences we have in the environment shape who we are (Ittelson, 1978). Humans are a product of the experience we have with place and environment that we live in (Ittelson, 1978; Tilley, 1994).
Experiences contain high amounts of details and information, which makes each experience uniquely different. Peak-end rule theory, developed and studied by Daniel Kahneman and other colleagues during the '90s and early 2000's, is a concept of how different experiences are remembered. This theory can be applied to many different situations (Figure 2.5) (Fredrickson & Kahneman, 1993; Kahneman, 2000; Wagler, 2009). The premise is that peak and end experiences are remembered most because they are unique and create stronger emotional responses than other parts of the experience. (Wagler, 2009). This theory suggests that common experiences are not as detailed as the peaks and end experiences during recall events. This concept can be studied and applied to things like spatial orientation and navigation. Our experiences differ from one another, which makes a select amount of them standout in our mind.

Ontological security is a stable mental state of the mind, which comes from having a sense of peace and wholeness to one's life. This security is influenced by our experiences and connection with our environment. Tilley (1994) is argues that the concern or sense of care that one has of a place helps provide mental stability through time and experience. Affection for a place or location is typically point or location based because of an experience

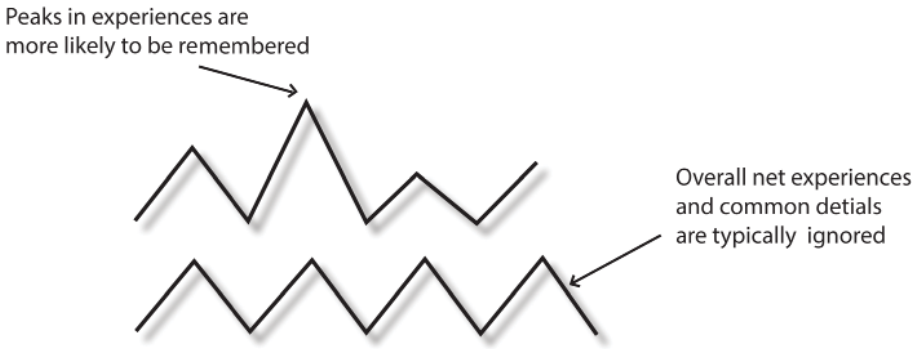


Figure 2.5: Peak-end Rule Theory developed by Kahneman and Fredrickson. Peaks of experiences are more likely to be remembered. Day to day experiences do not have as large of a remembrance. However, these frequent experiences are used to help guide daily activities (Wagler, 2009 adapted by Author)

(Tilley, 1994, 15). Tilley goes on to say that the meaning of place is rooted into the mind because it was lived consciously and is stored the brain. This idea ties back to perception and its stored location in the hippocampus. Humans have mental conversations in our mind to help remind us of experiences we have had and how they relate to the current situation (Cronon, 1992).

The environment is a pattern made of relationships and connections between elements and people (Rapoport, 1977). These experiences may be experienced firsthand or even indirectly. (Lynch, 1960; Rapoport, 1977). Place knowledge comes from human experiences, feeling, and thought (Tilley, 1994). Our experience with something is strengthened through our recognition of the memory that happened. Experience is a processed and remembered thought that influences how we learn and adapt to our environmental perception (Ittelson, 1978). Experience is a foundational component of narratives (Cronon, 1992).

Sequencing is a common way to organize spatial elements within cognitive maps similar to using a mnemonic device – as mentioned before (Appleyard, 1970). It is common to see an individual's cognitive map become more accurate along networks for traveling, commonly known as paths. This would make sense because of the frequency of interactions and experience in that place. Sequencing is a way of arranging specific sights, sounds, and emotions in a way that constructs an experience through time and space. This concept is also found in Gordon Cullen's work (1971), which focused on serial vision – a theory similar to sequencing. Serial vision focuses on how the order of things change how the city or fabric is experienced (Marichela, 2013). Sequencing can be used in a number of spaces, but is commonly used to as a way to connect elements of urban form

within cognitive maps (Lynch, 1990). Lynch (1960) notes that nothing is experienced by itself, meaning that experiences are always in relation to something else. Often this "something else" is the sequence of events that led up to the experience, including memories of past experiences. Sequential narratives are implemented into the landscape to strengthen the progressive experience as well as engage the pedestrian with space mentally, physically, and emotionally. Some events may act independently, but once events are experienced sequentially a new view and interpretation are developed (Potteiger & Purinton, 1998; Simonds & Starke, 2006). The perceived city elements relate to one another and help form experienced sequences. These remembered, experienced sequences are what help shape and build cognitive maps. These sequential narratives are the physical connection of stories within the landscape.

2.4 Urban Form

Urban form refers to the design and planning of elements that are viewed together and in relation to one another to shape the form of urban elements. This idea of urban form can be applied to the general organization and characteristics of elements in urban settings.

2.4.1 Urban Network

America is seeing more people moving and living in urban spaces than ever before based on US Census Bureau data (Cohen, 2015). As a result, urban public places are becoming more valuable and the perceived environment is becoming more integral to our daily lives (Lynch, 1960). One example has been that land use patterns have large effect on how people walk, which is important in highly dense locations and can affect many people (Ozbil et al. 2011). The urban form affects our day to day lives.

Networks within cities are vital to mobility, and ultimately the city's daily survival (Burgess, 2008). These networks typically involve components of infrastructure like transportation and utilities. The citizen transportation network includes sub-networks of streets and pathways (Lynch 1960; Carmona 2010). Rapoport (1977) believes, "... the location of people in the city, and the nature of their networks and activity patterns (which are related to the location of areas) affects their knowledge of the city and hence how they use it," i.e. networks affect how cities are used (Figure 2.6).

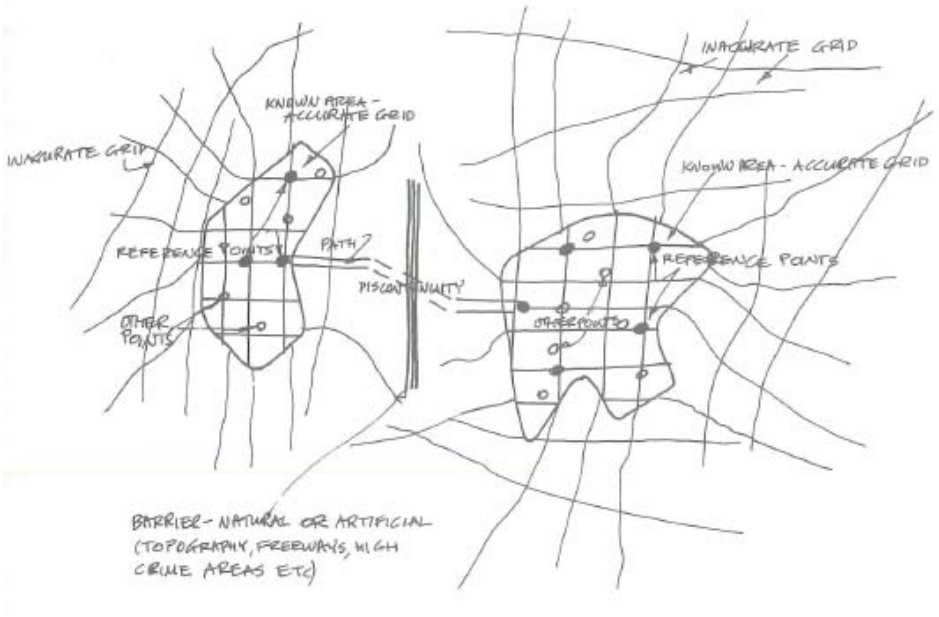


Figure 2.6: Network effect on cognitive maps (Rapoport, 1977)

2.4.2 Public Connection to the Urban Network

This idea of urban networks' influence on activity patterns and knowledge relates to experience and environmental perception because without urban experience and perception the mind would not understand how networks work through cognitive maps. Connectivity between city elements is important to citizens' overall understanding and knowledge of the urban network. The way the public experiences the city will affect how they view the city. Our knowledge of the spatial environment and our cognitive visualization and representation of it is a byproduct of our experience (Gould 1986).

Cognitive maps or schemas use some type of network orientation (Carley, 1990). Rapoport (1977) suggests that cognitive maps contain levels of known networks. He believes that there are different levels of networks that humans use in their cognitive maps – i.e. cognitive maps have varying degrees of knowledge about specific pieces within the urban network. This is similar to the concept of cognitive maps developing in sections and areas. The primary network is most commonly used and has the most clarity where secondary and tertiary begin to lose clarity or imageability. Lynch's five city elements are primarily used to help understand the how people experience the city's urban network. Lynch believes that the city is experienced through interaction with and the perception of these elements within the urban

network. These connections are perceived and interpreted by citizens in order to identify and navigate the city (Lang 1994).

Paths, i.e. streets and sidewalks, shape and guide the urban environment and its development. Paths provide a network for movement and are "the most potent means by which the whole can be ordered." Meaning that paths are typically the foundation of the cities as well as cognitive maps (Lynch, 1960). Paths are represented as one-dimensional links to other paths that together develop a network configuration. Of the five elements, Lynch (1960) believes that paths have the strongest relationships and are most identifiable to people. The pedestrian level is the most experienced part of urban form (Devisme, 2013). Through connectivity of the city elements and narratives, knowledge begins to formulate identity. Connectivity, through pedestrian movement, is strengthened by strategically arranged and aesthetically pleasing spaces. These visual places have the ability to move and shape how the public knows and uses the urban network. Connectivity, either physically or psychologically, helps establish routes and identity (Rapoport, 1977).

Streets and paths are the primary means of network connection in the urban environment. However, our minds and bodies react to space differently. Our minds are visualizing distance where our body is actually experiencing it (Hajrasouliha et al. 2015). Cognitive mapping is one way to study the relationship between spaces and the user, which can help indicate physical and mental connections that are being made (Hajrasouliha et al. 2015). Walking is one of the main modes of physical connectivity in an urban context. Connectivity, through pedestrian movement, is strengthened by the use of strategically arranged spaces that physically connect the user with the space. For example, green belts and urban parks provide mental stimulation and relaxation along paths (Bristow, Dion, Stefancik, & Hawkins, 2002). These spaces are typically experienced on foot, which strengthens the experience and narrative of the place.

Landmarks and their spatial organization, amongst other elements, make up the remembered layout of our experienced environment (Golledge, 1999). Landmarks are the most commonly used element to orientate and provide direction for pedestrians (Lynch, 1960; Foo, Warren, Duchon, & Tarr, 2005). The connections between elements are either developed in our cognitive maps through connections as narratives or a spatial cognitive schema. These connections may

range from an emotional draw to a location to a perceived association between two objects. An example of a physical connection would be a pathway that leads pedestrians to and from a landmark. Physical connections to the Five City Elements in a city typically contribute to the personalized urban network found in the cognitive map. These connections can occur between monuments, iconic architecture, city halls, art installations, museums, business districts, and other urban developments that work as landmarks (Lynch 1960). Since 1960, new theories on urban perception emerged, like Golledge's. Many of these theories have included new dimensions such as cognitive, affective, evaluative, and interpretative. Each theory that has been developed has a common trend – there must be an interaction or relationship between the space and the user for an experience to occur (Carmona, 2010; Marichela, 2013). Ellard (2009) claims that the organization and appearance of space directly affect how we feel and behave. Overall, the organization and planning of the city's network affects human emotion and behavior because of its deep impact on citizens' cognitive maps.

Through experienced connectivity, memories, and narratives a sense of meaning and attachment can take place. The psychological connectivity of a city influences how the city is cognitively mapped (Figure 2.7). The immediate memory recall of a narrative from a past experience is used to analyze the spatial environment and make judgments, which leads to action and movement (Lynch, 1960). Cognitive maps greatly influence the psychological connectivity or relationship of a place – positive or negative. Some places, in any given urban network, may be viewed negatively. These perceptions can be found in cognitive maps and create a disconnection or disassociation between the individual and that location, where the person may avoid thinking about and spending time in that location. Therefore, the

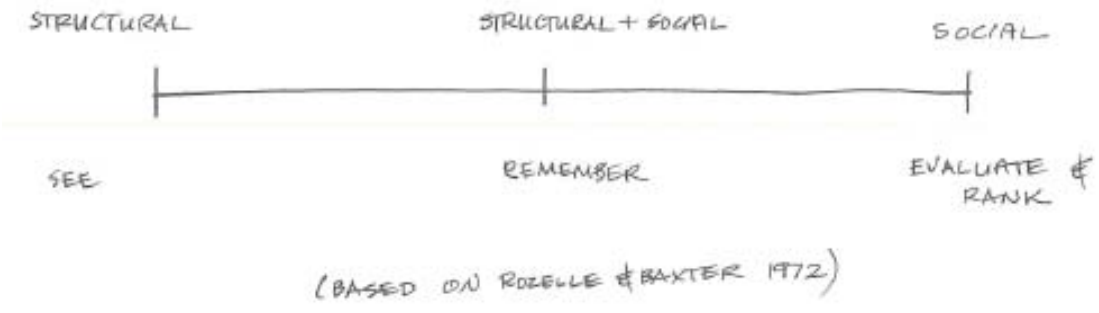


Figure 2.7: Structural to social experience (Rapoport, 1997)

disconnections and distance may create gaps within the urban network found in cognitive maps. However, in some traumatic instances negative narratives may create a well-known, yet unfriendly location within the cognitive map. The same can be said about positive perceptions or experiences within the urban network. A perception that has turned into a psychological narrative will stay with an individual in their long-term memory, until it has been changed or revised.

2.4.3 The City's Influence on People

American cities are centers of businesses, events, and activity. Cities are important to our everyday life whether you live in a city or not. Many decisions and actions occur in cities that begin a rippling effect that leads to our rural communities (Landry, 2012). For example, the New York Stock Exchange affects the economy and businesses in cities across the country (Amadeo, 2016). The status of a city is not only important to its inhabitants, but also a grand network of cities that connect our whole country and even the world (Beaverstock, Doel, Hubbard, & Taylor, 2002). When a city is struggling, Detroit for example, the whole country is affected to some degree directly or indirectly. American cities, like a mosaic tile, individually contain a narrative. When those narratives are put together they create a widespread narrative of the metropolitan area, the region, the state, and even America and its citizens.

There are many ways to gain knowledge on the status of a city (Landry, 2012). Status, used here to describe general characteristics of a city such as quality of life, communal engagement, economics, etc. A way to gain clarity of the status of a city is though social and cultural capital (Landry, 2012). Cities that lack social and cultural capital can potentially be depriving their citizens of a higher quality of life and well-rounded community (Kawachi, 1999). Many agree that cities should have a sense of community and place as well as an identity that supports it (Rapoport, 1977; Proshansky, 1978; Hummon, 1992; Ujang, 2010; Landry, 2012; Marichela Sepe, 2013). Cities should be direct and honor who they are (Landry, 2012). An example of this is the City of New Orleans. New Orleans celebrates its many cultures though different events like Mardi Gras, Jazz in the Park, Battle of New Orleans, Soul Fest and the French Quarter Festival. Culture affects other realms of the cities like economics (Manz, Sapienza, & Zingales, 2006). Therefore, the status of a city can be indicated its level of social and cultural capital.

Theories such as Social Identity Theory and Place Theory can be used to gain insight on social and cultural events (Table 2.2). They can help explain events like why some individuals feel emotionally attached to locations and others do not. These theories can be applied to cities and subsequently, cognitive maps.

2.4.3.1 Social Theories

Social identity theory looks into how people self-identify with a group or society (Hogg & Abrams, 1988; Stets & Burke, 2000; Hogg, 2016). According to Bruke (2006), Social identity theory can be applied to many phenomena such as prejudice, discrimination, ethnocentrism, stereotyping, intergroup conflict, conformity, leadership, deviance, and group cohesiveness. Stereotyping and prejudice within cognitive maps may indicate various types of associations and prejudices found in the urban environment. Stereotyping caused by experiences within the urban environment may indicate commonly perceived notions about specific urban elements.

The social identity of an individual can be an indicator of how a city works as a whole. Charles Landry (2012) states that, "Strong identity has positive impacts and creates the preconditions for establishing civic pride, community spirit and the necessary caring for the urban environment." Landry's claims support the idea of connecting social capital with cultural capital. As discussed earlier, experiences in the urban environment are shared among members of the community. Therefore, experiences of the urban environment develop into self and communal identities (Stets & Burke, 2000). Mcmillan and Chavis (1986) argue that personal investment may help indicate their sense community with others. This investment may be in time, energy, money, effort, emotional, etc. Diverse places and experiences within a city can help develop a cohesive communal identity (Landry, 2012). Thus, communities should strive to identify who they are and what they believe in. Landry's hope for future cities involves diverse places with large masses of people that regularly promote cultural festivals and organizations. Architecture would be a mix of old and new and the urban environment will contain a range of styles and designs that activate the urban environment. He goes on to say that if cities fostered and promoted creative urban elements and activities then identities, distinctiveness, and confidence will enrich the community's lives through the cultural recognition of values and norms of different social or cultural groups (Landry, 2012). Landry's statement is supported by the

Table 5.1 A framework for organizing psychological concepts that focuses on community in both its physical and social aspects

	Community-related dimensions	
	Place	**Social**
Cognitive	Place identity	Community identity
Affective	Place attachment	Sense of community
Behavioral	Participation in neighborhood planning, protection, and improvement	Neighboring activities, Participation in crime prevention, Community celebrations

Source: Manzo and Perkins (2006).

Table 2.2: Place and Social Dimensions (Manzo & Perkins, 2006)

concept that perception and experience within narratives helps establish identity (Rapoport, 1977; Ittelson, 1978; Tilley, 1994). Together these theories support a call for diverse experience and cultural elements in the urban environment to develop a stronger sense of identity.

2.4.3.2 Place Theories

Space and place theory says that space and place are two different things, where space is made of physical bounds that define a geographical location and place holds a cultural or personal meaning and significance (Hunziker, Buchecker, & Hartig, 2007; Tuan, 1977). Introduction to Cities by Xiangming Chen 2013, defines space as, “geographic entities with distinct shapes, scales, and other properties that set the stage for certain kinds of human activities”. A place is much different than space as, place is, “specific sites that are shaped by and shape the lives of human beings. Sites of human identity, security, and community” (Chen, 2013). Citizens share the use of places together as a community, which creates a commonality and sense of relation to one another. We are social creatures that use our daily interactions as an extension of self. Therefore, how our places are designed influence our lives.

Sense of Place is comprised of place attachment, place identity, and place dependence (Jorgensen & Stedman, 2001; Hunziker, Buchecker, & Hartig, 2007; Ujang, 2010). Sense of place is closely related to the ancient theories of genius loci or “spirit of the place,” which ultimately support the concept that place has meaning and it can be felt or experienced (Trancik, 1986). Place-identity is defined as “dimensions of self that define the individual’s personal identity in relation to the physical environment by means of a complex pattern of conscious and unconscious ideas, feelings, values, goals, preferences, skills, and behavioral tendencies relevant to a specific environment,” i.e. people identify themselves through

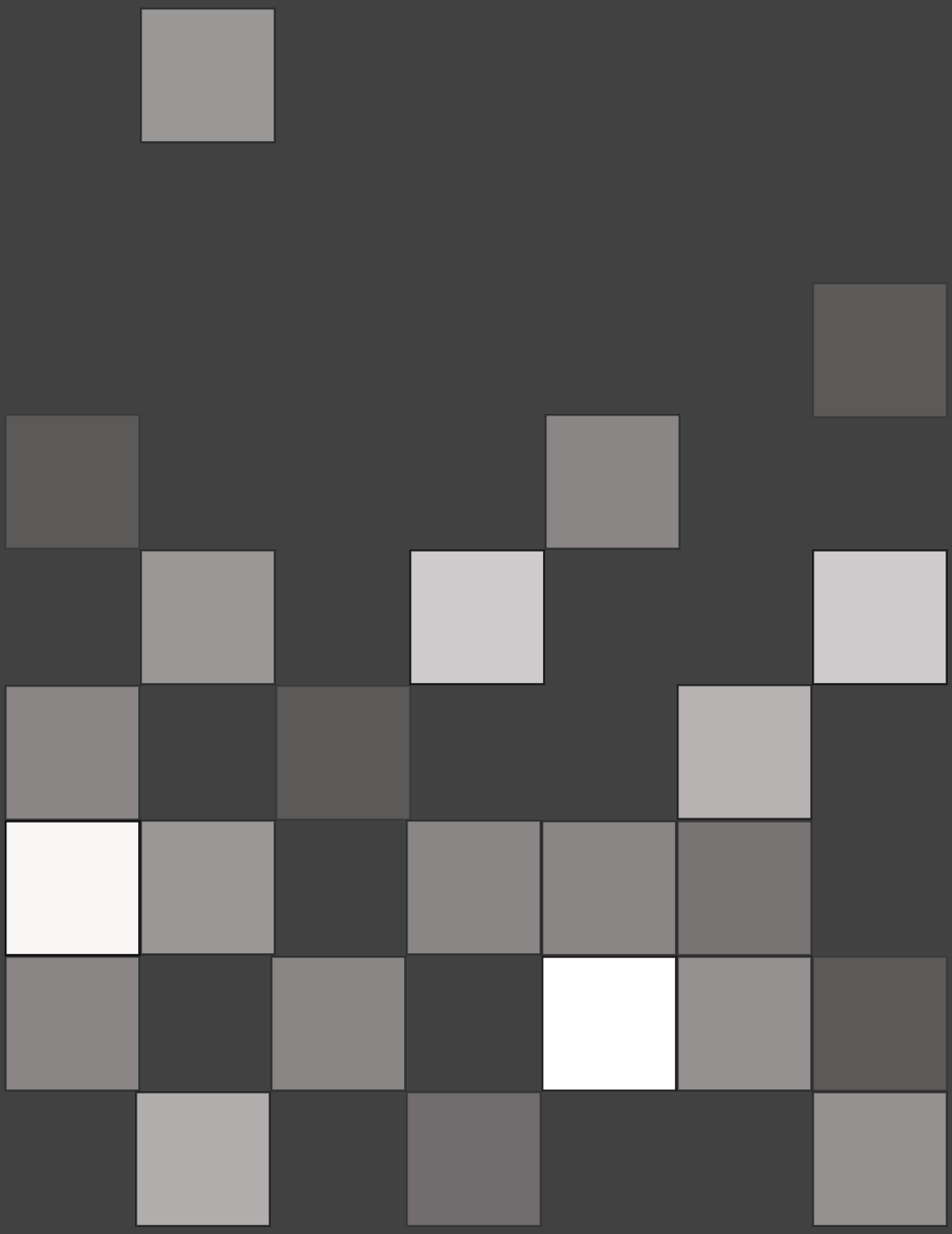
their personal relationship with a specific environment (Proshansky, 1978). Similarly, Tilley (1994) sees that "personal and cultural identity is bound up with place..." Place attachment considers how people are drawn or connected with places. David Seamon (as cited in Manzo & Devine-Wright, 2014), proposes that there are "six interconnected processes" that aid in the attachment of place. These six interconnections are: place interaction, place identity, place release, place realization, place creation, and place intensification. These interconnections are used to help organize and understand how and why people are attached to certain places. It should be understood that people are attached to places for various reasons and they influence how the place is viewed and used. These places may show up in cognitive maps for various reasons and levels of attachment. Place attachment is time sensitive, the connection of a place changes over time (Saar & Palang, 2009; Manzo & Devine–Wright, 2014). Landry (2012) advocates for cities to be as desirable as villages with a sense of place, identity, and connectivity with others in the community through trade, social interactions, and continuity.

2.4.4 Development and Revitalization

Many people flock to urban areas to find jobs and start new chapters of their lives. However, many American downtowns and districts are unsafe, underutilized, and lack strong relationships with other parts of the city (Burayidi, 2013). Landry (2012) describes how the potential use of our "city centre" can be used to develop and foster new ways of social integration to build a social identity. Downtowns have the ability to be a place for commonality without losing diversity. City centers can be a place for mingling and mixing of cultures (Landry, 2012).

Revitalization of these areas is important to bridge gaps in the urban network. However, if the revitalization of these areas does not address the social identity than its intended impact may not come to fruition. Understanding the identity of a community can help prioritize its development of human capital and future. Increasing human capital can be used to help local economic and community development (Manz, Sapienza, & Zingales, 2006; Landry, 2012). Human capital is the knowledge and skills of a person or population that will add value to a community. Social connections can help provide ties to resources that may not have otherwise been available (Green, 2012). Revitalized

areas have the ability to create social capital, increasing place attachment and sense of community (Nikolay Mihaylov & Douglas D. Perkins as cited by Manzo & Devine-Wright, 2014). Smart development and revitalization can strengthen the city's status or state of being through creating new experiences and identity within narratives of urban form in cognitive maps.



Chapter 3: Methodology

The primary goal of these methods were to collect, inventory, and analyze individuals' spatial cognitive schemas and narratives within their cognitive maps of Manhattan, Kansas. The methods are broken down into three main parts: Cognitive Map Research Study (CMRS), Cognitive Map Research Study Inventory & Analysis (CMRSIA), Geographic Information System Analysis (GISA). The Cognitive Map Research Study, uses cognitive map drawing exercises, an online survey, and a group discussion to gather information about individuals' cognitive map. In CMRSIA, data collected in each exercise in the CMRS is individually inventoried and paired with the corresponding information of the individual. The individual's cognitive map information is then analyzed with the intent of drawing connections between the narratives and spatial cognitive map schema with some information coming from GISA. The Geographical Information System Analysis, looks at how cognitive maps are spatially arranged and their accuracy to the real world. The information collected in the CMRS was simultaneously being used in CMRSIA and GISA.

3.1 Pilot Study

A pilot study was conducted before official testing began to test the flow of the study. The pilot study was conducted with seven (7) classmates and friends of the author. The main goal was to provide the author with examples of cognitive maps and reactions. None of this information was recorded or used in the findings or conclusion phase. The pilot study helped provide information used to adjust the study's protocol to increase its fluidity and performance. Some of the gained knowledge includes: adding a brainstorming session before the drawing portion, providing verbal examples (see Appendix A), and formatting as a group discussion. Overall, the pilot study provided essential information that helped to improve the study.

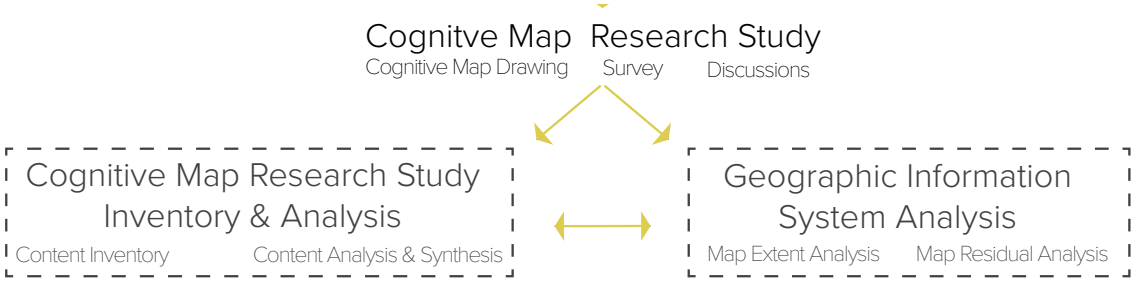


Figure 3.1: Methods Diagram

3.2 Cognitive Map Research Study

A variety of methods are used in the Cognitive Map Research Study, all with the goal of gaining quantitative and qualitative data regarding the participants' cognitive map, knowledge, and history of/ within Manhattan (Table 3.1). Using quantitative and qualitative methods are commonly used to identify places of meaning (Bernado Hernandez, M Carmen Higlago, Christina Ruiz, and Daniel R. Williams as cited by Manzo & Devine–Wright, 2014). These methods will help obtain physical drawn cognitive maps or schemas of Manhattan, Kansas as well as provide and establish a narrative about Manhattan and its elements.

3.2.1 Individual Mapping Warm-up (Section 1)

Section 1 was an individual brainstorming session. The pilot study indicated that some individuals felt anxious being tested on their cognitive map. The feeling of test anxiety may cause participants to draw things that they are unsure of when typically, they may know that

Table 3.1: Cognitive Map Research Study
[1] consent is acquired prior to Section 1

Section	Activity	Time (min.)	Reasoning
1	Individual Mapping Warm-up	5	To allow participants the ability to organize thoughts and structure of their cognitive map
2	Individual Cognitive Map	10	To obtain a detailed drawn representation of the participants' cognitive map
3	Individual Stereotype/ Cluster Map	10	To obtain a big picture drawn representation of the participants' cognitive map
4	Display and Group Discussion	20-30	To gain narrative information through participants' verbal storytelling and interaction with one another
-	Break	5	To allow researcher to set up and review maps created in the study
5	Short Online Survey	15	To record demographics, travel behavior, and participants' interaction with Manhattan
6	Individual Discussion	15	To visit and discuss deeper with an individual about their experiences and cognitively map Manhattan

area very well. Speed of recall is not important to this study. An accurate representation of the cognitive map is important, so a short brainstorming section occurred prior to the drawing of the cognitive maps.

Procedures:

1. Researcher provided participant with a blank 8.5in x 11in piece of copy paper

2. Participants individually warm up their mapping skills and think about how they organize their cognitive map with the copy paper used as scratch/doodle paper to help understand their thoughts

3.2.2 Drawing Cognitive and Stereotype Maps (Sections 2 & 3)

This section of the Cognitive Map Research Study adapts methods similar to those Kevin Lynch used in his influential 1960 book The Image of the City. Lynch used various methods of map drawing during interviews in order to try to understand how people see and navigate through the city. Drawing maps has become a common method for trying to spatially understand cognitive maps (Appleyard, 1970). Lynch specifically looked at how people viewed the city using his concept of city elements. He used his definition and identification of city elements as a way to communicate, understand, and analyze his participants' cognitive maps.

This research uses the classification and definition of the city elements differently. Lynch's city elements will not be used as a way to communicate with the research participants. The proposed research only uses Lynch's classifications as a way to study, review, and understand drawn cognitive maps. Another area where this research differs from Lynch's is that the research does not study way-finding, as Lynch did. This study is most closely related to his topics of perception, experience, and narrative; and their overall influence on the participants' cognitive map.

The drawing phase of the study contains two main phases. First, the individual was asked to draw their cognitive map of Manhattan. Second, the participant was asked to draw a big picture cluster map of districts and stereotypes found within their cognitive map. The cluster or stereotype map provides information on how the individual breaks down Manhattan into areas. The purpose of these sections are to collect the spatial cognitive schema that exists in the hippocampus. The maps were drawn by hand to provide possibilities of characteristics and details that may have been limited digitally. Participants were not allowed to start over. However, they were allowed to erase if they chose to use a pencil. No tools were used (i.e. a ruler or straightedge). Labels were encouraged in order to show what is important and to help the researcher understand symbols. These drawn cognitive maps were used in the Map Information Gathering Research Study Inventory & Analysis part of this research.

3.2.2.1 Individual Cognitive Map (Section 2)

Procedures:

1. Handed two (2) 11” x 17” sheets of paper with instruction at the top and a 10” x 10” drawing window. One sheet will be used for the cognitive map and the other will be used for the stereotype map.

2. A short prompt describing what a cognitive map is will be read to participants. This prompt will cover that we are not looking for a copy of Google Maps but a personalized map of how they mentally create and remember Manhattan, Kansas.

3. Participant had 10 minutes to draw their cognitive map

4. After the time was up, participants were asked to finish what they are working on and mark ten places on their map ranked 1 through 10 where they feel their map was accurate (1 being the most accurate). This indicated the level of confidence in their own drawn spatial cognitive schema and helped with the residual analysis

3.2.2.2 Individual Stereotype/Cluster Map (Section 3)

Procedures:

1. Participants will now take page two of what was handed to them prior to drawing their cognitive map.

2. A short prompt describing what a stereotype/cluster map is will be read to participants. This prompt will cover that we are wanting to understand how the participants cluster and organize parts of Manhattan, Kansas.

3. Participant will have 10 minutes to draw their stereotype/cluster map

4. After the time if up, participants will be asked to finish what they are working on and hand the researcher both maps that they drew.

* After sections 1-3 are completed the participants will get a 5-minute break

3.2.3. Display and Group Discussion (Section 4)

A group discussion was conducted with the participants after Sections 1-3 were completed. The discussion occurred after the drawing sections to allow the researcher time to discuss the drawings with the participants that drew them. The standard in-depth interview can provide valuable qualitative data about place attachment and meaning of place (Rishbeth & Powell, 2013; Manzo & Devine–Wright, 2014). This is one of the few ways to interpret the maps correctly so that the narratives of the drawn cognitive maps are verbally recorded. These narratives can be connected with the spatial cognitive schema of their cognitive map recorded in Sections 2 & 3. If there is no discussion, symbols and figures may get lost in translation (Bechtel, Marans, & Michelson, 1987). The first purpose of the group discussion will be to discuss the drawing's content. Participants were asked to provide ten locations on their map that they feel are most accurate. This provided data that was used in Cognitive Map Research Study Inventory and Analysis and Geographic Information System Analysis sections of the study. The discussion solidified and provided insight on the drawing and survey answers. Secondly, this part of the study focused on the storytelling of

the individual's cognitive maps and how it influences their day to day life. A discussion gave the opportunity to lead to new information that may not have been collected through the survey. For some, it was easier to verbally explain their mental map and how they spatially identify and understand Manhattan. For this reason, a group discussion was chosen. A group discussion allows for individuals to talk and react to each other. This seemingly causal conversation contains narratives, habits, and experience.

Procedures:

1. Participants will now be asked various general prompt questions
2. Throughout these questions some of the maps drawn in Sections 3 and 4 will be displayed on an overhead projector.
3. This discussion will continue until time expires

Prompt Questions:

A. Did you find anything surprising to you in your cognitive map?
B. Can you explain your cognitive map drawing process to me?
C. What type of things happen in the area of town you live in?
D. How has where you lived influenced how your cognitive map?
E. What places stand out to you most in your cognitive map?

3.2.3 Short Online Survey (Section 5)

Surveys can be a useful tool when trying to understand information about participants. Researchers may use surveys in a variety of ways to become aware of habits, emotions, expectations, and attitudes of the general public (Bechtel, Marans, & Michelson,1987). In this case, the survey is being used to collect demographics and reveal characteristics of cognitive maps. The survey was given to the participants after the drawing portion is completed. This method was written and used through the survey software, Qualtrics. Open ended and multiple choice questions were used to ask questions about demographics and basic information such as transportation modes and time living within Manhattan (see Appendix B). Any given city is perceived differently when walking, biking, transit, or driving (Figure 3.2) (Appleyard, 1970; Rapoport, 1977). This may have an effect on their spatial understanding of Manhattan. Differences between new students that live on campus verse students that live off campus is therefore noted in the results and discussion sections.

A map of Manhattan divided into 11 sections was used to gauge how each area is used and represented within the participant's cognitive map (Figure 3.3). This map was used by the city for previous communities surveys because it divides the city into sections based on streets and zoning.

An inventory of participants' mental maps was collected through the survey by providing participants with a location to describe their cognitive map and record what places they drew during sections 2 and 3 (Table 3.1) The survey was completed within 15 minutes.

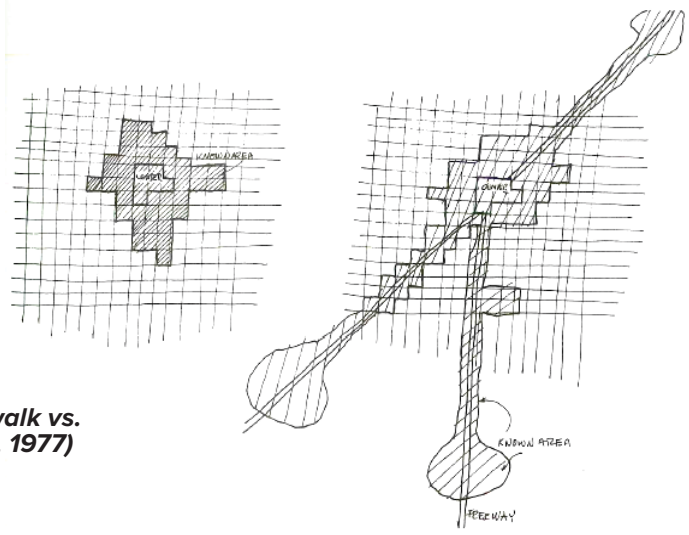


Figure 3.2: Modes of Transportation (walk vs. drive) effect on mental map (Rapoport, 1977)

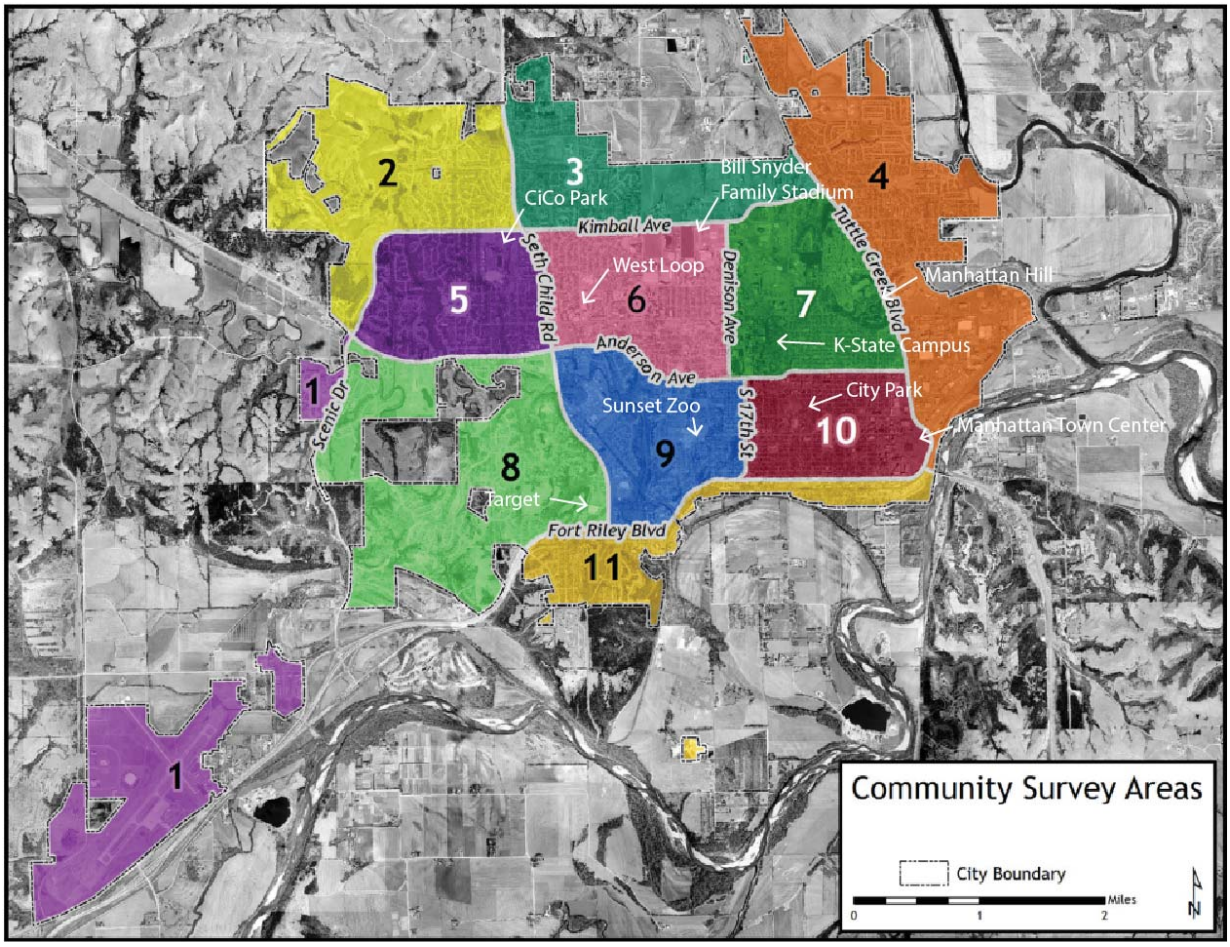


Figure 3.3: Map of Manhattan Used for Study - divided into sections (City of Manhattan adapted by Author, 2017)

Procedures:

1. Provide Qualtrics survey to all participants via laptops or smart phones
2. Confirm consent form
3. Participants complete survey (including an inventory of their map)

3.2.4 Case Discussion (Section 6)

Over the course of a few weeks the collected data was reviewed. Three interesting cases showed examples of experiences and narratives were found within the data (see 5.3 Cases). These three cases clearly represented experiences that were found in other individual datasets.

Each individual involved with each case was interviewed. A total of 4 interviews were conducted with a total of 5 individuals. For Case 2 two discussions (one participants in the first discussion and two individuals in the last discussion) were needed due to scheduling conflicts. This did not negatively affect the goal of the case discussion. Case 1 and 3 each contained one participant. Each discussion was audio recorded.

Procedures:

1. Develop questions base on review of data
2. Meet with participants and ask questions and develop loose dialog to gain insight on their cognitive maps

3.3 Cognitive Map Research Study Inventory & Analysis

The second part of the methods was to create an inventory of the drawing, discussion, and survey sections. After the inventory was completed an analysis was conducted to reveal the relationship between the drawing, discussion, and survey of each individual. This process provided insight on the relationship between experiences of urban form within narratives and spatial cognitive schema. The intent was find common experience or themes and to begin to link them to the actual environment. Once the analysis was conducted for each participant a new analysis began with analyzing the data across all participants.

3.3.1 Content Inventory

The purpose of this method is to establish an understanding of the content produced from the Cognitive Map Research Study. The content inventory began with the drawing content, then the survey content, and finally the discussion. For the drawing content inventory and discussion inventory a word map was created to illustrate the main themes of the maps whether it be transcribed audio or typed words. The word maps were developed though the Qualtrics survey software. Common words were removed from the maps. (to see the words removed see Appendix C).

3.3.1.1 Online Survey Content Inventory

The data collected during the survey portion of the study will be organized and recorded. The main focus of this process is to gain information about the participants' demographics, day-to-day life, and opinions. Day-to-day life includes but is not limited to transportation use and recorded areas within Manhattan that the participant say they are most active and familiar with. The information gathered from the online survey is directly from the individual, so no interpretation is required for inventory. Two questions from the online survey ask for the participants to inventory what they drew in Sections 2 & 3.

Procedures:

1. Look over survey in Qualtrics to make sure all answers were recorded and no data looks out of place

3.3.1.2 Drawing Content Inventory

For the drawing content, the main goal is to identify and record elements included or missing from the map. Answers about map inventory from the online survey provided a starting point. The intent of this inventory is to try to understand and interpret the narrative and relationships within the drawn cognitive map, which is essentially a spatial cognitive schema with little narratives representation. Prior knowledge of Lynch's City Elements helped support this process by providing tools for understanding cognitive maps, such as how landmarks are used (Lynch, 1960). This process provided the initial view and understanding of the participants' cognitive map. This inventory included both the drawn map inventory of the maps collected during the survey portion made collecting inventory easier. This diverted the inventory to the participants, which prevented any bias or misinterpretation of locations.

Procedures:

1. Scan drawings
2. Review comments made in each survey that is paired with the drawing
3. Use survey program Qualtrics to gather each self-inventoried cognitive map

3.3.1.3 Discussion Content Inventory

Content inventory of the discussion included reviewing the notes and audio recorded during the session. The main goal of this task was to filter out content that does not describe a specific narrative or information about the participants' narratives as a whole. This section involves reviewing content and identifying rich narratives found in the discussion about the drawn maps. Key words taken by notes during the session helped make the audio inventory easier. The transcribed audio of the discussion made searching for specific words and phrases easier to find.

Procedures:

1. Transcribe audio
2. Review audio along with the transcribed audio to look for narratives

3.3.2 Content Analysis & Synthesis

Content from all of the Cognitive Map Research Study sections were analyzed individually as much as possible then together to find commonalities and trends between individual participants as well as the participants as a whole. The data from the survey was analyzed through Qualtrics and then compared to the drawings and discussion.

The intent of the content analysis and synthesis was to look at the inventoried content and draw connections. The analysis and synthesis of the data viewing and lightly researching some of the sites mentioned in order to better understand what was expressed during Cognitive Map Research Study (Rishbeth & Powell, 2013; Manzo & Devine-Wright, 2014).

3.3.2.1 Online Survey Content Analysis

The content generated from the survey was a map familiarity, the cognitive map characteristics, and the map inventories. Each participant ranked their level of familiarity. The map familiarity was developed through a simple weighted analysis where each participant ranked their level of familiarity. The weighed information was then used within ArcGIS to visually illustrate the leveled of familiarity. This method was also used for the imageability maps.

3.3.2.2 Drawing Content Analysis

Nearly all of the drawing content was analyzed though GIS analyses (see 3.4 Geographic Information System Analyses). However, some maps were too abstract to geographically analyze. These maps' content were only visually analyzed. Stereotype maps were not analyzed spatially because much of the critical information was flushed out in the cognitive maps.

3.3.2.3 Discussion Content Analysis

The recorded and inventoried audio was reviewed and searched for patterns within narratives. Part of the analysis was conducted during the discussions as the researcher guides questions to answer questions about specific developing patterns.

3.4 Geographic Information System Analyses

The final part of the method is a Geographic Information System (GIS) Analysis. GIS may be used to help understand and visualize spatial narratives (Elwood, 2006). The goal is to measure how accurate, in term of location and spatial relationships of elements, the drawn cognitive map represents the real world. This analysis looked at how much each participant's cognitive map represents the real world. This is one way to so find where a pseudo spatial cognitive schema has been used to fill in missing information. It will help indicate the boundaries and confidence of the participant's cognitive map. The data obtained was used to create and map the cognitive maps created by participants during the drawing section of the research. GIS data was obtained from ESRI and the City of Manhattan.

3.4.1 Map Extent Analysis

The extent of the map provides valuable information about the person's habits and cognitive map imageability (Figure 3.4). For this analysis, each boundary of each drawn cognitive map was simply outlined over a map of Manhattan. This boundary is the extent of their drawn cognitive map. The extent of the map is important to the individuals overall narrative and the spatial characteristics it possesses. Narratives of space and place influence how their cognitive map is shaped. The extent of their cognitive map indicates what narratives of place are cognitively bound their spatial cognitive schema. The extent shows where narratives and urban form may relate to one another. When these extents are overlayed onto each other it illustrates where shared experiences within cognitive map extents exist of Manhattan; showing spatially where urban form has influenced narratives the most.

Informed Grounded Theory was used during this process to interpret the elements within the drawn cognitive maps. Mapping the cognitive map extents requires knowledge of the city because some representations drawn in the cognitive maps provide little to no information. These representations may also not be in the correct location, making it challenging to analyze without preexisting knowledge of the city's urban form.

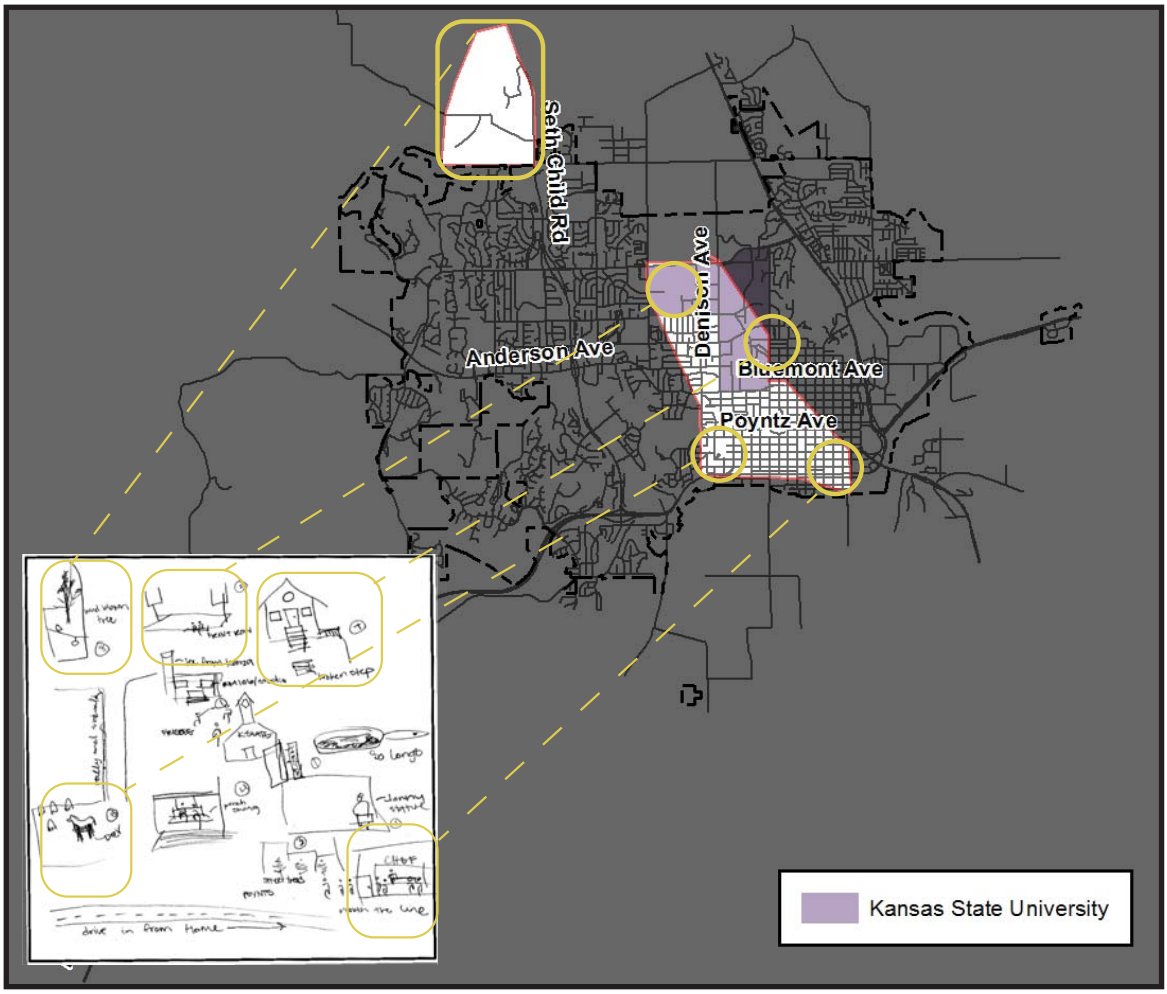


Figure 3.4: Example of the extent of a drawn cognitive map (ESRI, 2016; City of Manhattan, 2016 adapted by Author)

3.4.2 Map Residual Analysis

The map drawn during the drawing portion of the study was georeferenced using ArcMap. The points were based on the stated locations on the map that the participant felt were most accurate. The maps were georeferenced based on the "accurate" location listed in the interview. The accuracy will be determined by the Root Mean Square Error (RMS) derived from the georeferencing process. It may be that parts of the map will become distorted in order to accurately locate the map. Some of the more abstract maps may need to be removed from the analysis due to their complexity. The maps were taken to the 2nd degree polynomial Figure 3.11).

This analysis can add validation to the accuracy or imageability of cognitive maps. Places with high

personal value are thought to be more accurate (Rapoport, 1977). Maps with lower RMS indicate a higher degree of spatial accuracy in an individual's cognitive schema. Using this test provides another mechanism to evaluate how strongly an experience might be aligned with urban form as a result of a peak or memorable experience in a given location. Frequency of experience typically requires time, which would suggest that more time spent experiencing a space would increase its value and accuracy within the cognitive map. After this process is complete, the accuracy of the cognitive maps can be compared to determine if there is a correlation between time and accuracy.

Procedures:
(Figures 3.5-3.10)

1. Placed scan of map into GIS2. Review audio along with the transcribed audio to look for narratives

2. Place first georeference point

*3.*Add second point to shift imported map to meet georeference criteria

4. Add third point and the map will adjust and come skewed to meet the reference points

5. Continue placing points until the skewed map begins to show where the drawn map varies from reality

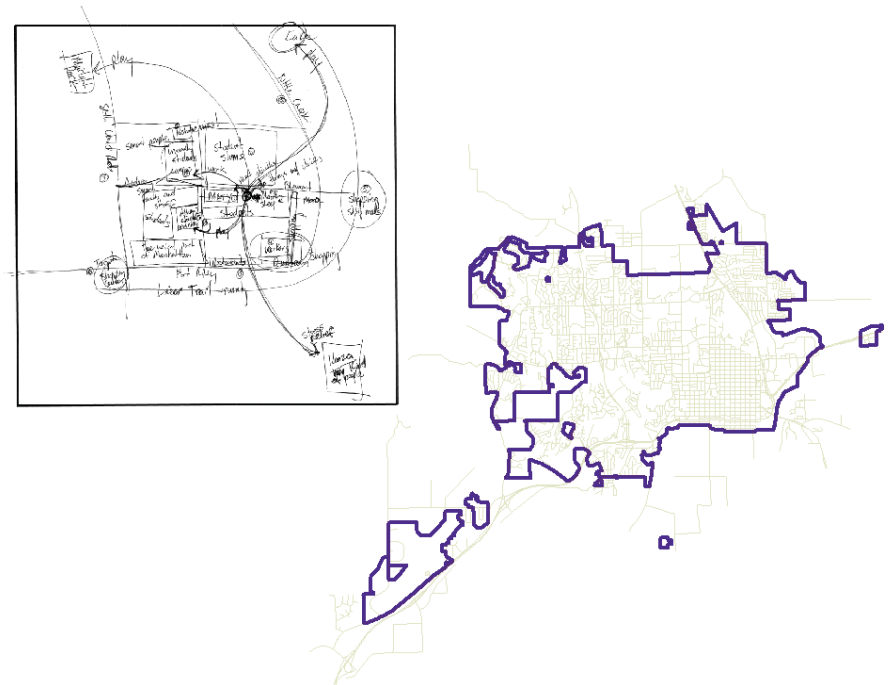


Figure 3.5: Residual Analysis Step 1 - placed scan of map into GIS (City of Manhattan, 2016 adapted by Author)

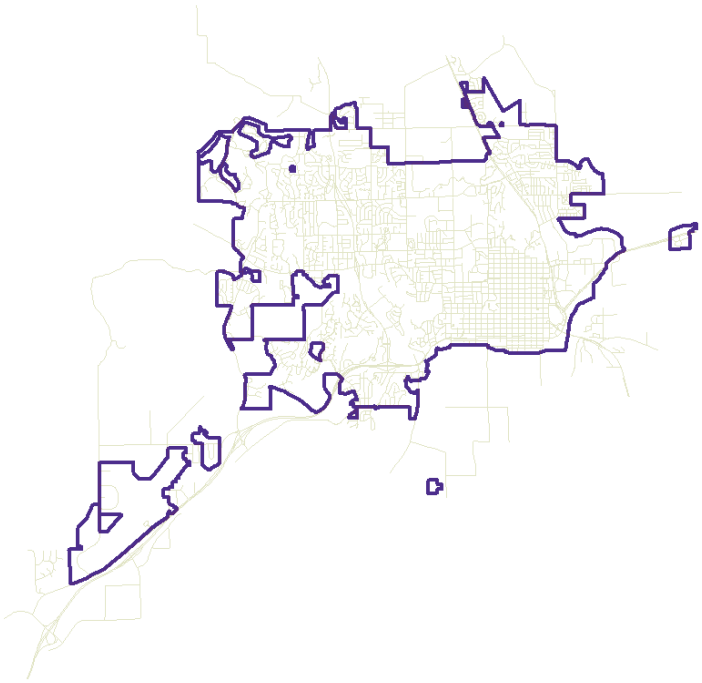


Figure 3.6: Residual Analysis Step 2 - place first georeference points (City of Manhattan, 2016 adapted by Author)

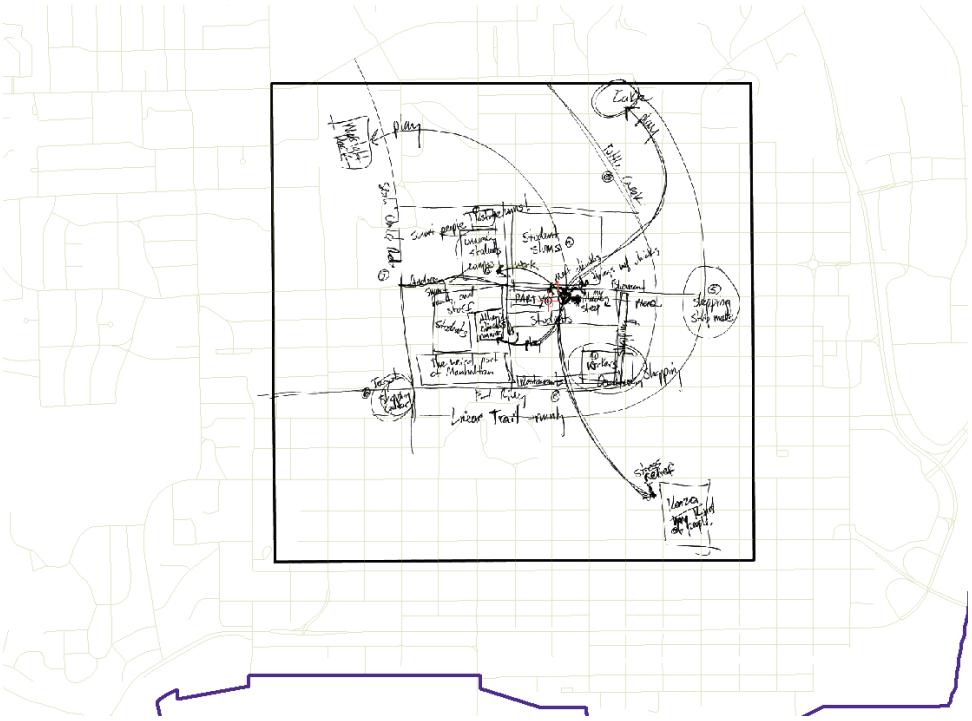


Figure 3.7: Residual Analysis Step 3 continue to add points as imported map will shift to meet georeference criteria(City of Manhattan, 2016 adapted by Author)

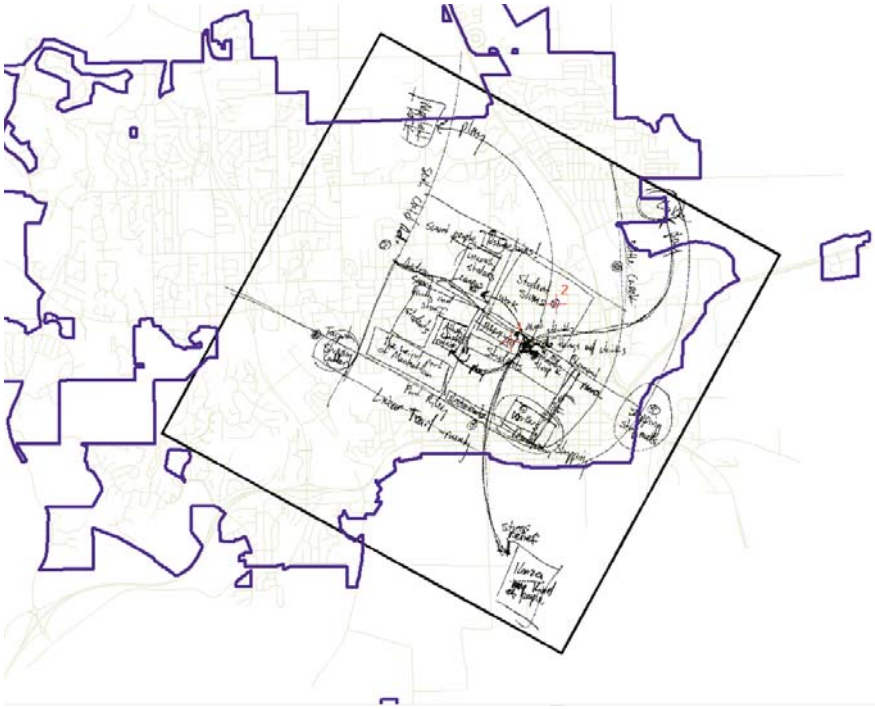


Figure 3.8: Residual Analysis Step 4 - Add third point and the map will adjust and come skewed to meet the reference points (City of Manhattan, 2016 adapted by Author)

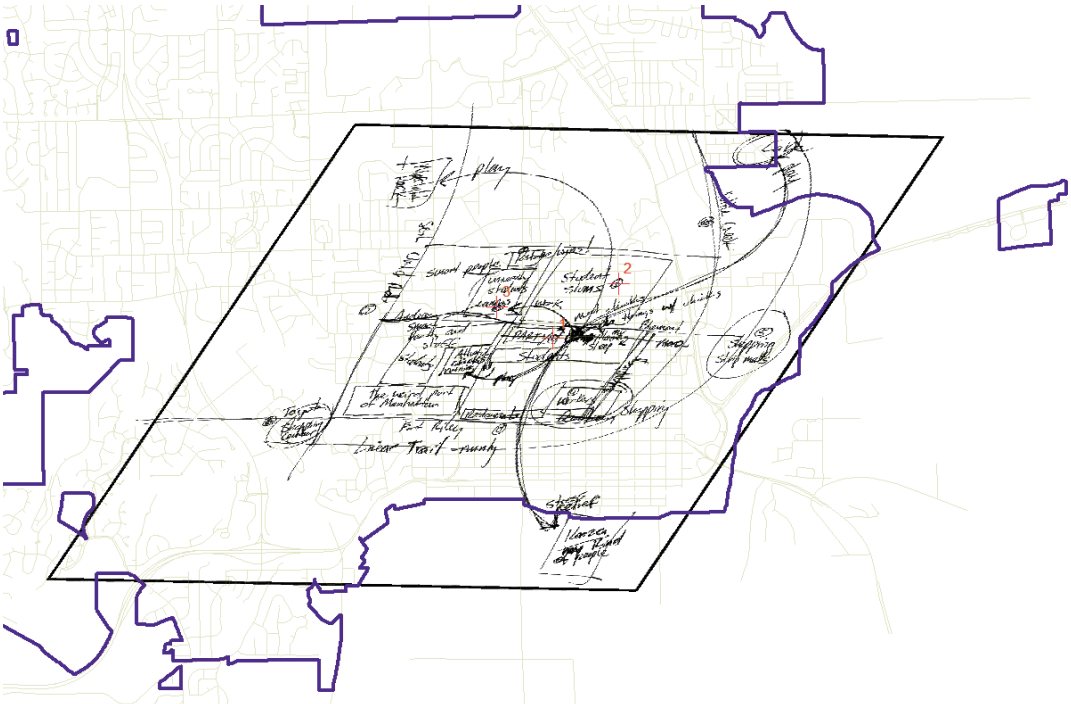


Figure 3.9: Residual Analysis Step 5 - Continue placing points until the skewed map begins to show where the drawn map varies from reality (City of Manhattan, 2016 adapted by Author)

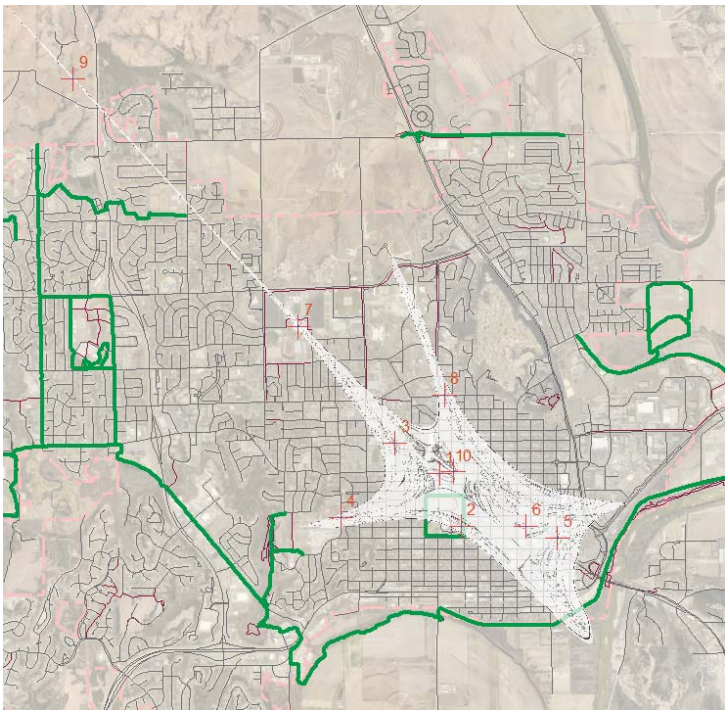


Figure 3.10: Contorted georeferenced cognitive map (ESRi 2016; City of Manhattan, 2016 adapted by Author)

Link

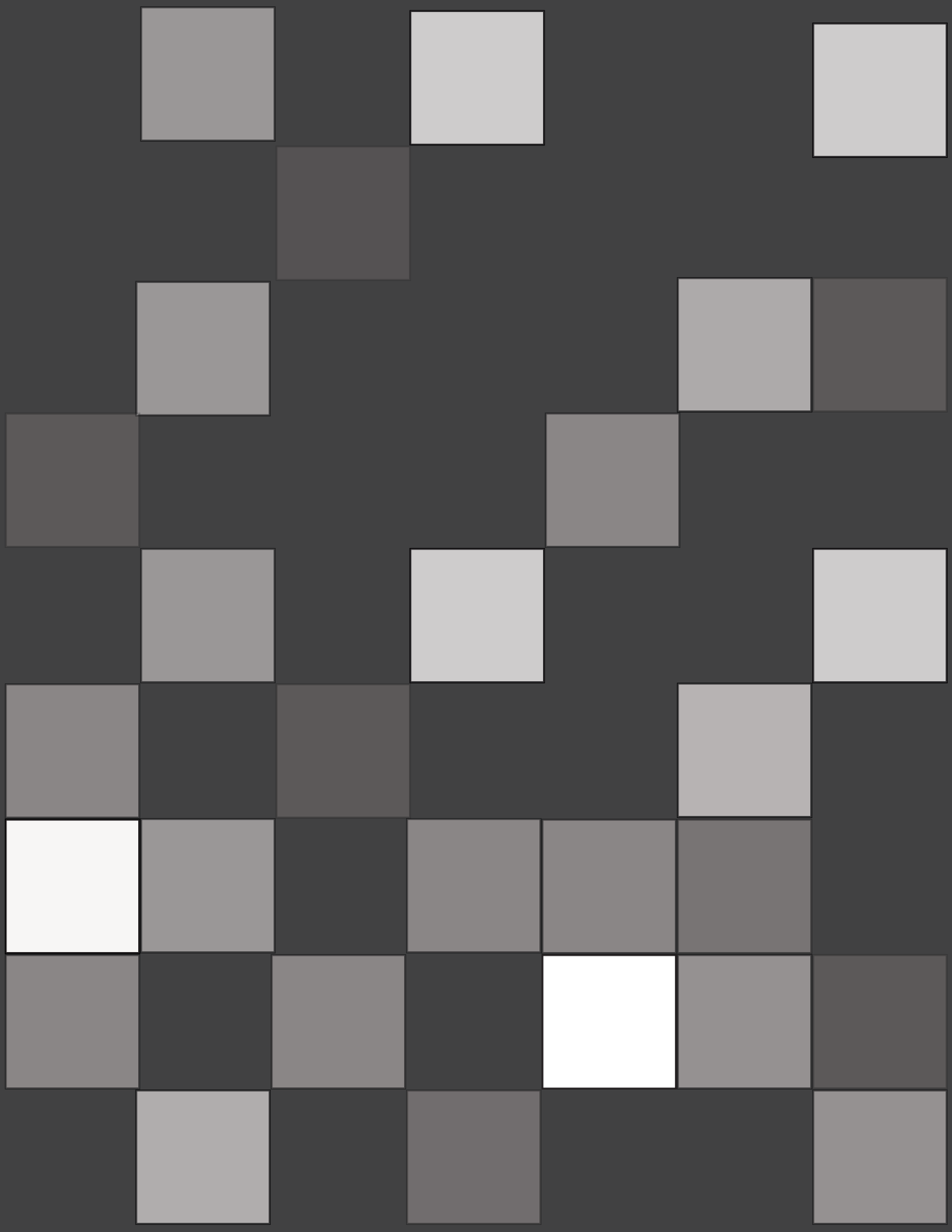
Total RMS Error: Forward:2670.74

Link	X Source	Y Source	X Map	Y Map	Residual_x	Residual_y
1	3827.080275	-3251.244725	1714627.328711	315027.404119	-2341.79	169.59
2	4504.814650	-1514.265558	1709258.188086	320962.299953	916.762	2322.91
3	1422.913609	-5417.911391	1716074.724544	313808.654119	-46.8124	127.885
4	4632.010831	-5435.133614	1720644.932878	311511.918008	579.254	61.2231
5	3614.649720	-1065.341947	1706032.085655	315473.723564	-330.136	-2093.67
6	5968.816386	-2633.050280	1712375.835655	318874.765230	-33.6152	-659.617
7	1458.399720	-1690.341947	1707297.710655	314838.306897	-2695.06	-14.9973
8	1753.799025	-3812.564169	1714074.880794	313513.827730	-2784.27	-540.504
9	1901.368470	-2987.911391	1721539.435192	314632.534328	6203.75	215.974
10	1180.158979	-762.433961	1705180.928248	315253.194050	531.916	411.2

Auto Adjust Transformation: 2nd Order Polynomial

Degrees Minutes Seconds Forward Residual Unit : Unknown

Figure 3.11: Example of links box with the residual difference and Total RMS Error indicating how accurate the points are in feet. (ESRI, 2016)



Chapter 4: Findings

Overall, the results from the Cognitive Map Research Study indicate that narratives were found to be paired with some spatial cognitive schema representing it. The narratives of the lives of the participants can easily be found in the narratives that make up their cognitive map. One variable of the study that proved to be important is the amount of time each participant has lived in Manhattan, which supports Rapoport's (1977) idea that time affects cognitive maps.

4.1 Participant Data

Overall there were 24 individuals tested, but one individual's data needed to be removed as it was later discovered that they were not a current student at Kansas State University. Data in Table 4.1 was collected through the survey.

Table 4.1: Participant Data

Valid Participants	23
Gender	12 (m) 11(f)
Age	
Range	18-39
Mean	23.26
Mode	22
Mode of Transportation (often - nearly always)	
Walk	70%
Bike	9%
Automobile	87%
Public Transportation	17%
Other	0%
Semesters at K-State	
Range	1-17
Average	6.57
Standard Deviation	4.18

4.2 Survey Results

The survey provided data that would have been difficult to obtain another way like familiarity and imageability because the survey forced the individuals to use standard questions and maps, which prevented kept data clean and comparable. The data collected from the survey include familiarity of Manhattan, self-described cognitive map characteristics, and self-inventoried cognitive and stereotype maps. The inventory component to the survey removed the researcher for misinterpreting drawn elements.

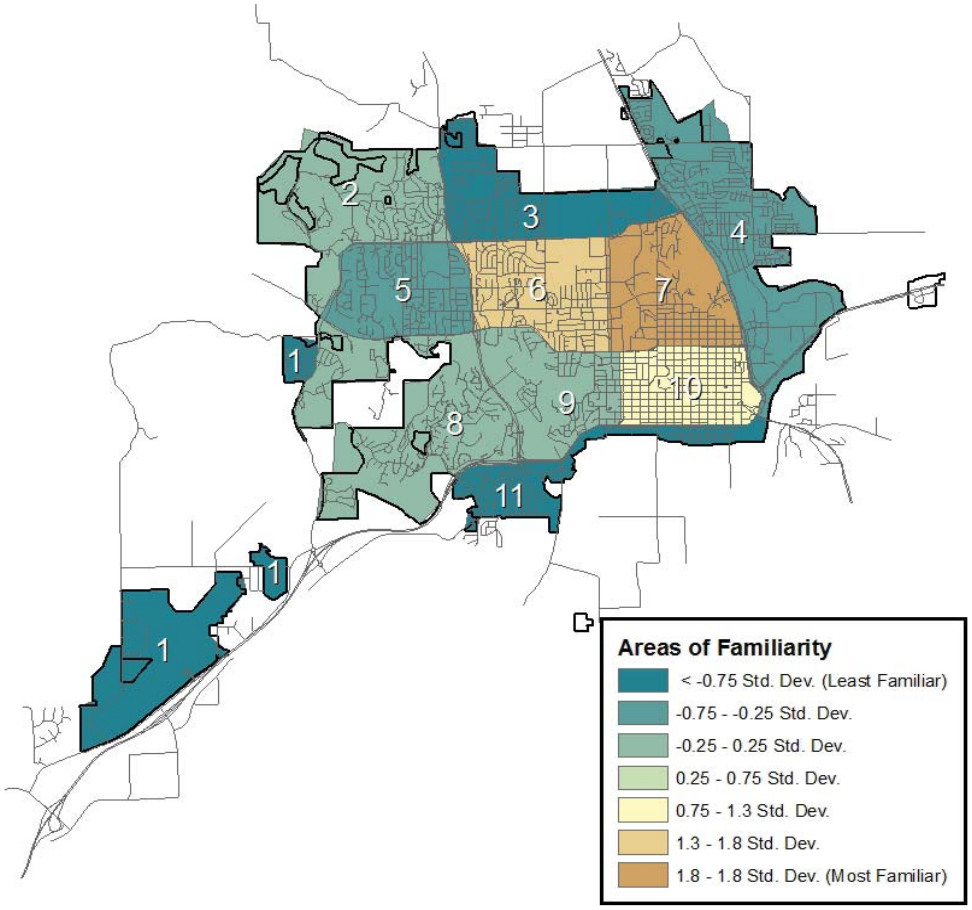


Figure 4.1: Areas of Manhattan based on Familiarity. Areas 6 & 7 contains the Kansas State University Campus, which is suspected to be the main cause for its high level of familiarity. More experiences are occurring in these locations. The map uses standard deviation to how predominate the most familiar areas are compared to areas with less familiarly. (City of Manhattan, 2016 adapted by Author)

4.2.1 Map Familiarity

As anticipated, the areas with the highest level of familiarity were around the Kansas State University campus (Figure 4.1). Many of the students live in or spend most of their awake time in these area (Figure 4.2 & Figure 4.3).

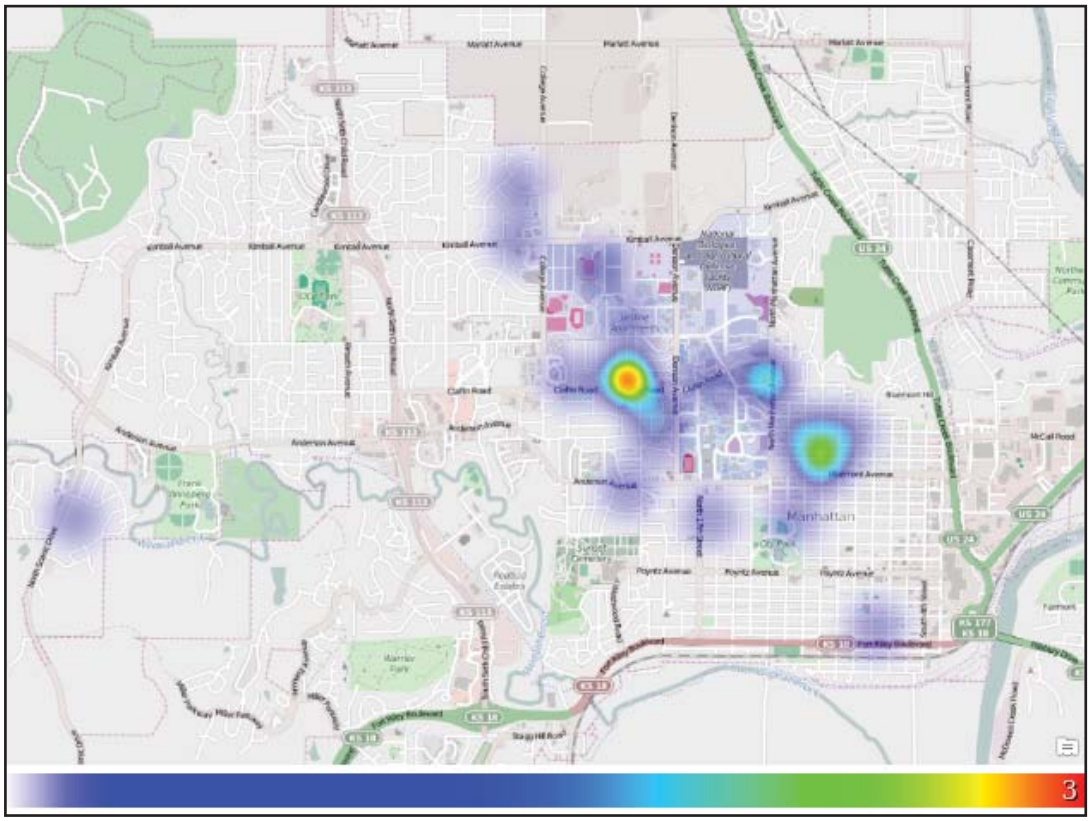


Figure 4.2: Approximate Location of Participants Currently Residence. Most of the participants live around campus as indicated by the heat map. These areas are typically high in dwelling unit density, so more individual interactions and events are being experienced in these areas. Areas of three residents are in red, two in green, and one in blue. (Google Maps, 2016 adapted by Author)

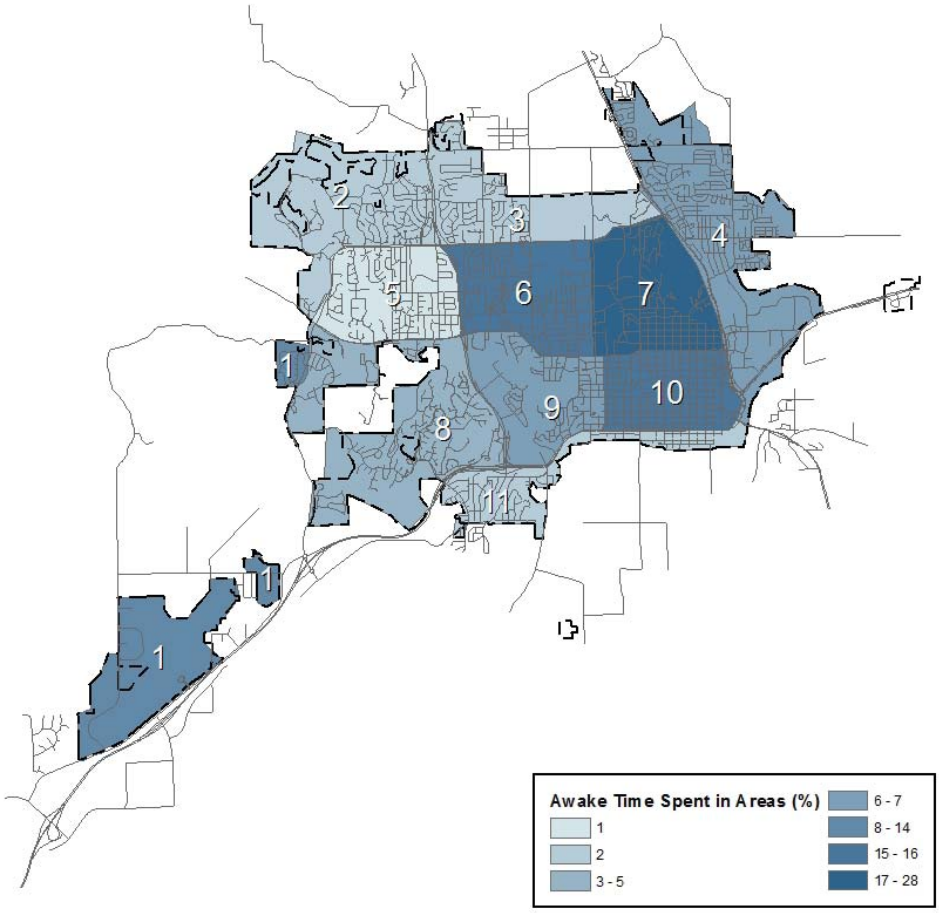


Figure 4.3: Areas where the most awake time is spent. The campus is one of the main reasons why Areas 6 & 7 are so high. Area 1 is likely high because it is contains a KSU facility where many of the participants go to attend a number of different class and work on projects. Area 10 contains Downtown and Aggieville, a business district located near the KSU campus. (City of Manhattan, 2016 adapted by Author)

4.2.2 Map Imageablity

An influence on map imageability is the urban form and network. The areas using a grid street pattern were easier to visualize than the areas with an organic street pattern (Figure 4.4). It should also be noted that those areas with an organic street pattern have an increased level of topographical change (see 4.4.1 Group Discussion).

Areas 6, 7, and 10 had high famliarity and awake time spent, but are also the areas that are the easiest to visualize or high imageablity. Areas were difficulty visualize were the areas that had little awake time spend there (Figure 4.5).

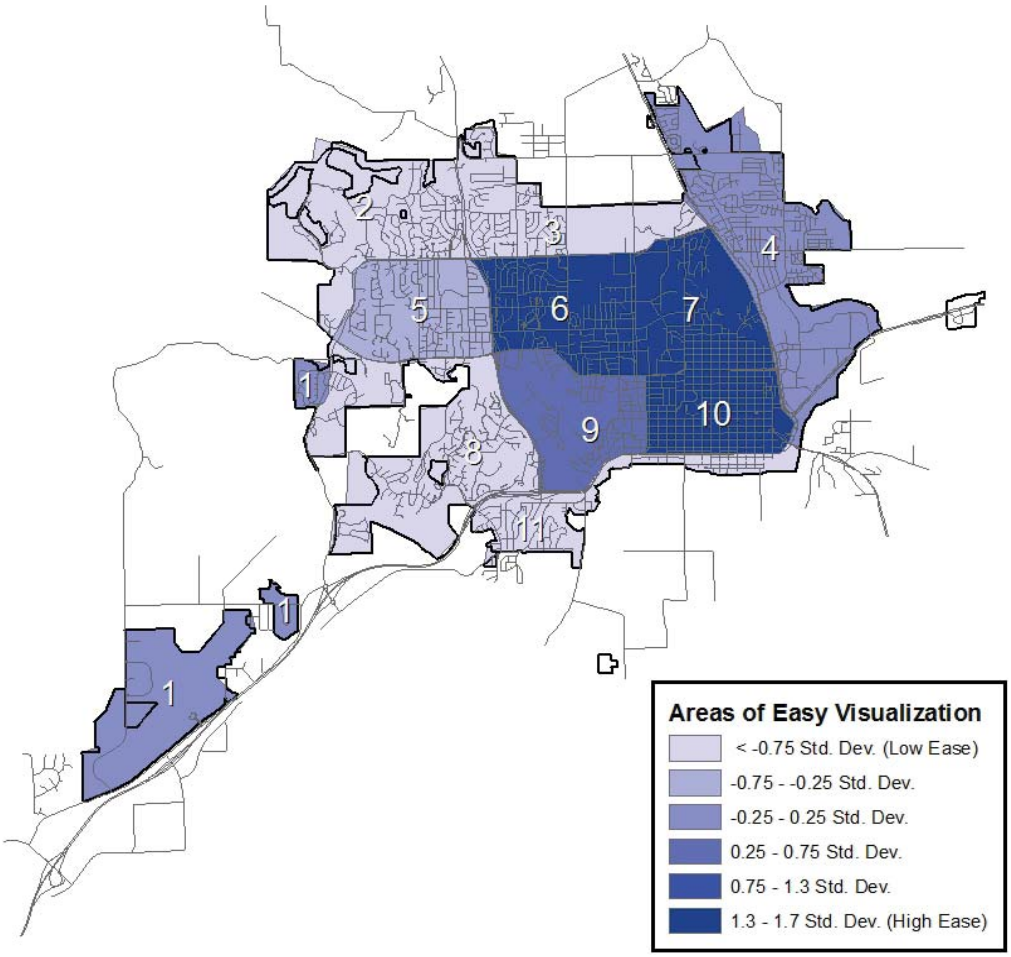


Figure 4.4: : Areas of Easy Imageability (City of Manhattan, 2016 adapted by Author)

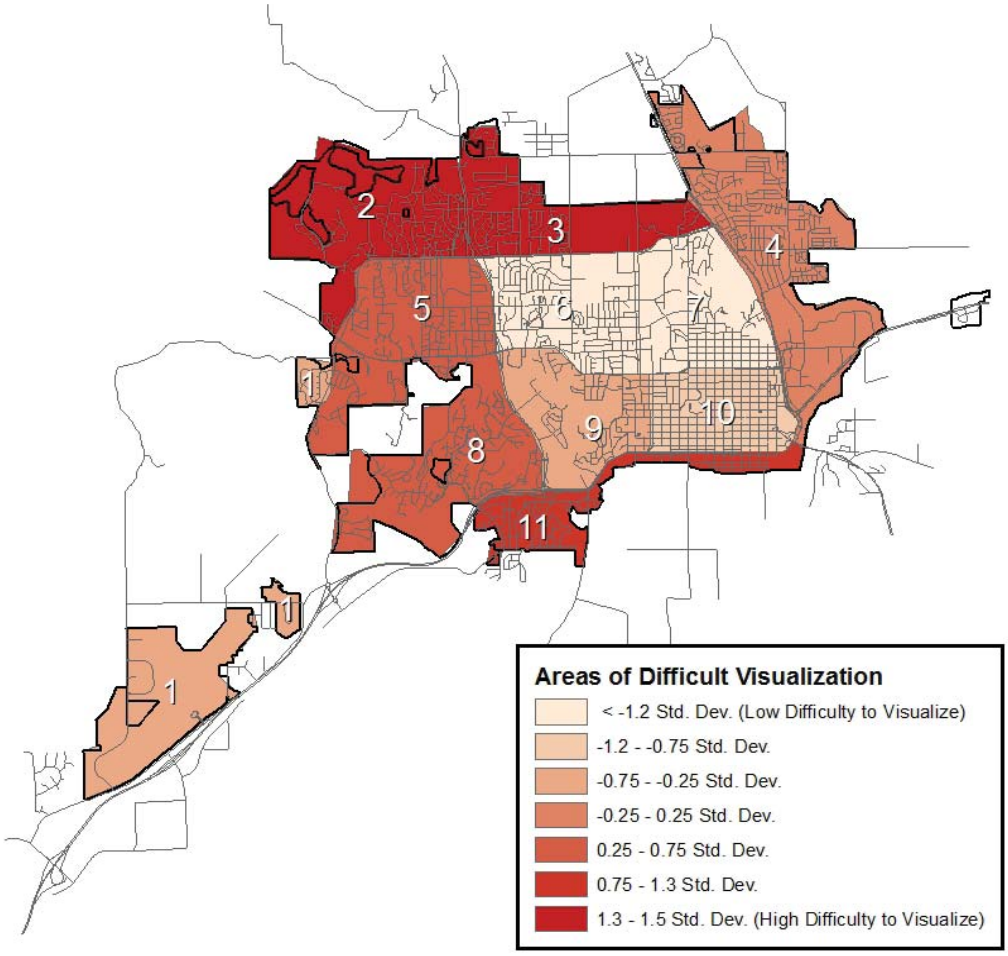


Figure 4.5: Areas of Difficult Imageability (City of Manhattan, 2016 adapted by Author)

4.2.3 Self-Described Cognitive Map Characteristics

From the online survey, participants were asked to describe their cognitive map's characteristics. Many participants described their cognitive maps as being in plan view. Some individuals said they break their cognitive maps of Manhattan into parts or districts. They say that much of their cognitive map is based on where they go most often and spend the most their awake time.

A *word cloud* was created from the online survey question to help visualize the terms participants used to describe their cognitive map characteristics (Figure 4.6). Larger and darker words appeared more often, illustrating the importance that it plays on their cognitive map.

Figure 4.6: Cognitive Map Characteristics. Words like "distinguish" and "part" suggest that a cognitive comparative process is being preformed when they think about their cognitive map. Some of Kevin Lynch's elements (district, road/route, landmark) were being used to describe their maps with the uses likely not knowing of the concept.

4.2.4 Cognitive Map Inventory

Much of the inventoried items that represent meaning of place, experiences, and narratives that are represented in their cognitive maps (Figure 4.7). For example, “house”, “home”, and “campus” are likely common places that are visited daily and have large amounts of time spent there, which creates narratives of experiences as time continues. Entertainment or recreation places or districts such “downtown” and “Aggieville” are commonly reported in cognitive maps.

Many of the places that were inventoried are landmarks, nodes, paths, or districts. Edges do not seems to have as great of presence within the drawn maps. This may be a result of the close connection between paths, districts, and edges indicating that form may relate to narratives. For instance, “stadium” is a landmark not only because of its structure, but also because of what it represents - experiences, sporting events, the university, time with family and friends, etc.

Figure 4.7: Cognitive Map Inventory.

4.2.5 Stereotype Map Inventory

As anticipated, the stereotype maps generally reported less specific elements or places (Figure 4.7). The common responses were overarching terms used to designate specific area of Manhattan such as commercial, unknown, Greek, downtown, campus, shopping, housing, west side, east side, and food. However, many individuals used terms to describe areas such as “Rich part of Manhattan”, “Party Houses”, and “Ghetto/poor/dirty/ugly/wors[t] parts of town”. One of the most common themes of the stereotypes were the land use association of the area. Many cluster their maps based on government termed districts such as commercial (i.e. shopping), campus, housing, downtown, etc.

The stereotype maps are indicating that they group like narratives and urban form together. “Shopping”, for example, can be interpreted in many different ways. Shopping is an activity or experience, but it is being associated with businesses that have spatial locations within the urban environment. Where the individual defines the edge between “shopping” businesses from other businesses is based on their experience and interpretation of the city elements and space.

Figure 4.8: Stereotype Inventory

4.3 Map Results

Most of the maps were drawn in plan view, while others were diagrammatic or views form a perspective. Each participant drew their map based on what they experienced throughout Manhattan. The results contain a wide range of representations and forms (see Figures 4.9-4.11). Complete inventory found in Appendix D. A Map Extents Analysis and Map Residual Analysis of the cognitive maps was conducted. These analyses were used to compare the cognitive maps to the natural and build environment.

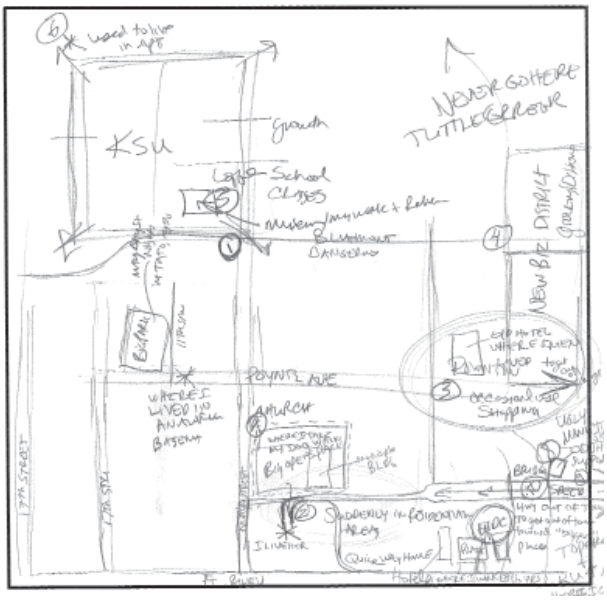


Figure 4.9: Example of cognitive map drawn in plan view

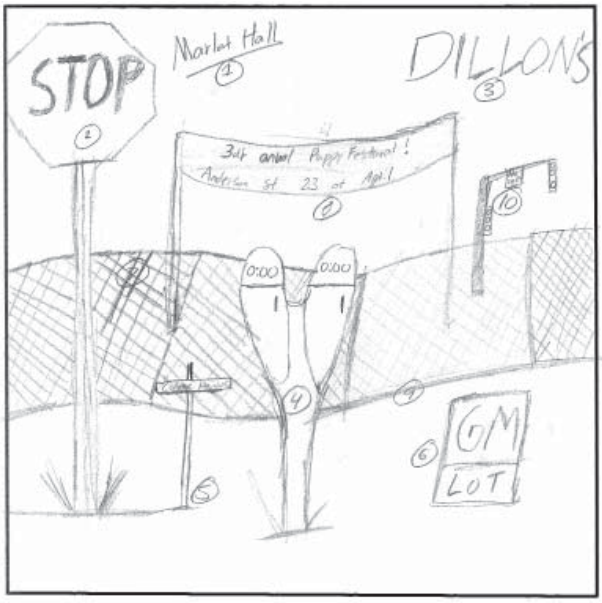


Figure 4.10: Example of cognitive map drawn in perspective containing individual elements that together represent their cognitive map

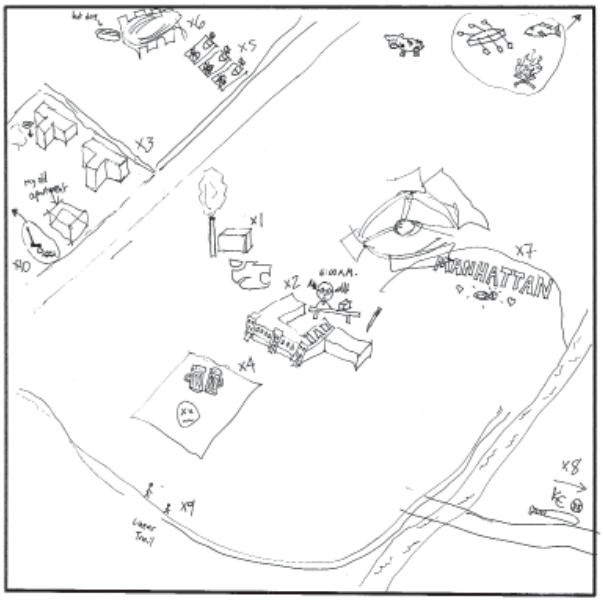


Figure 4.11: Example of drawn cognitive map from an aerial point of view

4.3.1 Map Extents Analysis

Each cognitive map extents were drawn (see section 3.4.1 Map Extent Analysis) and then overlaid on top of each other with the same level of transparency. In Figure 4.12, when the extents are combined the darkest gray represents the area most commonly drawn in each cognitive map. Areas around the Kansas State University Campus are represented the darkest. This result was anticipated based on the number of individuals that live around campus and spend most of their awake time around the campus and adjacent areas. Some drawn areas were not connected to the main body of their cognitive map. These areas are "floating" or have limited spatial connection to their spatial cognitive schema. They are in a general location, but would be hard to pin point without looking at a map or being there in person.

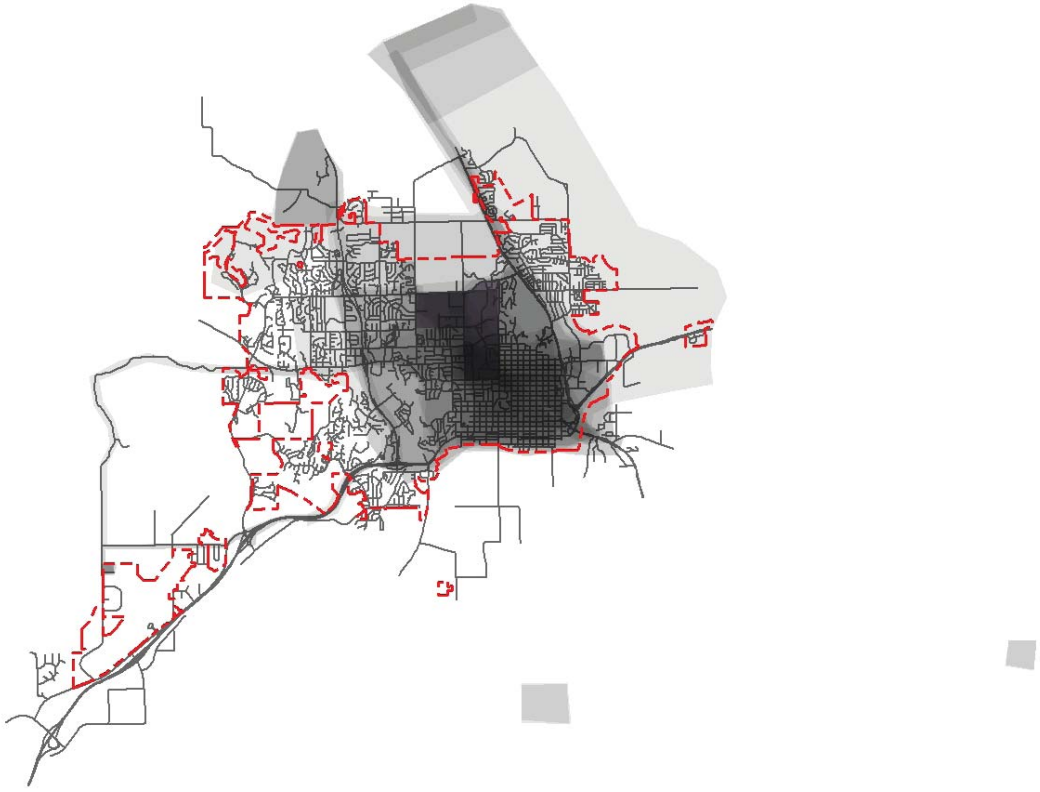


Figure 4.12: Composite Cognitive Map Extent where dark is known areas (City of Manhattan, 2016 adapted by Author)

4.3.2 Map Residual Analysis

The map residual analysis provided information on how accurate each individual's cognitive map is see section 3.4.2 Map Residual Analysis). Each person's ten self-marked accurate location points were challenging to map at times. Many individuals, particularly those who did not draw in plan view, did not mark points in precise locations. This made it difficult to interpret which part of their map each point was associated with. Three maps were unable to be used during this analysis due to their high abstraction.

Overall, the data showed no correlation (.026) between the accuracy and semesters spent at Kansas State, which is surprising. One reason for this may be the sample size. Another possible reason may lie in the collection and interpretation of the cognitive map. Participants were able to chose their own scale, which meant that some of the points used to in small scale maps had less total area covered, making the total possible distance a point could vary was significantly smaller than maps using points miles away, rather than feet. However, it should be noted that average feet off for each point was around 933 feet off, or roughly less than 3 blocks in Manhattan, Kansas, where city blocks range between 350 - 450 feet.

Table 4.2: Map Residual Analysis Results

Cognitive Maps | RMS Error			
	2nd Order Polynomial	Useable Points	Semesters at K-State
Most Accurate	208.41	9	9
	224.42	10	2
	234.48	10	5
	281.56	10	1
	303.65	9	9
	343.76	8	7
	492.71	10	2
	500.41	8	7
	501.28	9	7
	560.93	10	10
	625.36	8	11
	717.88	9	1
	718.77	10	1
	785.03	8	9
	823.01	10	11
	857.82	10	5
	1186.50	10	17
	2670.74	10	3
	3103.81	10	3
	3518.13	10	9
	932.93 Average feet off		
	Average blocks off 2.33 (avg/400)		

4.4 Discussion Results

The discussions provided much of the information on the narratives and details of each cognitive map. After talking with groups and individuals, most of the time there was a deeper narrative associated to each of the locations the person drew. This made it important during the discussions to encourage people to open up about their lives.

4.4.1 Group Discussion

Each discussion was loosely lead by prompt questions. The group discussions allowed individuals to see each other's cognitive maps and discuss what they saw. Most of the discussion was directed on what was drawn for the cognitive maps and stereotype maps moments before. For example, one individual drew Taco Bell which sparked a conversation about each individual's Taco Bell visiting habits. This seemingly normal information, provided a discussion between two or three individuals that would reveal narratives of the

Figure 4.13: Total discussions

location. These small narratives help shape the person's cognitive map and how they interact with the urban environment.

A key finding of the discussion was how topography and land use affected imageability. This is especially indicated in residential areas with a relatively large amount of grade change. An example of this is the neighborhoods adjacent to the intersection of Westwood Road and Fort Riley Boulevard (Figure 4.14). This is not to say that this is the only area this occurs, but this is an example brought up during the discussion. This example is located in the highest ranking familiar area that students typically do not live in. Also, this area is located near a major arterial road.

One individual described their experiences of that part of town and said,

"Since I have some experience going to the high school and that area I was about to visit someone house there and so I know that there are better and larger houses there, but also after that I don't actually know what happens. There is this gap because Seth Child,

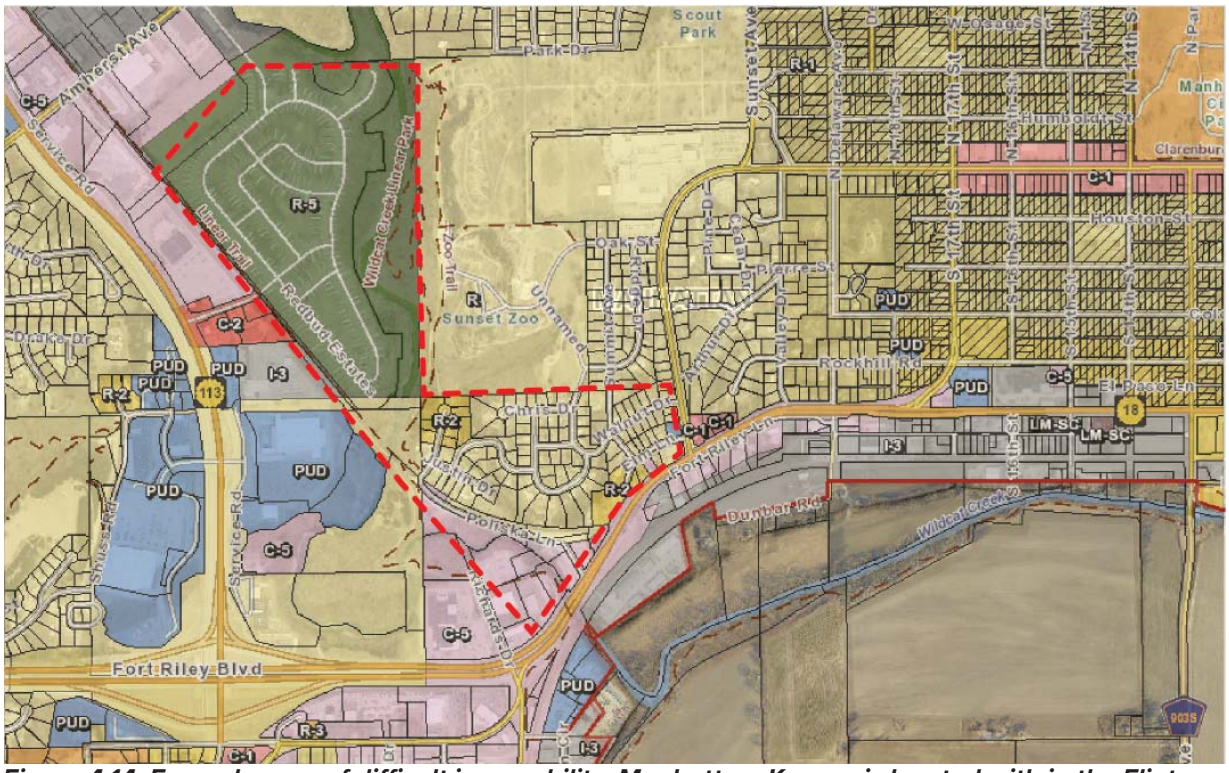


Figure 4.14: Example area of difficult imageability. Manhattan, Kansas is located with in the Flint Hills, known for its rolling hills or cuestas. (Riley County GIS Online, 2016 adapted by Author)

sorry Fort Riley winds down and back I the west market, but there must be a bit area that I don't even visualize or know what is there."

And went on to say,

" I think a lot of times it the speed of the road, like you are going fast and you really aren't take in stuff on Fort Riley, especially when you are on that windy part that curves and then you finally get to a stop, which is a stop light and you see the market and then the car as if you are going to um apd west, so you finally stop when you see the police station and then that I can tell but im trying to make sure imp on the road. the roads have a bit effect on how I perceive the surrounding things."

This finding supports Rapoport's (1977) theory that topography and natural elements influences the spatial cognitive schema resulting in harder ease of imageability.

4.4.2 Case Discussion

After the group discussions, four case discussions occurred at a later date. These case discussions were used to gather more information about individual's cognitive map. The case discussions provided the highest level of insight on the relationships between their narratives and spatial cognitive schema.

Some key findings were that experiences have "check points" needed to withstand the test of time before they can become deemed frequent. After they become a frequent experience, the space is generally remembered by the peak experiences of the frequent experiences. Generally frequent spaces develop its cognitive representation into peak or memorable experiences. Frederickson and Kahneman's Peak-end Rule Theory, (1993), supports the fact that peak experiences can also remembered from a one-time event.

Figures 4.15-4.18 are world clouds developed from transcribed keyword audio recording of the discussion. These word clouds indicate what their responses during the discussion revolved around.

Figure 4.15: Case 1 Discussion. This discussion primarily revolved around her daily experience of walking to campus. This is a frequent experience that she has a strong cognitive representation of. She typically walks alone, which allows her to experience the spaces for her own meaning and perceptions of space. This walk is a part of her life and provide an experience that is personal and unique to her.

Figure 4.16: Case 2 Discussion A. In this discussion, the older sister talked about her experiences within Manhattan and how she has introduced "cool" places with enjoyable experiences to her younger sister

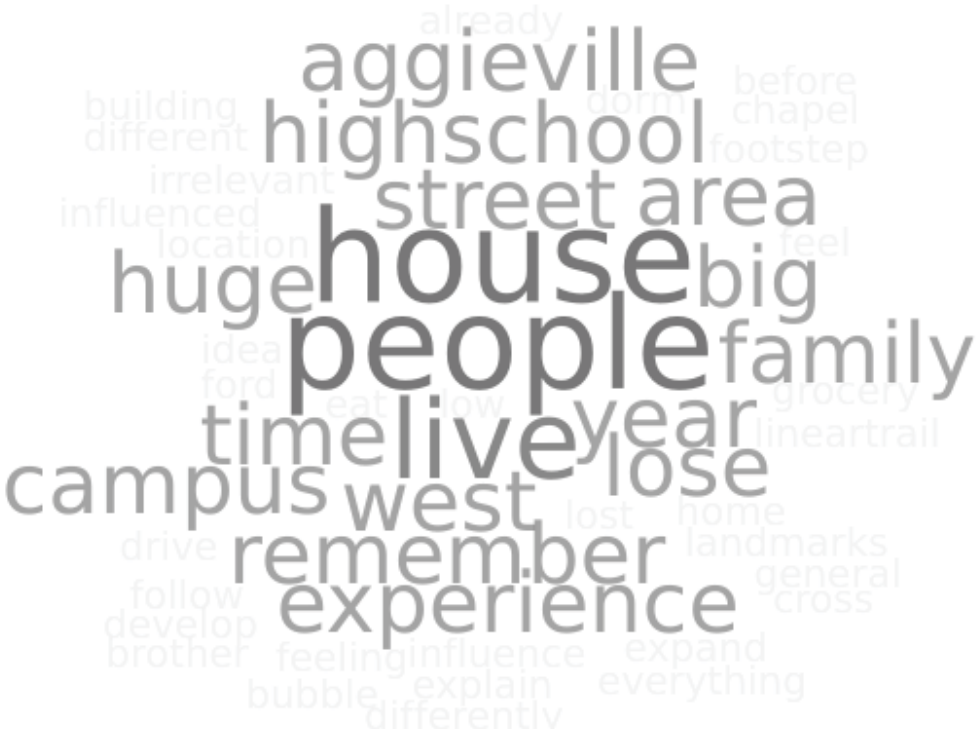
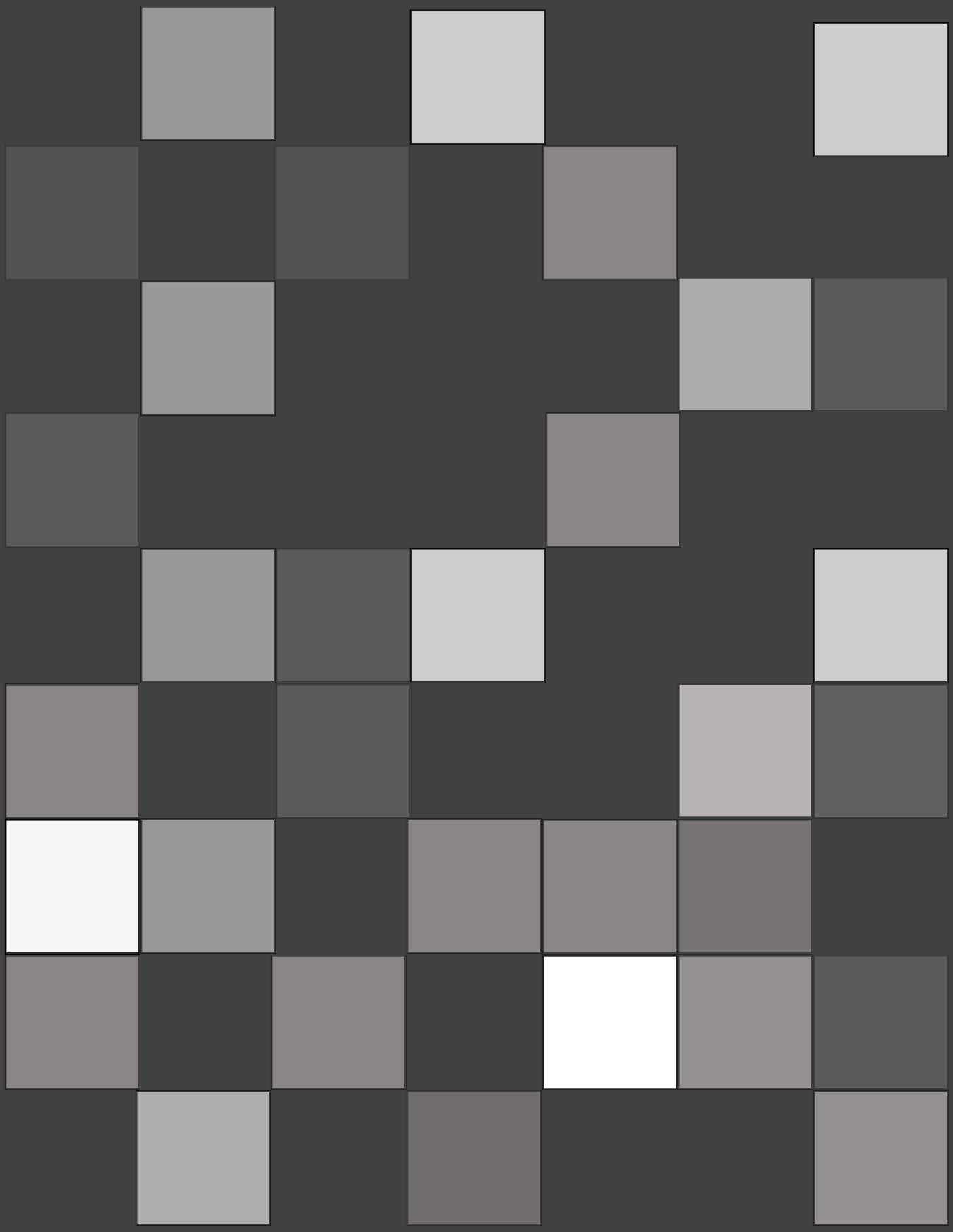


Figure 4.17: Case 2 Discussion B. This discussion revolved around first experiences within Manhattan

Figure 4.18: Case 3 Discussion. This discussion's main focus was how meaning and experiences change within cognitive maps change over time. Specifically, how peak and frequent experiences relate to one another.



Chapter 5: Discussion

The findings have indicated that there is a relationship between the experience of the urban environment and how it is represented within cognitive maps. The level of familiarity and amount of time spent within a part of town was represented in the extents of the cognitive maps, indicating that experience influence cognitve maps. However, using the Map Residual Analysis did not indicate this effect. Therefore, a further dive into particular cases has been chosen as another technique to illuminate possible effects and connections between narratives and urban form. Case examples, a synthesis of the study, research and future considerations are explored in this chapter in order to draw connections between personal examples of experiences with urban form and how it affects an individual's cognitive map.

5.1 Cases

Three cases were developed to illustrate the relationship between narratives and spatial cognitive schemas. Each case focuses on a different type of experience identified through this study. These experiences help provide information on how narratives of urban form relate to how people spatially understand the city. Kevin Lynch's theory can be applied to the maps tin order to see the relation.

5.1.1 Five City Elements Application

Kevin Lynch's Five City Elements can be found within some of the participants' cognitive maps. The elements found in the maps support his theory that many individuals mentally use the five elements. The use of these elements are drawn in a number of cognitive or stereotype maps. However, for some individuals these elements are just used to paint an abstract representation in their mind rather than form the basis for a spatially accurate map. Individuals may change the appearance or mental representation of the elements to better understand the city. Regardless, these elements appear in cognitive maps in a variety of different ways. For example, one individual drew their cognitive map as an abstract perspective visualization, but their stereotype map begins to show that they do use some of Lynch's city elements (Appendix D - Participant 1, 15, 20). Overall, participants' cognitive maps are coded by Lynch's Five City Elements, which are based on real world examples of districts, landmarks, paths, and node.

5.1.2 Case 1: The International

This individual has been selected because of their limited spatial cognitive schema of Manhattan and frequent experience of the same urban environment. The frequency experience of a relatively limited space through walking most of her trips makes her narrative different then the majority of other participants in the study.

Her main routes in her cognitive map are among her most important places (Figure 5.1).

"I have my main important places, my house, and then I come up to my classes. From classes that's the union is the main junction for me from there I go to APD or from that along go to Aggieville for how every long it is."

The international has lived in Manhattan for less than one year. She indicated that she walks nearly to and from every destination. Most of her time is spent on K-State campus. She explains her characteristics of their map as,

"Having been for about 7 months in Manhattan, ***my cognitive map expresses my daily experience along my route from home to class and vice versa.*** *It has a plan view of the routes and its experiences alongside.* ***My map (as expressed) also has a rough zoning of the different areas of the town - like campus residences, academic blocks, commercial areas, old side of Manhattan,etc."***

She drew her stereotype map with those sections (Figure 5.2), which indicates that she is using different types of land use, rather than comparing residential areas to residential areas. Many of the individuals that have lived in Manhattan for a number of years compared different places amongst similar land uses. However, this individual does not yet have the experience of these areas to compare them at a finer level of detail, but she is beginning to form and build an opinion of a place based on her experience (Rapoport, 1977).

When describing her cognitive map she says,

"...because what I understand as an international student is that I have my residences on the left top then I have my campus here, and this side I have commercial spaces dividing that beyond the poyntz thing, ***I know that my map is a bit over here, but according to my understanding and along this side I go to my studio classes, to APD, so this is how my circle goes, so Ive never gone to that side, so once and a while I see the difference, but let it be in planning, let it be people staying here, let it be the culture aspect of it. There is a lot***

of difference in that area, even how the buildings are really planned. *This commercial area kind of divides that according to me."*

She has her main "circle" that she encompass most of her daily routines but it is beginning to expand (Figure 5.3).

She goes on to say.

"So, architecture doesn't probably have an impact on my mind when compared to experience. Experience is more... affective when having it remembered."

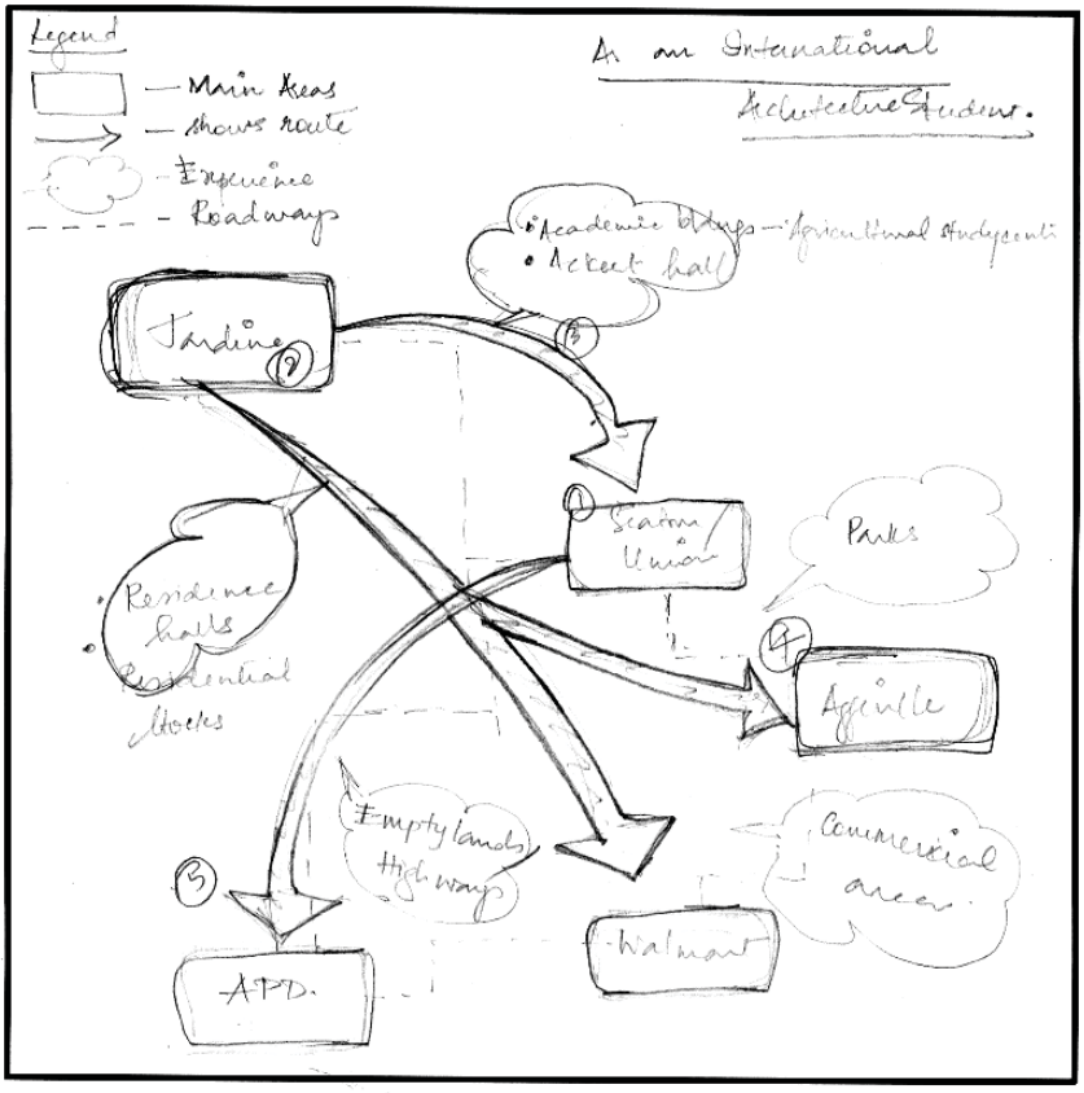


Figure 5.1: Case 1 Cognitive Map showing a map that is abstract and diagrammatic

Overall, we can see that her cognitive map revolves around her frequent experiences, based on her frequent activities like walking to class, studying on campus, visiting the union, and walking home. Some of these frequent experiences occur day to day where others only happen one a week or less like buying groceries. Many of her new experiences have become familiar enough to become frequent experiences (which she

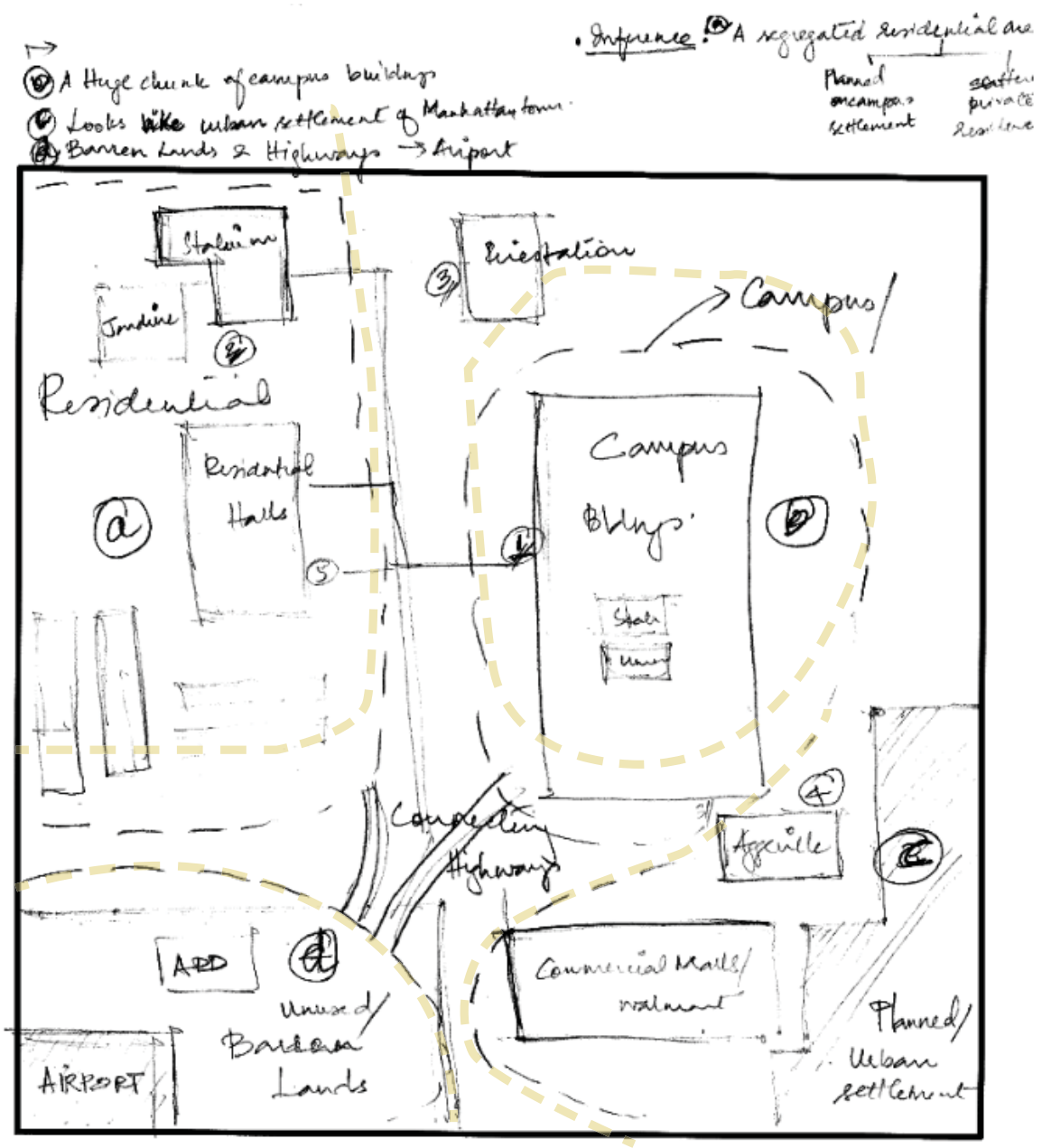


Figure 5.2: Case 1 Stereotype Map showing organic and diagrammatic clusters of areas based on land use

remembers most). At this point in time, some of her frequent experiences have begun to shape her day to day life. This can clearly be seen when she describes her walk to campus, an activity she does almost every day. She typically walks through locations that she has frequented (at least two or three times) that are more enjoyable or provide a higher average peak experience. Frederickson and Kahneman's theory of Peak-end Rule can be used to illustrate the process of how she understands and uses the city elements that Lynch theorizes. Her peak experiences with the city elements are influencing her cognitive map because the city elements provide concrete meaning and value to her life.

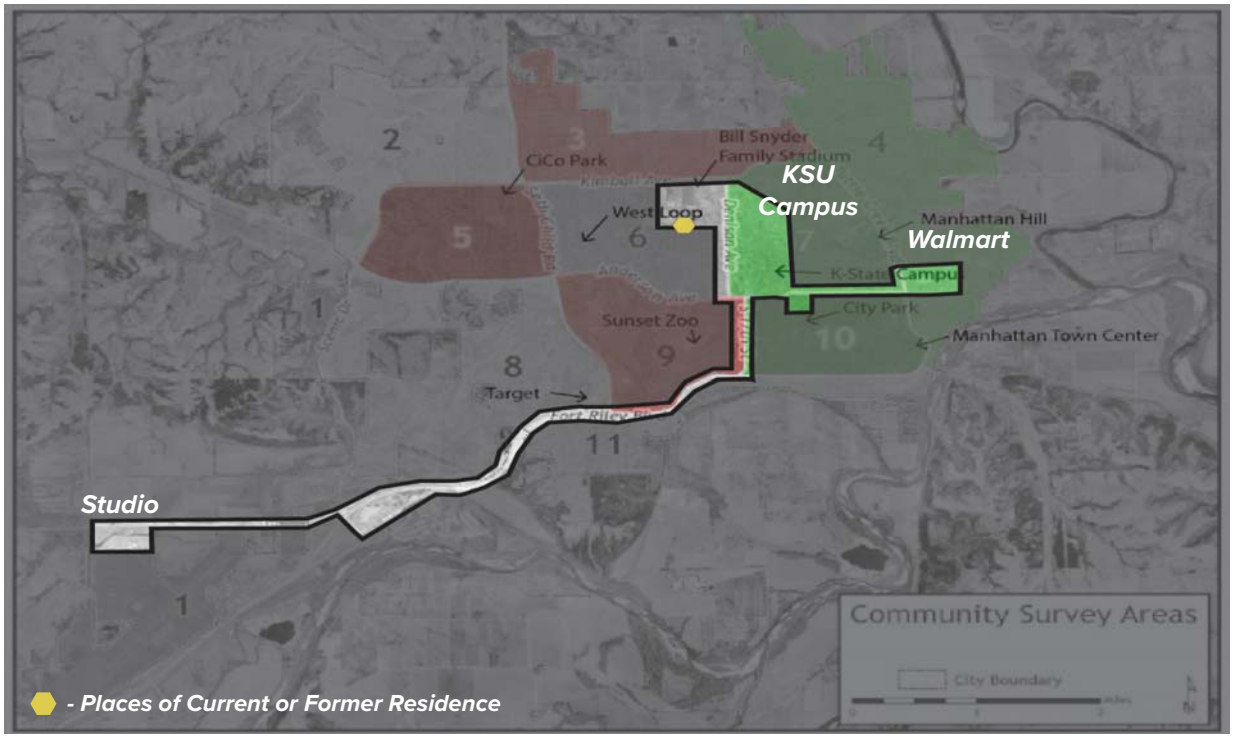


Figure 5.3: Case 1 Map extent overlayed onto areas of imageability (level of imageability: green - easy; no color - average; red - difficult). Her cognitive map extent was taken from an abstract cognitive map, but what was interpreted shows that her map is based around her indicated use of public transportation to necessary locations for a student like class in studio and Walmart for day to day items. Other then those locations she indicated that she mostly walk to areas close to campus and her home, which would support her ease of imageablitiy in those areas. (City of Manhattan, 2016 adapted by Author)

5.1.3 Case 2: The Siblings

The primary focus of this case is about two female siblings that are four years of age apart. A secondary focus of this study involved the younger sister's long term boyfriend, who was tested in the same group. From the group discussion it appeared that because of the relationship between the sister, the boyfriend was being introduced to new locations within Manhattan with this girlfriend, the younger sister, by the older sister. For the case discussion two separate discussions were conducted. The first discussion was only with the older sister. For the second discussion, the younger sister and her boyfriend were interviewed together.

Some elements found in the younger sibling and her boyfriend's cognitive map are first experiences that were shared with her older sibling. Cognitive maps are made of experiences and their relationship to other experiences. Together these two siblings experienced very similar thing, but have different meanings within their cognitive maps.

Overall, it was found that many of the younger sibling's first experiences in Manhattan were influences or originated from experiences of older family members. Through told narratives or in-person experiences, older family members share their experiences with younger family members. In this case, some narratives and experiences of Manhattan were developed and accepted into their cognitive map without ever living in Manhattan.

5.1.3.1 Primary

The results seem to suggest that the older sister's frequent or peak experiences are being passed along to the younger sister, influencing her cognitive map (Figure 5.4-5.9). Some experiences within Manhattan were experiences by both sisters. However, the older sibling is experiencing a frequent experience to a common place., while at the same time the younger sister is having a first experience. An example of this may be when the older sister takes her sister to a local restaurant. The older sister may be experiencing this for the fifth or sixth time, but this may be the younger sister's first time there. Their cognitive maps are being influenced by similar narratives but different experiences. The older sibling says,

> *"I definitely think it... like my favorite places I introduced to her. So maybe some of them she's only gone to once because I dragged her there, but I have a feeling that they are cool places and*

she will probably go back. ***Like I know I took her to the Konza for the first time and like even though I haven't been with her...I took her when she was in high school and she came up to visit me. I haven't been with her [there], but I know she goes there and things like that.*** *I feel like places I introduced her to restaurants and stuff too, which she goes to. And she joined the same sorority as me so that and all that goes with that."*

The older sibling even goes on to say,

"Our relationship, I feel like, helped make her map of Manhattan."

When the younger sister was asked about external influences on her cognitive map she said,

"I think mine is pretty influenced by other people. Just cause, like, that's how I learn by going to places with other people."

The younger sister was then asked about her first time in Manhattan, which was influenced by her sister. She reflects on her first experience by saying,

"Honestly, the first time I remember was probably when she was a freshman and I stayed in the dorms with her." ... "It was so fun or at least I thought at the time".

It is clear from her stories that she knows she is having an influence on her younger sister's cognitive map and understanding of Manhattan. The older sibling is guiding and shaping her younger sister's first experiences because she knows that it will make a lasting impact. Some of these experiences may even of been passed down through family and friends, sharing narratives. This suggests a cultural connection between a shared narrative of a designed element within the greater urban fabric.

The younger sibling is open and aware to these first experiences and even expressed that she how she thought they were impacting her. She said,

"I feel like if you have a first experience or something weird like a low experience then you will remember that, it's not normal."

In some cases, a simple verbal narrative of a space from the older sister can impact the younger sisters cognitive map and plant the formation of the first experinece of the place. For example, the older sister suggested that the younger sister visit a restaurant on the Northwest side of town. Days later while the older sister was at the restaurant she described earlier, her younger sister, boyfriend, and

others friends arrived at the same restaurant at the same time. The simple narrative of place provided a note in her sister's cognitive map. She may have used Google Maps to find the destination, but the narrative of the space was inventoried within her cognitive map. The new location was at one point "floating". These floating spaces are still located within the spatial cognitive schema, but do not have spatial connections to other locations.

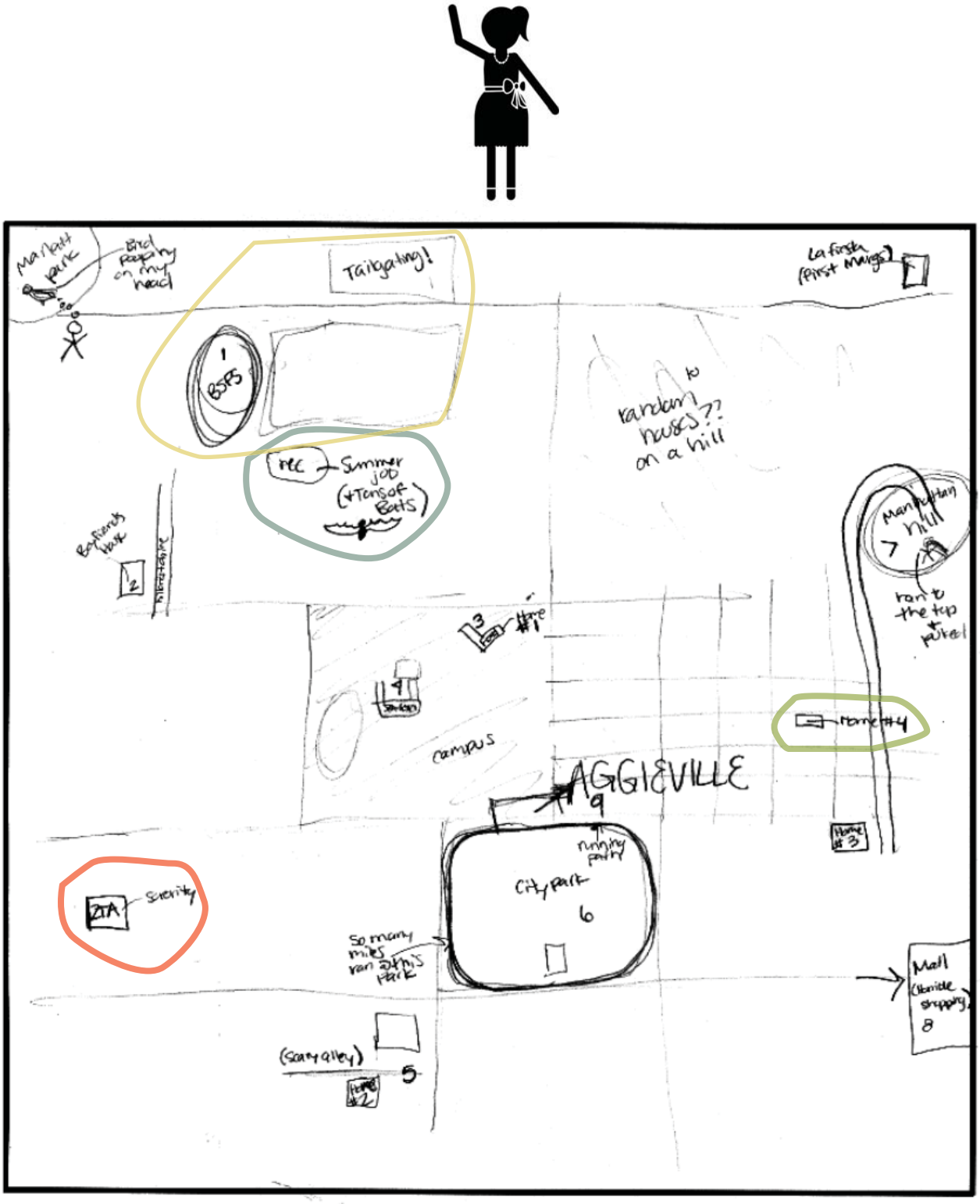


Figure 5.4: Case 2 cognitive map of the older sister

**Colored circles correspond to elements found in both maps*

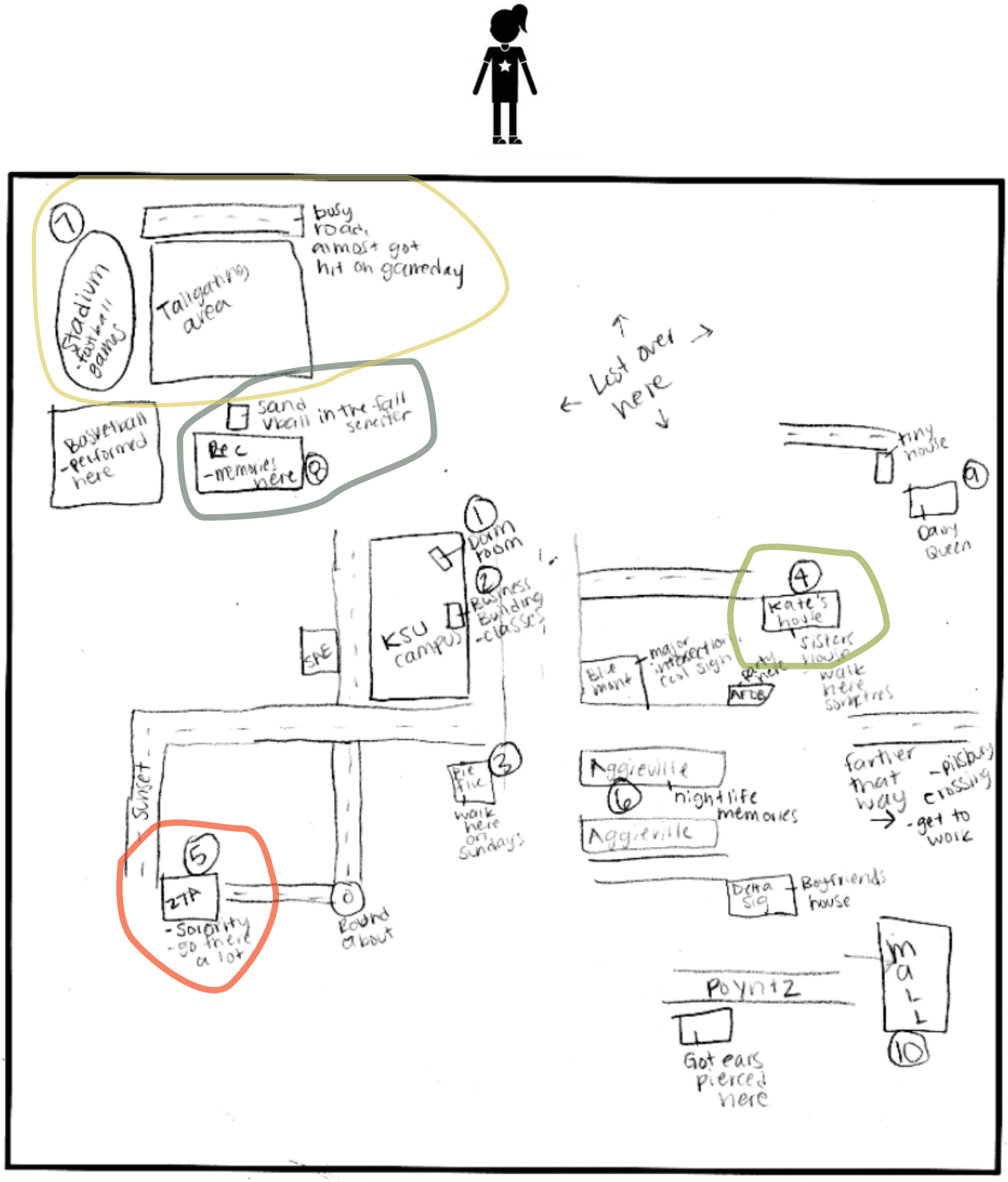


Figure 5.5: Case 2 cognitive map of the younger sister

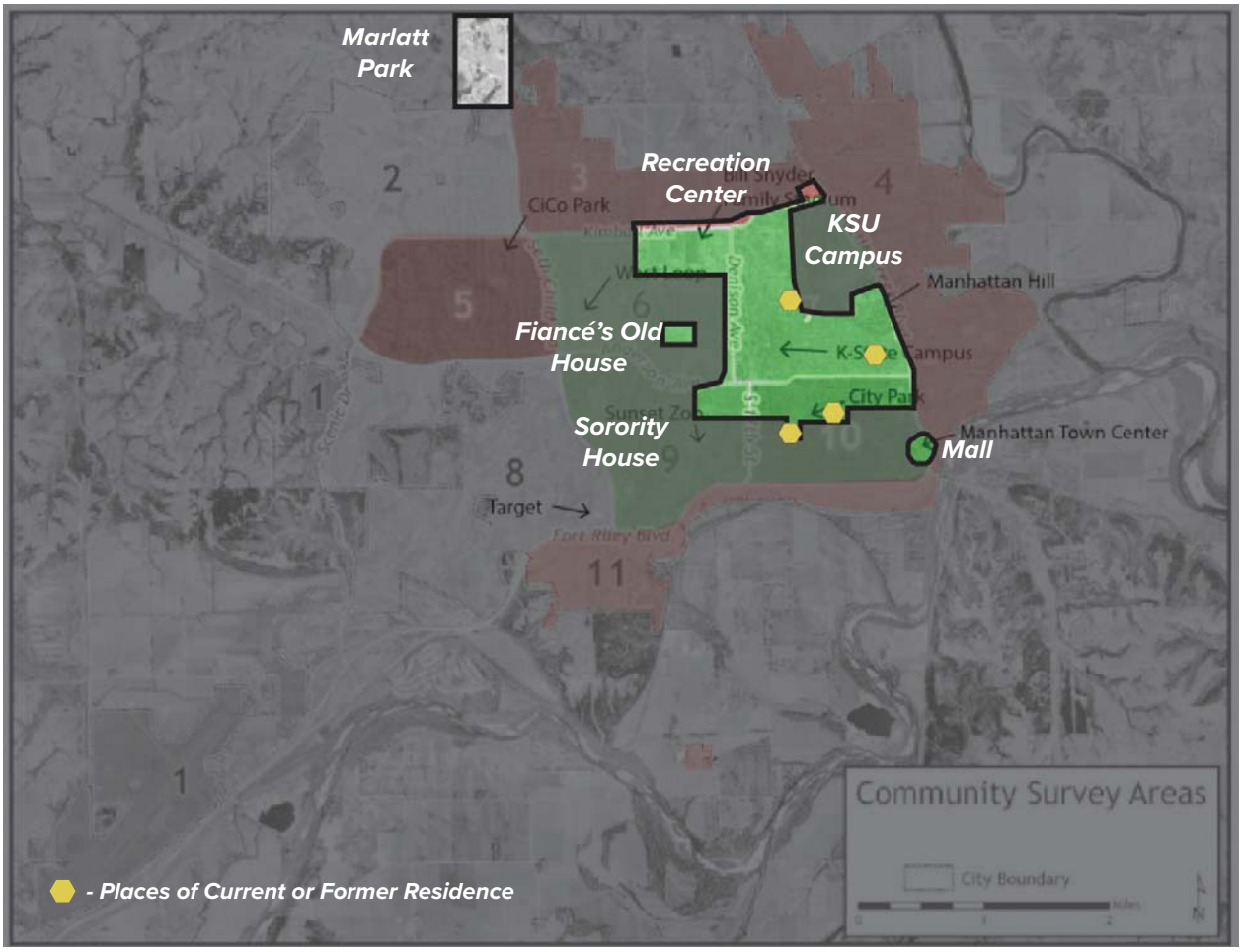


Figure 5.6: Case 2 older sister cognitive map extent overlayed onto areas of imageability (level of imageability: green - easy; no color - average; red - difficult). Her cognitive map extent is mostly based around her day to day activities, which she mentioned during the discussion is going to the the recreation center, campus, city park. However, some of her peak experiences are showing, but are now floating like her fiance's old house, the mall, and Marlatt Park. (City of Manhattan, 2016 adapted by Author)

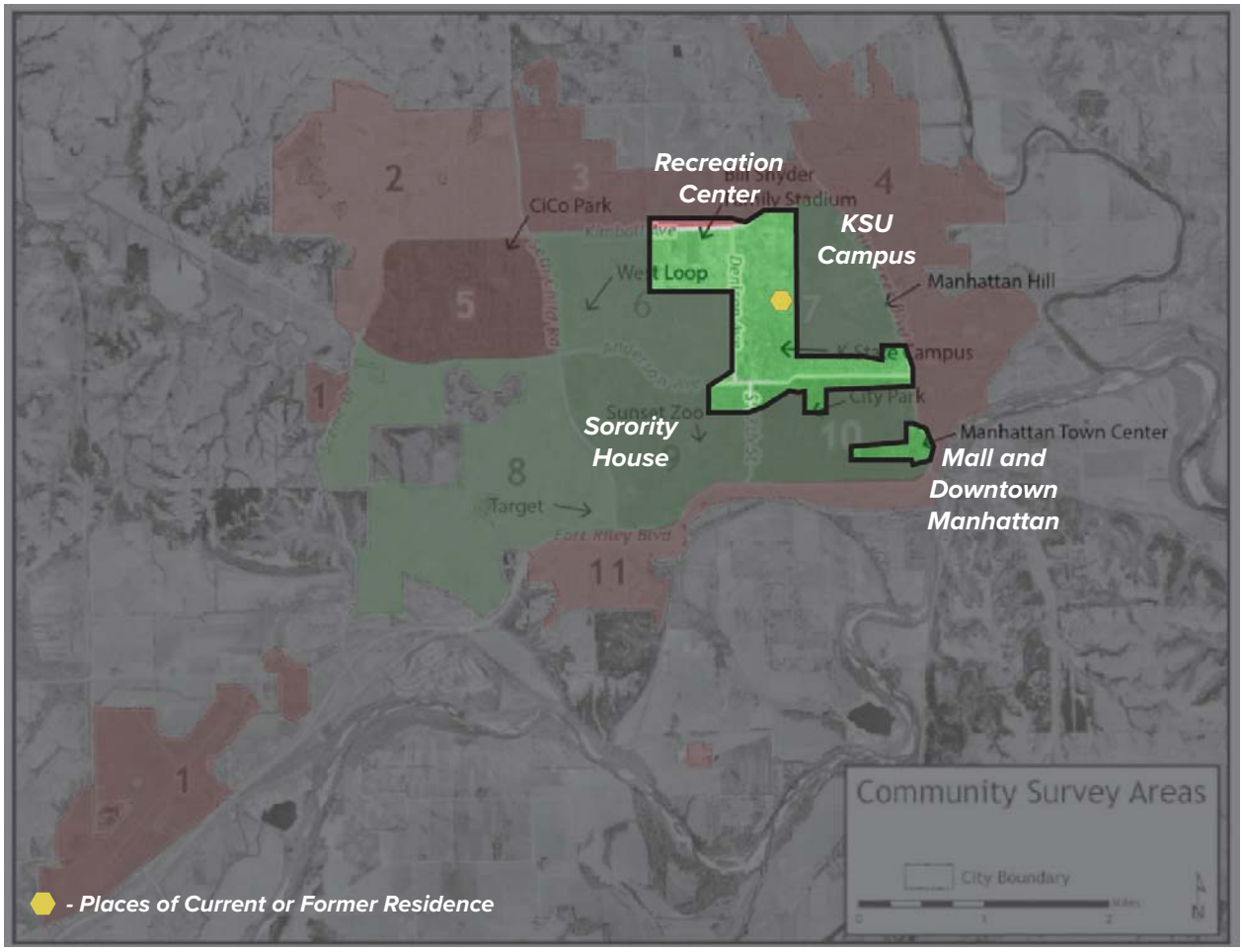


Figure 5.7: Case 2 younger sister cognitive map extent overlayed onto areas of imageability (level of imageability: green - easy; no color - average; red - difficult). The younger siblings cognitive map extent was bound by many of the same places as her older sister. The younger sister's life is current formed around places that she shares an experience with her older sister. However, as she experiences things on her own her map will begin to shape around new experiences that do not include her older sister. (City of Manhattan, 2016 adapted by Author)

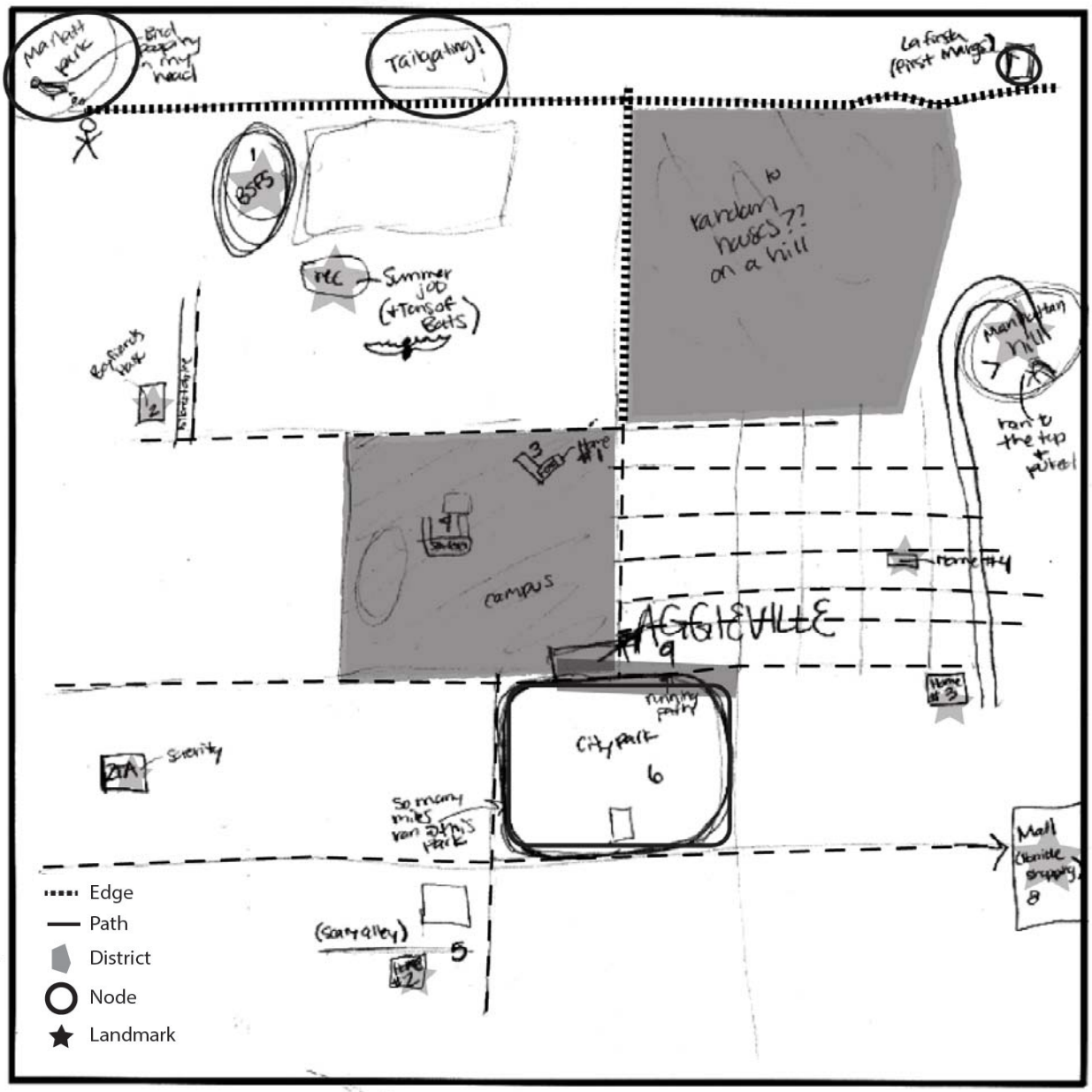


Figure 5.8: Case 2 older sister cognitive map coded into example of Kevin Lynch's Five City Elements. Her cognitive map validates that Lynch's theory can be used in cognitive maps that focus on experience.

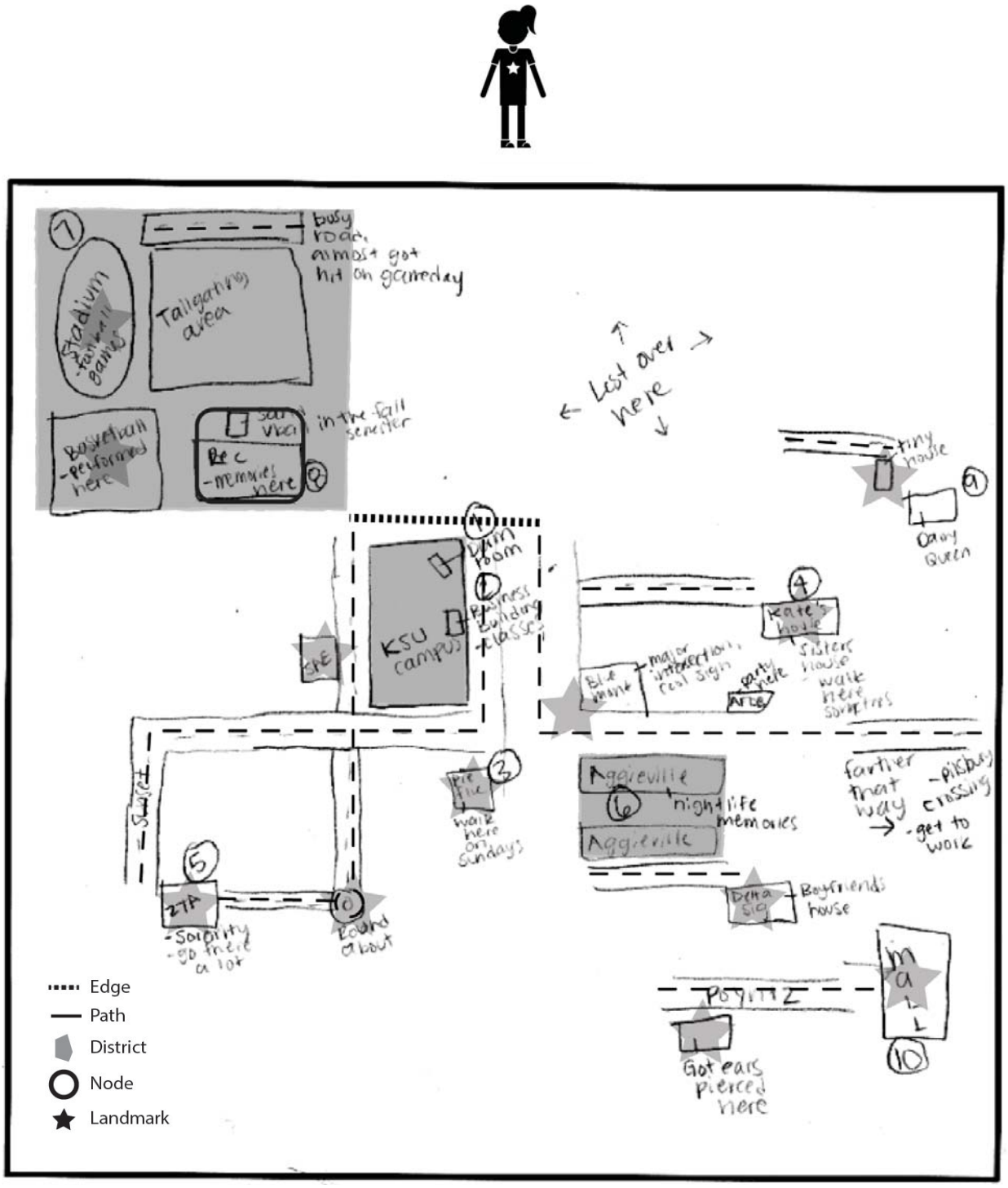


Figure 5.9: Case 2 younger sister cognitive map coded into example of Kevin Lynch's Five City Elements. The younger sister has many of the same places as her older sister, but ther cognitive map uses a different combination of elements.

5.1.3.2 Secondary

It was found out through the boyfriend that two of his older family members are/were a part of his fraternity, Delta Sigma Phi Fraternity. His older brother goes to Kansas State University and provided narratives of Manhattan to him even before he moved to Manhattan. Through the discussion it was discovered that the a similar mental process as his girlfriend was used develop parts of his mental map. Second-hand experiences were indirectly experienced to shape his cognitive map. These floating spaces contribute to the shaping his cognitive map.

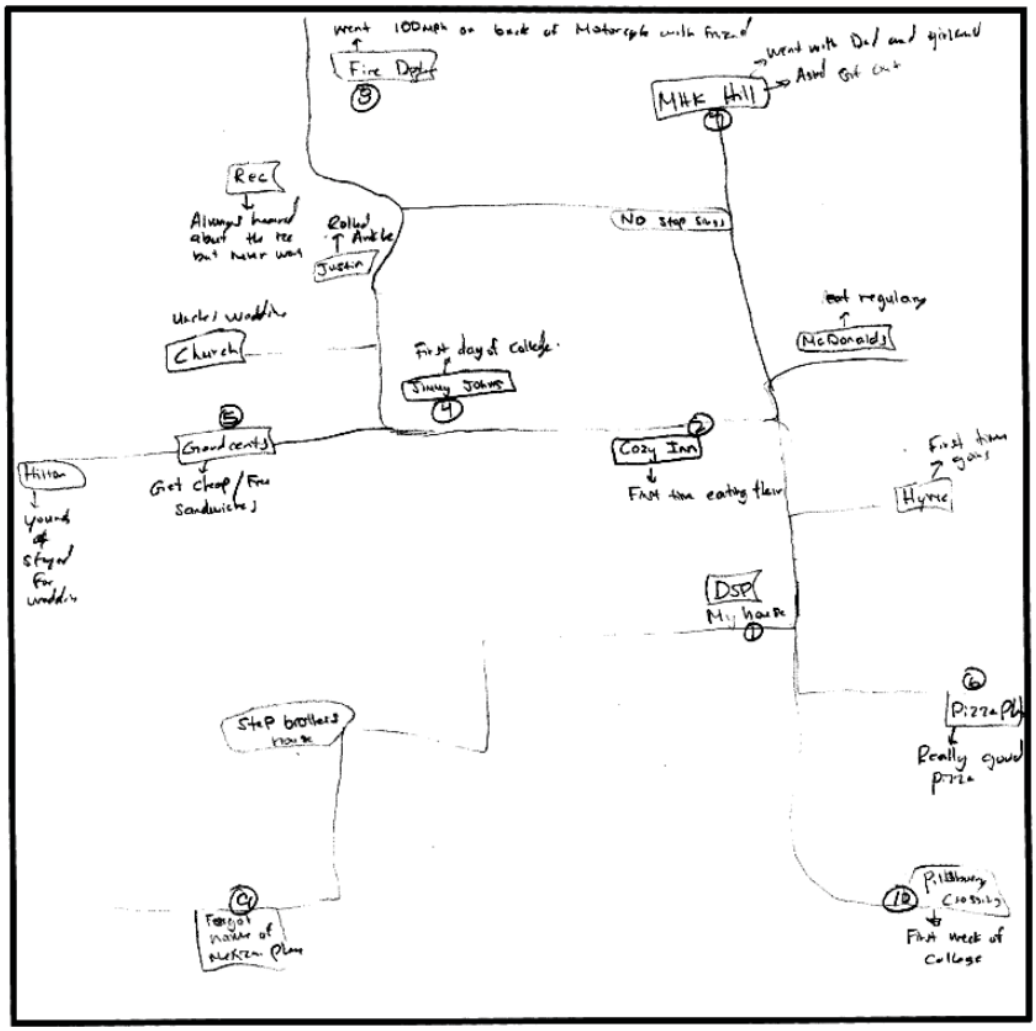


Figure 5.10: Case 2 younger sister's boyfriend cognitive map. This drawing contains places like "Cozy-Inn", "Jimmy Johns", "Pillsbury Crossing", "Hyvee" and "Rec" that were mapped becuase they were first experiences.

5.1.4 Case 3: The Returner

The Returner has lived in Manhattan two separate times. His experience of Manhattan is present in two separate part or phases of his life. The two stints in Manhattan take place with different people, places, and activities. Once coming back to Manhattan, he had pre-existing spatial cognitive schema and narratives. So, his cognitive map contains narratives from two separate residential experiences that occurred years apart. What is fascinating about his cognitive map is that is contains narratives from all types of experiences (Figures 5.11-5.15). Because he has lived in Manhattan twice, his cognitive maps are stored differently in his mind. He is not only chuncking his maps based on his everyday life, but he is clustering and remembering experiences from different phases of his life. For most of the individuals I have tested, they are currently living in Manhattan. However, with this individual, he lives in Manhattan, but he has also lived outside Manhattan after living there. These separate phases are influencing what experiences he remembers.

These first experiences aren't always remembered, but if they create a significant experiential impact, they may become peak experiences. When his first experiences (i.e. living in the dorms, walking to sporting events, etc.) became frequent, only the peak experiences amongst the past frequent experiences were remembered. There is a temporal aspect to these experiences because usually as time progresses the representation of experiences change in one's cognitive schema. So as time moves and experiences increase his cognitive map is morphing as new information from the narrative is being gathered.

When asked about what he remembers of Manhattan from his first time he said,

"So even like the earliest memories of Manhattan or K-State as a full time resident here stick in my mind. Maybe that is because they were my first experiences."

and...

"Even if there is a gap or though I was gone for two years and even though some things are ten years in the past, the things that sticks out to me are frequency plus experience, I guess."

This tells us that some experiences are able to stay with us longer than others. Some experiences of less value begin to fade and eventually do not help shape our cognitive map. The experiences that do stay in our cognitive maps over a lengthy period of time appear to be represented by a handful of peak experiences based on frequent experiences. When asked about Bramlage Coliseum, which was drawn in his cognitive map, he described his experience there as,

"So I worked there [as a photographer] 40 games a year, probably, between women's and men's basketball. I remember, obviously, a lot about the place and the experience of shooting the games and being on the sidelines and all that. But ***what I will remember and the stories I will tell are more specific to certain events*** *like being KU in 2008 and specific games and things that happened. More than my memory of the way something looked or smelled.* ***I wouldn't necessary remember those detail but those big events that happened within this bigger bubble of Bramlage****."*

This bubble he is referring to is the clustering of experiences that is mentally occurring as he is reviewing his cognitive map. He elaborates on his clustering of experiences as,

"Its like a nested thing, I guess. There is like a big circle and within that are the peak experiences. The things I recall and think about are the routine things that I did frequently and within that are the things I would pick out and say, so if im telling someone "yeah, I used to shoot photos at the games" I wouldn't talk about Bramlage or the act of shooting the game, but I would say "yeah, it was really cool being at the game in 2008 or meeting Frank Martin [former mens basketball head coach] or whatever, ***it's those peak experiences that stand out amongst the day to day experiences."***

He reiterates this concept by explaining how this concept is found throughout many places in his cognitive map like the K-State Campus, and the Konza Prairie Preserve, which is a conservation and biological and ecological testing site that allows the public to hike some of its trails.

"If I think if all my eight years in Manhattan, the things are probably related to.... Like the Konza, Ive been there maybe twenty times, no, probably a hundred...and twenty times or more. ***So the Konza is a place I frequent, but what I remember of the Konza Prairie is more of like five or six specific events that were high points****. Same*

with like K-State and campus, ***I would say like the daily minutia of begin here doesn't stick out but I'll remember 'this' event or things my friends did one time. There is like a contain and then like a heat beat or something.****"*

Overall, with this case we can see that experiences have a temporal element within cognitive maps. This suggests that cognitive maps change over time, demonstrating that the experiences or realization of edges, districts, et cetera, in Lynch's Five City Elements are influencing meaning within his narrative.. Our cognitive representation and value of the place changes as our personal relationship to the place changes through time. In this particular case some of the more meaningful experiences maintained their representation in the participant's cognitive schema, while others have faded away because of time. An example of how this concept is shown in his coding of Marlatt Hall, his freshman dorm. Marlatt Hall because a landmark during his first experience and continues to serve as a landmark for him years later because of its personal meaning to him. This suggests that particular aspects of urban form do influence narrative and may serve as a conduit for developing narratives and thus place identity.

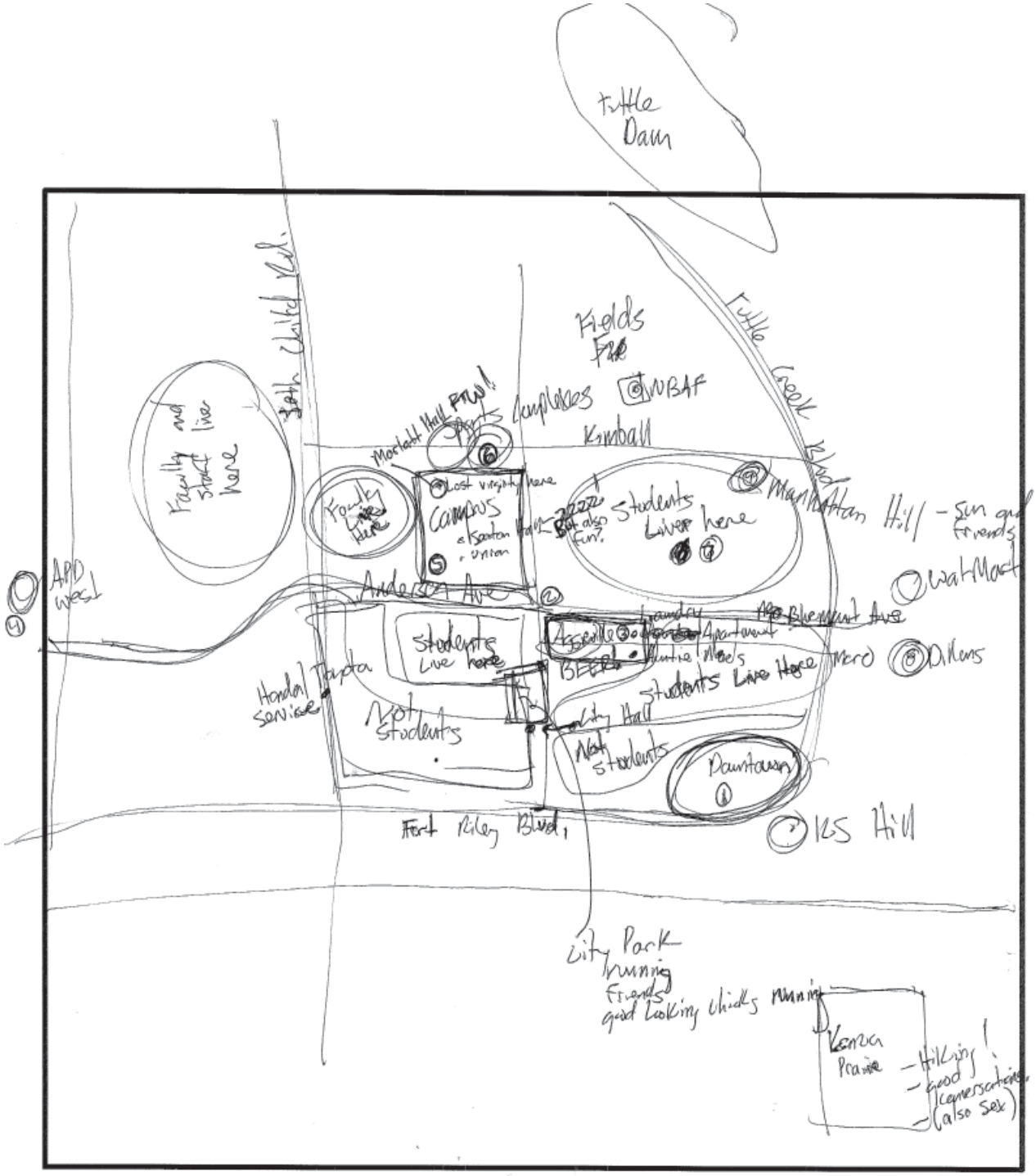


Figure 5.11: Case 3 cognitive map. This cognitive map contain a large number of places that are all fairly accurately located and does not contain many gaps. However, this map contains places from different time periods. For example, he wrote "Lost virginity here" next to the dorm he lived in his freshman year eight years ago.

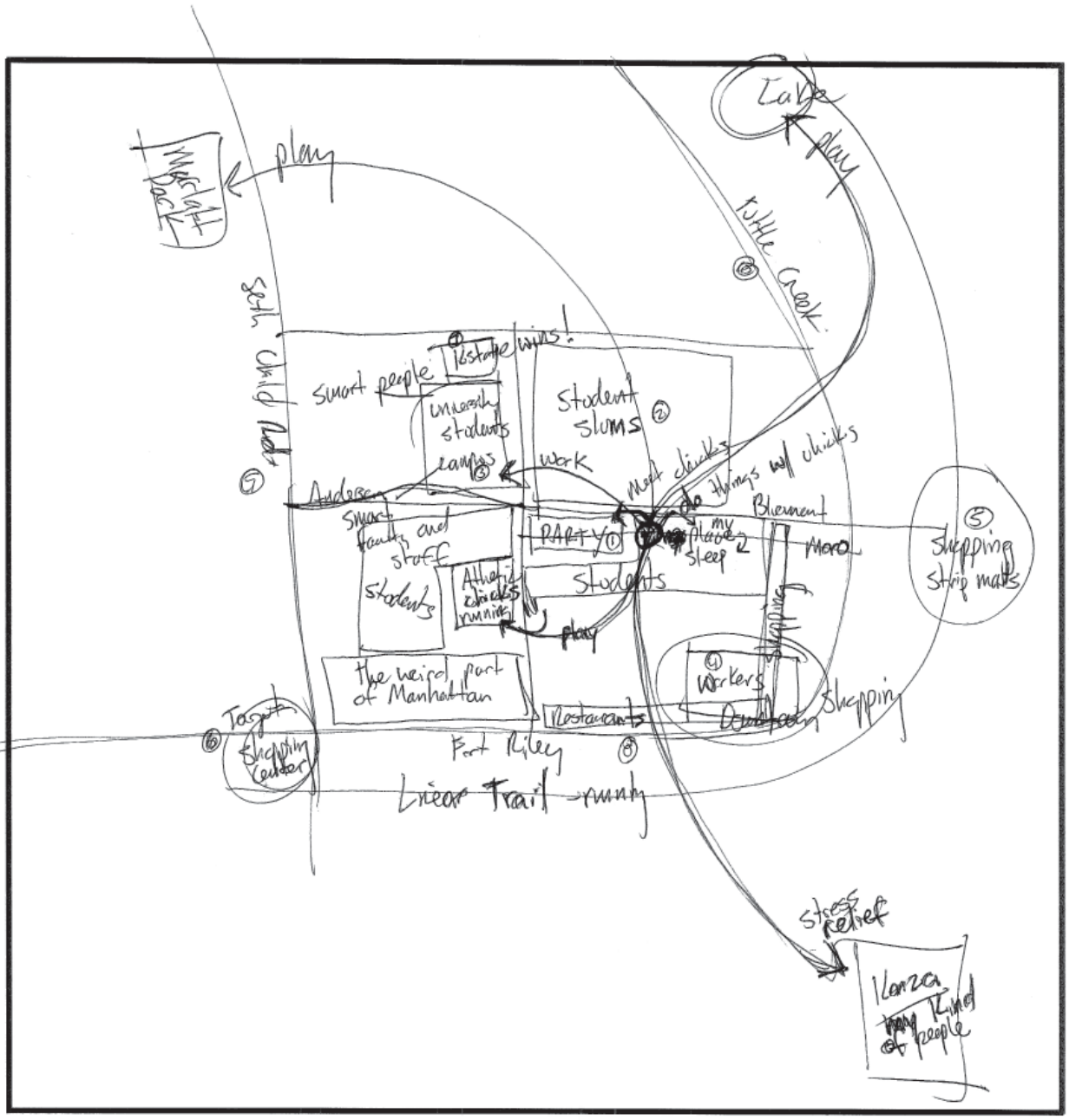


Figure 5.12: Case 3 stereotype map. Similar to his cognitive map, his stereotype map does not have many gaps. This map also references places outside of the city adn why they are frequented.

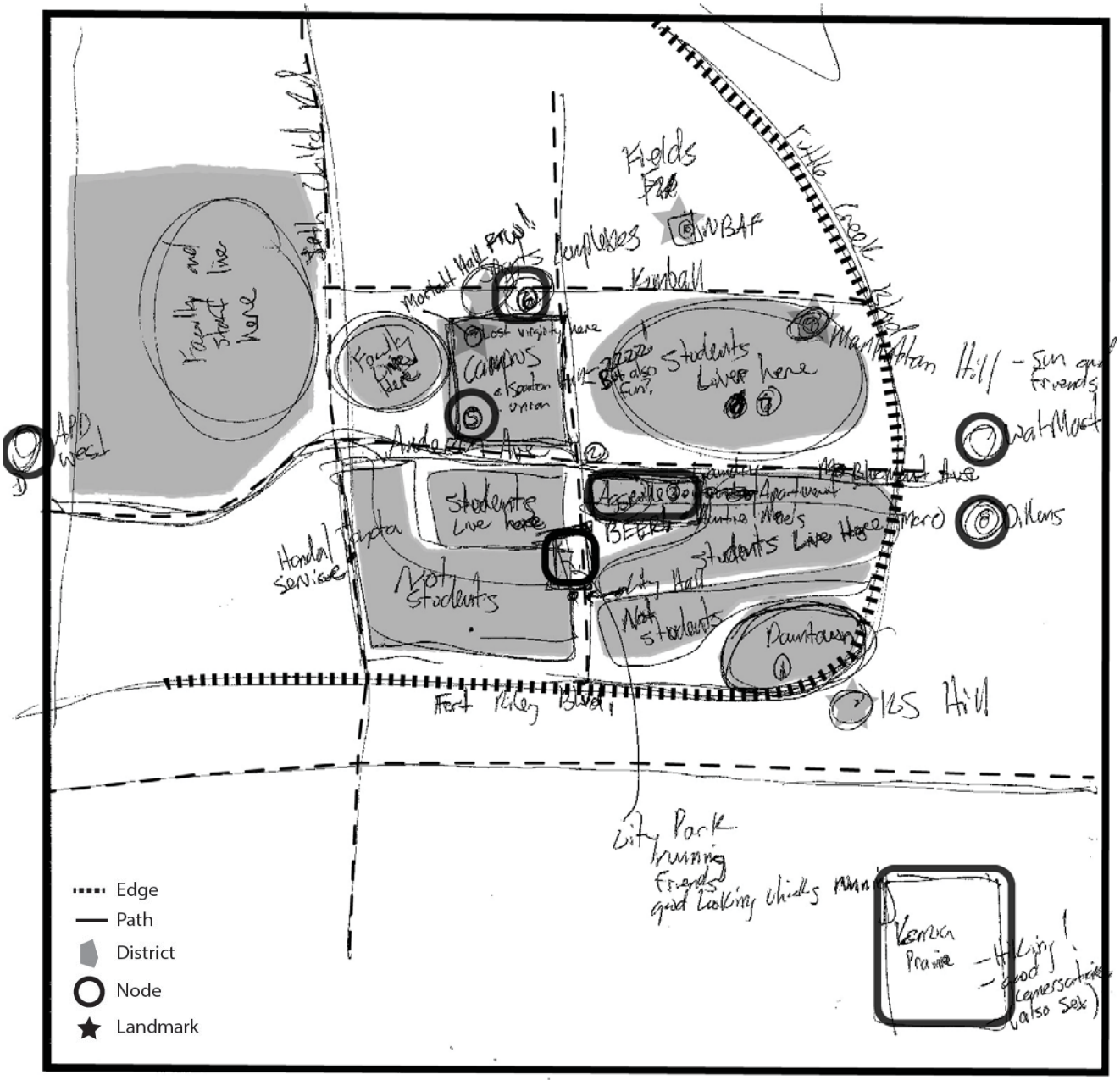


Figure 5.13: Case 3 cognitive map coded into example of Kevin Lynch's Five City Elements. This cognitive map does not contain as many gaps, which allows Lynch's elements to be easily applied. Nodes and districts were the most used elements followed by paths. This combination of elements is likely due to the fact that landmarks, a typical highly used element, are not used as much. This individual has been in Manhattan for so long that the frequent experiences may be enough information for him to move among the nodes and districts via paths without the need of a physical landmark as a reminder.

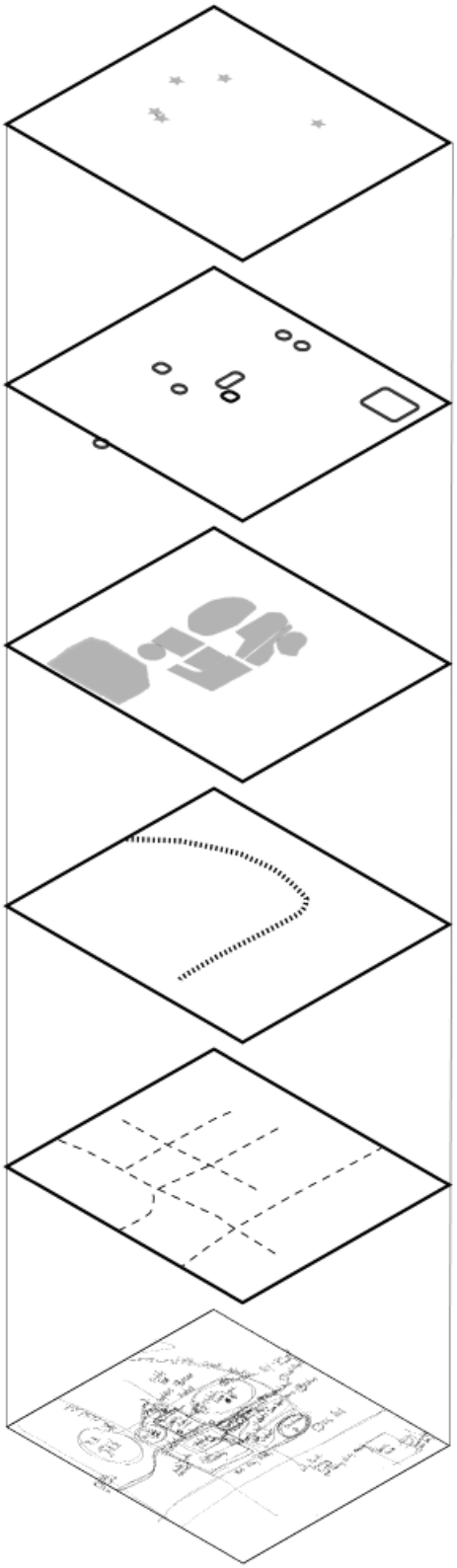


Figure 5.14: Exploded axonometric of his cognitive map elements

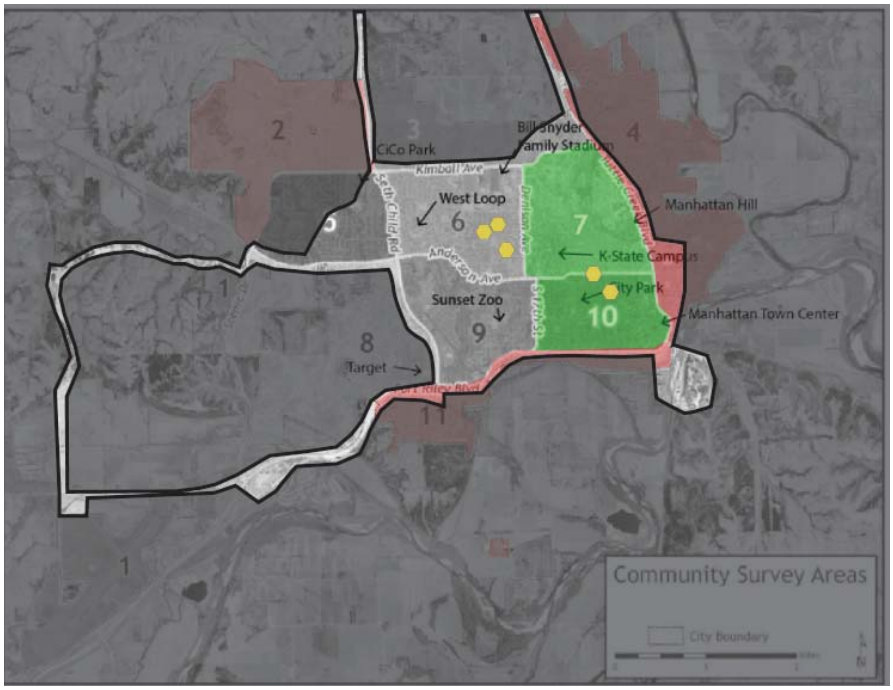


Figure 5.15: Case 3 cognitive map extent overlayed onto areas of imageability (level of imageability: green - easy; no color - average; red - difficult). His cognitive map extents is among the largest in the study. His map's extent is fairly limted to areas of easy or average imageability. This level of imageablity is likely due to time and the exploration of the city to build on frist or frequent experiences. (City of Manhattan, 2016 adapted by Author)

5.2 Synthesis

A synthesis of the findings and discussion includes four parts: Cognitive Map Research Study, Research Question Reflection, An Application, Critique, and Augmentation to Lynch's Five City Elements, and Application to the Profession. Table 5.1 shows the experiences that were identified through the findings and discussion. These experiences are mentioned throughout the synthesis section to illustrate their role in the union between narratives and spatial cognitve schemas

5.2.1 Cognitive Map Research Study

Overall, the research study shows that the participants showed greater familiarity and ease of imageability in areas near the Kansas State University campus (see Section 4.2). Many students live near campus and drew elements that were highly associated with this area. Some individuals' cognitive map extent was limited to just the areas around the campus. Regardless of the extent of the cognitive maps, each cognitive map contained places that represented a type of experience. The study was able to shed light onto a typology of how people are remembering space and the elements of the city. Each cognitive map is made of elements that expresses a type of experience.

Table 5.1: Found Direct and Indirect Experiences

This table is contains experiences that were found throughout the study and their characteristics. The experiences within the table will be referenced periodically throughout this section.

Direct	E1: First Experiences	Occur for the first time
	E2: Frequent Experiences	Commonly occur; day to day
	E3: Peak Experiences	Create a lasting feeling, memory, meaning, or narrative
	DE: Dual Experiences	Peak experience that occurs with/during a first or frequent experience
Indirect	E4: Second-hand Experiences	Based on shared narratives from an outside source

Three cases highlight the different type of experiences that were represented in the other cognitive maps. For Case 1, an international student's data was used to show how frequent experiences influence how someone might understand and remember space. The international student walks from her house to her classes on campus. Her frequent experience (Table 5.1.E2.) of walking the path contains value because it is a part of her day to day experience. As she frequents the path more her spatial cognitive schema becomes more accurate. This idea can be applied to most frequent experiences. Case 2, a look into a sibling relationships, shows the impact that others have on our cognitive maps. In this case, the older sister is sharing her frequent experiences with her younger sister. For the younger sister these are new experiences (Table 5.1.E1.). This means that the sisters are simultaneously experiencing a space, but representing it differently because the meaning of the place is dependent upon the type of experience. One place does not always provide the same experience, which results in different levels of meaning to different people. Case 3 shows a student whose cognitive map contains places from two separate times he lived in Manhattan. His cognitive map shows a transition of representation and value of his experiences. These findings suggests that the representation of a place in our mind is tied to our value of the place based on an experience (Figure 5.16).

5.2.2 Research Question Reflection

What is the relationship of narratives and spatial cognitive schemas?

A narrative contains experiences that relate to other experiences. This relationship between experiences shapes our narrative of space and place. Narrative is a collection of experiences with settings, people, actions, and emotions (Corman, 2013). As experiences of space occur it begins to evolve the narrative of the space. For example, in Case 3 the frequent experiences of Bramlage Coliseum occurred, but the experiences that represent Bramlage in his cognitive map evolved from a frequent experience representation to the peak experience representation. The narrative of space contains spatial characteristics that feed the spatial cognitive schema (Rapoport, 1977). An example of this is first experiences of the younger sister in Case 2. The narrative of space she experienced for the first time

is being recorded and placed into her spatial cognitive schema. These first experiences help build and grow the extent and imageability of their cognitive map. Sometimes these spaces are "floating" or not connected to any other part of their spatial cognitive schema. The more the space is experienced the more the space will begin to be connected and located accurately. More valuable experiences will sharpen the narratives' characteristics, including the spatial characteristics (Lynch, 1960). Over time, only the most valuable experiences and their narratives are remembered, including their spatial characteristics such as location, size, shape, aspect, and many others. If spatial characteristics weren't retained with the narrative, then even the most meaningful and clear experiences would not be able to be placed spatially. Case 3 showcases this idea fairly well. In Case 3, the only experiences represented in his cognitive map from his first time living in Manhattan were frequent experiences that carried into this time living in Manhattan and past peak experiences that contain value. Meaningful spatial characteristics will increase the imageability of the spatial cognitive schema (Lynch, 1960). For example, the international student in Case 1 uses her frequent experiences to guide her decisions, which are based on her increasing understanding of space through experiences. Cognitive maps may reference the spatial cognitive schemas first and then reference the tied narrative and even deeper, the experience with feelings and thoughts of space. The cognitive process of referencing within the hippocampus may be formed within a split second (McNamara, Shelton, & Shelton, 2003). When place is referenced the narrative may be referenced before the spatial cognitive schema. This shows a direct connection between narrative and spatial cognitive schema where the narrative takes reference order preference over the spatial cognitive schema indicating meaning of place (Trancik, 1986; Tilley 1994; Landry 2012). Meaning of place is a foundational concept used for Place Attachment Theory and Place Identity Theory. These theories point to possible guidelines for place making design.

This leaves three important resulting questions to ask:

- What variables cause an experience to gain value, if any?
- If there are clear variables, how and why do they affect the value of the experience?
- Can these variables be used to design urban spaces that result in higher levels of meaning and value?

5.3.3 An Application, Critique, and Augmentation to Lynch's Five City Elements

Kevin Lynch's theory of the Five City Elements was used in multiple ways throughout the research process. First, his theory was used as part of the research's application of informed grounded theory. The concept of the five elements was used by the researcher throughout the study to help frame questions during the discussions, which occurred after the completion of the cognitive and stereotype mapping (see section 3.2.2). Secondly, Lynch's theory was able to be applied to many cognitive maps within this study, where drawn symbols can be interpreted into one of the five elements. In some cases, it was unable to be applied due to the abstraction of the drawn cognitive map.

After use of his theory, an important limitation became apparent. To begin, the theory does not seem to directly account for different types of experiences and narratives that affect the spatial cognitive schema of the cognitive map, but rather relies on indirect association of elements to the formation of narratives. Not accounting for the affective experience limits the potential depth and application of the theory to urban form. As mentioned before, meaning of place is a foundational concept to many current social pace theories, which were recognized after Lynch's Five City Elements. Thus, Lynch's theory lacks of recognition of meaning of place. This causes concern for the application of the Five City Elements to urban form and design in the future.

This research calls for an augmentation to Lynch's Five City Elements in order to account for experience and temporal variables, while acknowledging recent social place theories. Methods to investigate these variables would need to be conducted before any augmentation is accepted. The following is an outlined methods procedure: First the participants would start by recalling important events, actions, thoughts, feelings, and experience, in essence providing a story about their association with a place. These would then be used to develop more spatially structured cognitive maps.. The participants would draw their cognitive maps of a specific city at different time intervals based on their life at that point in time based on the chronological order (loosely) if the experiences and narratives from the first step. A minimal of three different phases would then need to occur in order to get a comparable sample. For example, participants may be asked to draw one cognitive map once a year for five years. The maps would need to contain written

descriptions of how and why they remember the places found in their cognitive maps. This would present the researcher with a temporal comparison. Next, the researcher would identify places that were found in different periods of time for each individual. Next, the goal is to identify the experience tied to the place and see how the experience and reason for remembering has changed. This may illustrate the evolutions of the space value and meaning with in cognitive maps. Then, the researcher would identify what experience phase the space is represented in (see Table 5.1) (Fredrickson & Kahneman, 1993). For example, the experience may be shifting from a first to frequent experience, from frequent to dual experience, etc. This process would help show how the person's life has changed over time including habits and frequent experiences. Finally, the research would identify trigger points to cause shift of experience and place value within cognitive maps in an attempt to isolate experiential and temporal variables that could be used to plan and design place making projects.

5.3.4 Application to the Profession

The current study can be used to understand how experience of urban form impacts individual knowledge and value of the urban fabric. Understanding value of place and its application to place attachment and social identity theory can help frame urban design projects to think about and design for place-making. Landscape architects and planners can apply this concept during the design process to design with different types of experiences in mind. Experiences of place can be applied to land-use planning, master planning, zoning, revitalization, redevelopment, urban streetscape, parks, campuses, resorts, etc. For example, a landscape architect may be designing a streetscape in a desolate busines s district in rural America. In order to create bring life, energy, and meaning of place to the space a dual experience made up of a first and peak experience could be used. The landscape architect could look to add a plaza that encourages adjacent restaurants to place their outdoor dinning next to – similar to how many European plazas are designed. The plaza could then be programed to provide live entertainment on evenings to provide a dual experience. Unique to many westerners, the European plaza design would be a first experience. By designing a shared plaza the outdoor experience of the design would create a lively atmosphere and provide entertainment. If the designer wanted to help develop the districts identity they may try to target creating a memorable frequent

experience with in their program by adding banners with the name of the district to street lamps. This design decision may stand out to individuals that inadvertently pass through the district and help them begin to add shape the bounds of the district in their mind. Designers should have the types of experiences in mind when designed so that they may be aware of how their design might affect users value of the space. Planners can use the types of experiences to visualize Lynch's Five City Elements differently. They can begin to recognize the public may cognitively understand the city based on their experiences. This may influence design review committees and their roll of making sure development, whether it be a proposed landmark, district, or road, efficiently works to increase imageability.

After studying and augmenting the theory, landscape architects and planners would be able to identify and design specific elements to appeal and accommodate users with diversity of experiences according to how they cognitively code or value the place. The development of a trigger variables for each experience could be used to with the goal of developing spaces that have high meaning and value. Urban form could then be developed around experience. Urban designers may use these variables to build a kit of parts of experiences they want to use in the design. For example, zoning ordinances for an entertainment district could be written in ways to allow for or encourage a specific type of experiences through experiential variables.

This study has opened my eyes to the massive impact our environments affect our lives. We are constantly experiencing and recording information about our environments. For example, I now think of how and why my experiences are influencing my decisions. I am being more thoughtful and throughout of how I am experiencing a place and how it is being recorded and categorized in my mind 'which of the 5 types are occurring'. This new awareness has already begun to shape how I think of space and place. I recently assisted with a mid-critique for an underclass studio. During the mid-critique I was analyzing each space's experience and using it to influence my design recommendations. I feel that this will continue throughout my life and will ultimately help me understand how to design with experience in mind.

Figure 5.16, was created to show that the type of experience can result in a different impact on cognitive maps. These types of experiences can then be used to better understand how cognitive maps could be coded by their

experiences (Figure 5.17 & 5.18). This understanding of experience type may influence how designers think of forming narratives and how they relate to the greater urban context, with the goal of creating a cohesive understanding of the urban fabric. For instance, DE in Figure 5.16 represents that the combination of frequent and peak experiences will likely have a most lasting impression on memory and thus cognitive map. Whereas, first experiences, if not peak emotional, may fade quickly from memory due to lack of meaning.

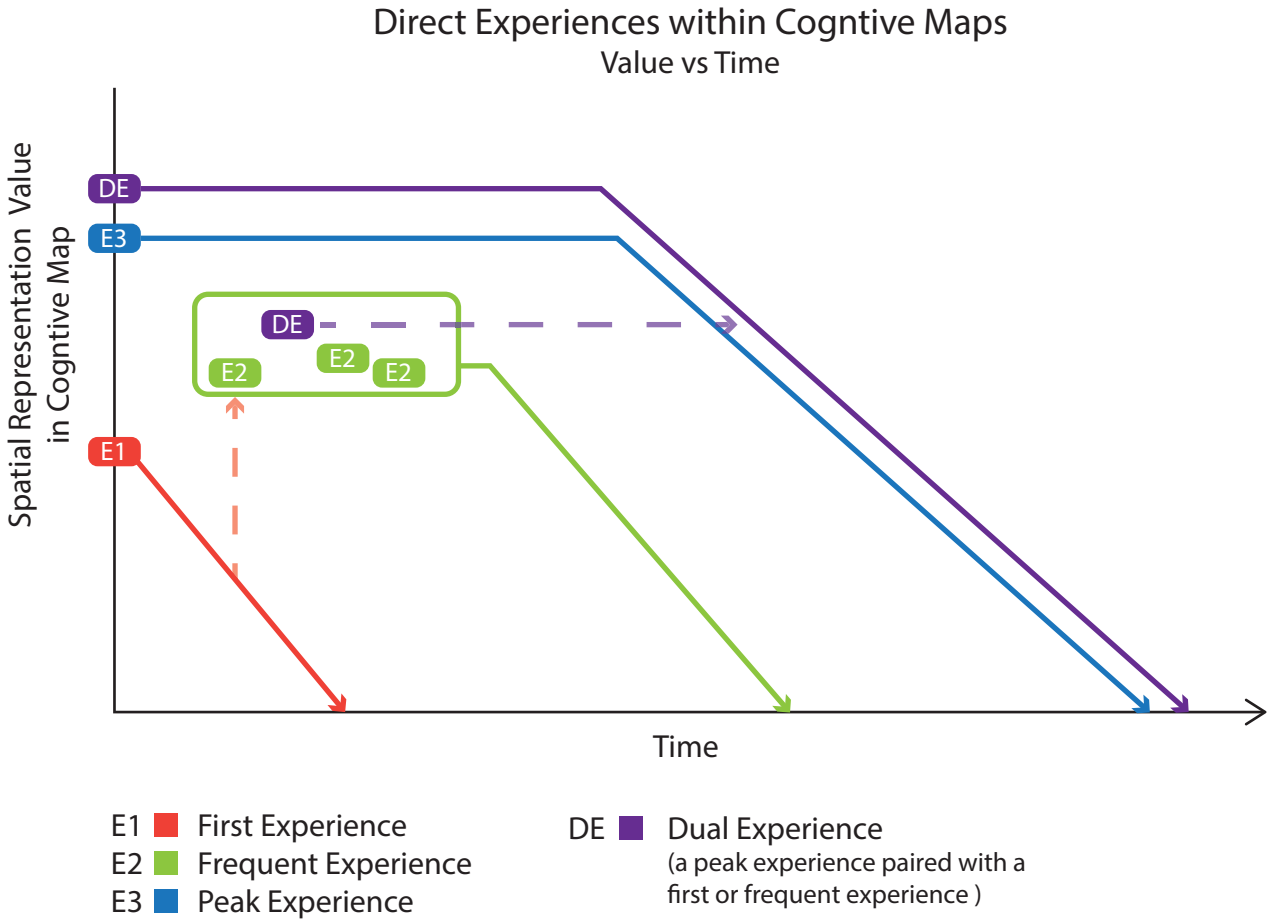


Figure 5.16: Concept graph of Direct Experiences within Cognitive Maps in relation to value and time. Not all experiences of one type have the same value. Some experiences may be more valuable than others with in the same type. The experiences with the higher values are theorized to last longer and contain higher levels of imageability within cognitive maps.

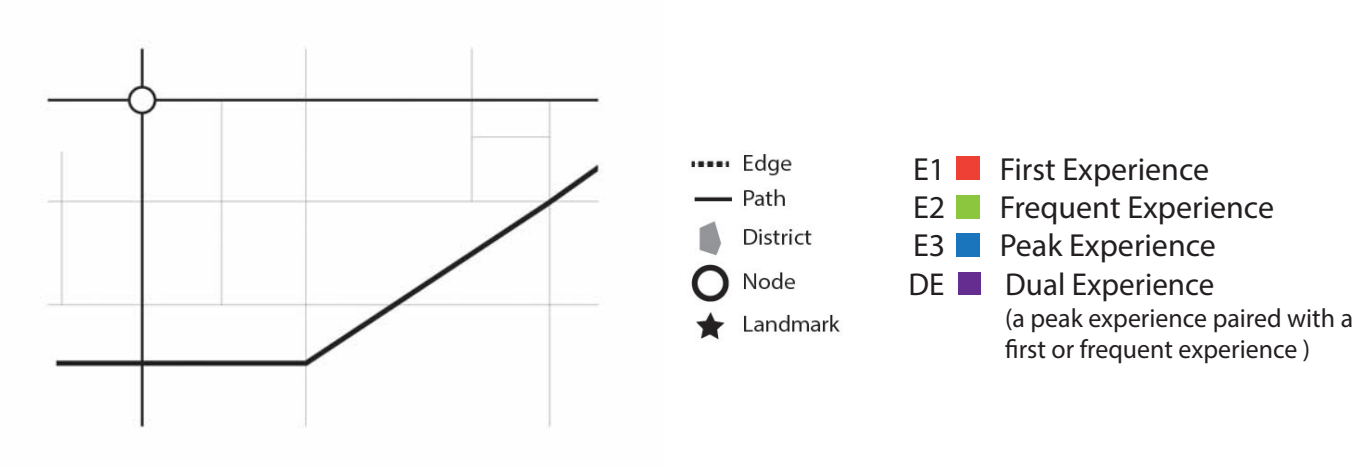


Figure 5.17: Example Base Map

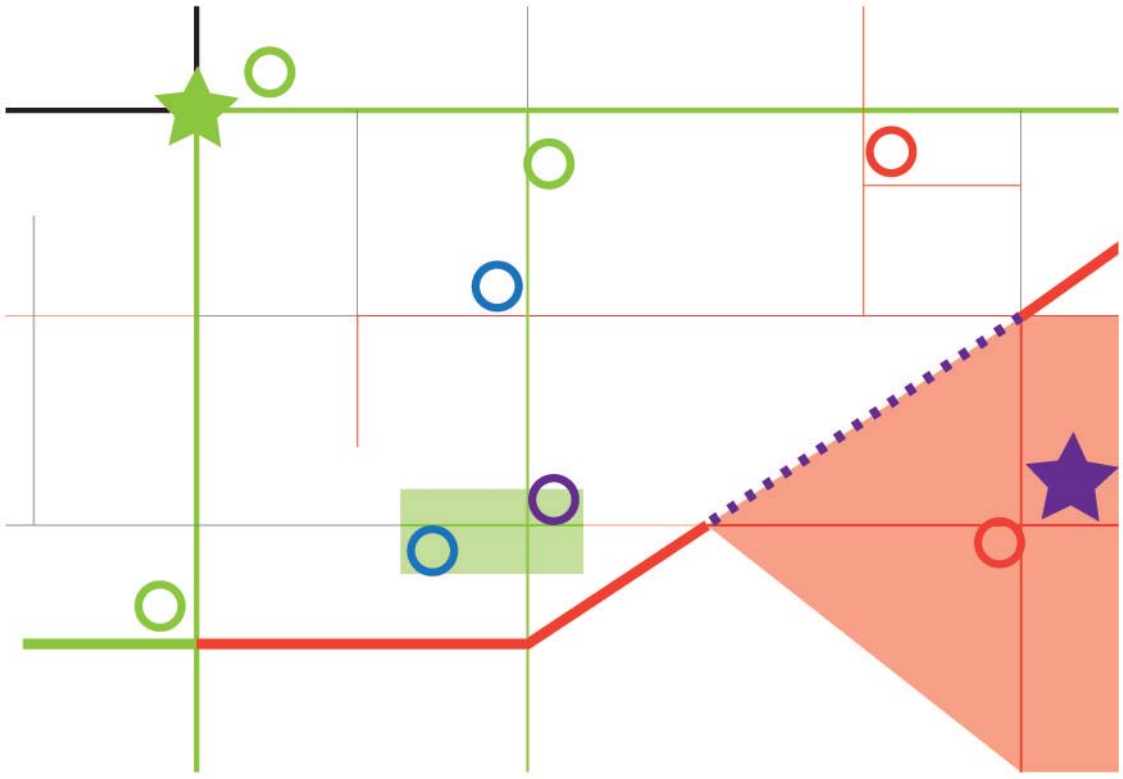


Figure 5.18: Example of how Lynch's Five City Elements can be futhered with experience in mind. This is a closer representation to how cognitive maps appear than with the Five City Elements alone.

5.3 Research Considerations

5.3.1 Limitations and Lessons Learned

This study was limited by time and number of participants. This was primarily because participants were gathered through a volunteer basis. If more time was available I would have looked into developing my methods to allow for a in-person cognitive map tour, where the participant would guide me around the city based on their cognitive map. I also would have developed a follow up study to address questions or delimmas, such as having participants draw their cogntive maps again, but at the same scale. It is highly encouraged that future research test as many individuals a possible in order to provide as much comparable data as possible. This would help isolate variables.

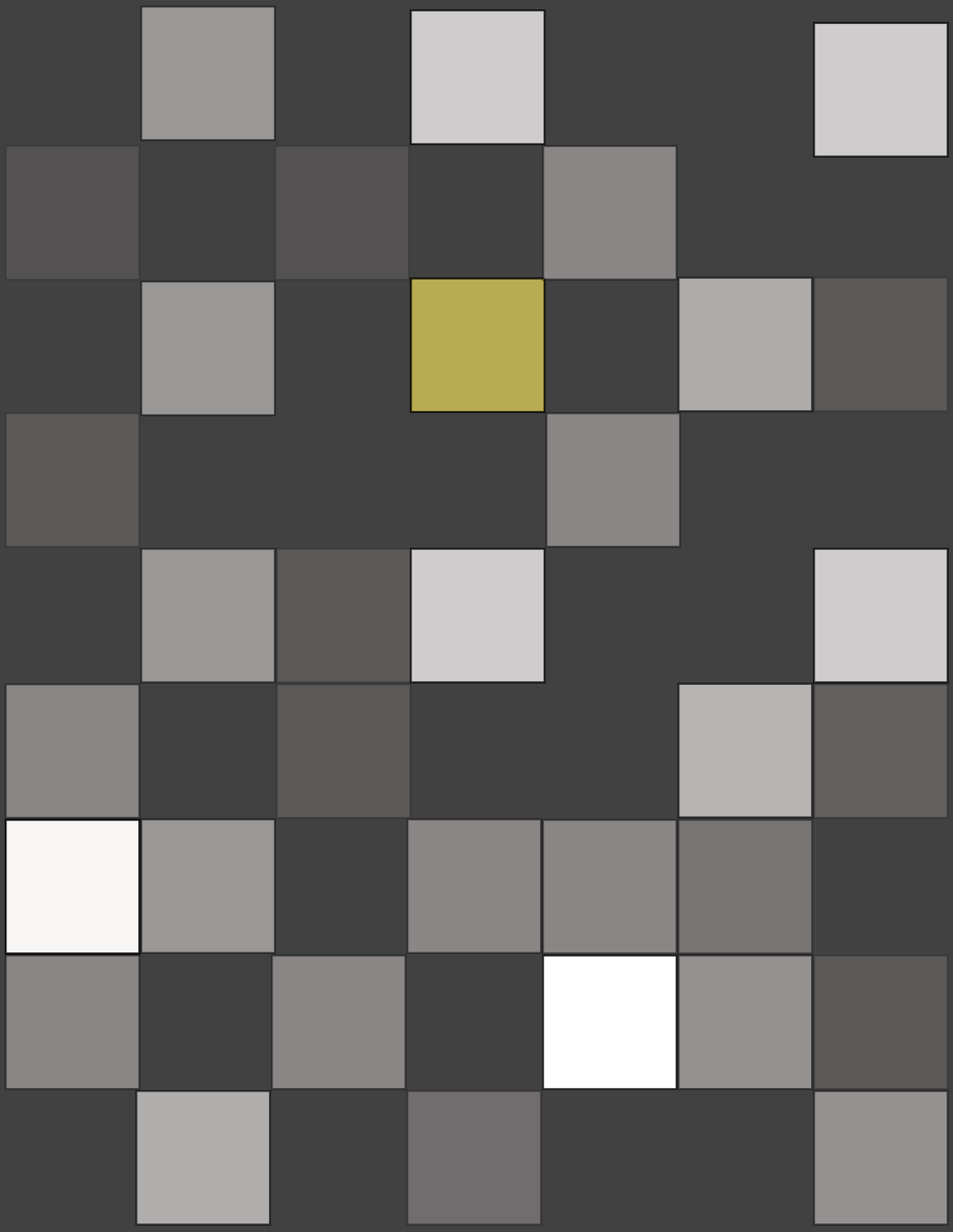
One shortcoming of this research is the investigation of second-hand experiences. The methods developed did not allow enough time to dive deeper into second-hand experiences. Second-hand experiences are indirect and are mainly comprised of thoughts, where direct experiences are real world and thoughts together. Another study with a focused approach would have needed to be developed in order to clearly understand the relationship between second-hand experiences, narratives, and spatial cognitive schema. This is primarily because of the lack of knowledge on the abstract cognitive representation of second-hand experiences and is more difficult to qualitatively study than real world urban environment experience.

Many lessons were learned during this process including: how to administer a multi-section study, develop a framework of experience development, mapped experience of urban form, and applied general theories of other disciplines to urban experiences.

5.4 Future Considerations

This study may be furthered by investigating each individual's cognitive map within the real urban environment. This could be done by having a participant take the researcher around the study city as demonstrated in Lynch (1960). This would allow the researcher to record where the person drives and the comments they make about the urban environment. These would be real time narratives being experienced in real-time, not asking participants to actively recall and draw their maps. This would allow for narratives to be expressed on-site, which may provide detailed information that may not be recalled on the spot during a study away from the site.

This research could furthered by conducting the outlined research found in Section 5.1.



Chapter 6: Conclusion

This study builds on a variety of literature and previous studies, which together, demonstrate that individuals' use experience to craft narratives that have spatial components that are diagrammed in cognitive maps. These narratives correspond with elements found within spatial cognitive schemas of cognitive maps. These narratives are experienced based.

6.1 Result Significance

This study has determined that experience within the urban environment can lead to the formation of narratives which can be found in cognitive maps. These narratives provide an indication of how and why specific elements are found on cognitive maps and ultimately shape our lives as Rapoport (1977), Tuan (1977), and Ittelson (1978) theorized. Peak experiences increase remembrance, which may be used to orient how planners and landscape architects design city elements to foster meaning of place (Lynch, 1960; Fredrickson & Kahneman, 1993). Adopting these findings and concepts can improve designing spaces by adding meaning to the urban environment.

6.2 Closing thoughts

Many meaningful narratives about urban form exist. Our cognitive maps are one way of spatially representing narratives. Urban experiences shape how individuals spatially understand and build on their experiences in cities. Researching cognitive maps can illustrate how cities and inherently people identify themselves.

Personally, this experience has allowed be to dive deeper into narratives of urban form. The findings of this study have strengthened my belief that designers have the ability to craft narrative within the urban environment by implementing specific amenities to encourage different types of experiences. The hope is that through my own designs process, I will be able to positively influence narratives - effecting peoples lives through spatial, social, and cultural meaning.

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Design Graphics

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Appendices

A - Outline of Researcher Procedures

Introduction

“Thank you for volunteering your time and supporting my research. Please read and complete this consent form. *hand out consent form and give a few moments for them to complete*.

Section 1: Individual Brainstorming (5 minutes)

“Thank you for completing the consent form. We will now move into the first of the five sections of this study. *hands out copy paper to participants* For this section, please take the next five minutes to individually organize and brainstorm about how you view and understand Manhattan. I will not be using this for the research so please do what is comfortable to you. The main goal of this is to allow you to think about your mental map. The goal isn’t to recreate Google Maps.”

Procedures:

1. Researcher will provide participant with a plank letter size piece of copy paper

2. Participants will individually brainstorm and think about how they organize their cognitive map with the copy paper used as scratch/doodle paper to help organize their thoughts

Section 2: Individual Cognitive Map (10 mins)

“You may use your brainstorming paper to help you with your individual cognitive maps. We are wanting you to try to best represent your how you organize and understand Manhattan spatially. Again, we are not looking for a recreation of a map of Manhattan. Rather, we would for you to draw how you see Manhattan. You may draw your best friend’s house, where you always go for brunch, or where you fell and sprained your ankle. Draw it if it helps you understand, feel, or orientate yourself in Manhattan. We are mainly focusing on locations. Areas will occur later. This may be how you think of Manhattan on the ground”

Procedures:

1. Handed two (2) 11” x 17” sheets of paper with instruction at the top and a 10” x 10” drawing window. One sheet will be used for the cognitive map and the other will be used for the stereotype map.

2. A short prompt describing what a cognitive map is will be read to participants. This

prompt will cover that we are not looking for a copy of Google Maps but a personalized map of how they mentally create and remember Manhattan, Kansas.

3. Participant will have 10 minutes to draw their cognitive map

4. After the time if up, participants will be asked to finish what they are working on and put their maps to the side

Section 3: Individual Stereotype/Cluster Map (10 mins)

“This map may be similar to your cognitive map, however we are want to look at your map but from a bird’s eye view or how you think about parts and areas of Manhattan. For example, I may think of the south side of Chicago differently than you do. It may be a place of home for me, while it may be a crime filled place for you. We want to see how you cluster points and areas in Manhattan base on your experience.”

Procedures:

1. Participants will now take page two of what was handed to them prior to drawing their cognitive map.

2. A short prompt describing what a stereotype/cluster map is will be read to participants. This prompt will cover that we are wanting to understand how the participants cluster and organize parts of Manhattan, Kansas.

3. Participant will have 10 minutes to draw their stereotype/cluster map

4. After the time if up, participants will be asked to finish what they are working on and hand the researcher both maps that they drew.

Break (5 mins)

*Allows researcher to review drawn maps and set up for Section 5: Display and Group Discussion

“Please take a break and get some water or relax. We will begin again in 5 minutes”

Section 4: Display and Group Discussion (20 minutes)

Procedures:

1. Participants will now be asked various general prompt questions

2. Throughout these questions some of the maps drawn in Sections 3 and 4 will be displayed on an overhead projector.

3. This discussion will continue until time expires

Participants will now complete the Section 1

Potential Prompt Questions:

A. Did you find anything surprising to you in your cognitive map?

B. Can you explain your cognitive map drawing process to me?

C. What type of things happen in the area of town you live in?

D. How has where you lived influenced how your cognitive map?

E. What places stand out to you most in your cognitive map?

Section 5: Short Online Survey

“Thank you for your participation so far. We have reached the last section of the study – the online survey. After you complete the survey, you are free to leave.”

Procedures:

1. Provide Qualtrics survey to all participants via laptops and tablets and smartphones

2. Confirm consent form

3. Collect survey deceives

Sections 2-5 completed during this time

4. Participants to complete survey (including and inventory of their map)

5. Study will now end

Section 6: Individual Discussion

Questions for Case 1: International

• Why do you think your map is framed this way?
• Can you describe your map for me? Step by step
• What stands out to you most in you cognitive maps? Any narratives along the way?
• Are you happy with your cognitive map? What would you change?

Questions for Case 2: Siblings

• How much of your mental map is influenced by your sister, her stories or going there with her?
• How does the older sibling affect how your understand the city?
• What parts of Manhattan have you shown her and why?
• How much of your cognitive map is filled with places you have never been and are arbitrary floating in your map?
• Who were you first with when you cam to Manhattan? How has your map formed over time? Rapidly?
• Are you happy with you cognitive map? What would you change?

Questions for Case 3: The Returner

• How has your map changed over time?
• What spaces were important to you back then verses now?
• Are you happy with your cognitive map? What would you change?

B - Online Survey

KANSAS STATE UNIVERSITY

Consent Form/ID

Please enter the ID provided to you

Age

How many fall and spring semesters have you completed at K-State?

Which of the following genders do you most associate with:

Male
Female
Other

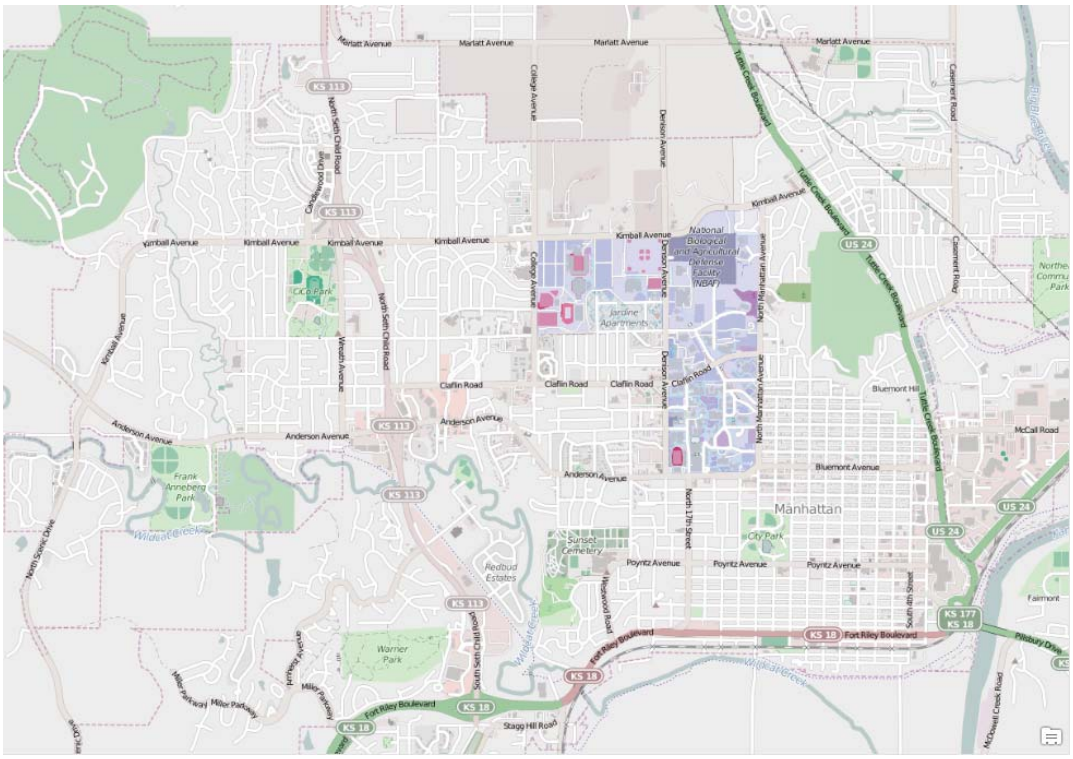
How long have you lived in Manhattan, Kansas?

Less than one year
1-2 Years
3-4 Years
4-5 Years
5+ Years

How do you travel through Manhattan, Kansas?

	Never	Rarely	Sometimes	Often	(Nearly) Always
Walk	○	○	○	○	○
Bike	○	○	○	○	○
Automobile	○	○	○	○	○
Public Transportation	○	○	○	○	○
Other (i.e. skateboard, rollerblade)	○	○	○	○	○

Click on the map once to indicate where you currently live (within a block or so)



What month/year did you start living there (e.g. 9/2016)

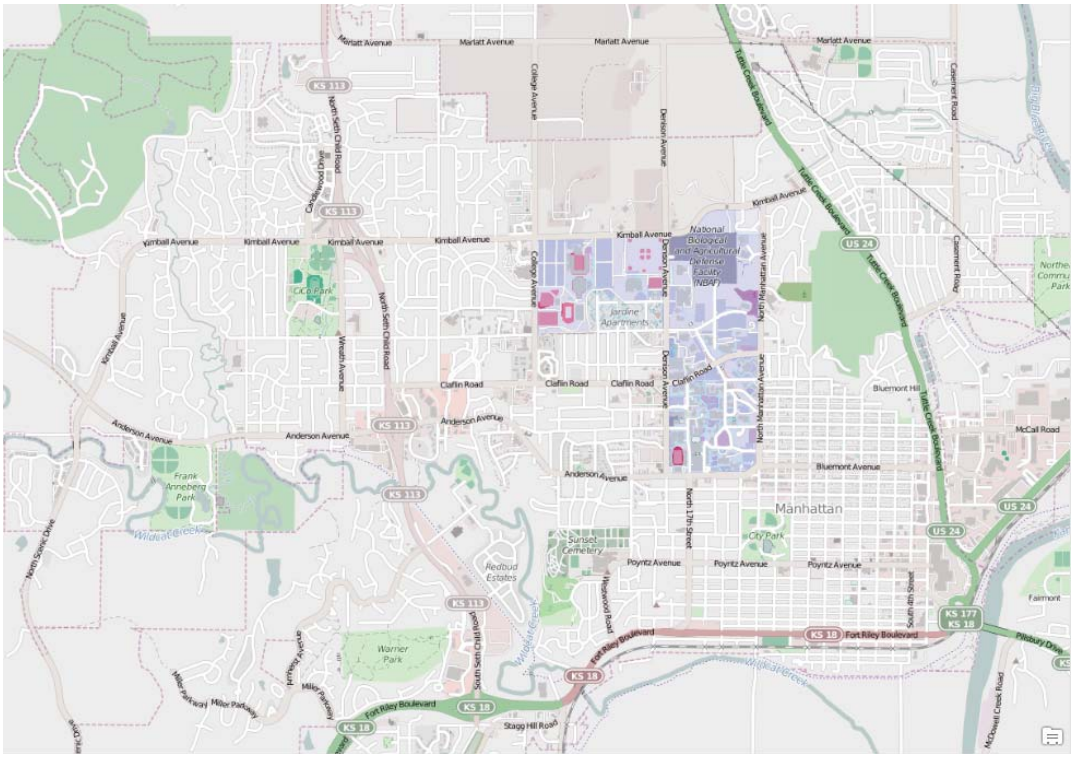
How many months did or have you lived there?

Have you lived anywhere else in Manhattan?

Yes

No

Click once to indicate where else you have lived (within a block or so)



What month/year did you start living there (e.g. 9/2016)

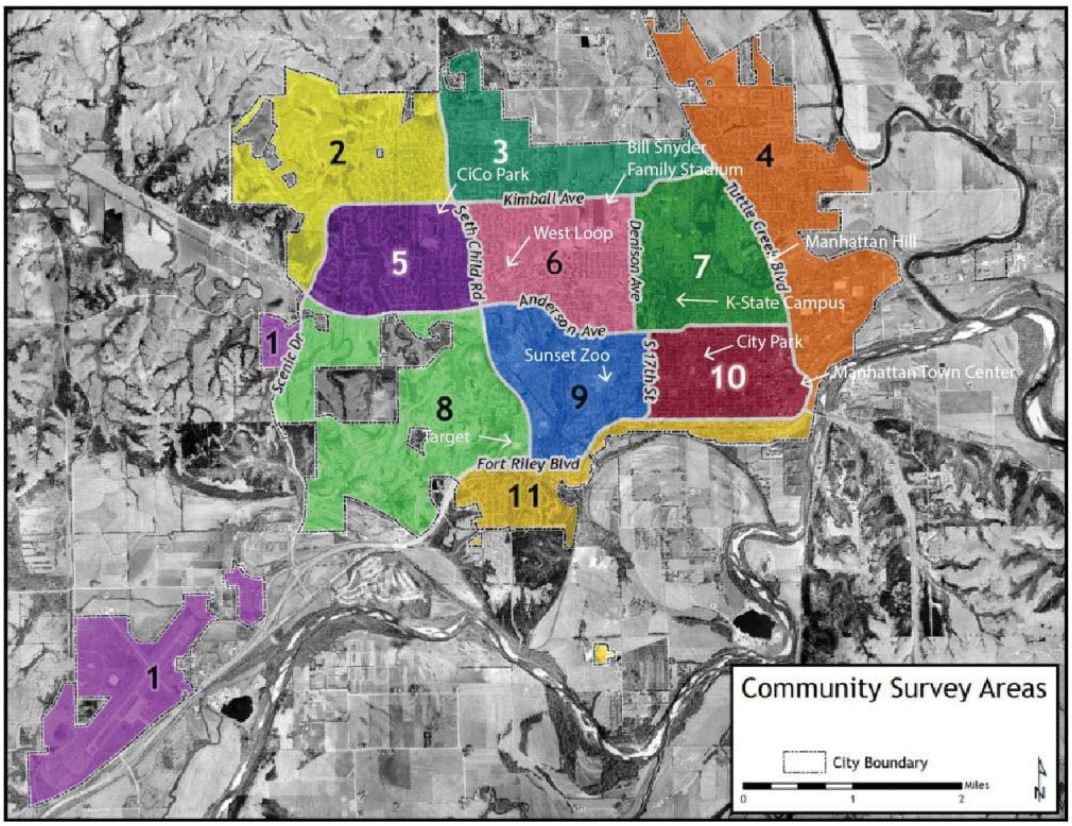
How many months did or have you lived there?

Have you lived anywhere else in Manhattan?

Yes

No

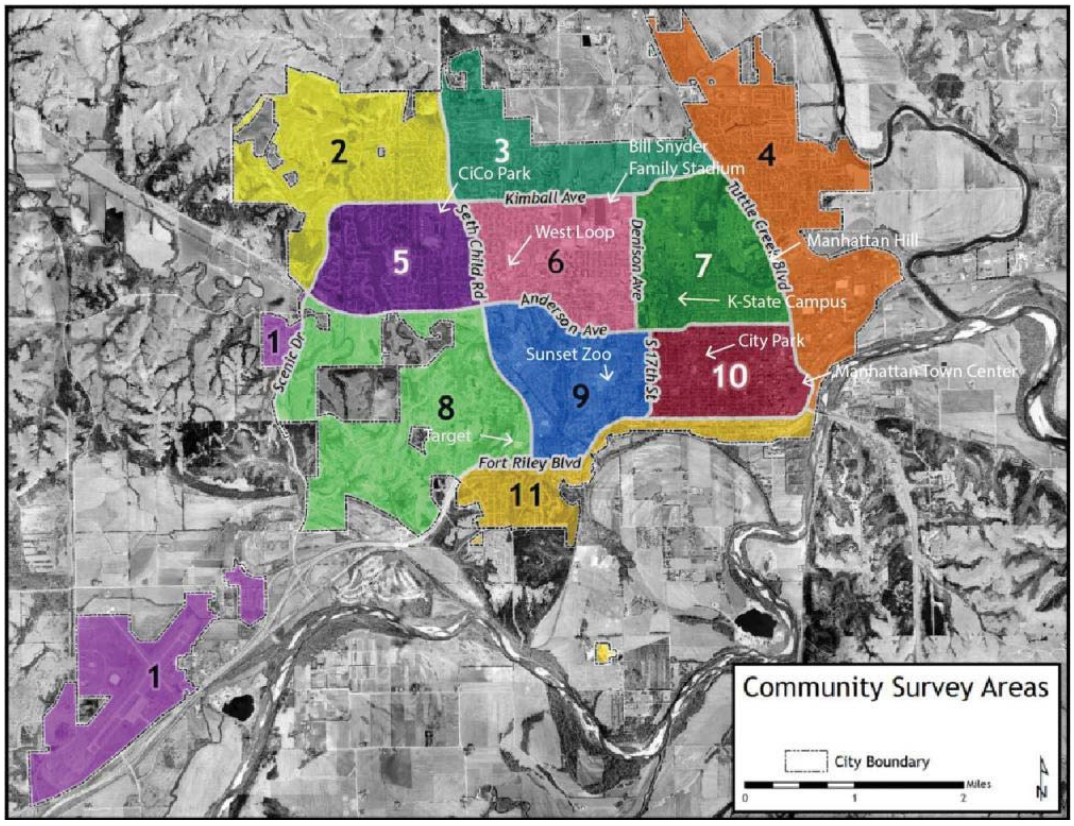
This question was repeated 5 times to allow individuals that have lived in multiple places



Use the map above to complete the following question

Since you began living in Manhattan, where have you/do you spend your awake time?

Area 1
Area 2
Area 3
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9
Area 10
Area 11



Use the map above to complete the following question

Which part of Manhattan are you most familiar with?

Please drag and rank the areas of Manhattan in order of how familiar you feel with them. (1-most familiar | 11-least familiar)

Area 1

Area 2

Area 3

Area 4

Area 5

Area 6

Area 7

Area 8

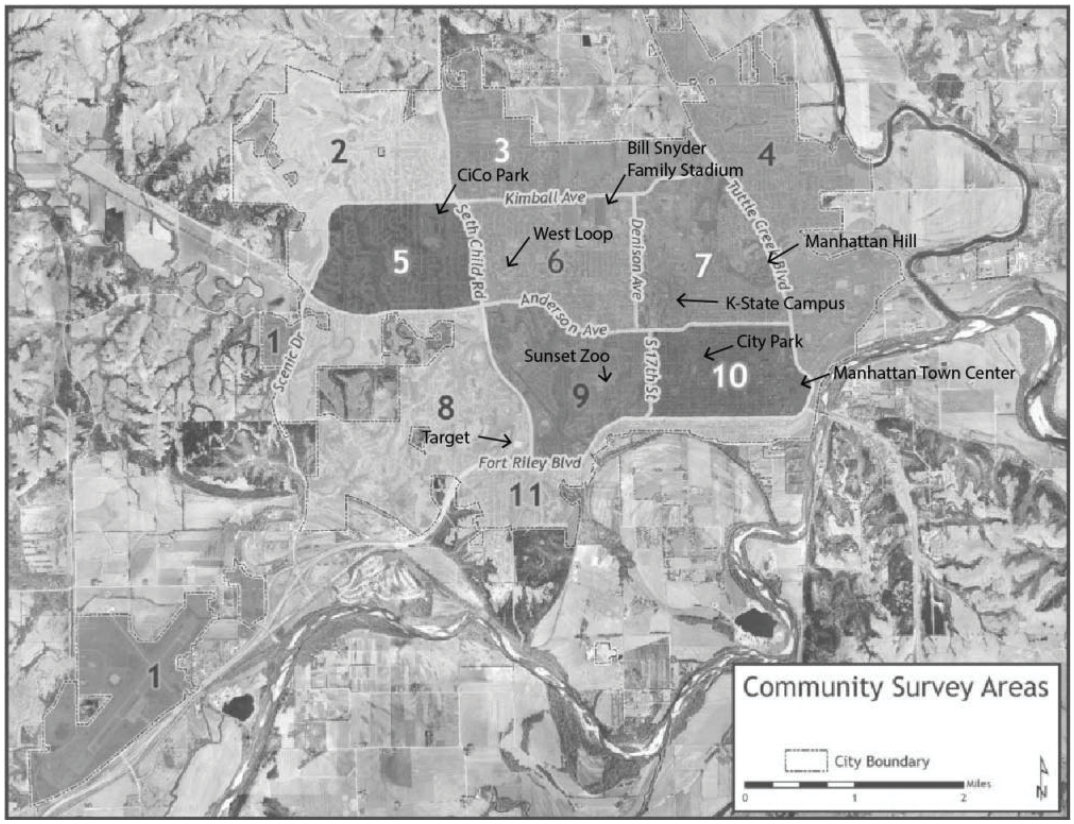
Area 9

Area 10

Area 11

Which parts of Manhattan are hard for you to identify/cognitively map?

Click on each region to show your familiarity. Green (1 click) if you can identify that part of town easily. Red (2 clicks) if it is hard to map cognitively map that region. Clear (0 or 3 clicks) if you can fairly identify that part of town



Please briefly describe characteristics of your cognitive map?

e.g. Is your cognitive map mostly plan-view or point-of-view? How do you distinguish different parts of Manhattan?

Please inventory the elements that were drawn on your **cognitive** map earlier.

e.g. my house, the airport, where I found the lost puppy, awesome house party from freshman year, the ville, etc

Please inventory the elements that were drawn on your **stereotype** map earlier.

e.g. east campus, downtown, fast food area, townies, wealthy area, old houses, ghetto, etc

Would you be interested in possibly continuing with this study at a later date?

Yes
No

Thank you for your participation in this study on cognitive maps and their relationship with narratives and experience. The information you have provided us will be inventoried and analyzed. Please feel free to contact us if you have any further questions.

Dr. Brent Chamberlain, Assistant Professor, Landscape Architecture and Regional & Community Planning, Kansas State University, lacjr@ksu.edu, (785) 532-2431.

Timothy Kellams, MLA Student, Landscape Architecture and Regional & Community Planning, Kansas State University, tkellams@ksu.edu, (316) 708-0899.

C - Word Clouds - Removed Text

For the Case Discussions, audio was transcribed using only keywords, which minimized the amount of common words that needed to be removed

Figure 4.6: Cognitive Map Characteristics - a, because, mostly, etc. view

Figure 4.7: Cognitive Map Inventory - a,

Figure 4.8: Stereotype Inventory - a, area

Figure 4.13: Total Discussions - a, map, long, form, light, don, citi, soror, start, thing, guess, I've, also, am, an, and, are, aren't, as, at, be, been, but, by, can, can't, cannot, could, couldn't, did, didn't, do, does, doesn't, don't, down, e.g., for, from, get, gets, got, had, hadn't, has, hasn't, have, haven't, he, he'd, he'll, he's, her, him, his, how, however, I, i.e., I'd, I'll, I'm, I've, if, in, into, is, isn't, it, it's, its, may, me, might, mine, must, mustn't, must've, my, no, not, of, off, on, or, our, ours, out, shall, she, she'd, she'll, she's, should, shouldn't, so, such, than, that, that's, the, their, theirs, them, then, there, there's, these, they, they'd, they'll, they're, they've, this, those, thus, to, too, up, us, very, was, wasn't, we, we'd, we'll, we're, we've, were, what, when, where, which, who, why, will, with, won't, would, wouldn't, you, you'd, you'll, you're, you've, your, yours, so, like, yeah, goes, most, say, yes, maybe, still, much, well, because, back, about, just, really, let, left, some, another, here, explain, kind, right, pick, only, ways, see, way, else, take, trying, more, tried, talking, lot

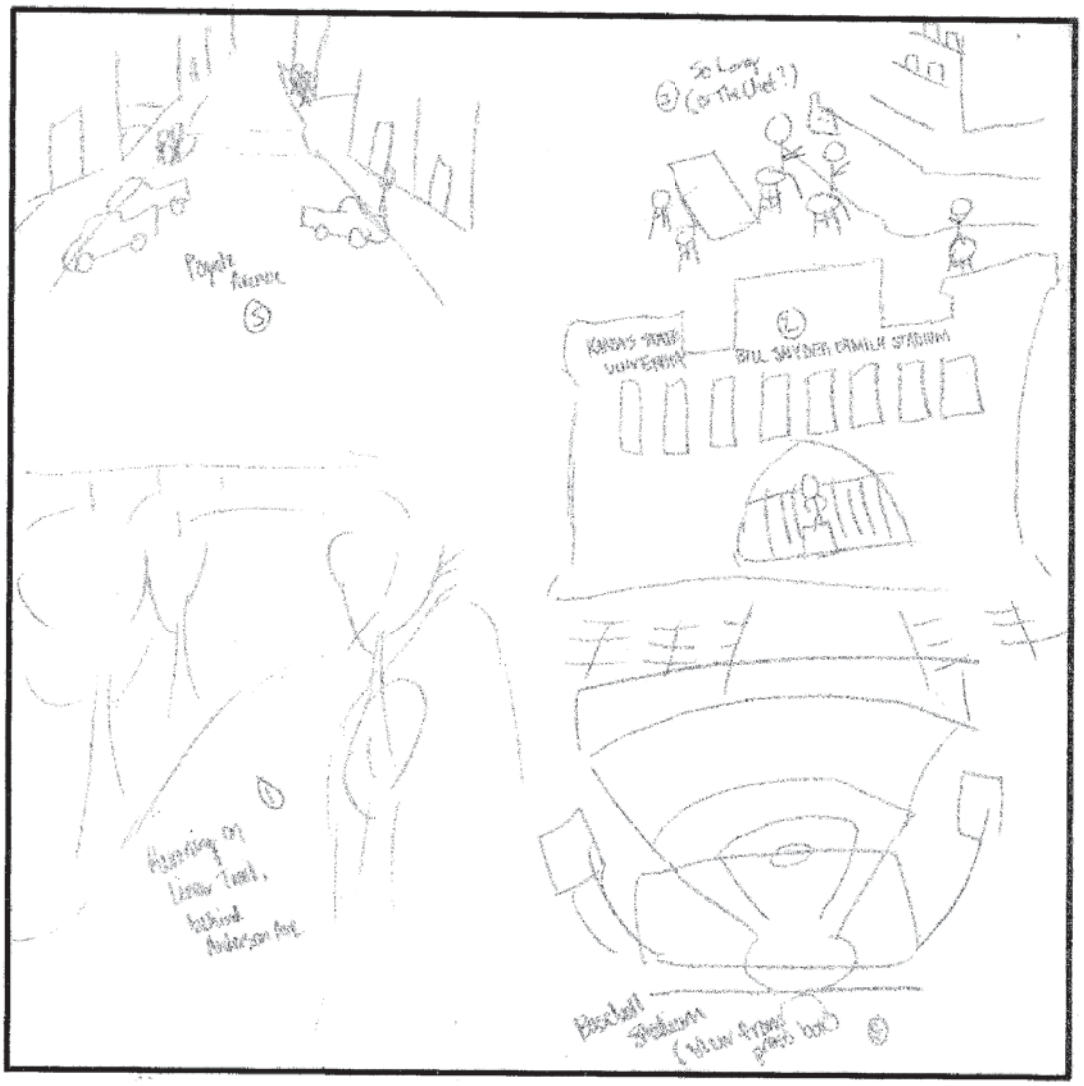
Figure 4.15: Case 1 Discussion - a,

Figure 4.16: Case 2 Discussion A - a, once, thing

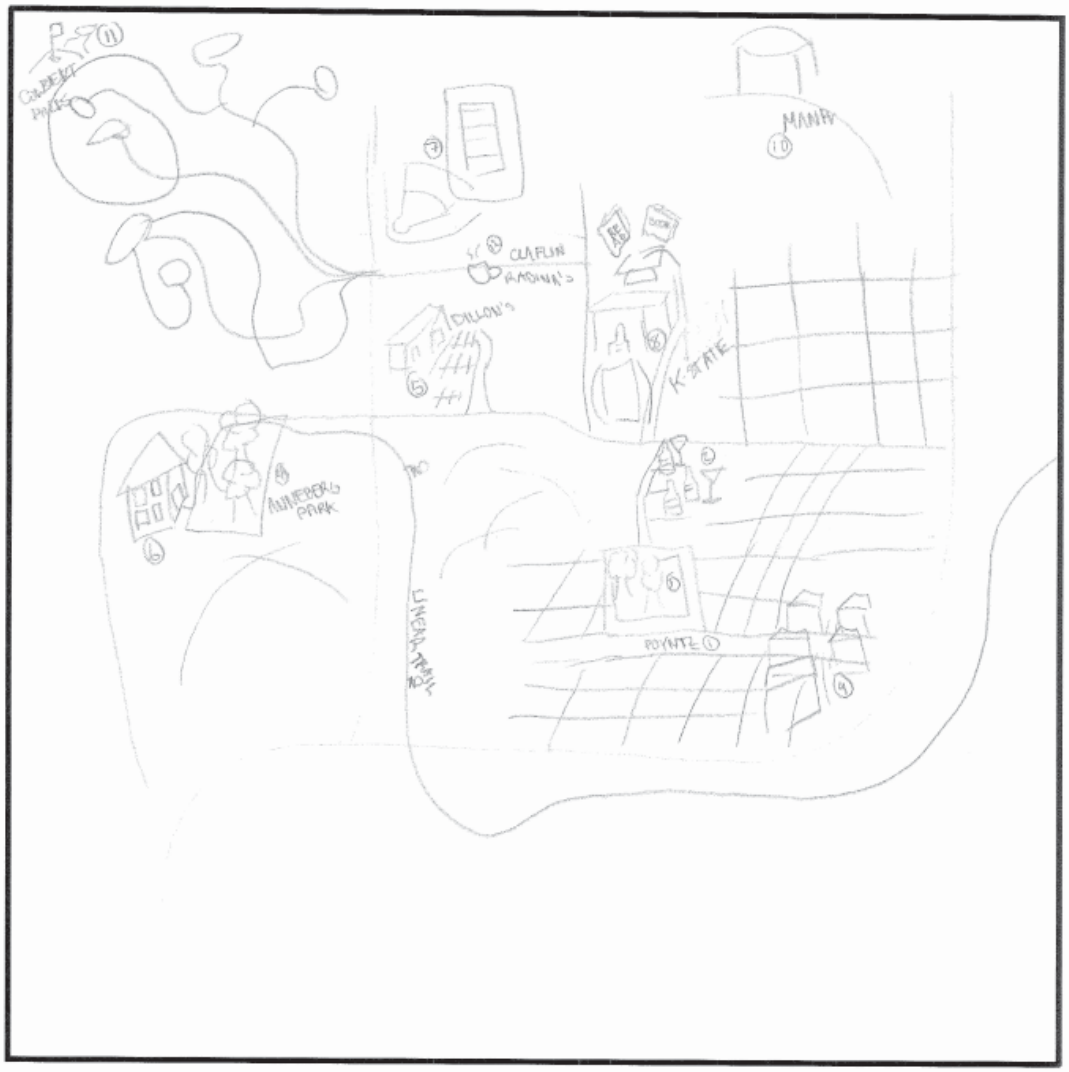
Figure 4.17: Case 2 Discussion B - a, inn, holiday

Figure 4.18: Case 3 Discussion - a, pick, thing

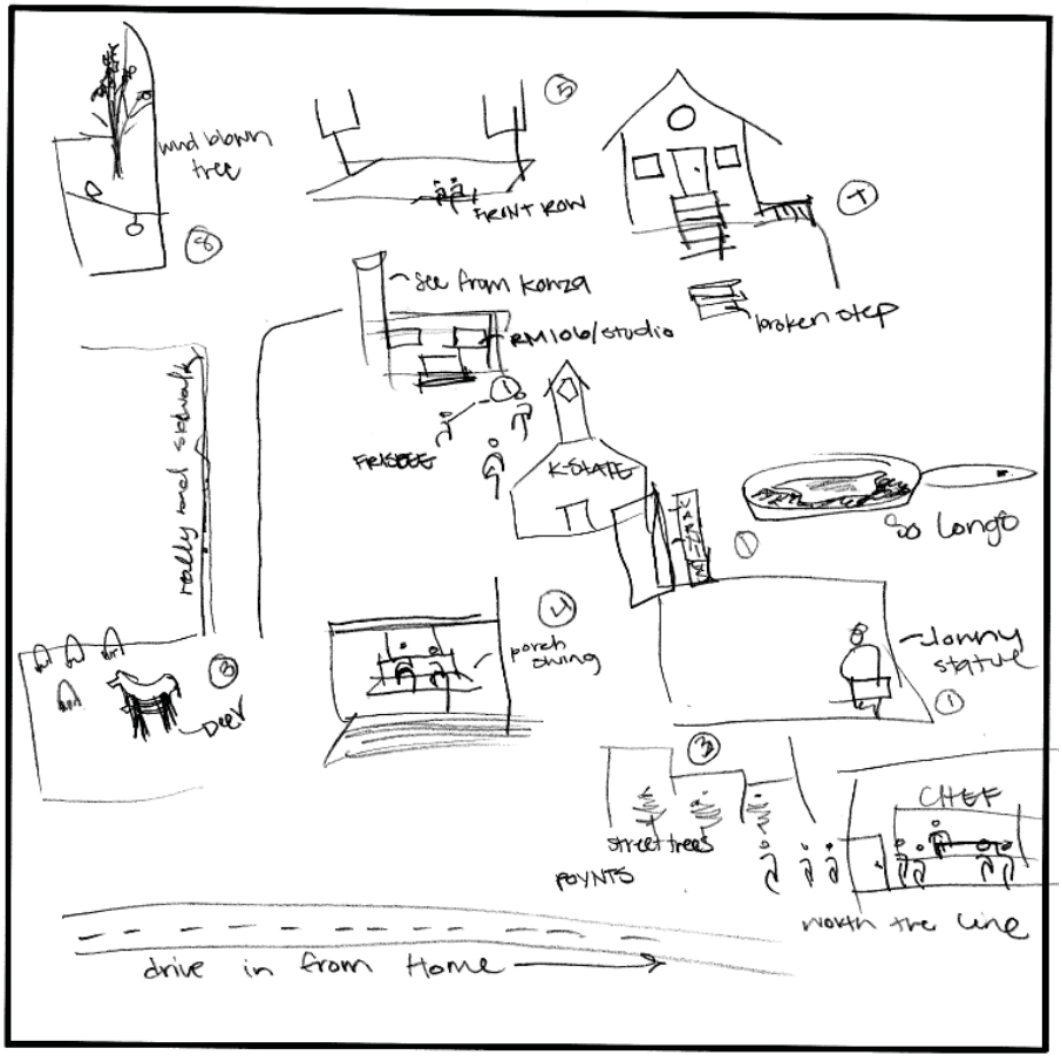
D - Drawn Cognitive and Stereotype Maps



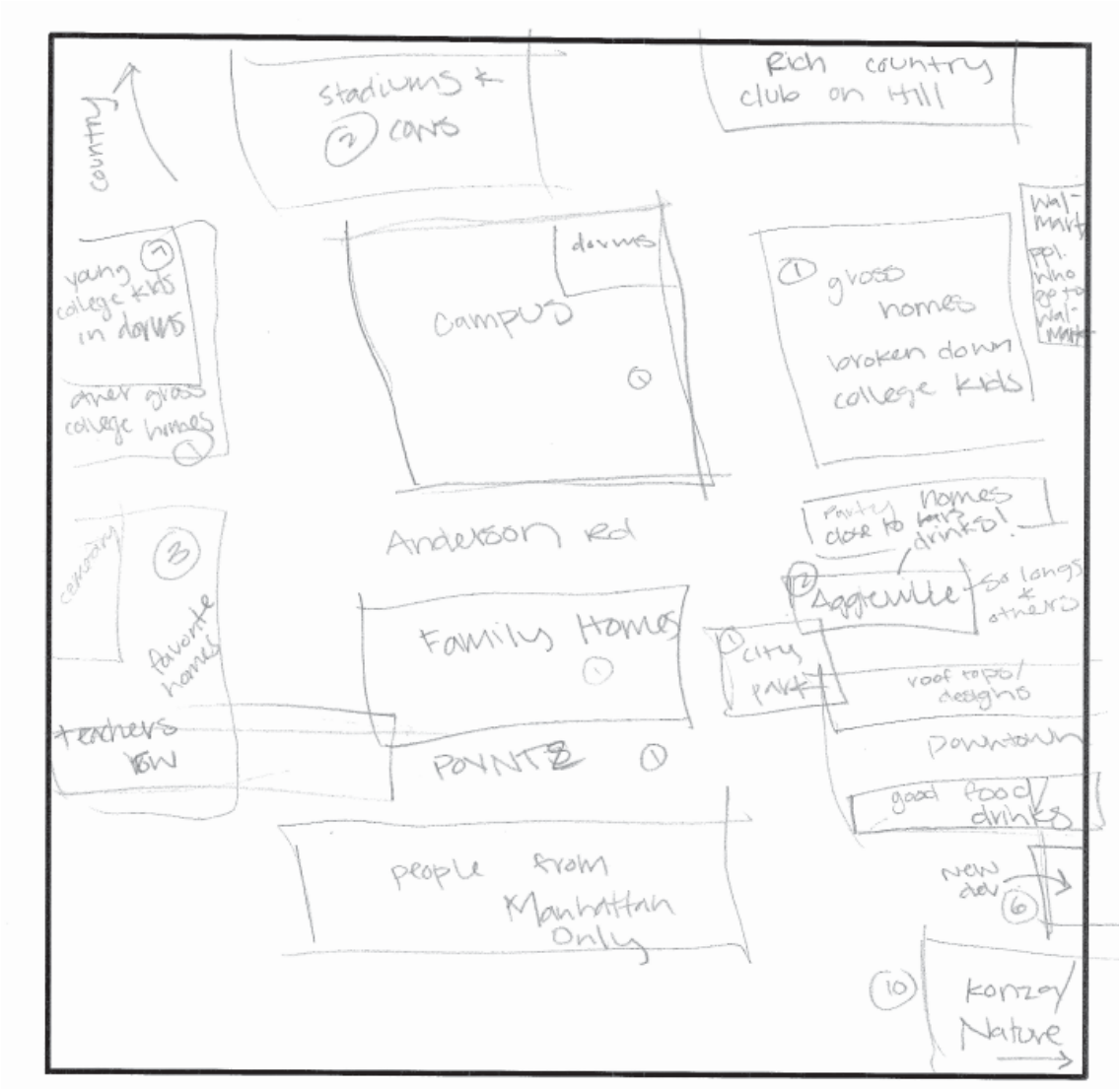
Participant 1 - Cognitive Map



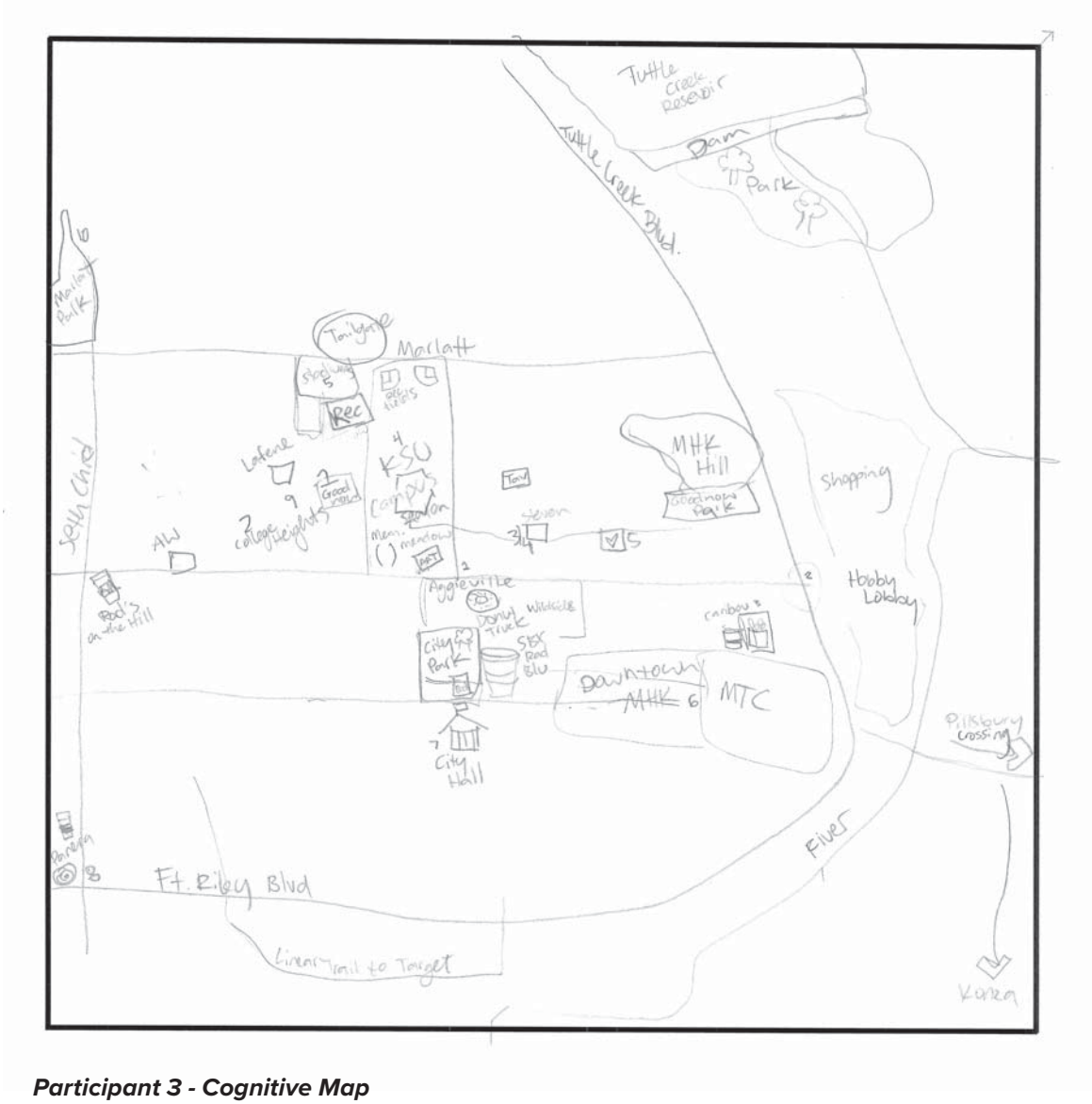
Participant 1 - Stereotype Map



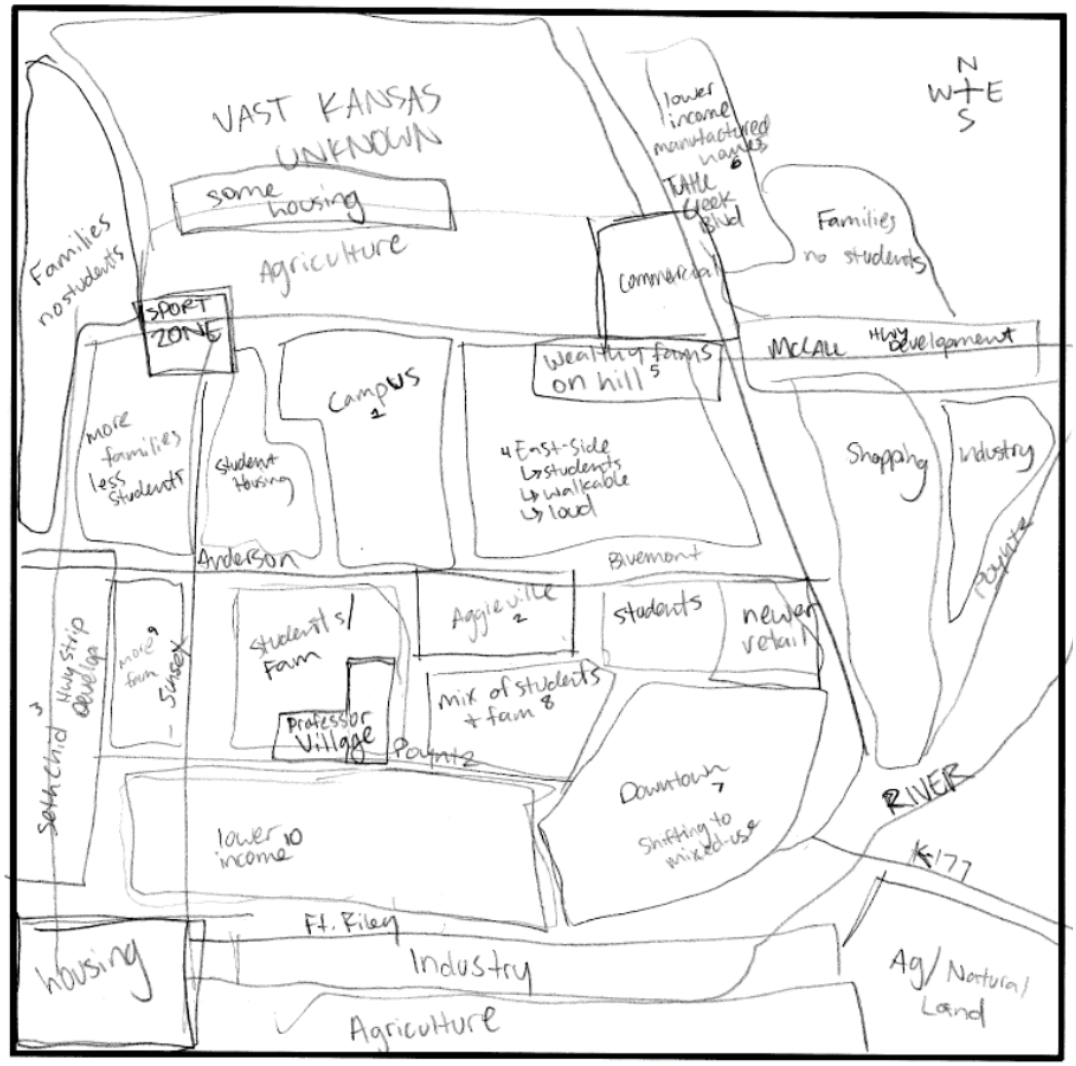
Participant 2- Cognitive Map



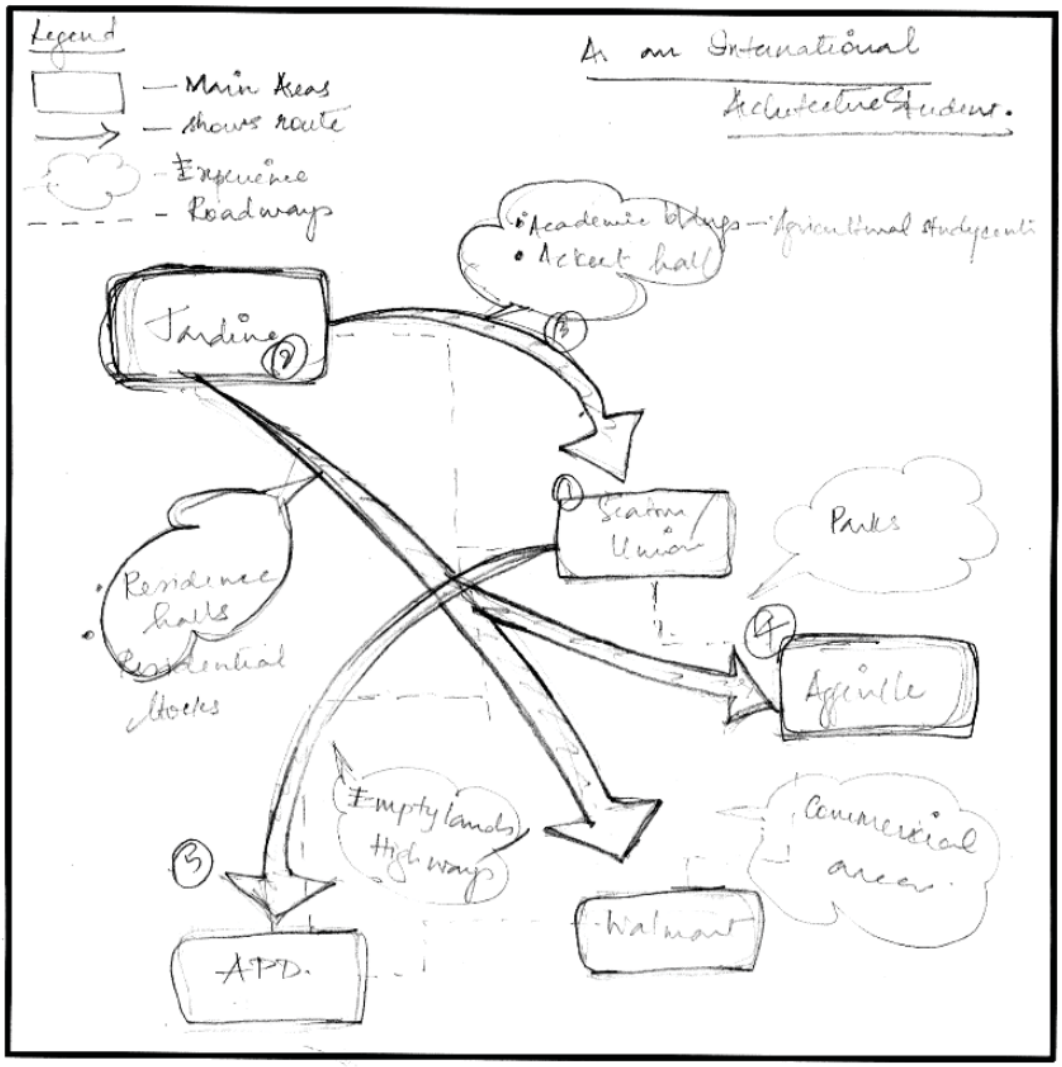
Participant 2 - Stereotype Map



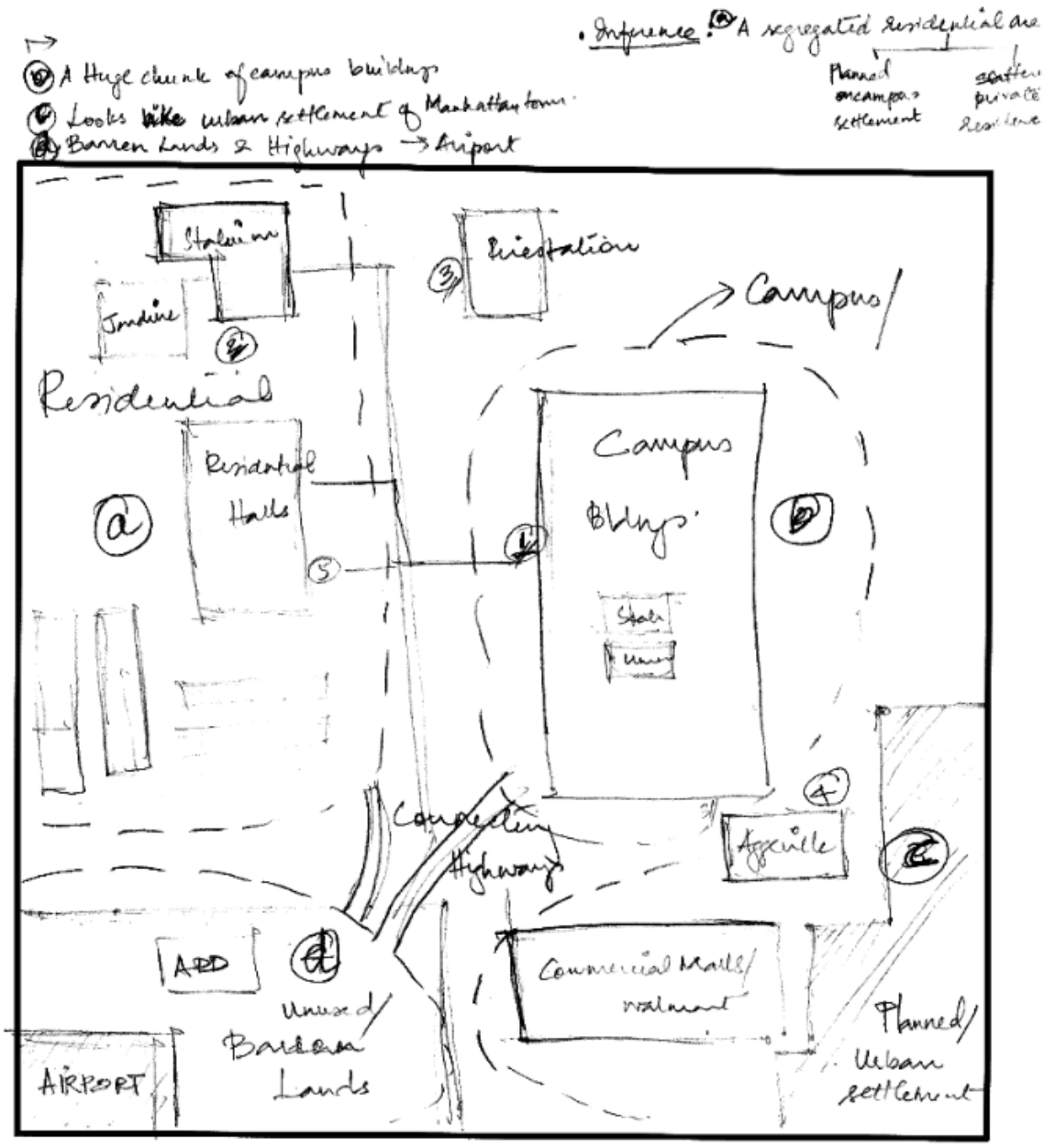
Participant 3 - Cognitive Map



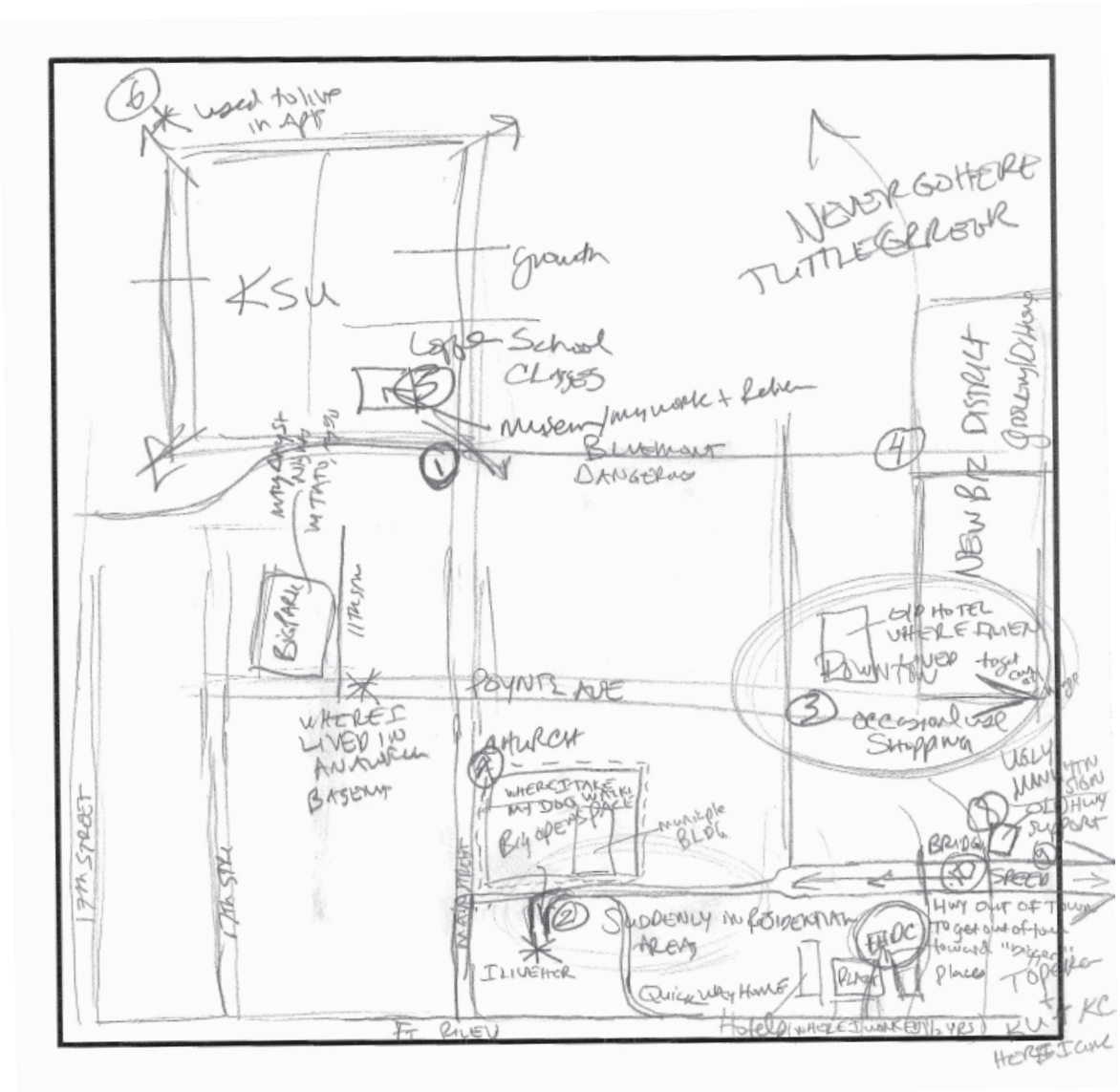
Participant 3 - Stereotype Map



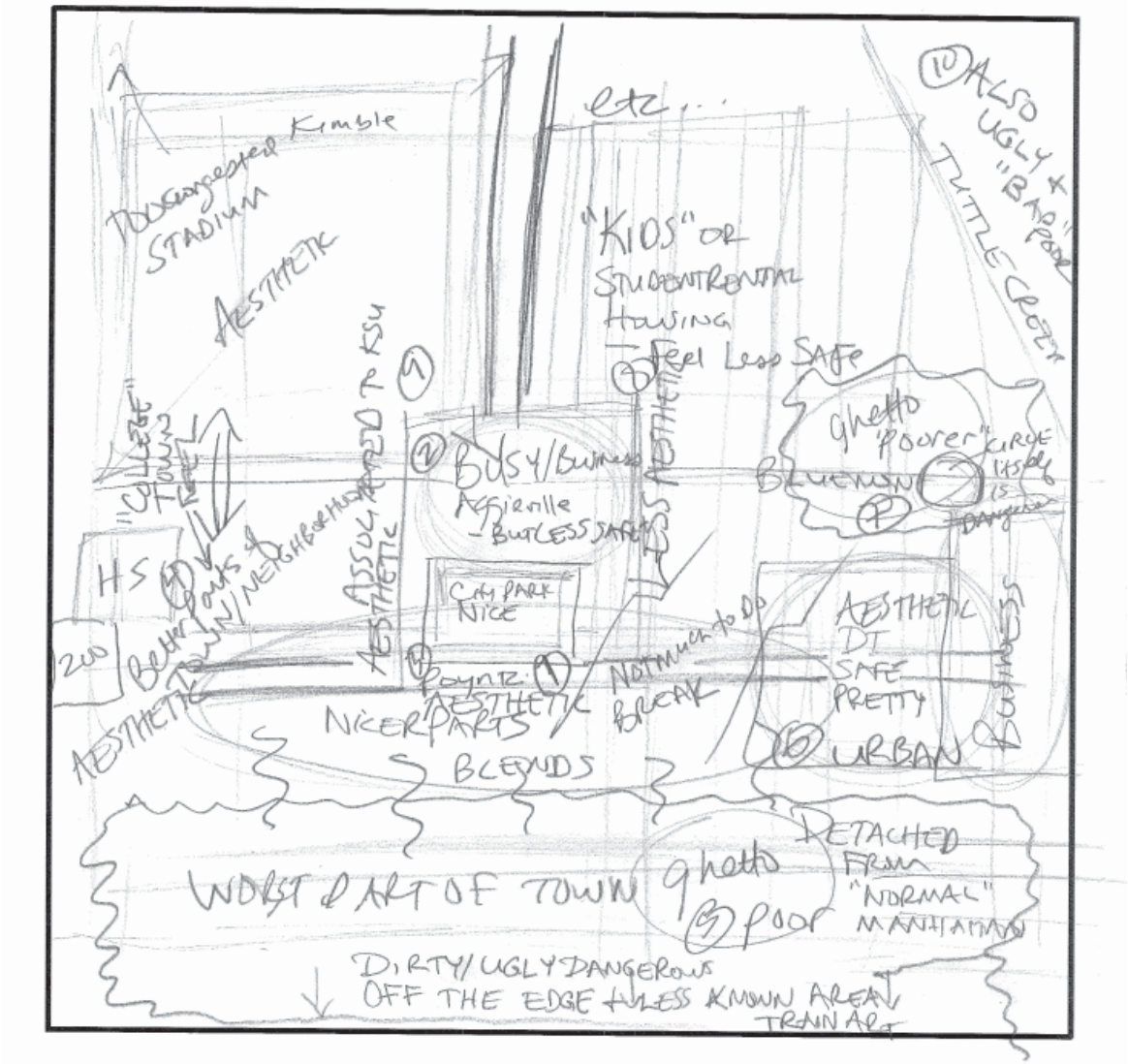
Participant 4 - Cognitive Map



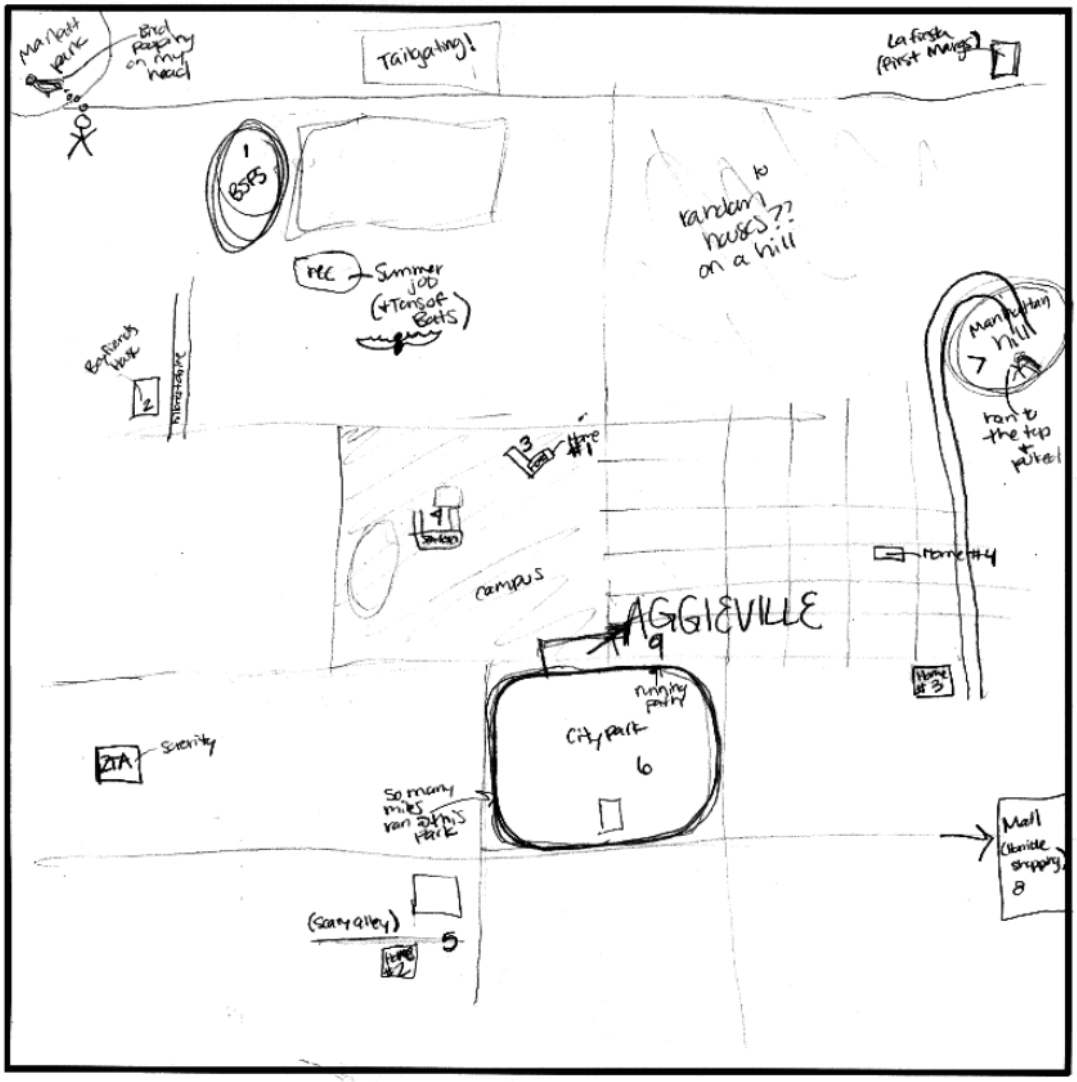
Participant 4 - Stereotype Map



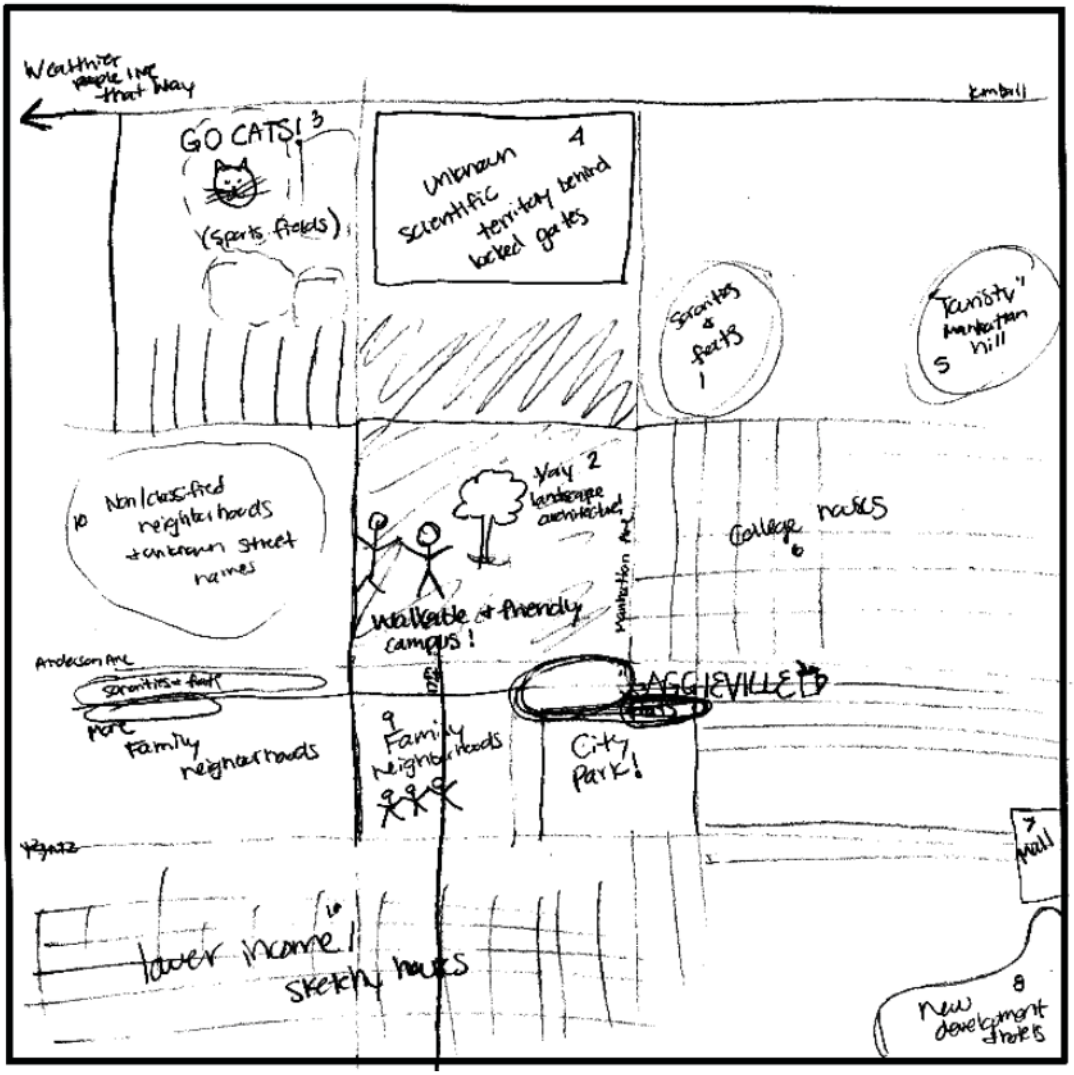
Participant 5 - Cognitive Map



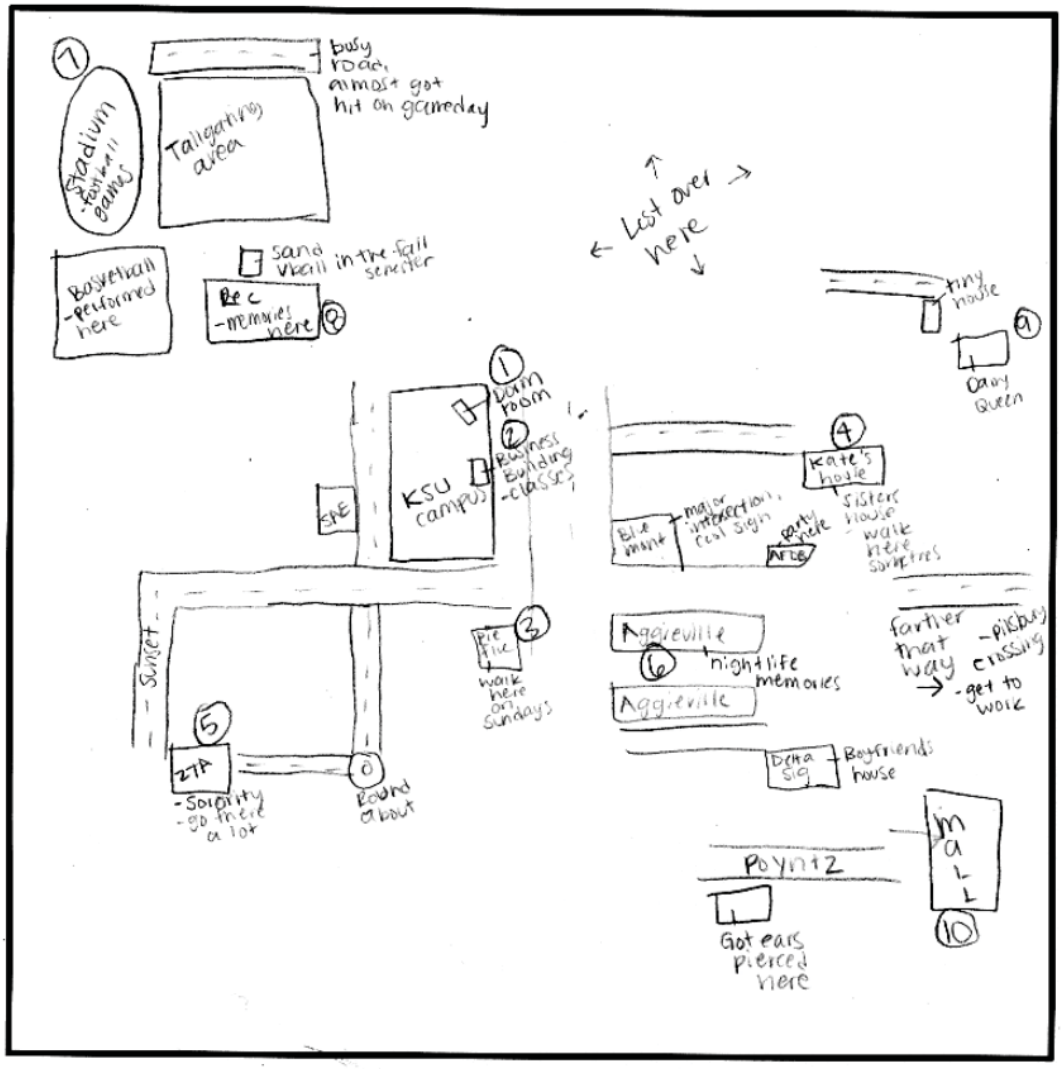
Participant 5 - Stereotype Map



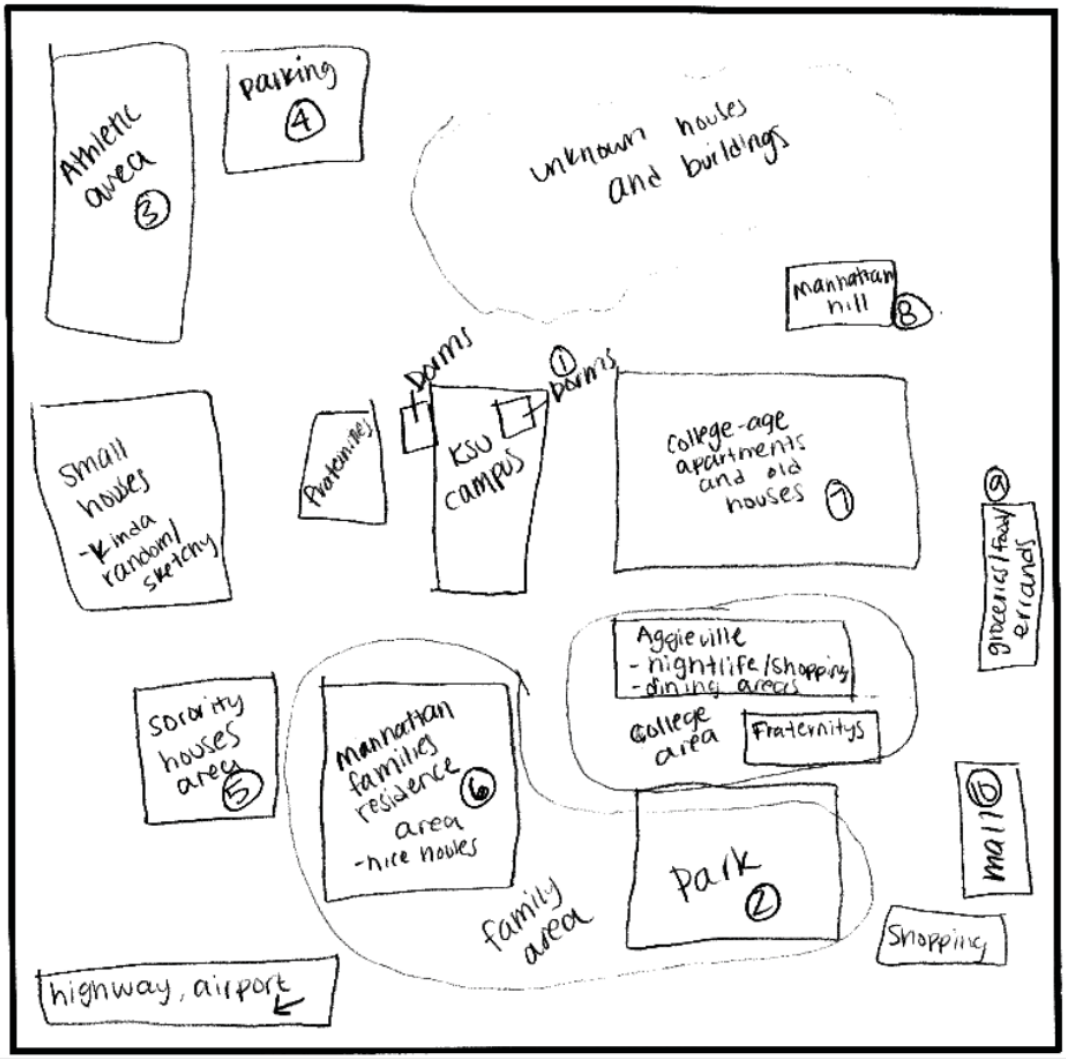
Participant 6 - Cognitive Map



Participant 6 - Stereotype Map



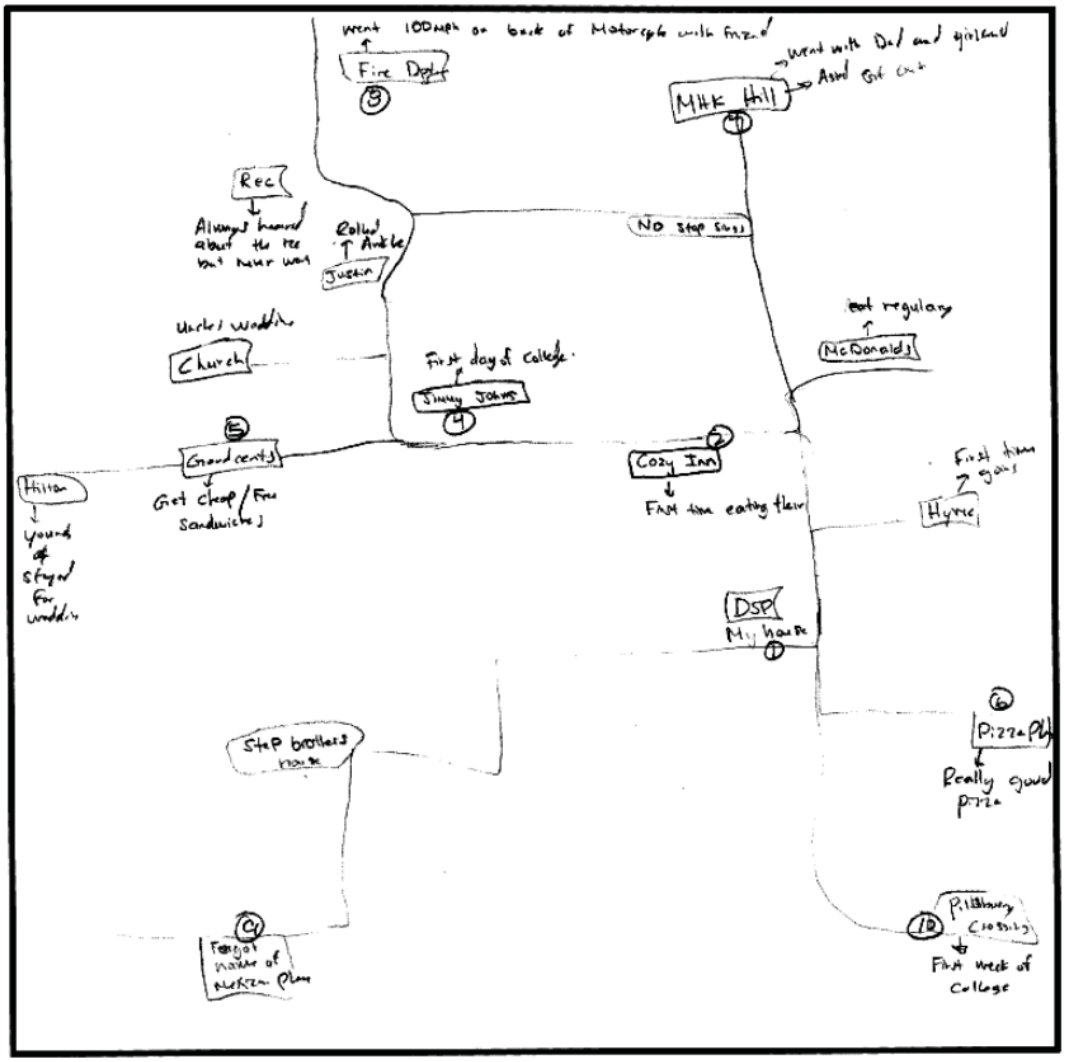
Participant 7 - Cognitive Map



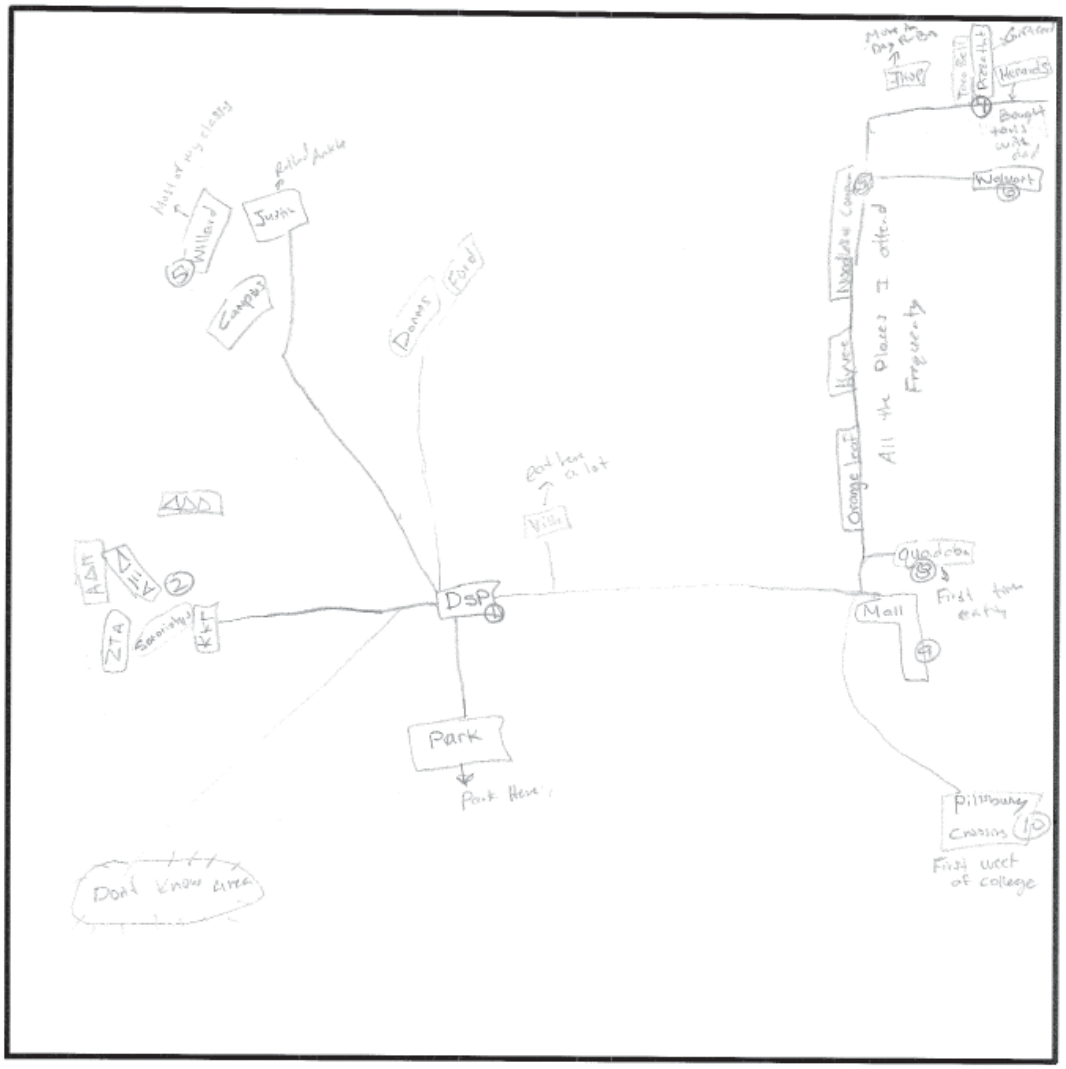
Participant 7 - Stereotype Map

Participant 8 - Cognitive Map

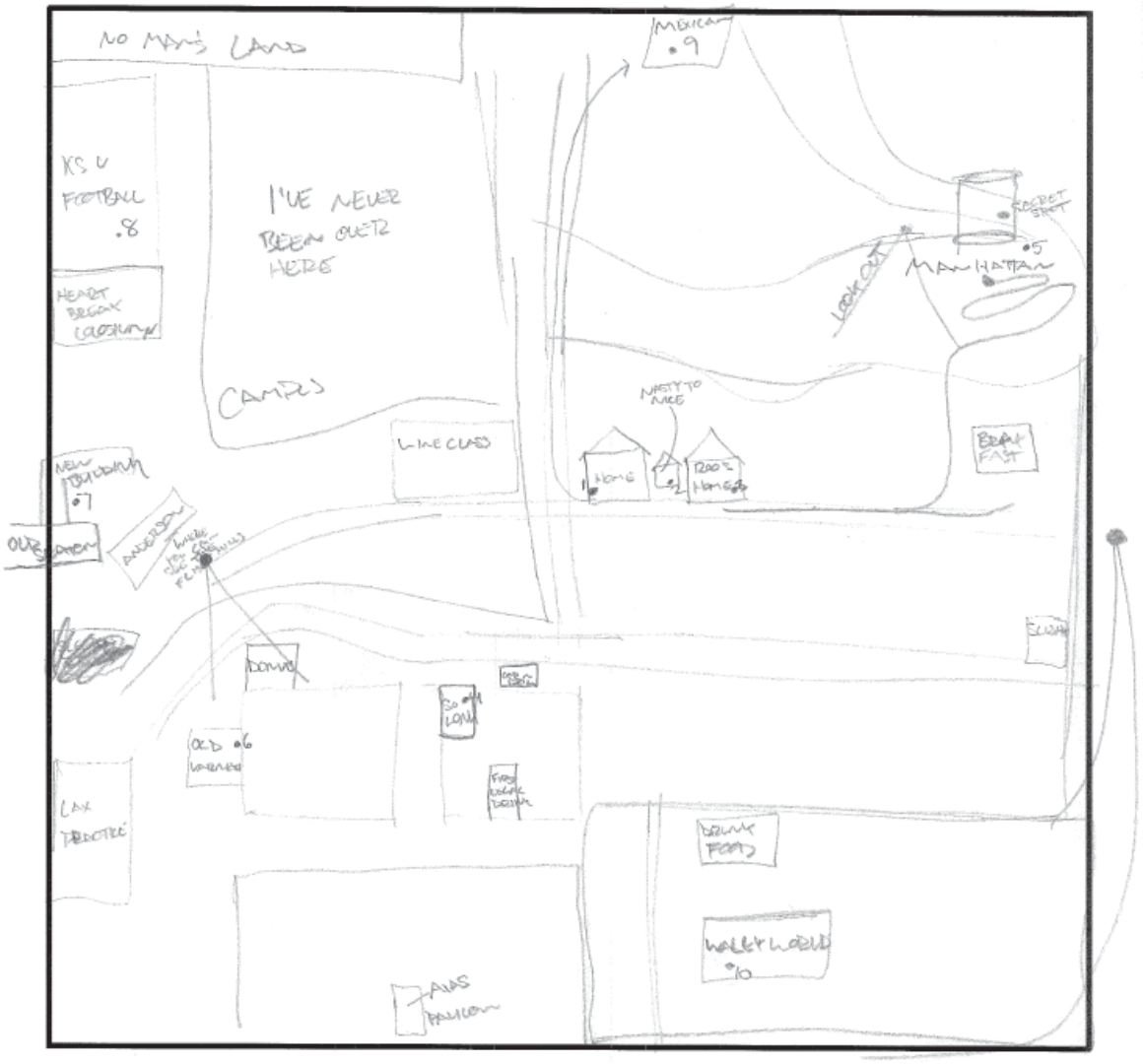
Participant 8 - Stereotype Map



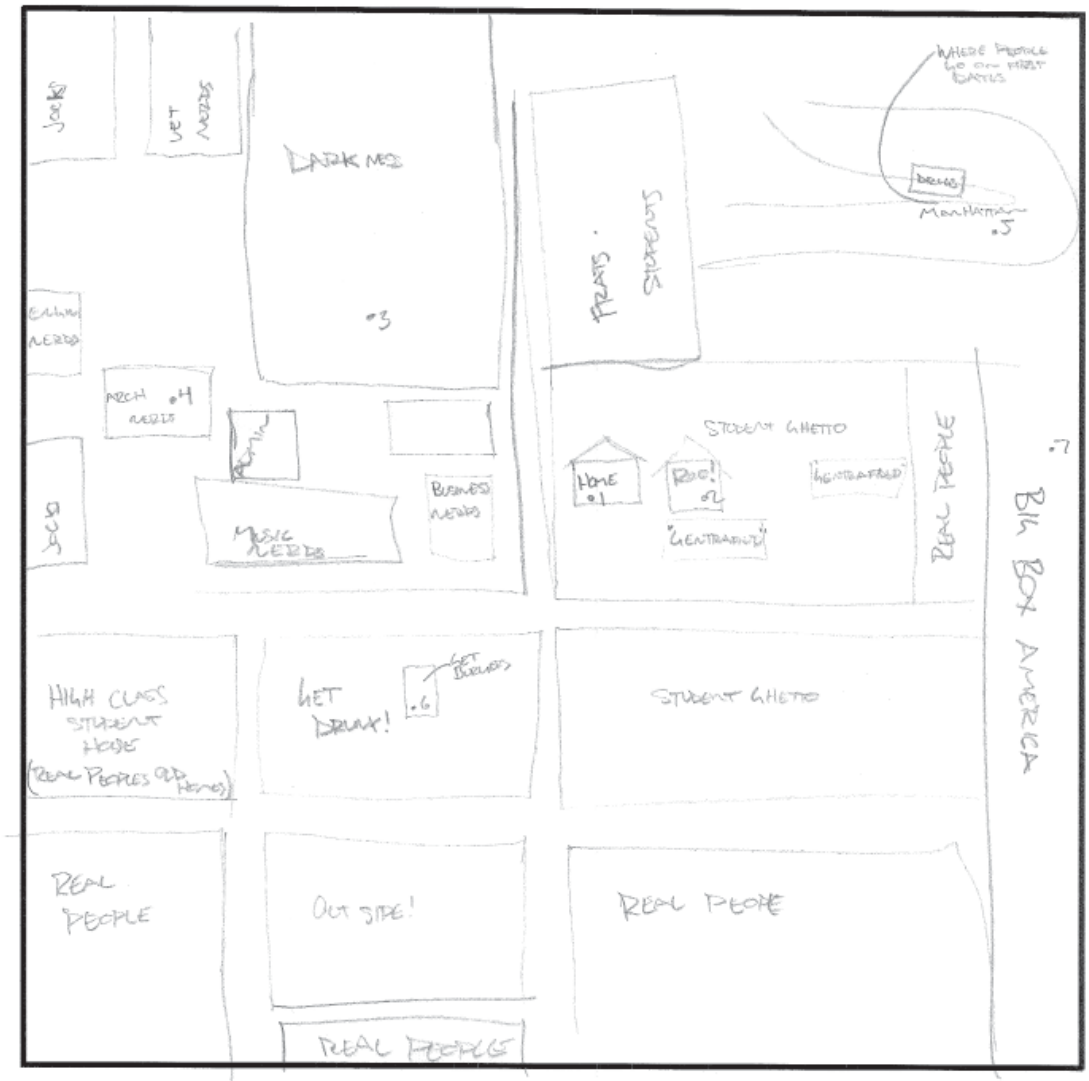
Participant 9 - Cognitive Map



Participant 9 - Stereotype Map



Participant 10 - Cognitive Map



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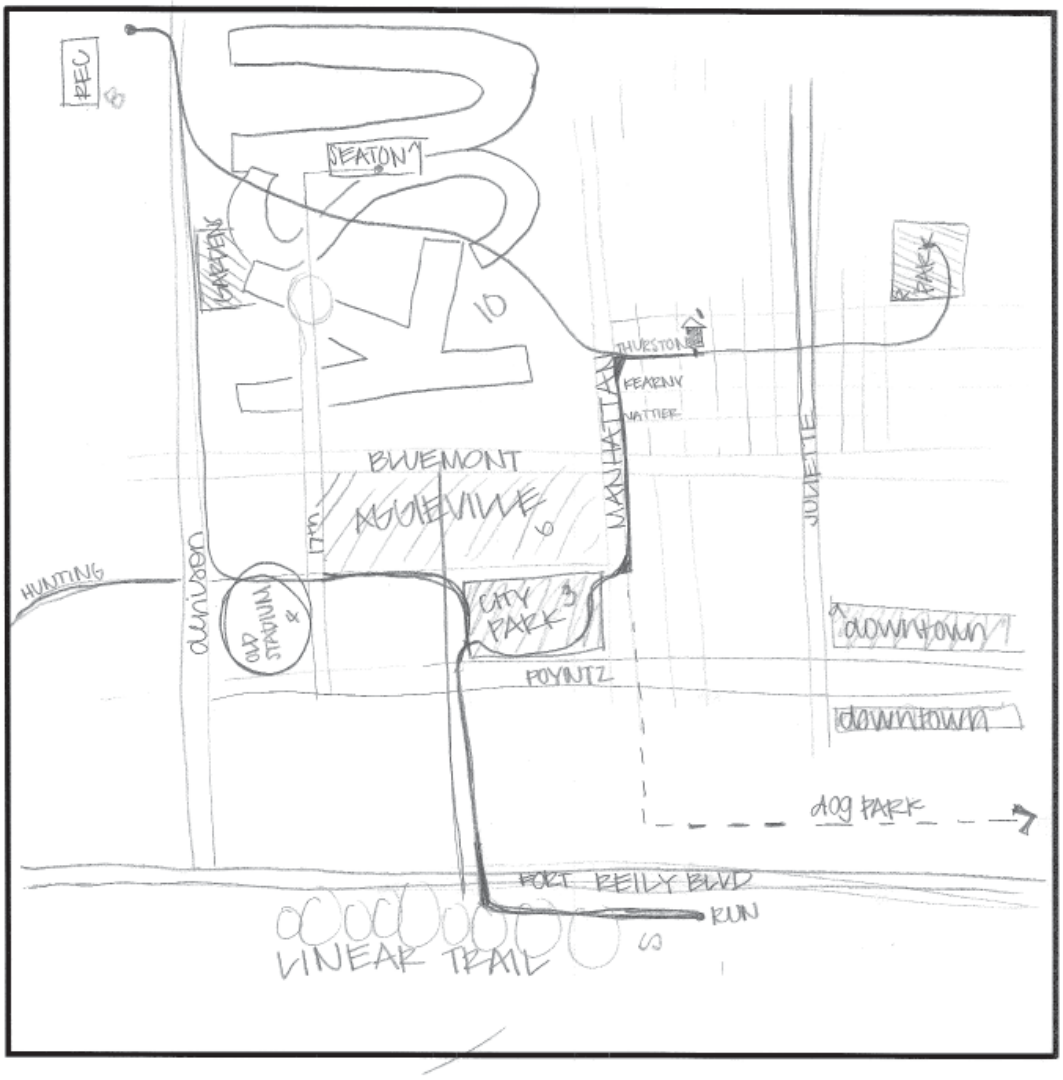
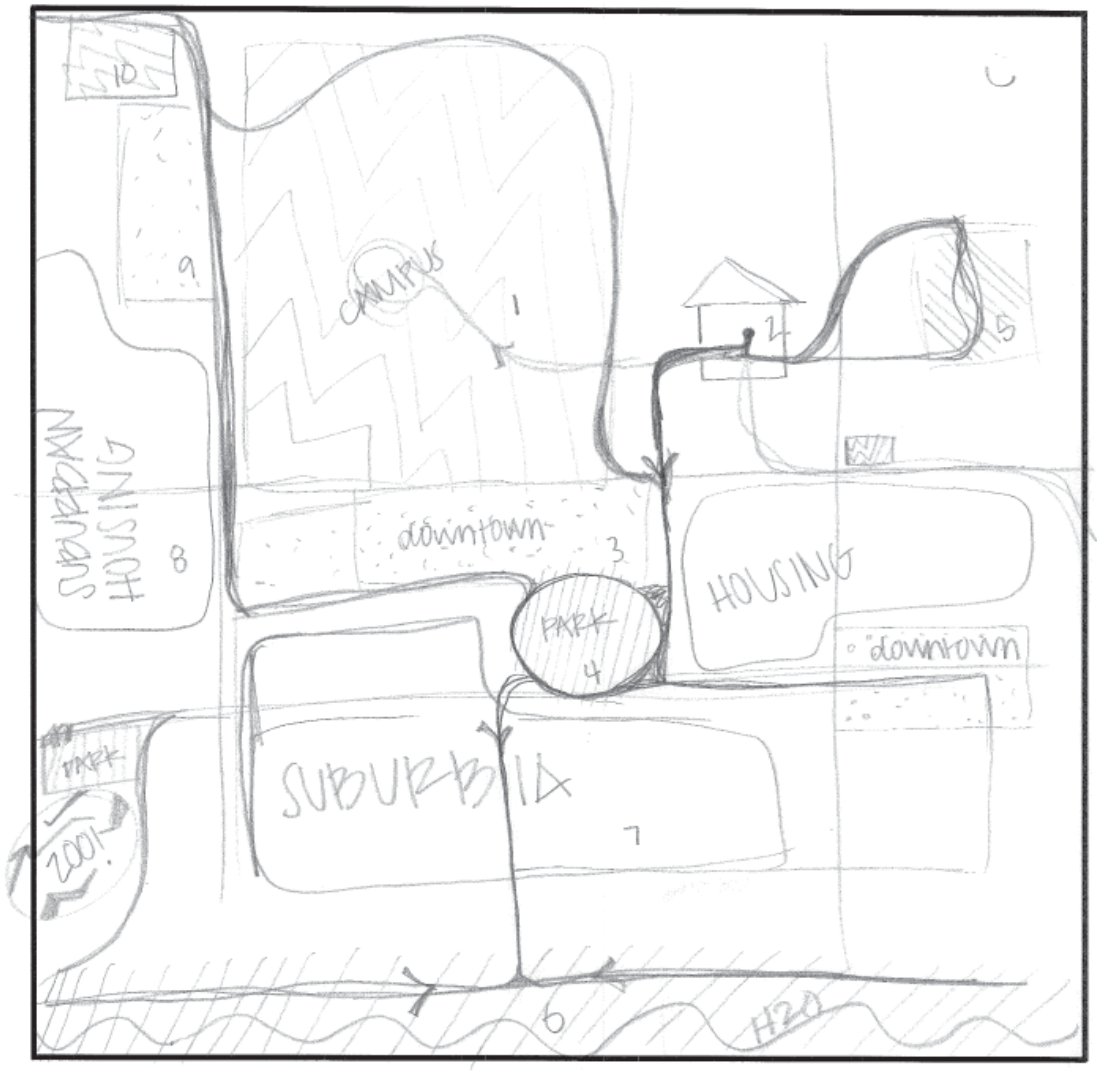


Participant 11 - Cognitive Map



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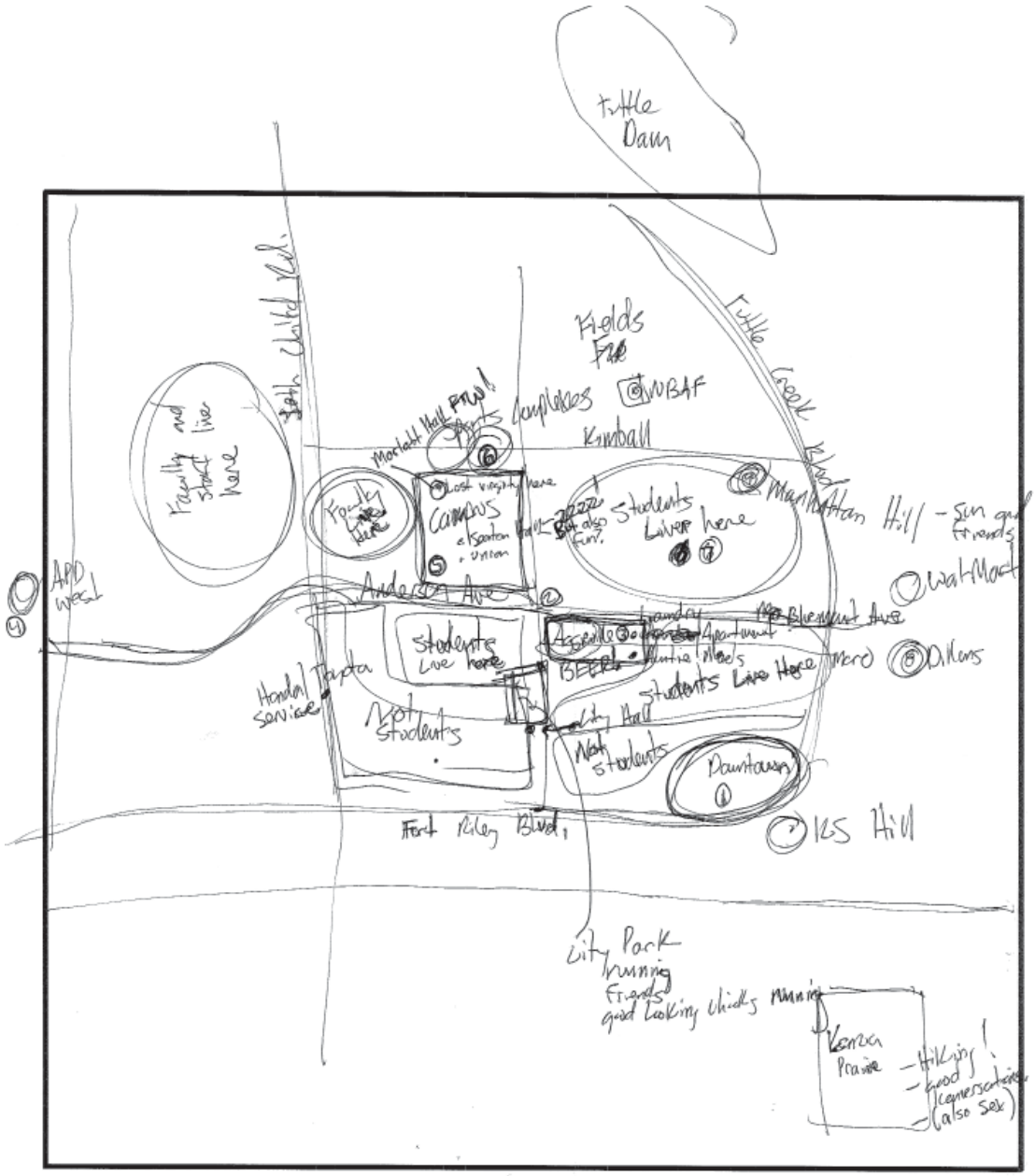
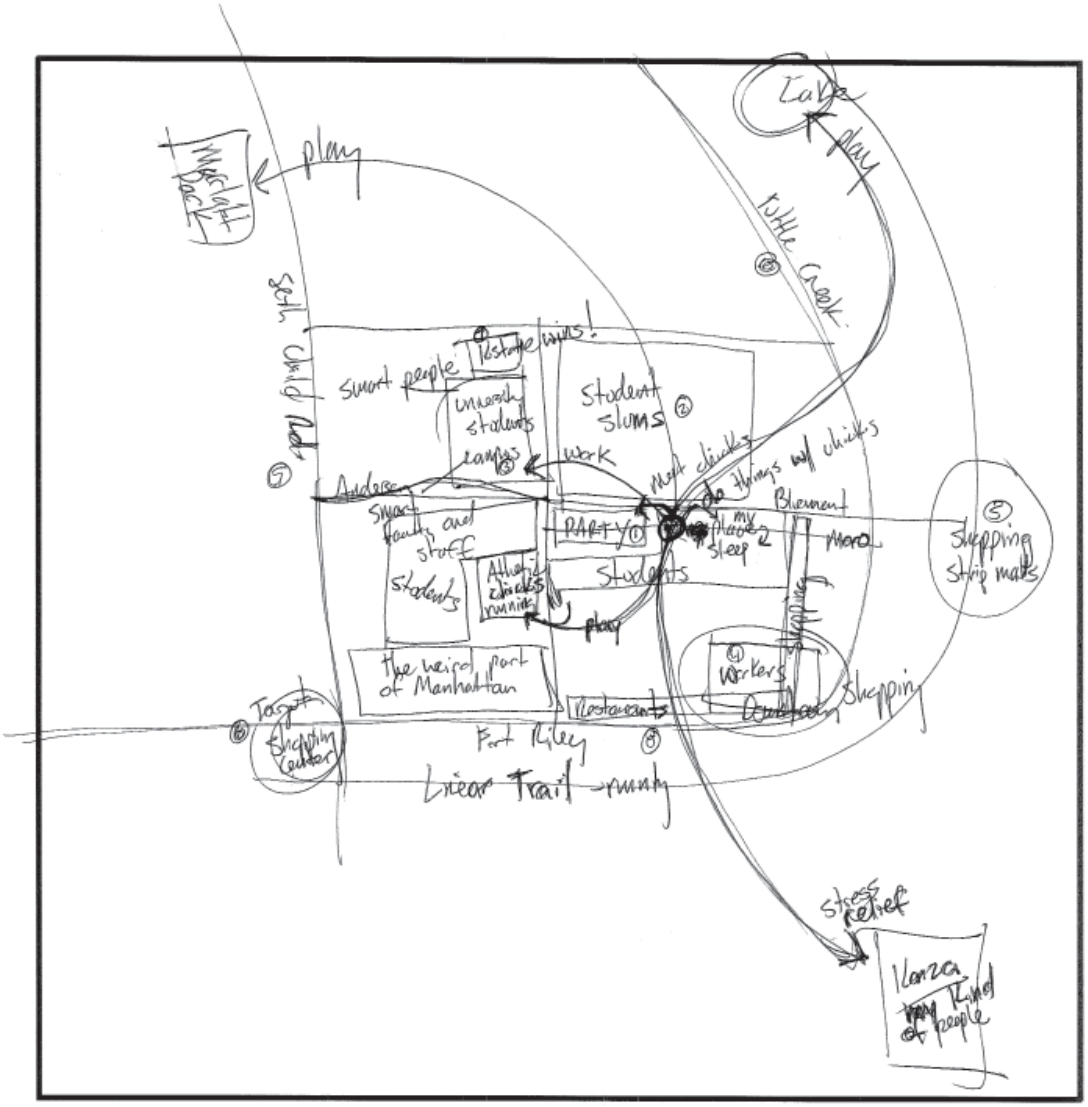


Participant 12- Cognitive Map



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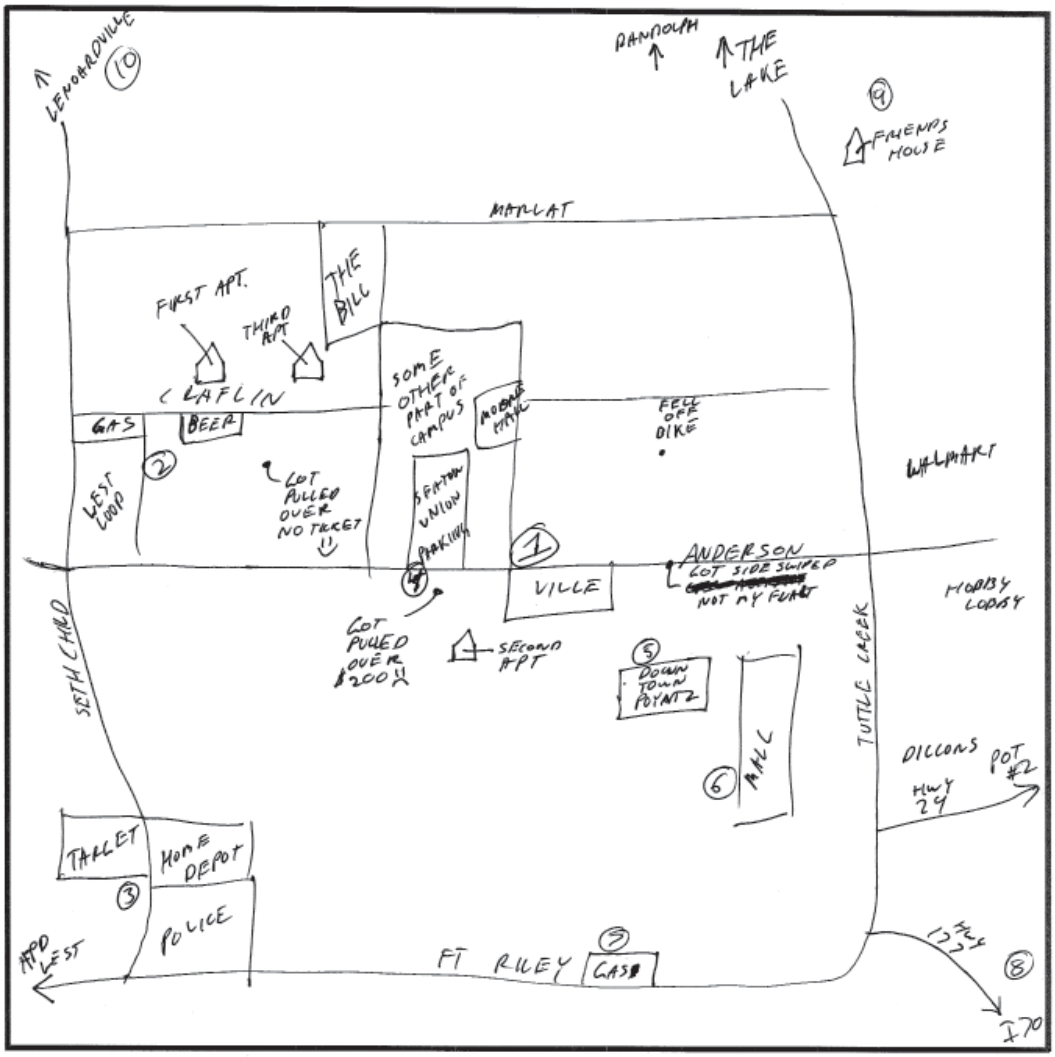

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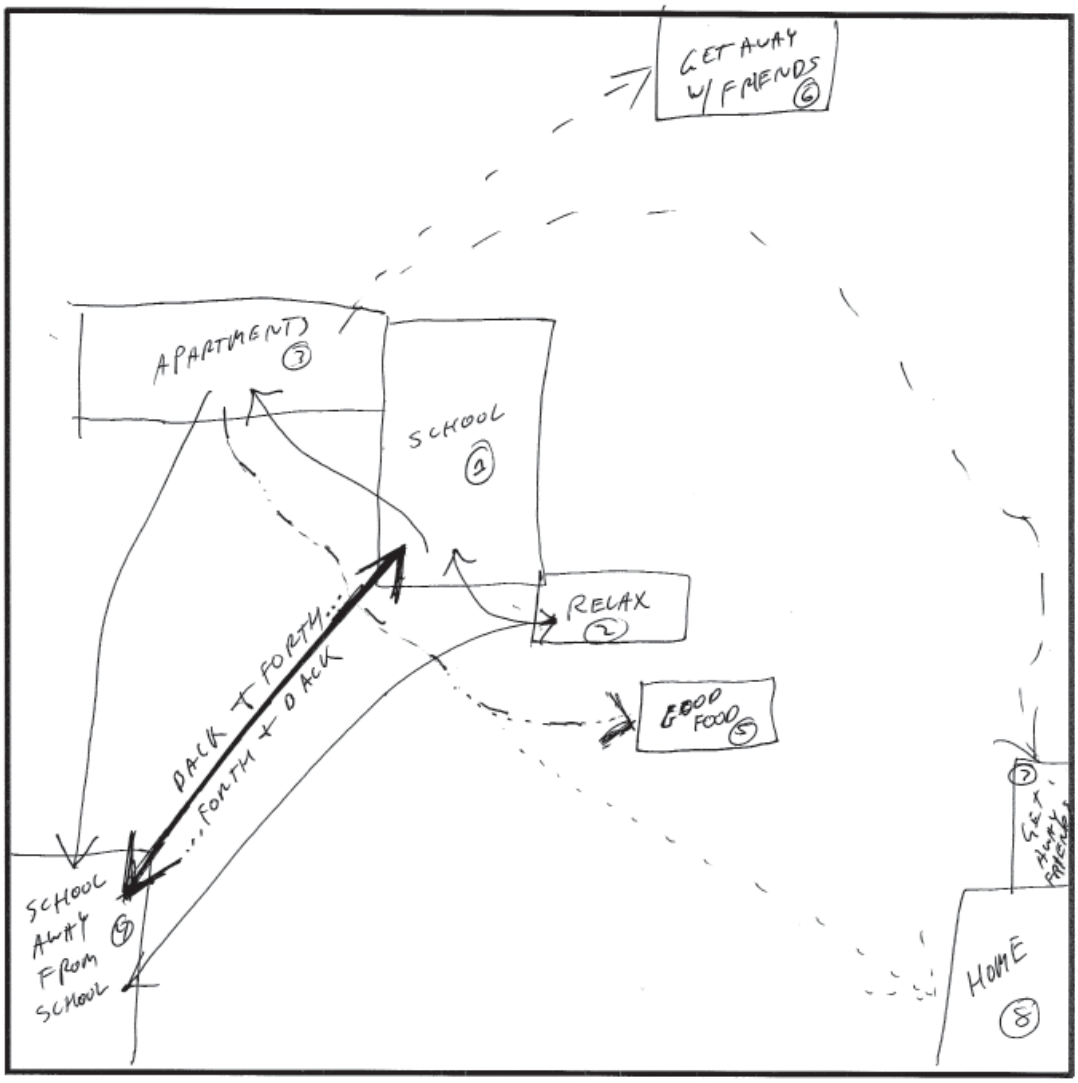
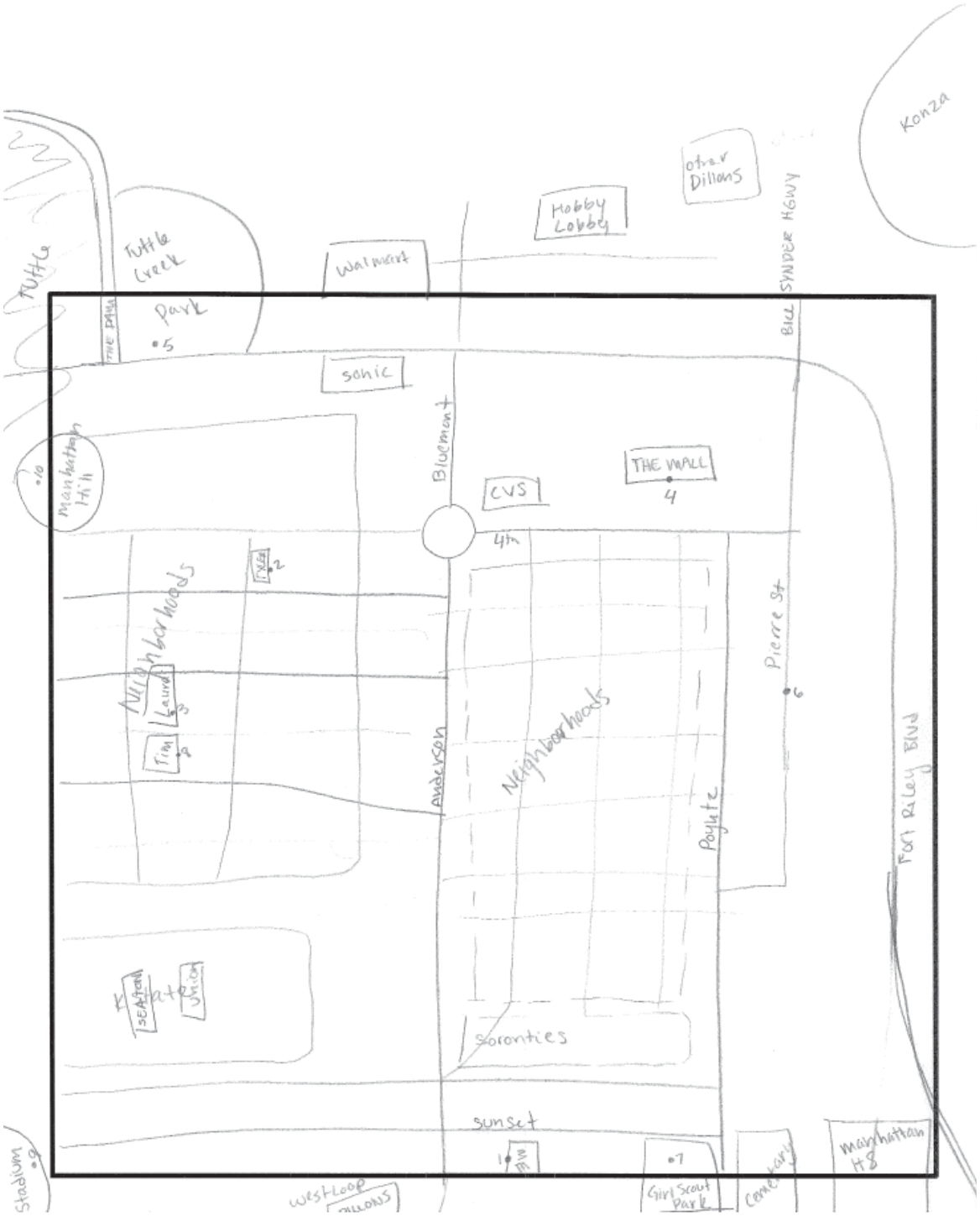
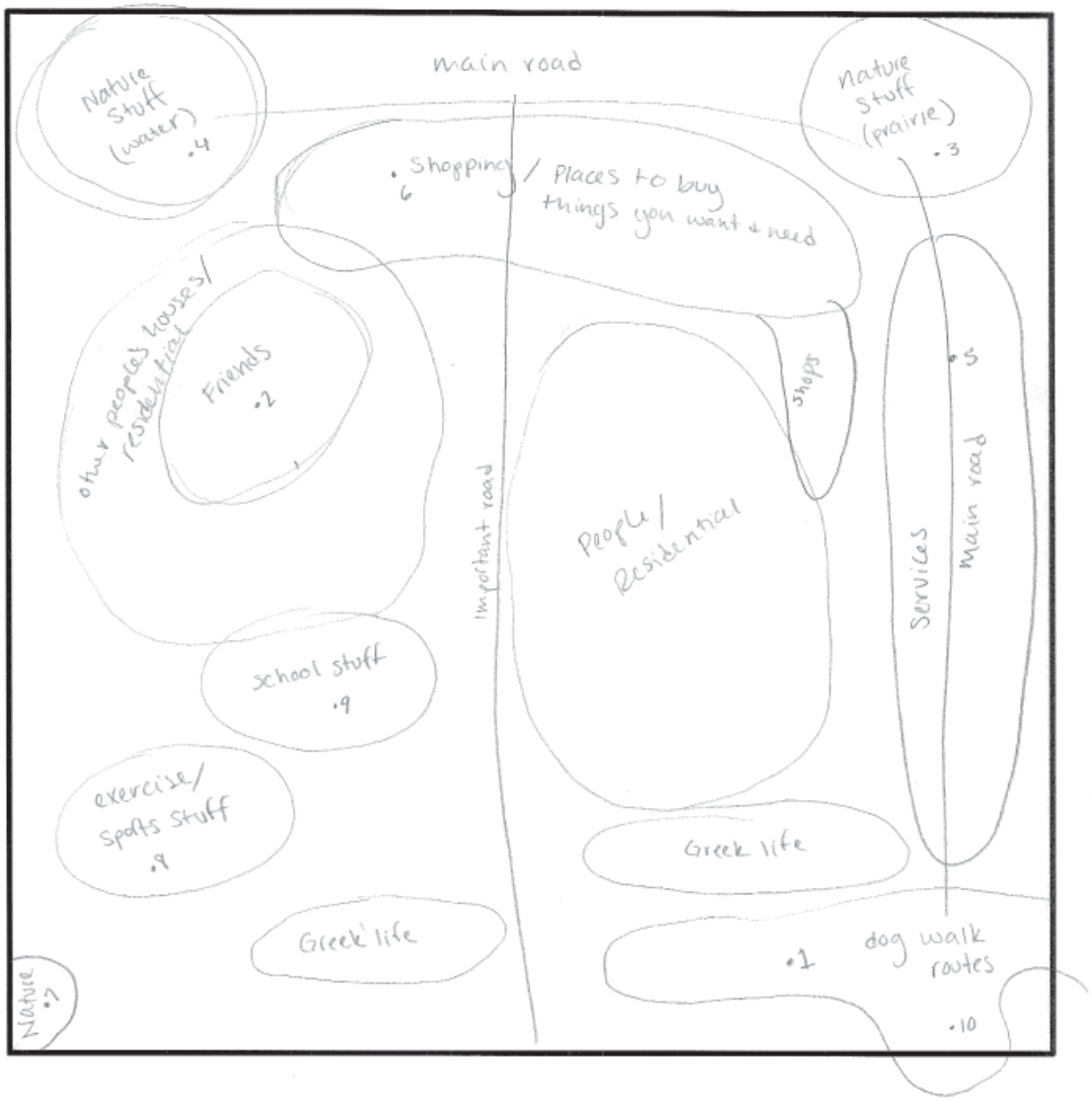


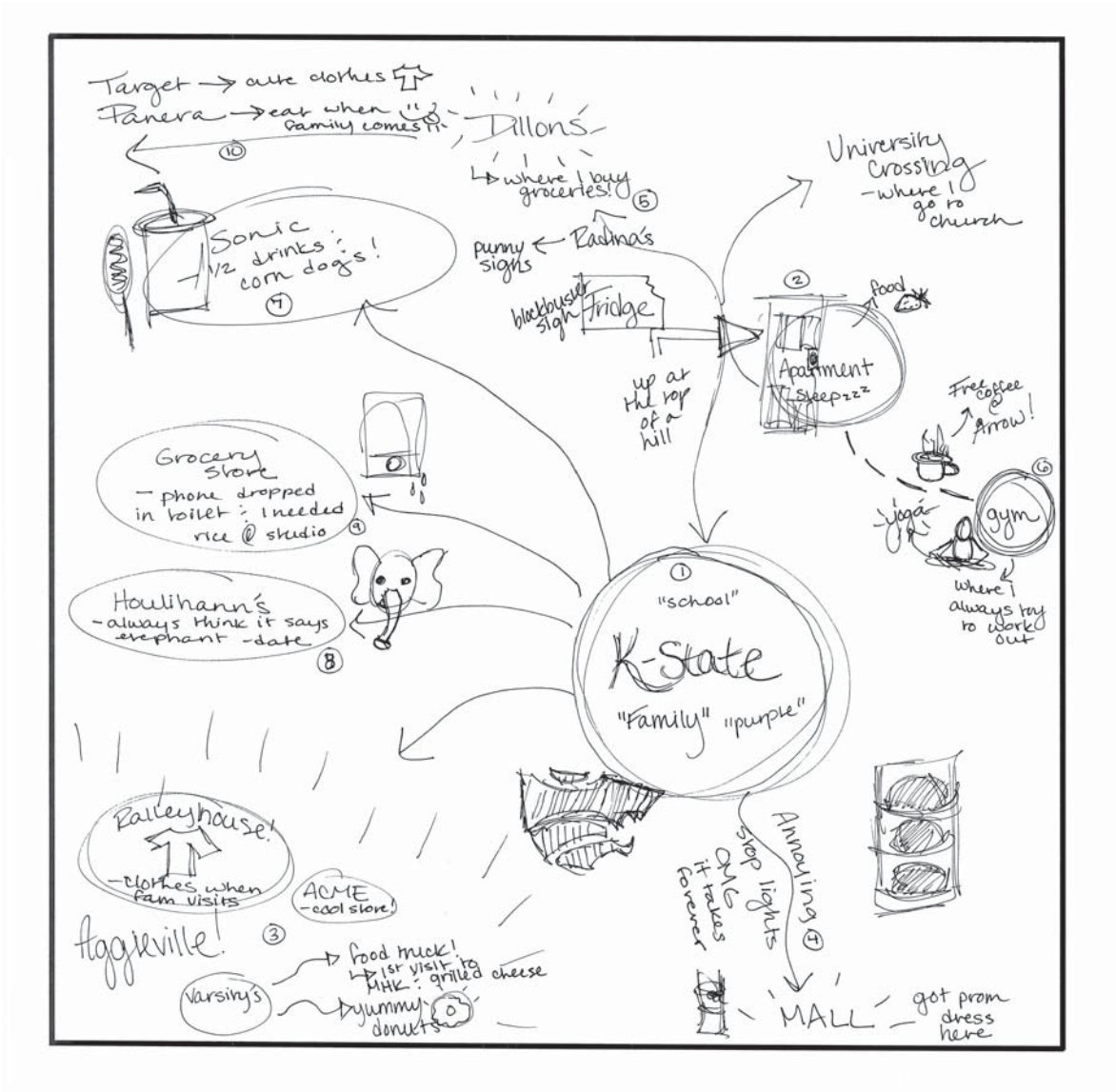
Participant 13 - Stereotype Map



Participant 14 - Cognitive Map

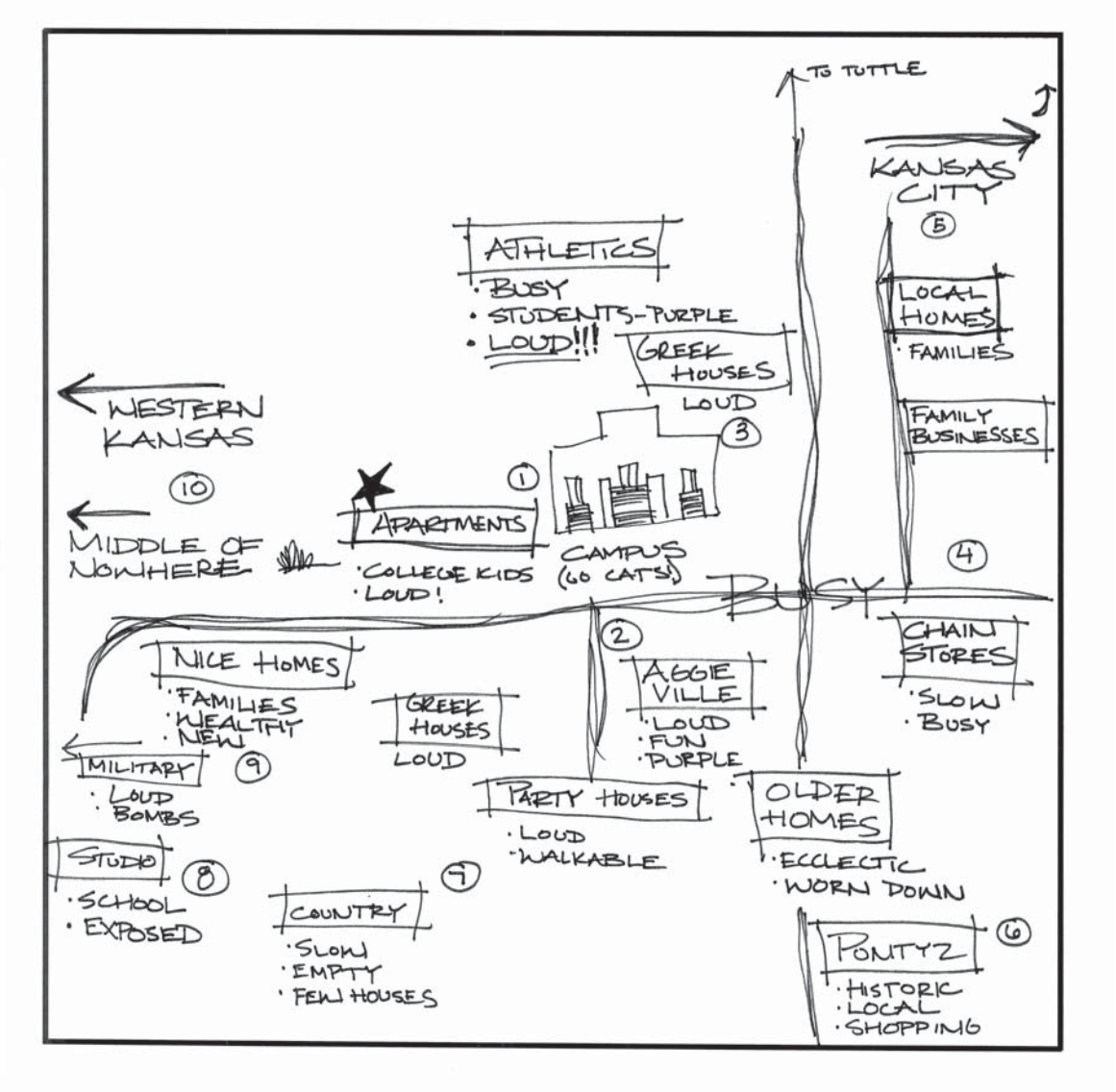


Participant 14 - Stereotype Map

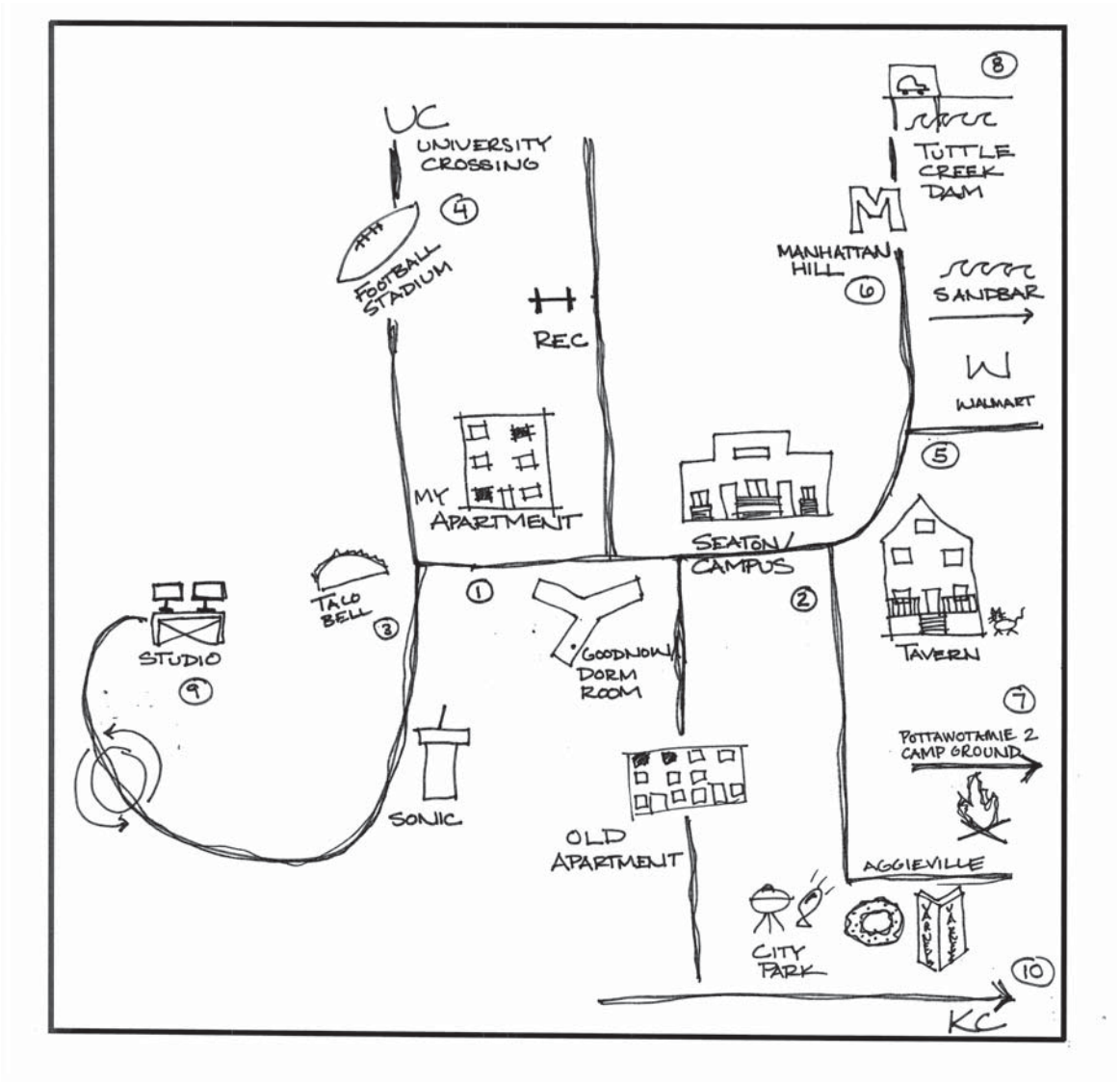


Participant 15 - Cognitive Map

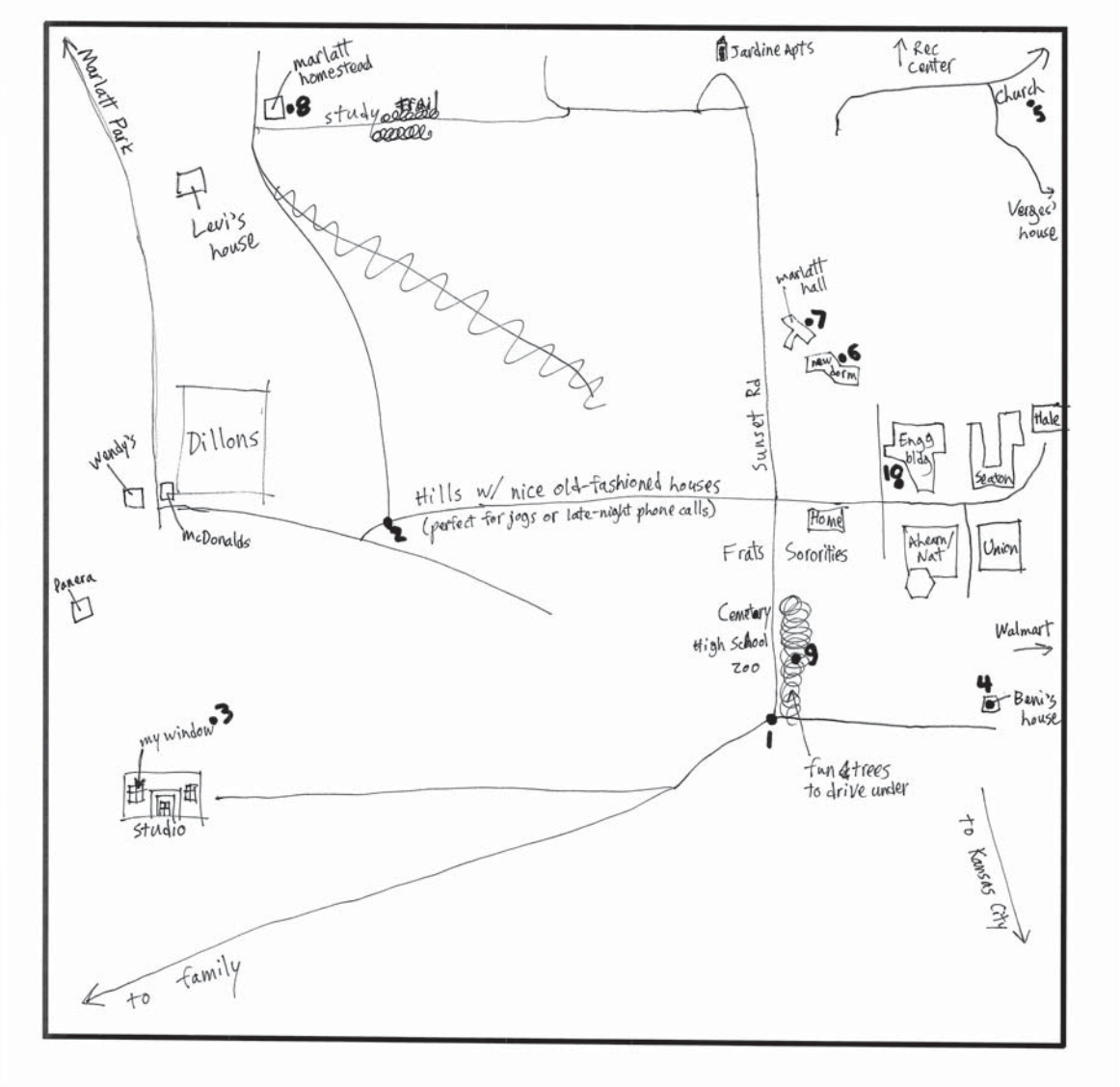
Participant 15 - Stereotype Map



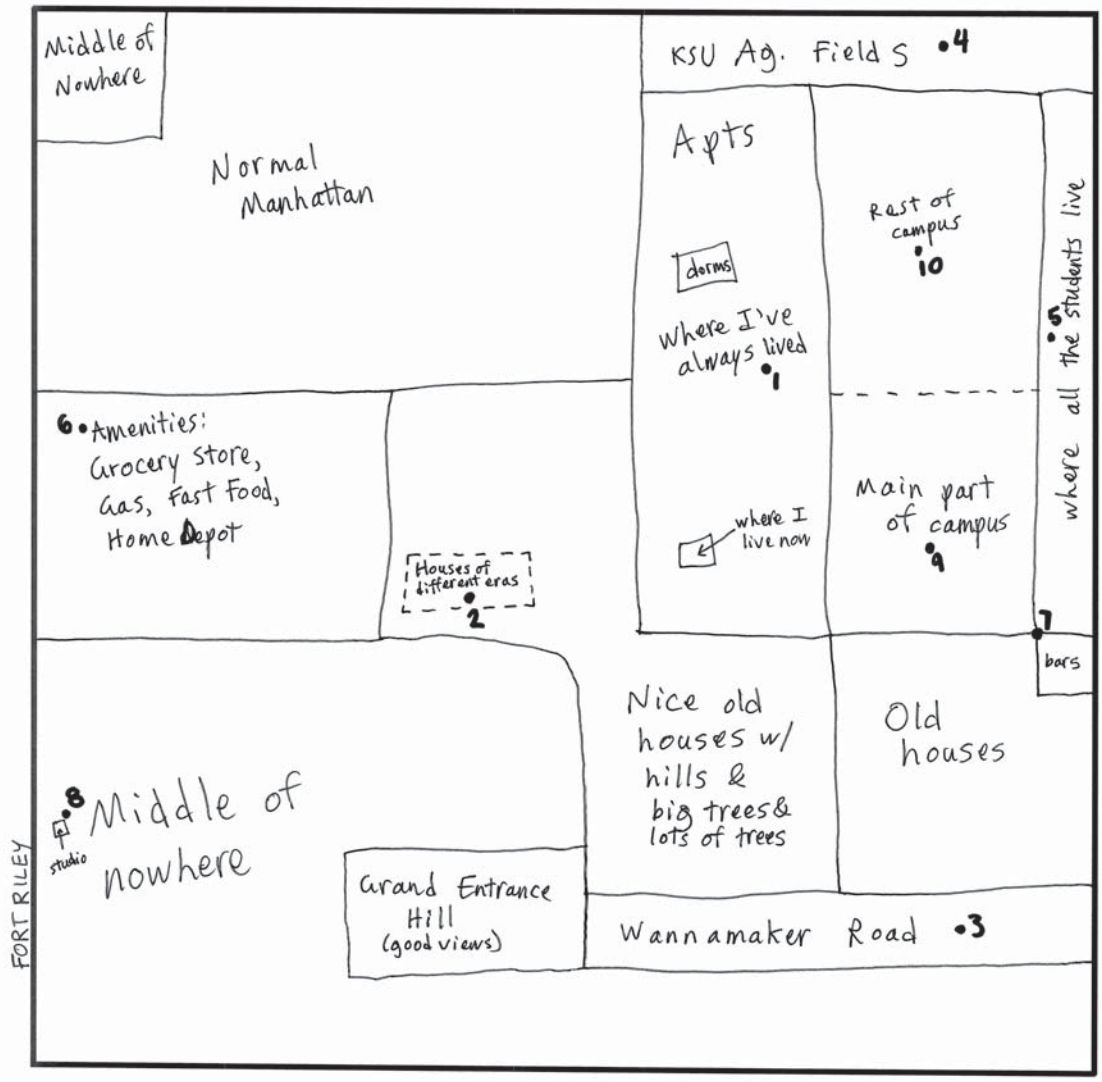
Participant 16 - Cognitive Map



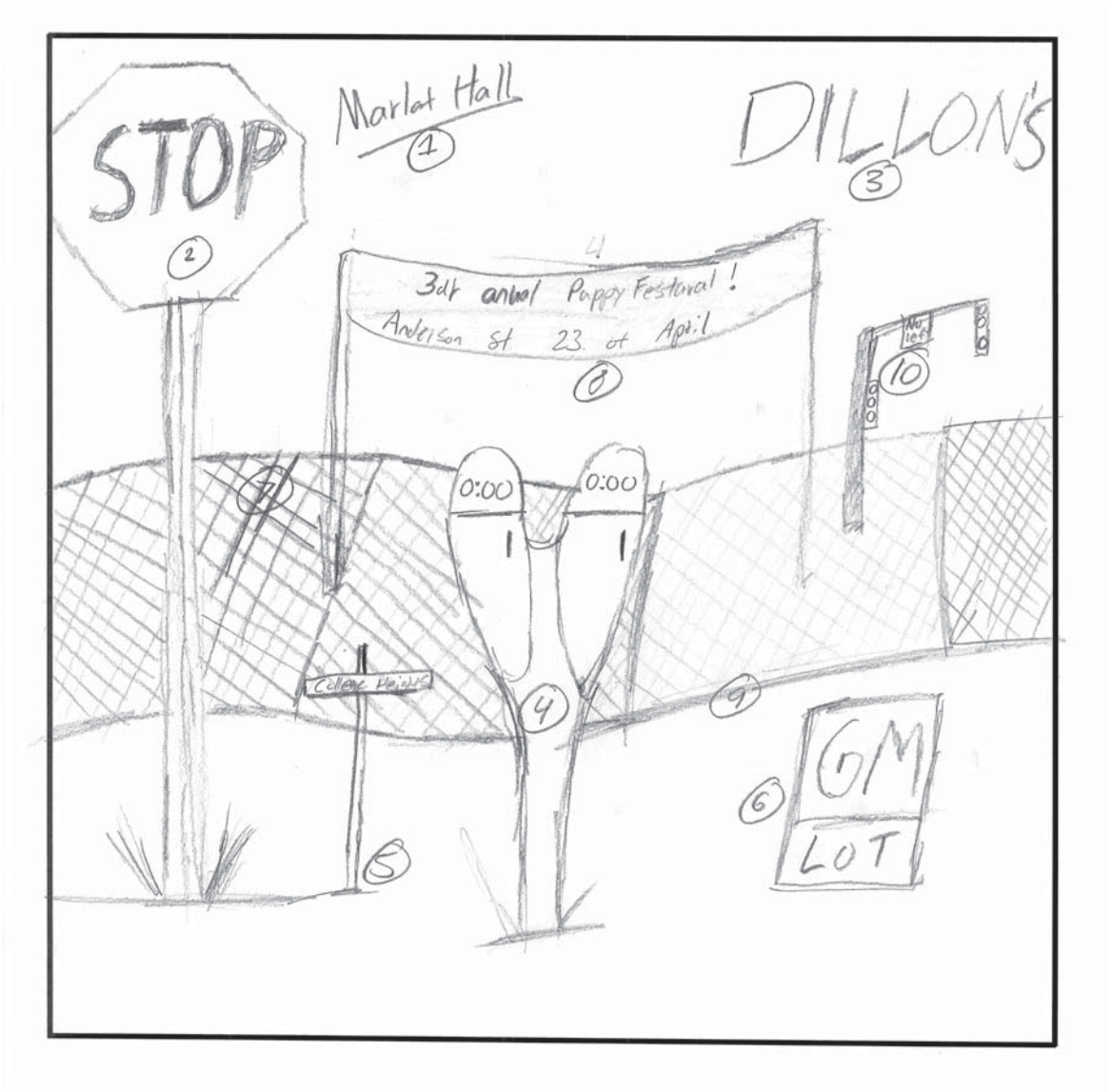
Participant 16 - Stereotype Map



Participant 17 - Cognitive Map

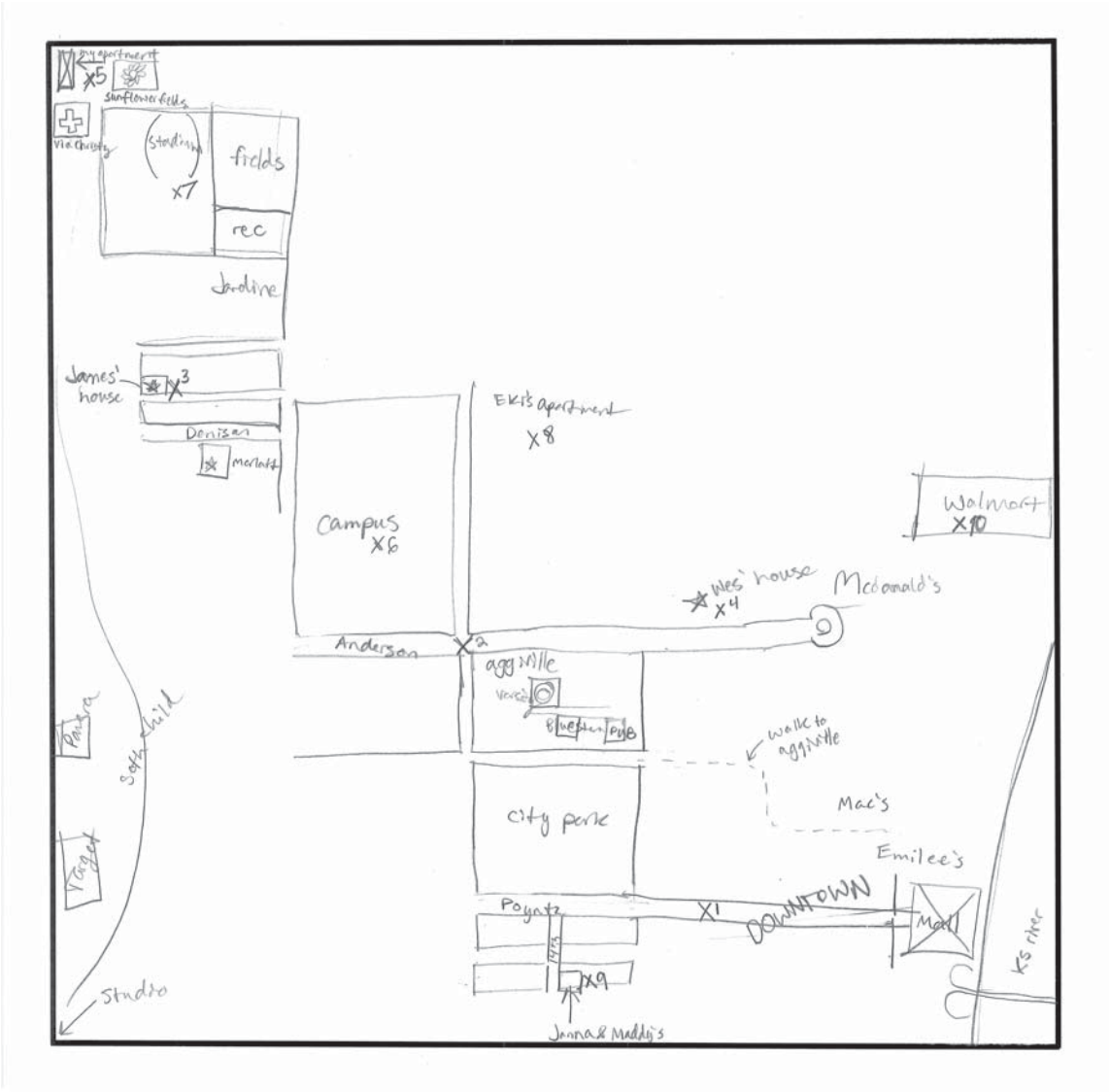


Participant 17 - Stereotype Map

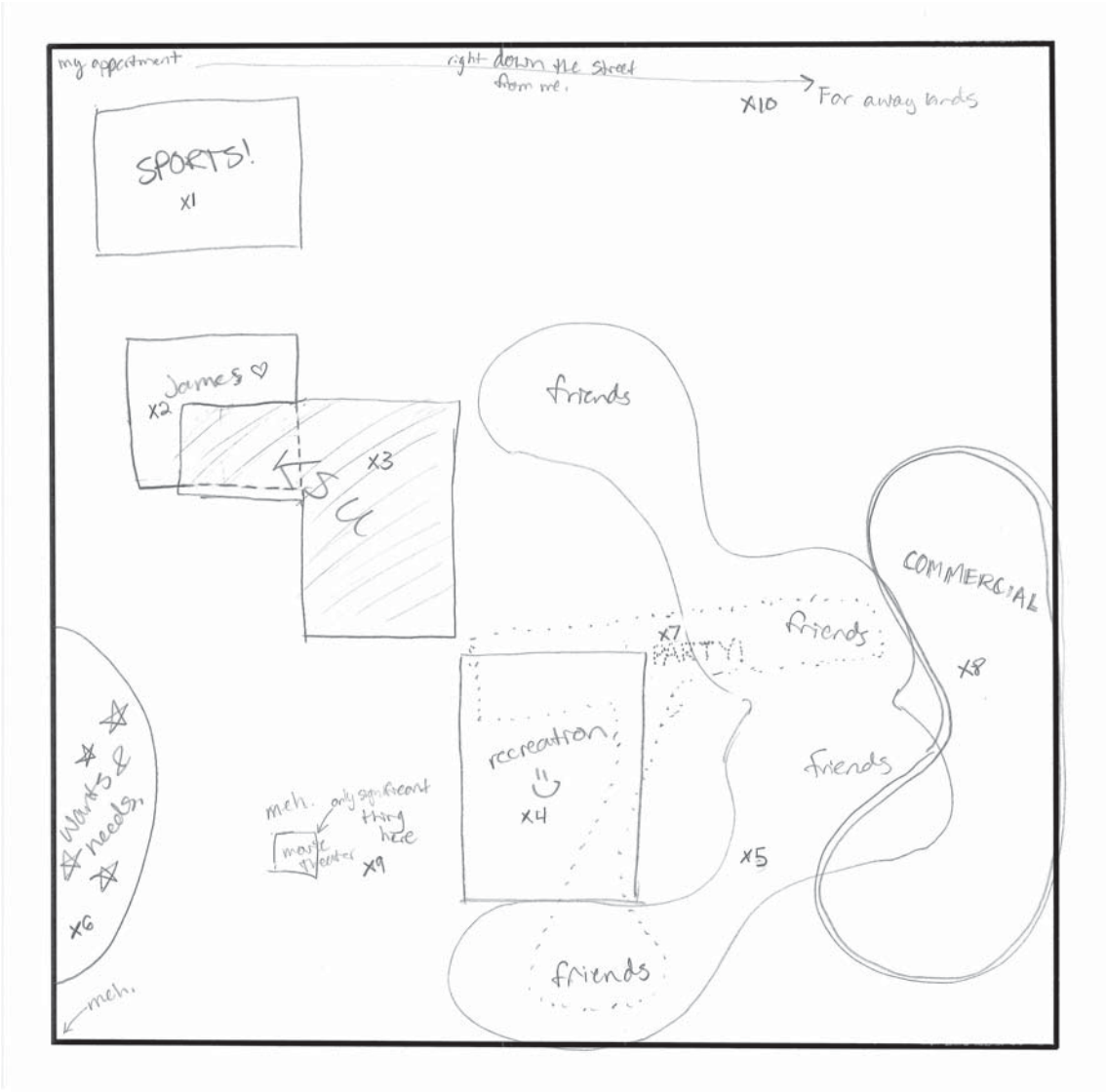


Participant 18 - Cognitive Map

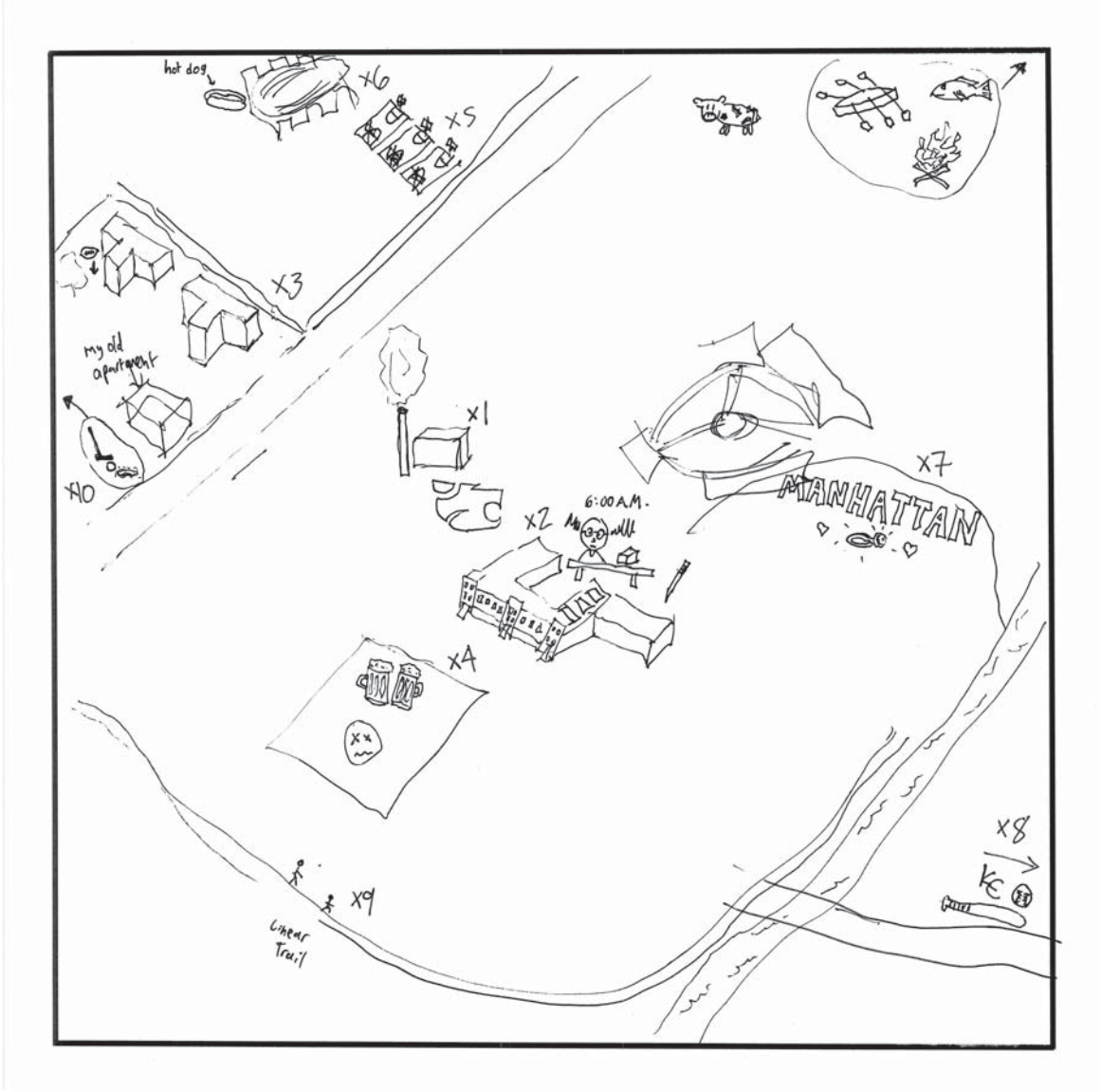
Participant 18- Stereotype Map



Participant 19- Cognitive Map



Participant 19 - Stereotype Map



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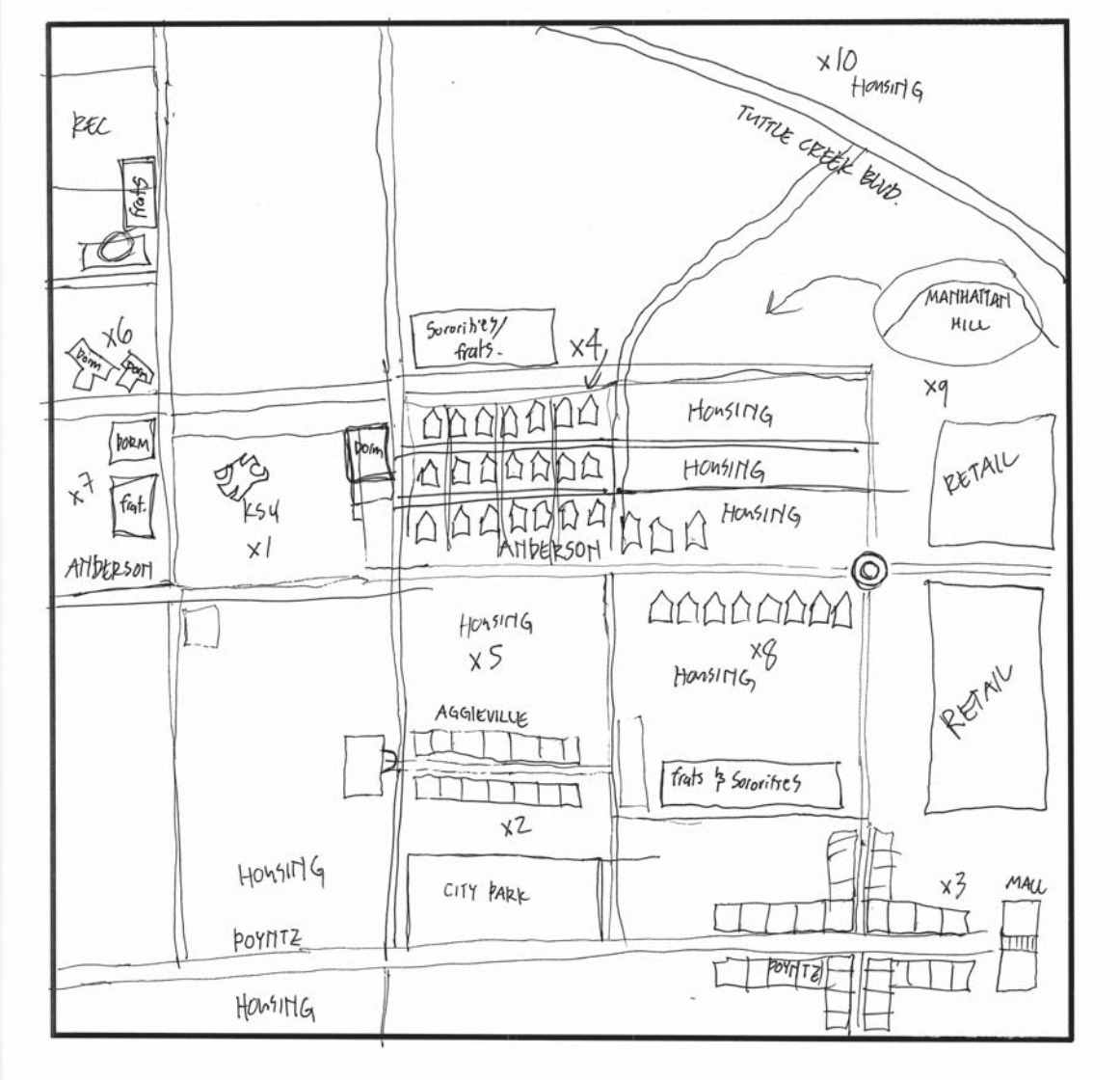
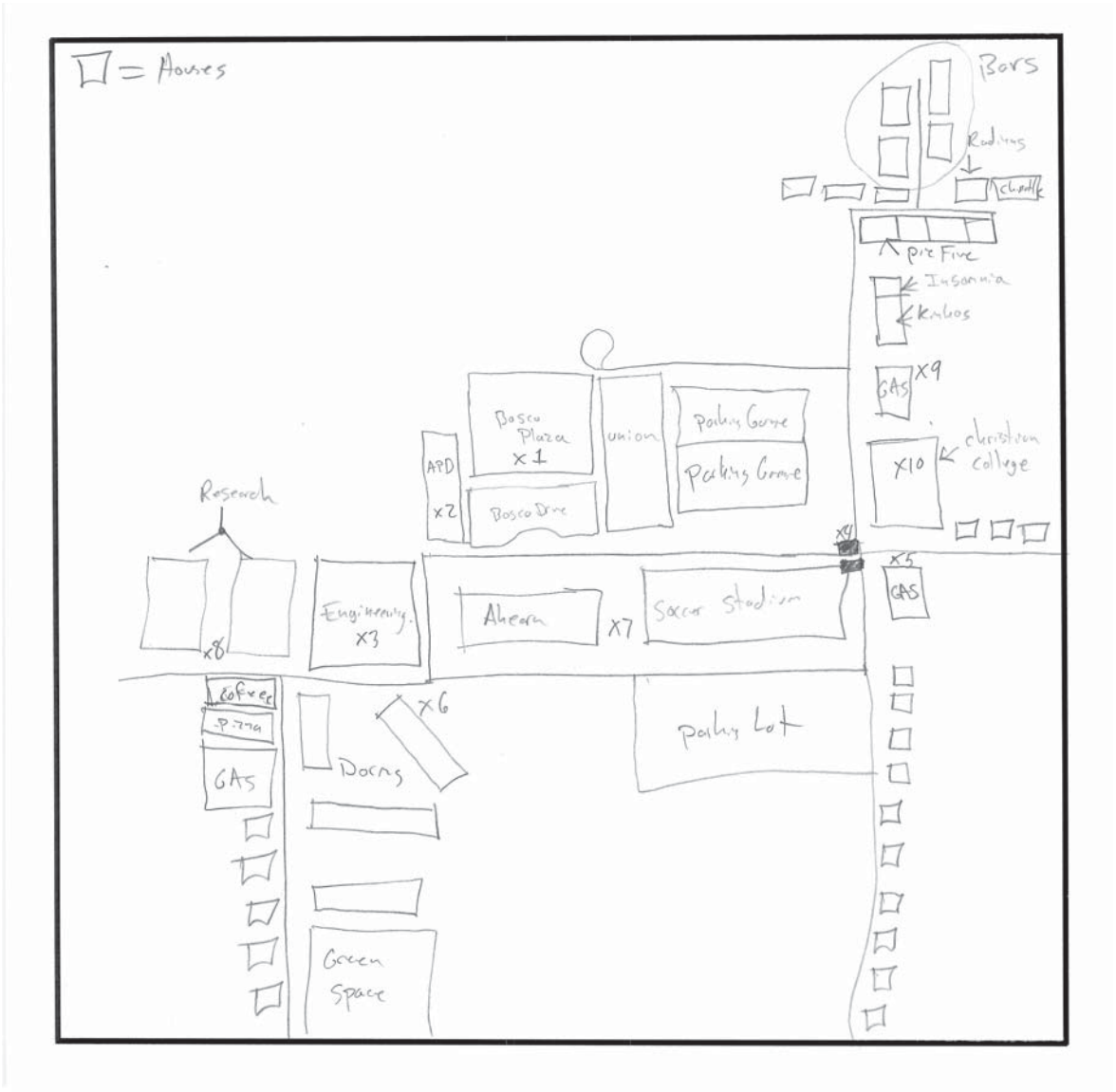
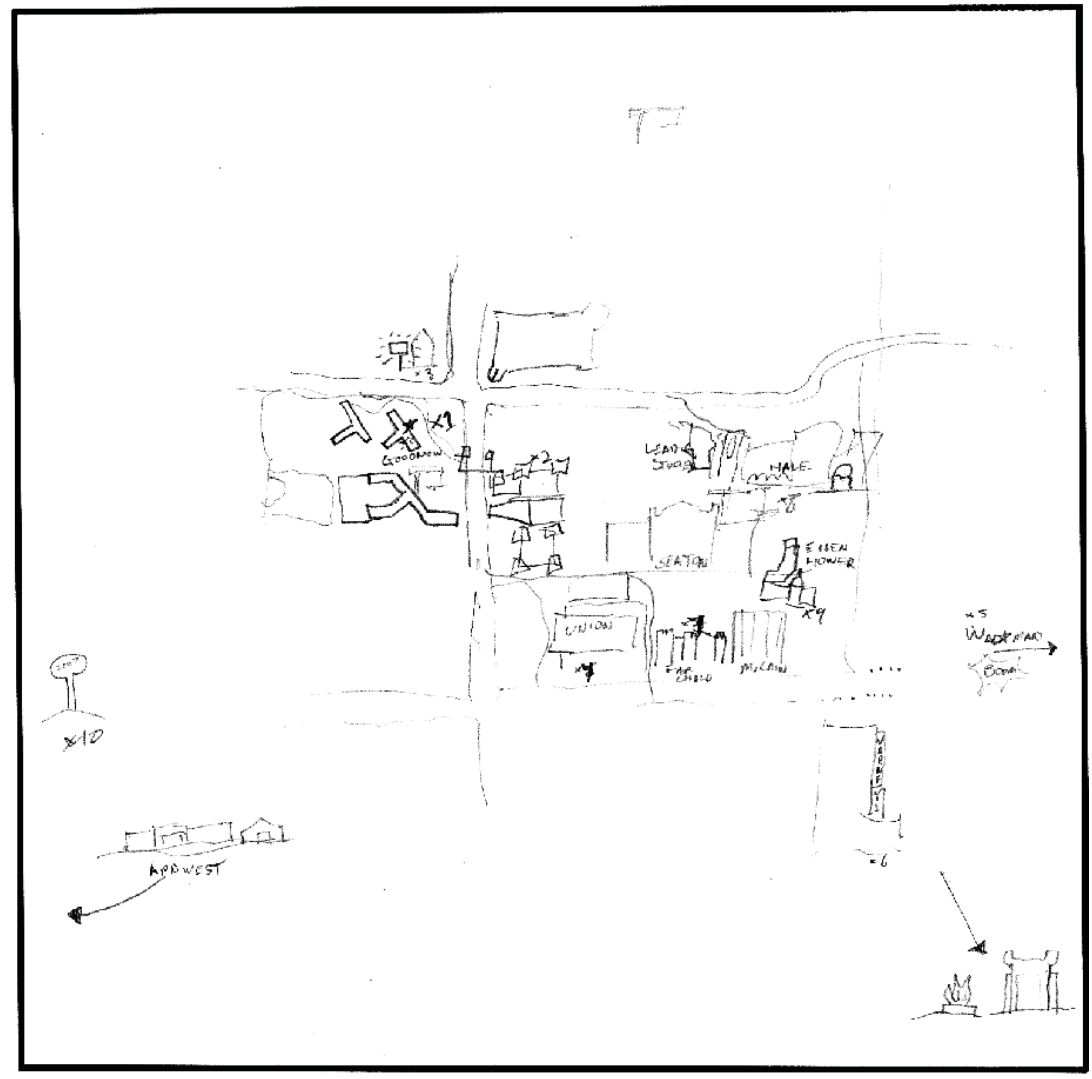


Participant 20 - Stereotype Map

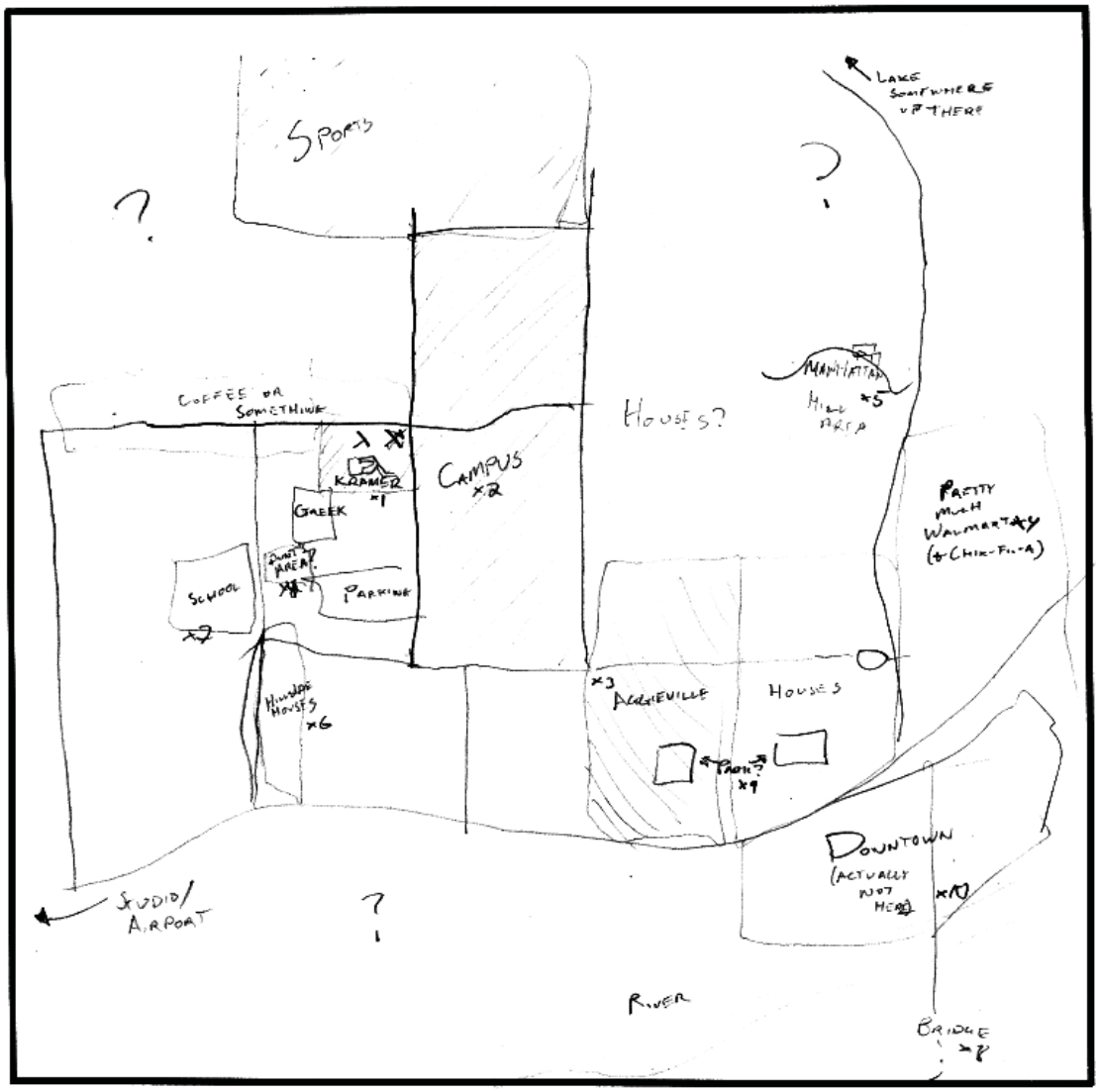


Participant 21 - Cognitive Map

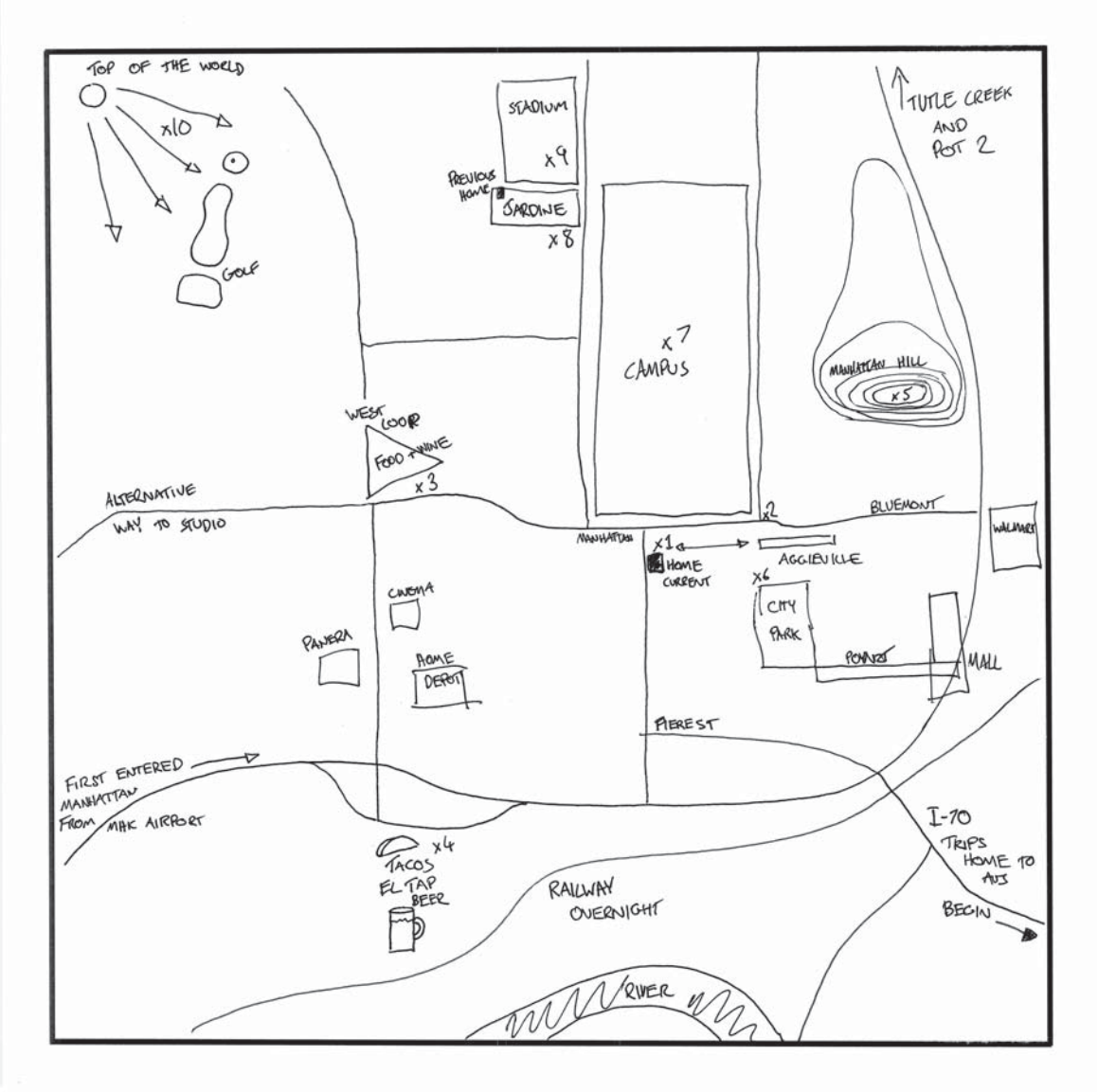
Participant 21 - Stereotype Map



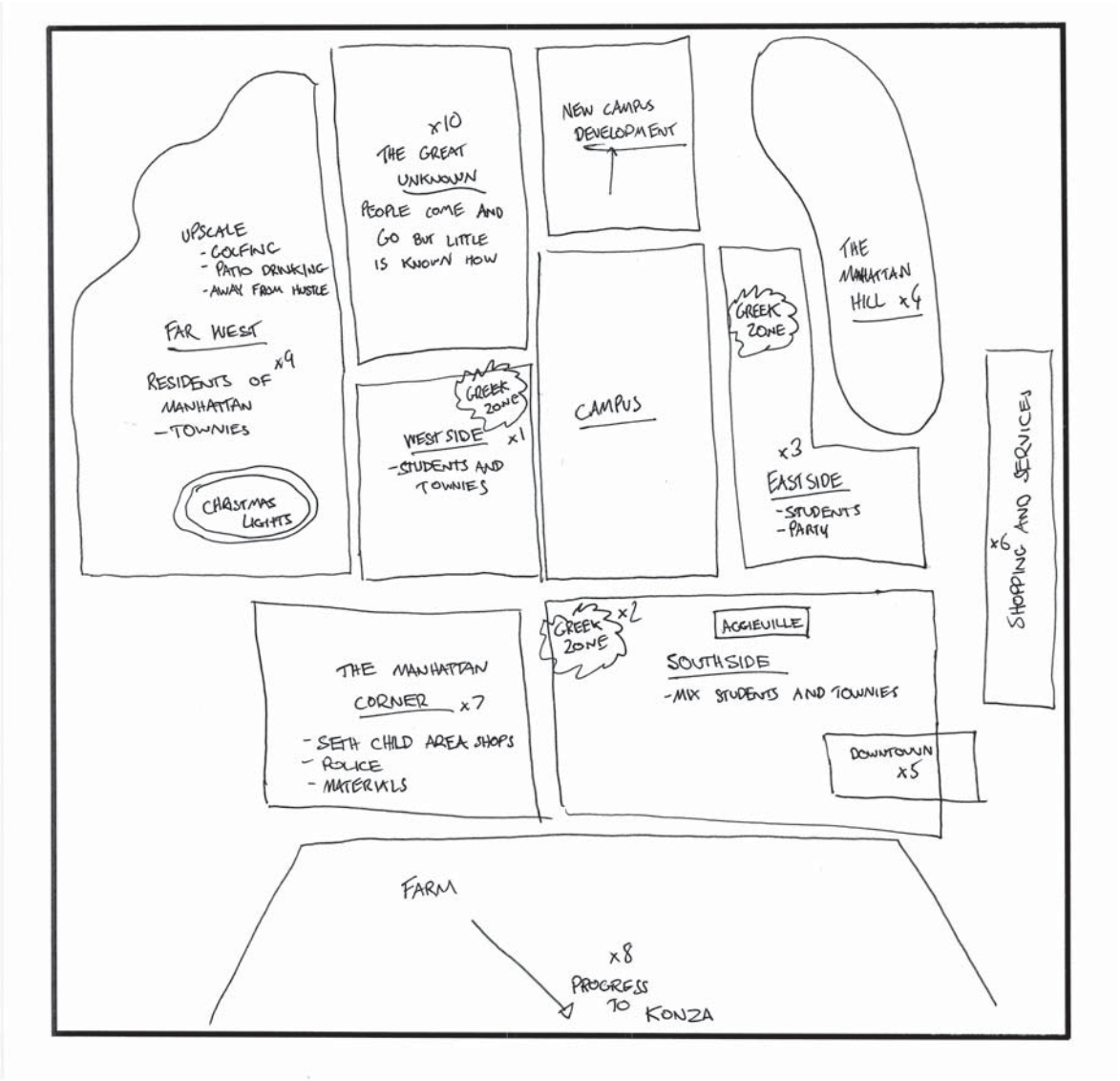
Participant 22 - Cognitive Map



Participant 22 - Stereotype Map



Participant 23 - Cognitive Map



Participant 23 - Stereotype Map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