Maxwell Zaleski
Professor Ryan
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<center>Mental Mapping of the University of Massachusetts, Amherst's Campus</center>

Mental mapping is the human brain's attempt at forming connections between spaces and areas, to help humans navigate and survive–forming a person's perception.[1] This mental mapping exercise studied how three test subjects drew the entirety of the University of Massachusetts, Amherst (UMass Amherst) campus from memory when given a blank sheet of paper and fifteen minutes to do so. They were told to indicate 'key features,' which included: major buildings, open spaces, roads, and natural features. The results suggest that occupation, mode of travel, and age have a direct impact on a person's mental map of the campus. The results also legitimize mental mapping research by Donald Appleyard and Kevin Lynch, while also revealing other aspects of mental mapping. The findings could have implications for the future design of the UMass Amherst campus and the supporting wayfinding materials.

All subjects reported that the mental mapping activity was challenging.[i] This is the main similarity between the three subjects—indicating that they struggled to express their respective mental maps. The greatest contributor to the divergence between the mental maps is that both Subject A and Subject C (myself) are visual designers. Meaning they are aware of design limitations and are less inwardly focused—showing some empathy toward the user (the person reading their map). While Subject B chose to use a pen, Subject A and I used a pencil, allowing us to edit our maps.[ii] Subject B's choice might have prevented them from making edits to their map and might have made them appear apathetic toward the user. Regardless, Subject A and I indicate empathy for the user by providing additional context. This development of context begins with the choice to zoom-out and show a larger view of the UMass Amherst campus and ends with the labeling of most major roads and landmarks. The mode of travel was the next contributor to map inconsistencies. Subject A who drives the most had the most accurate map—most likely from their mix of walking and driving around campus. It could be that they have formed a quasi-grid of the campus, where they are able to cross reference the location of different landmarks and pedestrian areas in relation to streets to get a better sense of where other buildings fall. While the age difference is not much, it probably did lead to differences with the maps. Subject A and B, the youngest participants, drew their maps in the horizontal orientation, while I drew my map in the vertical orientation. This might be because Subjects A and B are less adamant about what constitutes as the 'ideal orientation' for maps. Additionally, Subject A, the youngest subject, was the only participant to use 'their voice,' guessing which campus areas 'have monkey testing labs'. These labels are supposed to be humorous but could be read as offensive. This might be in part due to their personality (they are not inhibited) and/or their naivety. My findings indicate that "Length of Residence in the Area" and the "Residential Location" do not have an impact on the drawing of the maps. All of the maps are connected to Donald Appleyard's research and Kevin Lynch's research on perception and mental maps.

On a broader level, the mental maps indicated that all the test subjects used a combination of spatial and sequential mapping techniques.[2] Subject B used linked and fragmented mapping methods.[3] The map was linked, with buildings, roads, and paths connected to one another. The map

[1] Francis McAndrew. "2: Environmental Cognition." In *Environmental Psychology*, 27-50. (Pacific Grove, CA: Brooks/Cole Publishing Company, 1993.), 33.; McAndrew, 49.; Rachel Kaplan, Stephen Kaplan, and Robert Ryan. *With People in Mind: Design and Management of Everyday Nature.* (Washington, D.C.: Island Press, 1998.), 23-24.

[2] Donald Appleyard. *Styles and Methods of Structuring a City*, 70-81. (Thousand Oaks, CA: Sage Publications. PDF.), 73.

[3] Appleyard, 73-76.

was fragmented because approximately half the page was white space (part of the paper was left blank). This area might be incomplete or might it have been an area that was not a priority to map out (with Subject B consciously choosing not to include the area information). Subject A and I had similar maps, with a combination of scattered, linked, and network mapping methods.[4] Buildings were drawn scattered around the campus and were linked by roads. Overall the maps were quite accurate, making them network maps—although, mine was more fragmented than Subject B's map (with areas of white space).[5] Kevin Lynch's research delves into the mental map on a deeper level.

Lynch proposed successful cities have legibility or a coherent pattern that supports human needs and is never jarring.[6] Lynch also states that mental maps for urban locations are made up of five key components: districts, landmarks, nodes, paths, and edges.[7] It could be argued that UMass Amherst is a miniature city and is applicable to Lynch's categorization. Districts are areas classified by their 'distinct character'.[8] Subject B's map was primarily a magnified district, commonly called referred to as the Central Residential area, located in the hilly Eastern part of the UMass Amherst campus—barring them from most of the upcoming analysis. Subject A and I marked and labeled all of the residential districts on our zoomed-out maps. The districts in question are largely based off unfounded biases and stereotypes (i.e. that those who live in Southwest are 'party animals') and serve to categorize and group the areas of the campus into memorable pieces of information that can be easily recalled. Due to the limited range of Subject B's map, the shared landmarks (or prominent features of the campus) between all test subjects include only Franklin Dining Commons and the Design Building.[9] Subject B and I shared two major landmarks, Van Meter Hall (with a copula that is visible from the middle of campus) and the University Health Services. Some landmarks shared between Subject A and me included the Fine Arts Center, the Campus Pond, Haigis Mall, the Mullins Center, and the Campus Center.[iii] The aforementioned locations are classified as landmarks because they typically have a gravitas and influence on campus, and often overlapped with the nodes (or areas bustling with activity).[10] Common nodes found between Subject A and me included the peripheries of districts; the Campus Pond; the Fine Arts Center and Haigis Mall; the four dining commons; and street intersections.[iv] These nodes could be categorized as gateways because these locations usually are areas for "transition", where people "pause" to comprehend the surrounding landscape and what lies beyond.[11] The paths (or routes that people take) differed between the subjects.[12] Subject B was focused on drawing the details of roads and paths in solely the Central Residential area while Subject A and I plotted and labeled the major roads throughout the campus. The edges of the campus were the least developed, as no subject really knew where the campus ended. I indicated what was located 'off the map,' but my I did not have enough time to flush out the details. The study also found new intriguing mental mapping processes, that build upon Appleyard's and Lynch's research.

The first process could be deemed 'spatial ballooning and correction' and was experienced by Subject A and myself.[v] During this process the subjects initially emphasize certain buildings and areas, giving them hierarchy over other locations, only then to go back and reduce their scale (even after revision the scale is sometimes still incorrect). This occurrence could be attributed to the fact that people emphasize the location with which they are most familiar and spend the most time in.

[4] Appleyard, 73-76.
[5] Appleyard, 73.
[6] McAndrew, 37.
[7] McAndrew, 37.
[8] McAndrew, 37.
[9] Kaplan, Kaplan, and Ryan, 53.; McAndrew, 37-38.
[10] McAndrew, 37.
[11] Kaplan, Kaplan, and Ryan, 81-82.
[12] McAndrew, 37.

Similarly, the shapes of buildings were warped in the aerial view. This occurrence is fairly easy to explain, as the subjects rarely get a view of the campus from above. The second process could be deemed 'dealing with spatial anxiety' and is split into two user groups. One where white space and uncharted territory are seen as dangerous and test subjects counteract this by drawing too much (the case with Subject A and myself) and another where white space is seen as relaxing and one less thing to contemplate, and draw too little (the case with Subject B).[vi]

This activity proved useful at pinpointing 'sticking points' for the three students. If the UMass Amherst Campus Planning group (UACP) brought together larger user study groups and gave them a similar mental mapping exercise, the UACP may figure out which aspects of the campus have profound impacts on the students—and revamp wayfinding accordingly—so navigating becomes enjoyable and less of a chore. The main goals of a new Amherst UMass wayfinding system should be to create (1) visual hierarchy, (2) a balance of simplicity and complexity, and (3) more wayfinding signage overall. Too much information becomes cluttered and incomprehensible and users fear getting lost.[13] Too little information and the campus looks barren and dangerous—imbuing users with dread. The redesign of wayfinding should begin with an examination of Maslow's "hierarchy of needs". This will help prioritize the landmark locations that provide humans with "food, water, warmth, [and] rest… safety and security" and the locations that can help individuals pursue their professional endeavors and strive for greatness.[14] One way to find a balance of simplicity and complexity is to design maps and signage that are tailored to specific user groups.[vii] A second way is to use other drawing techniques to explain areas that would otherwise be too cluttered or full of white space. Cutouts that show the heights of buildings and their placement in the skyline would serve to clarify and help with navigating the campus at night. Oblique drawings could be used too, showing depth and sightlines.[15] In order for the new wayfinding signage to be effective, it needs to be more accessible, meaning that it should be all over the campus. UMass Amherst Campus Planning group implements these ideas, they should find that students, faculty, and visitors have less anxiety about finding campus locations and are more likely to explore the entirety of the campus.

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[13] Kaplan, Kaplan, and Ryan, 49.; Kaplan, Kaplan, and Ryan, 54.
[14] McAndrew, 46.
[15] Kaplan, Kaplan, and Ryan, 61.

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Test Subject Background Information

Subject A:
Age: 19
Occupation: Full-time Student, Transit Worker, and Visual Designer
Length of Residence in the Area: Two and a half years
Residential Location: On Campus—Brett Hall Dormitory—Central Residential Area
Most Frequent Mode of Transport: Walking

Subject B:
Age: 21
Occupation: Full-time Student
Length of Residence in the Area: Three and a half years
Residential Location: On Campus—Baker Hall Dormitory—Central Residential Area
Most Frequent Mode of Transport: Walking

Subject C / Myself:
Age: 22
Occupation: Full-time Student and Visual Designer
Length of Residence in the Area: Three and a half years
Residential Location: On Campus—Baker Hall Dormitory—Central Residential Area
Most Frequent Mode of Transport: Walking

Endnotes

[i] Please note that Subject C is me. I had an intermediate understanding of mental mapping before drawing and designing my map, which skewed the study and could be deemed as 'an error'.

[ii] The choice to use a pen may indicate that Subject B thinks they are confident in their mental mapping abilities

[iii] Other shared landmarks include: the Isenberg School of Management, the Student Union building, the Campus Recreation Center, Herter Hall, Bartlett Hall, and the Whitmore Administration Building, and the three other dining commons (Worcester, Berkshire, and Hampshire)

[iv] The intersections: (1) at Commonwealth Avenue and Massachusetts Avenue; (2) at Presidents Drive and Massachusetts Avenue; (3) at North Pleasant Street and Massachusetts Avenue; and (4) at North Pleasant Street and Governors Drive

[v] This process is very similar to Lynch's distortion, in which parts of maps are drawn incorrectly

[vi] The third process could be called the 'inner and outer technique' in which participants work between the 'center most' landmarks and outer most areas, enabling them to develop a center point and frame, in an attempt to try and reduce the effects of the spatial warping. The final process is called 'laziness and apathy' and might have been caused by the fifteen-minute time limit, which could have rushed test subjects. All subjects, unfortunately, partook in this process, choosing to abbreviate names and leave-off context (like the edges of the campus) which would, of course, confuse users who do not have experience on the campus. I began to tackle this process by including a legend, and useful building facts (the number of floors), to simple cardinal direction indications for orientation.

[vii] For instance, people could receive maps and additional information that pertains to their department, major/field of study, spoken language, and residential location—with a sprinkling of additional context. Context would include landmarks like DuBois Library, the Campus Center, Lederle Graduate Research Center, the Mullins Center, the five Southwest Towers, and the Fine Arts Center, Haigis Mall, the Campus Pond. Context would also include a legend, cardinal directions, and demarcated edges.