# community connector bus stop system

supporting the mobility and social connectedness of older adults

an industrial design thesis by allison krish
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**Abstract**

Social isolation is a major factor in the wellness of aging adults. Many people begin to experience issues with their physical mobility as they age, which can increase their likelihood of social isolation. However, having social connections is very important, as it is one of the key elements to aging well, alongside health, financial security, and adequate housing. This project, developed in conjunction with the Upper Arlington Commission on Aging and the Age Friendly Innovation Center, is centered around the idea of supporting the social connectedness and mobility of older adults in Upper Arlington. In the coming months these organizations will be introducing a bus to the city of Upper Arlington, nicknamed the Community Connector, that addresses the needs of older adults by providing rides throughout the neighborhood. As the system grows its ridership, it will decrease the need for older adults to drive their own personal vehicles while encouraging mobility, social connection, and sustainable practices within the neighborhood. This project focuses on the design of a network of bus stops that enhances the experience of using the Community Connector so that it becomes an appealing mode of transportation even for older adults who are still able to drive themselves. The resulting bus stops will become engaging community spaces where all members of the community have the opportunity to form genuine social connections with their neighbors.

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# introduction

Social isolation is a major factor in the wellness of aging adults. Many people begin to experience issues with their physical mobility as they age, which often increases the likelihood of an older adult experiencing the negative effects of social isolation. However, having social connections is a key element in aging well, alongside financial security, adequate housing, and health. The COVID-19 pandemic has made it very difficult for aging adults, particularly those who do not always have a secure means of transportation, to maintain relationships and get to where they need to go.

The city of Upper Arlington is a suburb of Columbus, Ohio. According to the US census, the 2020 population of Upper Arlington was estimated to be 36,800 (U.S. Census Bureau). Approximately 17.2% of Upper Arlington's population consists of people aged 65 and older (UACOA), which is slightly higher than the portion of the national population that is 65 and older, estimated to be 16% in 2019 (Administration for Community Living).
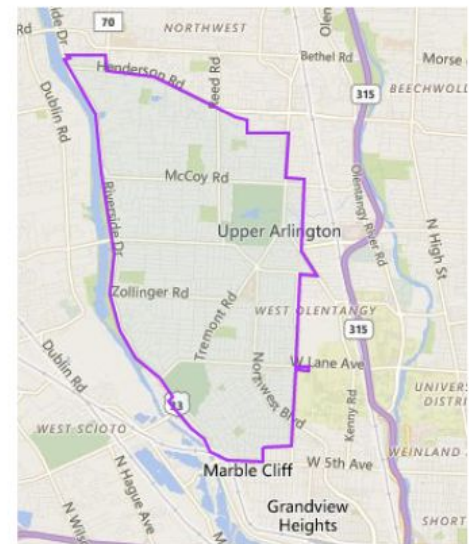

*The City of Upper Arlington outlined above.*
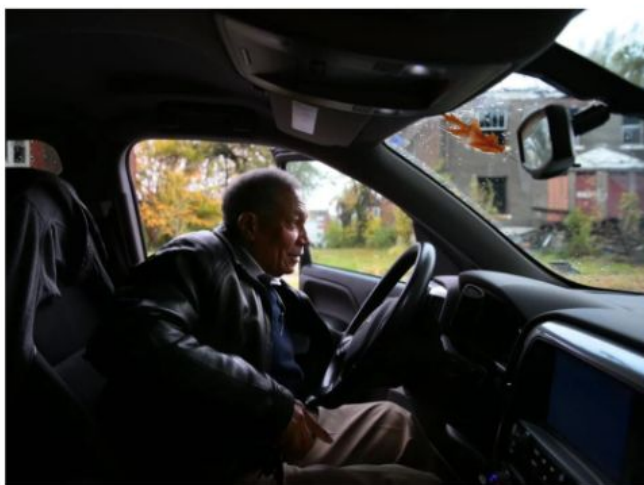

*Driving becomes more dangerous as people age.*

Driving is the most common mode of transportation amongst Upper Arlington residents, and older adults are no exception. In a survey conducted by the Upper Arlington Commission on Aging (UACOA), 95.3% of respondents aged 65 and over said that they primarily drove themselves to get where they needed to go. This can border on dangerous,

as it is fairly common for older adults to continue driving past the point where it is no longer safe for them to do so. The same UACOA survey asked older adults about how they would want to get around if their primary means was no longer an option. In this case, 68.4% of respondents said that they would rely on their friends, family, and neighbors to drive them to appointments and run errands- another situation in which personal vehicles are the primary mode of transportation.

In the first meeting with our project partners, UACOA and the Age-Friendly Innovation Center, the concept of a new circulator bus system was brought up. The circulator, which is set for a January 2022 pilot run, is being implemented to assist older adults in Upper Arlington with getting around the city. It is intended to provide older adults with a mode of transportation that is created specifically to address their needs, and would provide service to and from various destinations in Upper Arlington.



*Participants of the first codesign session.*

In order to gain a greater understanding of the problem space, two of my classmates and myself facilitated a couple of codesign sessions with older adults who are currently residents of Upper Arlington. We wanted to know more about how older adults in Upper Arlington get around currently and whether a new circulator system would even be a relevant addition to the neighborhood.

Based on the sessions with our codesign participants, we learned that there definitely is a need. Throughout both of our sessions, our codesign participants talked about their experiences with another bus service in Columbus: the Central Ohio Transit Authority (COTA) bus service. Our participants were very critical of the current COTA system, describing a few of the issues they

have personally faced. One major problem is that the current COTA system is inconsistent. Participants discussed the multiple times that they have waited at the bus stop for a bus to come, only to find out a half an hour later that the bus that they had intended on taking had broken down. On some occasions, COTA sent another bus in its place that didn't arrive until much later, but on other occasions, our participants told us that a replacement bus was never sent at all, forcing them to reconfigure their travel plans. Participants stressed that it was often impossible to make time-sensitive plans if they intended on taking the bus. One of our participants, who is unable to drive, told us he moved to his current apartment building specifically because it was near a bus stop that was originally serviced by three different COTA lines. However, the bus lines have since been rerouted so that only one line still services that specific bus stop. In order to be successful, the proposed circulator would need to take these important issues into account.

The inconsistencies extended to bus stops as well: our participants explained that some stops offered those who were waiting for the bus a covered bench and a map of COTA's routes, while other stops were little more than a pole stuck into the grass on the side of the road- not a very comfortable or weather-resistant environment for someone who is waiting for their bus.



*Some COTA stops offer riders a bench and an awning while they wait for their bus, while other stops consist of only a sign.*

Planning and scheduling was cited as another major pain point by our participants. Many talked about the stress of planning a trip not only if they were planning on utilizing COTA buses, but also with taking other modes of transportation like shuttle buses and ride shares. If one wants to take

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a COTA bus they have to search for the current routes that are being serviced, how often the buses run on each route, locate the bus stops that are nearest to their house as well as their destination, figure out if they need to transfer routes, then calculate how long the trip will take and consider the time want to reach their destination to find out when they need to leave their house to arrive on time. For the reservation based-systems our participants use, they often need to use an app or call to schedule out their reservation days, if not weeks, in advance. Our participants told us that they wanted an easy way to access this information in a centralized location. They also mentioned that they would like a resource that consolidates information about local news and events, allowing them to stay up to date easily.



*COTA routes in Upper Arlington.*

Something else that needs to be considered is current transportation tendencies in Upper Arlington. While a circulator would very likely be used by those who do not own a car or cannot drive themselves, data shows that this is only a small portion of Upper Arlington's population. The majority of older adults already drive themselves to where they need to go. In order to make an impact, the circulator would need to attract riders who can still drive themselves.

Social connectedness is another key aspect of this problem space that ought to be addressed. Loneliness impacts more than just one's mental and emotional health. Studies have actually shown associations between loneliness in older adults and physical health problems like higher blood pressure and dementia. Additionally, social isolation has been linked to risky health behaviors like smoking and physical inactivity (Span).

*The Upper Arlington Public Library is one place where older adults go to stay connected within their community.*

Our codesign participants spoke about their own experiences with social connectivity during the codesign sessions. The participants stated that they thought staying connected within the community was incredibly important and many had a variety of ways in which they did so. One participant described the annual neighborhood block parties that she likes to attend. A second cited participating in book clubs, visiting the library, and attending activities at the senior center as ways that she stays connected. Another spoke highly about events like music in the park and the annual Upper Arlington Labor Day Arts Festival as places where she can meet new people and maintain existing friendships.

An Upper Arlington circulator has the potential to impact the community in a big way. A solution that supports the circulator in encouraging social connections and providing older adults with a reliable means of getting around would help make the circulator an empowering experience for older adults. It would provide those who cannot drive with the opportunity to get around without relying on friends or family to drive them places. It would make the transition to stop driving easier for older adults who are nearing the age where it is no longer safe for them to drive. It would provide seniors who still can drive with a more leisurely and sociable alternative, and it would also have an environmental impact by reducing the number of personal vehicles on the road, producing fewer emissions and making Upper Arlington a safer, greener, and more enjoyable city to live in.
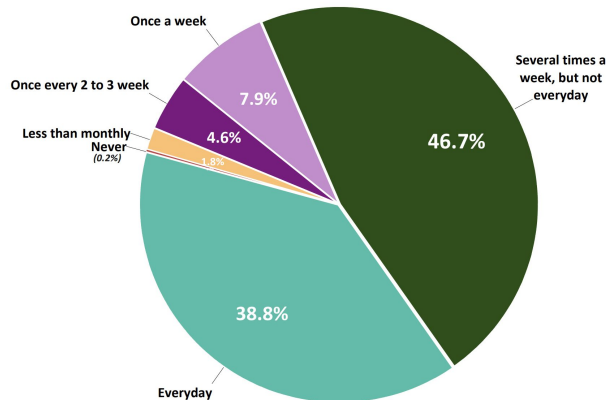
# research

- survey
- secondary research
- primary research
- conjectures

A valuable resource at the beginning of the research process was a report which documented the findings of a community survey conducted by the Upper Arlington Commission on Aging. The survey was sent out to older adults who resided in Upper Arlington and asked a variety of questions about the respondent's life. Shown is a sample of the results.
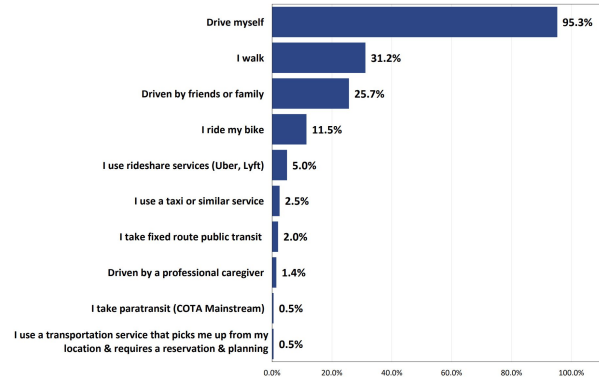
**Q16. How often do you have contact with family, friends, or neighbors who do not live with you?**
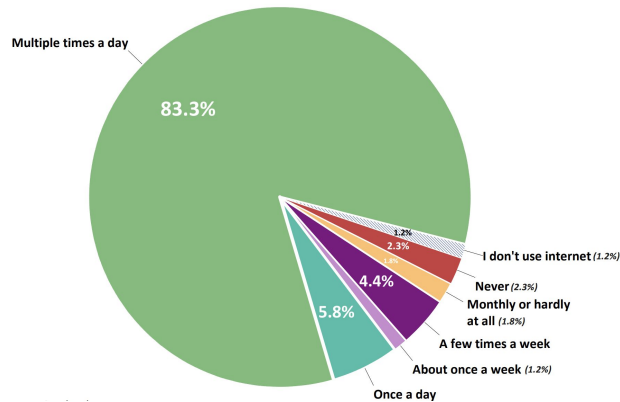by percentage of respondents (without "not provided")

- Once a week
- Once every 2 to 3 week
- Less than monthly
- Never *(0.2%)*
- Several times a week, but not everyday
- Everyday

7.9%
4.6%
1.8%
46.7%
38.8%

**Q1. What is your usual way of getting to where you want and need to go?**
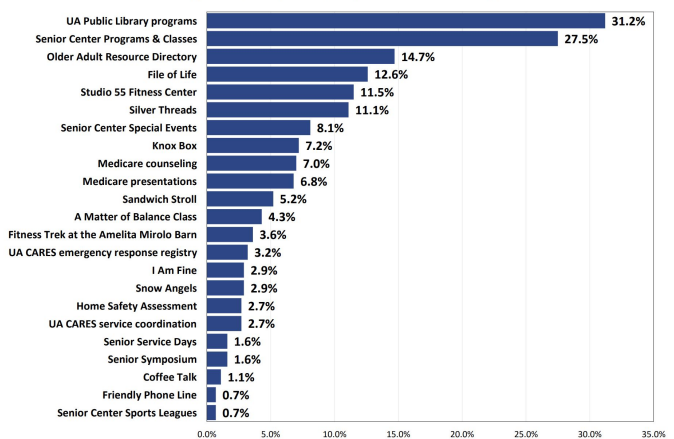by percentage of respondents (multiple choices could be selected)

| | |
|---|---|
| Drive myself | 95.3% |
| I walk | 31.2% |
| Driven by friends or family | 25.7% |
| I ride my bike | 11.5% |
| I use rideshare services (Uber, Lyft) | 5.0% |
| I use a taxi or similar service | 2.5% |
| I take fixed route public transit | 2.0% |
| Driven by a professional caregiver | 1.4% |
| I take paratransit (COTA Mainstream) | 0.5% |
| I use a transportation service that picks me up from my location & requires a reservation & planning | 0.5% |

**Q32. How often do you use the internet?**
by percentage of respondents (without "not provided")

- Multiple times a day 83.3%
- A few times a week 5.8%
- About once a week *(1.2%)*
- Once a day 4.4%
- Monthly or hardly at all *(1.8%)*
- Never *(2.3%)*
- I don't use internet *(1.2%)*

2.3%
1.2%

**Q26. Which of the following services have you used?**
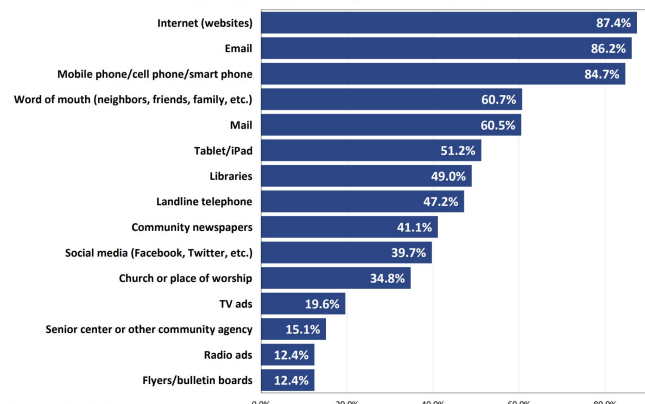by percentage of respondents (multiple choices could be selected)

| | |
|---|---|
| UA Public Library programs | 31.2% |
| Senior Center Programs & Classes | 27.5% |
| Older Adult Resource Directory | 14.7% |
| File of Life | 12.6% |
| Studio 55 Fitness Center | 11.5% |
| Silver Threads | 11.1% |
| Senior Center Special Events | 8.1% |
| Knox Box | 7.2% |
| Medicare counseling | 7.0% |
| Medicare presentations | 6.8% |
| Sandwich Stroll | 5.2% |
| A Matter of Balance Class | 4.3% |
| Fitness Trek at the Amelita Mirolo Barn | 3.6% |
| UA CARES emergency response registry | 3.2% |
| I Am Fine | 2.9% |
| Snow Angels | 2.9% |
| Home Safety Assessment | 2.7% |
| UA CARES service coordination | 2.7% |
| Senior Service Days | 1.6% |
| Senior Symposium | 1.6% |
| Coffee Talk | 1.1% |
| Friendly Phone Line | 0.7% |
| Senior Center Sports Leagues | 0.7% |

**Q15. Are you currently receiving care from someone else?**
by percentage of respondents (without "not provided")

- Yes 4.9%
- No 95.1%
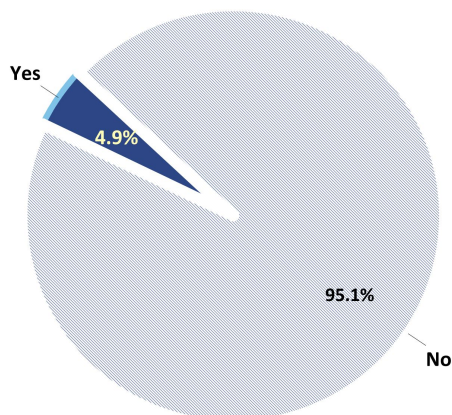
**Q24. What methods do you use, on a regular basis, to find information and plan your life?**
by percentage of respondents (multiple choices could be selected)

| | |
|---|---|
| Internet (websites) | 87.4% |
| Email | 86.2% |
| Mobile phone/cell phone/smart phone | 84.7% |
| Word of mouth (neighbors, friends, family, etc.) | 60.7% |
| Mail | 60.5% |
| Tablet/iPad | 51.2% |
| Libraries | 49.0% |
| Landline telephone | 47.2% |
| Community newspapers | 41.1% |
| Social media (Facebook, Twitter, etc.) | 39.7% |
| Church or place of worship | 34.8% |
| TV ads | 19.6% |
| Senior center or other community agency | 15.1% |
| Radio ads | 12.4% |
| Flyers/bulletin boards | 12.4% |

To begin our primary research, two of my classmates and I formed a research group and designed an online survey to collect information about the physical and digital mobility of older adults. The survey consisted of 6 multiple choice and 2 open-ended response questions that took approximately 1-2 minutes to complete. We sent the survey out over text and in group messages on social media to those who knew older adults or to older adults themselves and filtered responses by age, ensuring that all of the data we analyzed came from those who were 65 or older. Shown is a sample of the questions asked.

What type of housing do you currently live in?

House

Apartment

Condo

Assisted Living Facility

Other

How confident do you feel learning new technologies (apps, websites, devices, etc.)?

Very Confident

Pretty Confident

Somewhat Confident

A little Confident

Not Confident at All

What mode of transportation do you take most frequently?

Walking

Car: driving self

Car: rides from friends or family

Car: from Uber, Lyft, taxi, or similar service

Public Transportation (ex. bus)

Other

Where do you go most frequently when you leave your house?

Do you have a personal device(s) that you use to access the internet? If yes, what device(s) do you own? (select all that apply)

I do not have devices to access the internet

Desktop Computer

Laptop

Tablet

Smartphone

Other

What are some activities you currently enjoy? Does mobility (whatever this term means to you) impact your ability to participate in these activities?

Of the responses we received, 12 responses were from people age 65+. We analyzed this data and used it in conjunction with the results of the comprehensive survey conducted recently by the Upper Arlington Commission on Aging to inform further research and design efforts.

## The Mobility of Older Adults in Upper Arlington

According to the US census, the city of Upper Arlington has a population of about

**36,800**

About **17.1%** of these residents are **aged 65+**

**46.1%** of UACOA survey respondents had a **graduate or professional degree** and
**33.3%** of respondents had a **bachelors degree.**

**All** of our respondents live in **single family homes.**

**100%** of our survey respondents said that they still **drive themselves**, while
**95.3%** of UACOA survey respondents said the same.

**62.5%** of responses about where older adults frequently go included the **grocery store.**

**100%** of our respondents access the internet through **smartphones.**
**75%** use a **tablet** to access the internet.
**37.5%** use a **desktop computer.**

75.2% of older adults in Upper Arlington **do not agree** or are **unsure** if Upper Arlington **provides transportation** to and from the places th

51% of older adults in Upper Arlington think the city provides places for them to **socialize.**

55.5% of older adults in Upper Arlington think that the city provides access to **community information** in one **central source.**

Yes
Not Sure
No

Not Sure
Yes
No

Not Sure
Yes
No

Data from the Upper Arlington Commission on Aging survey and my research group's survey was analyzed and combined to create this infographic.

The secondary research for this project consisted of reading a broad range of articles that related to my focus of mobility and social connectedness of older adults to varying degrees. I read about intergenerational connection, walkable cities, reduced fare transportation models, caregiving robots, urban planning models, the effects of aging on one's physical, emotional, and psychological health,, and how aging populations affect political and economic policy in various countries around the world.



**Innovative Housing Models for Older Adults**
**Allison Krish** - September 22, 2021    0

**Predicted Future Transportation Models**

Americans only love the coll it's the only time in their live communities
2:44 PM · Jan 10, 2021 · Twitter for Androiu
36.1K Retweets   4,872 Quote Tweets   467.7K Likes

**Making the Suburbs Walkable**
**Allison Krish** - September 22, 2021    0

**Impacts of a Reduced Cost Model on Public Transportation**
**Allison Krish** - September 15, 2021    0

**Making the Suburbs Walkable**

**The Benefits of Intergenerational Connections**

**Japan's Aging Population**
**Allison Krish** - September 1, 2021

**Architectural Styles of Old Arlington**
Allison Krish - September 28, 2021    0
In October 1985, the Upper Arlington Historic District was listed on the National Register of Historic Places by the Park Service of...

**Healthy Aging and the Arts**
**Allison Krish** - September 28, 2021    0
Lifting their voices for healthy aging Singing in a community choir may be a unique approach to promote the...

**The Aging Population's Effect on the U.S. Economy**
**Allison Krish** - September 1, 2021    0

**Integrating Robots into the Senior Care Industry**
**Allison Krish** - September 7, 2021

**Are Robots the Solution for Loneliness in Older Adults?**
0

**Forming Friendships to Combat Loneliness**
**Allison Krish** - September 1, 2021    0

**The Benefits of Intergenerational Connections**

**Origins of the Garden City Movement**
**Allison Krish** - September 28, 2021
Imagine a small city, built from scratch, overf with parks and green space, dense enough to be walkable but not so much...

**An Experimental Approach to Bus Stop Design**
**Allison Krish** - September 28, 2021    0

Here are a few key statistics from the secondary research regarding older adult drivers in Ohio. These statistics help to justify the existence of a bus that would provide rides around to older adults in Upper Arlington.

**1.6 million** Ohio drivers are 65+ (6th most in the U.S.)

In 2016, **22 percent of fatal crashes** in Ohio involved at least one driver 65 or older (11th highest in the U.S.)

fatal crashes involving 65+ driver

**20%** of all Ohio drivers are 65+ (15th most in the U.S.)
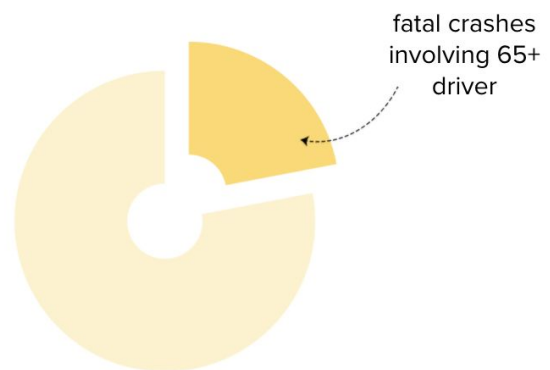
In 2016,

**250 people were killed**

in crashes that involved at least one driver 65 or older (7th highest in the U.S.)

Here are a few key insights regarding public transit stops. These insights informed the decision to pursue the design bus stops that support the bus, nicknamed the Community Cruiser, in Upper Arlington.

**1** Americans are more likely to use public transit if they can walk to it and have a comfortable place to wait.

**2** Amenities at bus stops make the wait easier to endure and can make riders feel safer, especially women who perceive their surroundings as unsafe.

**3** Bus stops market the existence and quality of the service itself, helping to retain existing riders while also attracting new ones.

After our secondary research, my research group ran two codesign sessions with a groups of 5-7 older adults in Upper Arlington. We used a variety of codesign methods to gain insights about the mobility and social connectedness of themselves as well as other older adults they know. In one activity we asked our participants to write down some of the issues they've faced with their existing methods of transportation, and some features that they would find appealing in future modes of transportation.

Through this activity we learned that our participants were frustrated with the inconsistencies of the COTA bus system. They expressed that information about exactly when buses were coming was often lacking, which made planning and scheduling a hassle. The amenities at bus stops were also inconsistent: some stops had a bench and an awning, while other bus stops were merely a sign stuck in the grass on the side of the road.



*The outcome of one of the codesign activities, which highlights issues our participants had with existing transportation in Upper Arlington as well as features that they would find appealing in future modes of transportation.*

In another codesign activity we presented participants with a variety of strange and thought-provoking transportation concepts. We asked participants to imagine each concept being implemented in Upper Arlington, and then asked them for their criticism of each concept. We presented participants with a few prompts to get them started:

- Is there something about the concept that would dissuade you or other people you know from using a service like this?
- Are there issues with the specific features you see in the images?
- Do you think there would be logistical issues (like issues with the scheduling or management of the service)?
- Are there any other concerns you have?

Examples of the transportation concepts we presented:



- pedal pub type of transportation
- older adults are picked up from preselected locations and driven around town
- passengers are able to get in some exercise as they chat with fellow riders and go from place to place
- passengers gain unlimited access by purchasing a $20 monthly pass
- can also order food and beverages at an extra cost, like a snack bar on wheels
- service from march to november

- a sort of rickshaw carriage service
- younger person is called to bring older adults **from** a location of their choice **to** a location of their choice and then back
- expect a wait time of about an hour
- passengers sit in an open carriage in the front
- rides are free for older adults, but there is a small cost if an older adult wants to bring a younger guest (younger than 65) with them
- year-round service



- delivery robot runs errands for you
- place your order through an app, your order is brought to your door
- can pick up online orders from the grocery store, pharmacy, dry cleaners, clothing stores, etc
- capsules in robots are insulated to keep goods cold/warm
- travel restricted to UA city limits
- expect a delivery time of 1-2 hours from the time you place the order to the time the robot shows up at your door
- year-round service

This activity gave us a lot of interesting insights. Rather than ask our participants what they liked about each concept and get generic responses, asking them what they disliked gave our participants the freedom to get specific about the flaws that they saw. By hearing the specific aspects that participants didn't like about a concept and why they didn't like them, we received information that we could take with us through the design process, which would allow us to make informed design decisions that avoided those aspects that our older adult participants were opposed to.

Another research method I used for this project was design conjecturing. Conjectures are theoretical solutions that are intentionally only half thought out. This allows the user to quickly generate different ideas without getting bogged down by the details. Conjectures are helpful in exploring the possibilities and constraints of a problem space using a wide breadth of solutions.
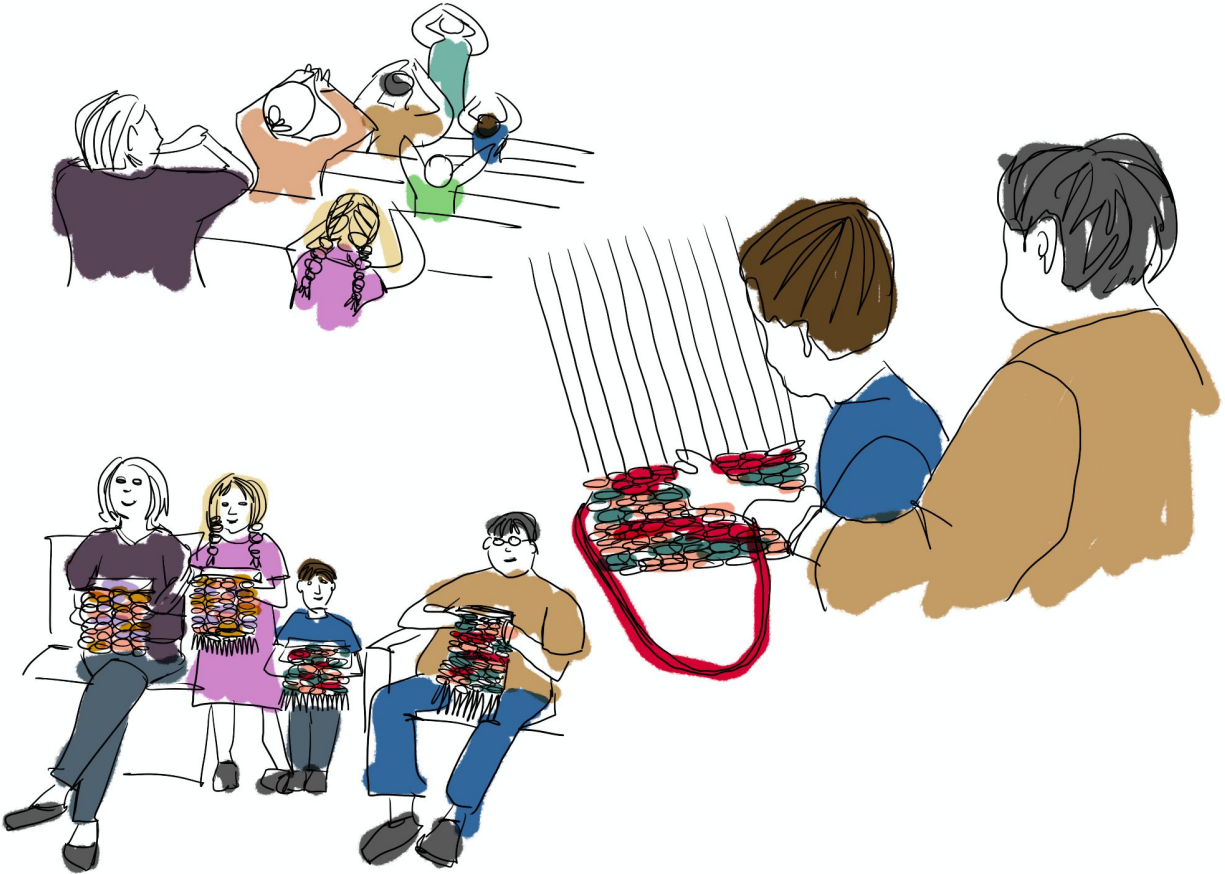


This conjecture is based on the ideas of purposeful existence, intergenerational connection, and passing down traditional skills and knowledge. A weekly program that is facilitated by a community organization such as the YMCA, my concept brings together older adults and children for classes in various traditional crafting techniques. Each week a different older adult would lead the children and other adults in a skill or technique they know from their own childhood as a way of sharing their own culture. This would be an opportunity for children to learn more about the world around them and the history of various people, places, and skills through making. The older adults would also be able to learn new things and create their own craft while helping children they are partnered up with complete the activity. The program would help children develop hard skills specific to the activity and soft skills like communication, teamwork, open-mindedness, and creativity. Meanwhile the older adults could engage in social connection and gain a greater understanding of the children and younger adults in their community. Weekly activities could include weaving, calligraphy, sewing/embroidery, dyeing, paper cutting, beadwork, cooking, and traditional methods of planting and harvesting.
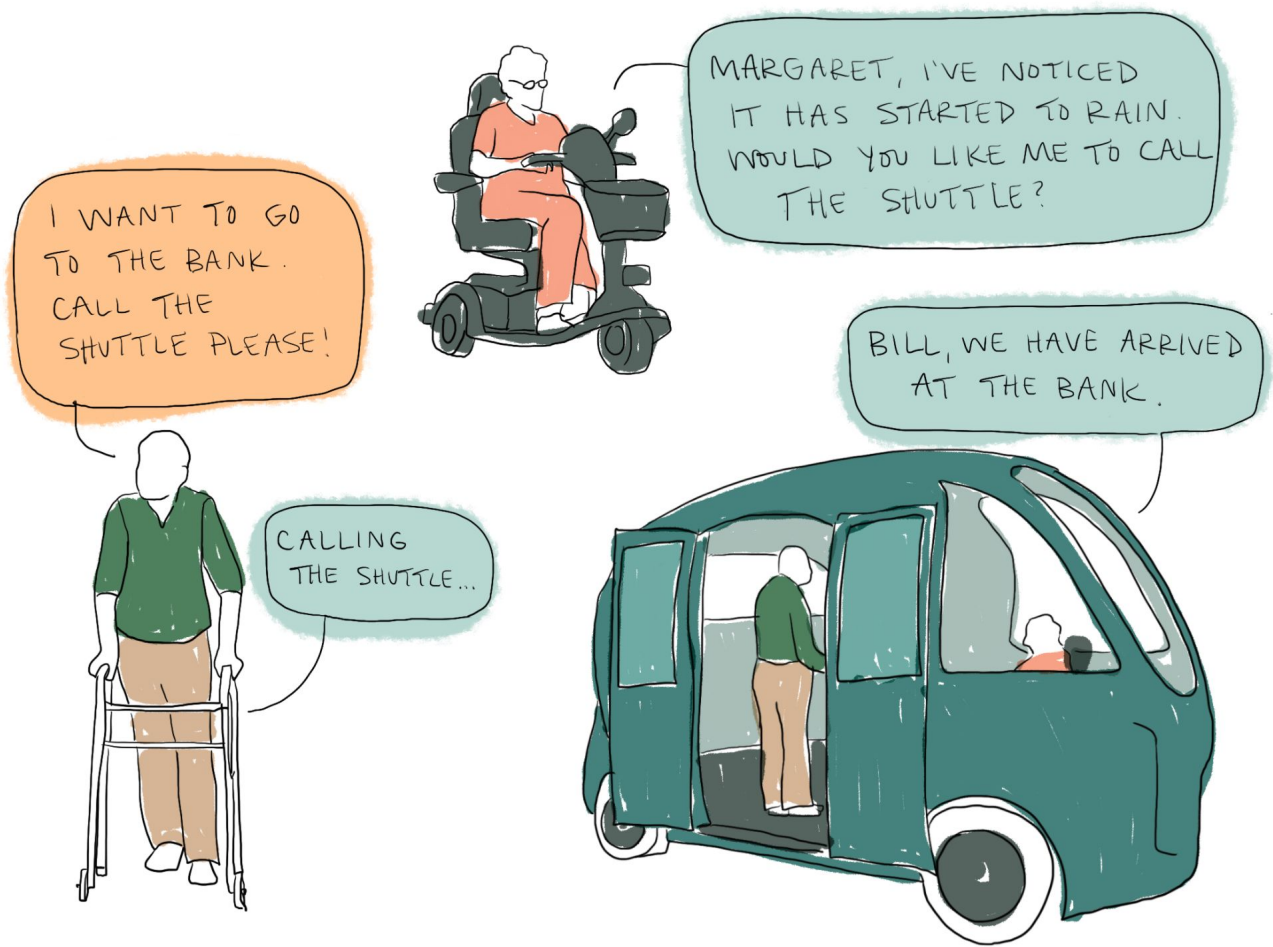
This conjecture imagines a mobility solution driven by artificial intelligence and automation. Mobility aids that are meant for individual users such as scooters and walkers would be connected to the same system as a larger, more communal mobility aid, such as an autonomous shuttle bus for older adults. Artificial intelligence that has been integrated into the personal mobility aid would allow older adults to summon the shuttle to their exact location or to a designated shuttle stop. Users would simply need to activate the AI with a phrase (similar "Hey Siri" or "Alexa,") and enter in their request. They would then get an ETA for the shuttle while their request is entered into a queuing system. Once the older adult has boarded the shuttle, screens located around the interior would give each adult on the bus an idea of the shuttle's ETA at their intended destination. Each shuttle would have the capacity to transport up to 8 older adults at a time, with the idea being that a handful of shuttles would be driving around Upper Arlington simultaneously. Older adults on the shuttle would be able to speak to a human representative if needed through a video call screen on the bus. Meanwhile, interior space that would otherwise be allotted to a driver and steering mechanisms could instead be used to make the interior of the shuttle comfortable for users.

bird's eye view

street view
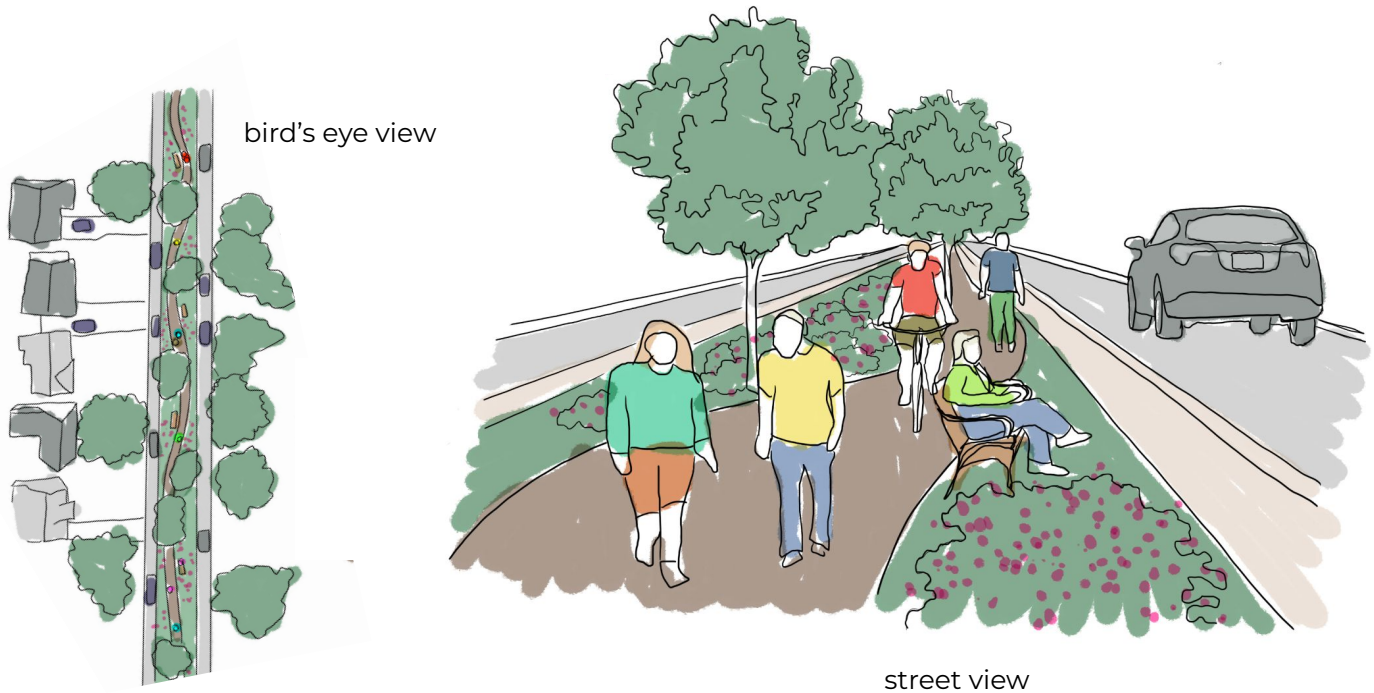
This conjecture draws upon the concept of the '20-minute city' model of city planning and the idea of beautifying streets as a way of increasing pedestrian traffic. In this conjecture, a parkway is created from the two center lanes of one of the larger roadways in Upper Arlington (think Lane Ave, Fishinger Road, or West Henderson Road) and are transformed for pedestrian use. Cars still use the outer two lanes of the road, but a median is created from the middle two lanes with greenery to beautify the space and a meandering pedestrian path for cyclists, joggers, and walkers to use. Biking and cycling offer a greener alternative to driving cars (or riding in buses) and allow pedestrians to connect with their neighbors as they pass one another on the trail. Benches are dotted along the path to encourage people to sit and chat with one another. Bus stops could even be integrated into the design of this parkway, allowing it to be serviced by buses. This would create even greater connectivity between the different parts of Upper Arlington.

This conjecture draws primarily upon the idea of the Garden City- particularly the idea of a large glass building that hosts a marketplace, which is located at the heart of every Garden City. This large building in Upper Arlington would serve as the community hub and essentially be a cross between a YMCA, a co-op marketplace, and a bus terminal. The building would have space to host community events and activities for all generations, like those that would typically be found at a community center. The building would also house a marketplace for people from Upper Arlington and other nearby communities to sell foods that they cook or grow and handcrafted goods that they make. Lastly, the building would serve as a major hub for bus services like COTA, where people would be able to switch bus lines as needed. Not only would this hub foster all kinds of social connections within the community, but it would also streamline running errands while encouraging the use of sustainable forms of transportation. A hub like this would make it easy for people to take a bus to a single location where they can get the things that they need, rather than taking their own car to multiple locations to get everything they need. The architectural style of the building blends a glass greenhouse-type structure with the revival styles that are common in Old Arlington, further integrating this hub into the city.

# development

- design brief
- ideation methodology
- aesthetic exploration
- form development

This project is centered around the idea of designing a solution that encourages mobility and social connection amongst older adults in Upper Arlington. The Upper Arlington Committee on Aging is already planning on introducing a circulator bus in the city that would help older adults get around. I will be working with my classmate Lauren Goslee to design solutions that support this circulator. We will individually design solutions that focus on a different aspect of the system, but our solutions will reference one another and act as interlocking pieces of a larger puzzle. I will concentrate my efforts on the experiences that one has at the series of bus stops that the circulator services. I will be particularly focused on the social aspect of the experience and making the circulator an appealing mode of transportation so that older adults who are still able to drive themselves will want to use the circulator instead.

## Context

**The Problem:**
Social isolation is documented as one of the principal factors affecting the wellness of an aging population. According to the World Health Organization, social connectedness is a central dimension of aging well, alongside health, financial security, and adequate housing. Mobility accounts for a central issue associated with social isolation. From the loss of social capital to environmental hurdles, the capacity for mobility can be greatly affected.

**Stakeholders:**
- older adults: intended users of solution
- Upper Arlington Committee on Aging: project partner
- Age-Friendly Innovation Center: project partner
- City of Upper Arlington: solution will be integrated throughout the city- will likely need to consider permits and zoning if designing a space
- Upper Arlington residents: solution will impact everyone, not just older adults
- people involved in facilitating solution (bus drivers, maintenance staff, people who lead programming, etc)

**Social and Economic Setting:**
- city of Upper Arlington
    - population: approx. 37,000
    - approx. 17% of population is 65+
    - upper middle class neighborhood, though some pockets of lower economic status within the city
    - primarily white residents
    - highly educated (46.1% of survey respondents age 65+ have a graduate or professional degree, 33.3% of respondents have a bachelor's degree https://www.uacoa.com/files/136265776.pdf)
- potentially other cities in and around Columbus

**Issues to Account For:**
- 81.3% of Upper Arlington older adult survey respondents say it is very important to them that they are able to remain in their home as they age, 16.4% said it is somewhat important
- driving becomes dangerous for older adults past a certain point, but many continue to drive themselves (95.3% of respondents 65+ in Upper Arlington drive themselves)
- in American culture, older adults are often seen as a burden on friends/family/caretakers when they can no longer work or care for themselves (46.1% of respondents agree that there are negative stereotypes about older adults, 16.2% strongly agree)
- 3.5% of respondents says transportation has affected their ability to access medical care, 2.1% say transportation has affected their ability to access food
- Americans are more likely to use public transit if they can walk to it and have a comfortable place to wait ("From Sorry to Superb: Everything You Need to Know about Great Bus Stops." Transit Center, Oct. 2018.)
- Amenities at bus stops make the wait easier to endure and can make riders feel safer- especially women who perceive their surroundings as unsafe ("From Sorry to Superb: Everything You Need to Know about Great Bus Stops." Transit Center, Oct. 2018.)
- Bus stops market the existence and quality of the service itself, both helping to retain existing riders and attract new ones ("From Sorry to Superb: Everything You Need to Know about Great Bus Stops." Transit Center, Oct. 2018.)

## Objectives

**General Objective:**
- design a solution that enhances the experience of using the circulator created to assist older adults in Upper Arlington

**Specific Objectives:**
- make the circulator appealing so that older adults who can still drive will want to use the circulator instead
- create opportunities for genuine social connection and relationship building amongst community members
- alleviate stress and uncertainty of public transportation
- make circulator experience something to attract older adults to live in Upper Arlington
- make circulator experience something other generations want to enjoy as well

## Methodology

- iterative sketching will allow me to generate bus stop layout concepts
- user journey mapping will help determine the current experiences at bus stops compared to ideal experiences to help me pinpoint trouble areas to focus on
- iterative 3D modeling and prototyping will help determine the ideal spatial layout of a bus stop that encourages social interaction and provides an appealing place to congregate while riders wait for the bus
- a critical study of the features, attributes, and intended users of current innovative bus stops and how older adults in Upper Arlington might perceive these things
- regular check-ins with the project partners will ensure that I don't lose sight of the project focus and complete tasks in a timely manner

## Features and Attributes

**Features:**

- ability to store goods like groceries, dry cleaning, etc
- weather resistant
- comfortable/ergonomic furniture

**Attributes:**

- aesthetically appealing, fit in with neighborhood aesthetics
- intuitive, stress-free system
- casual, informal space that encourages socialization

# methodology

Initial brainstorming began with a session of writing down whatever came to mind about the topic. It's important to think about the times when the bus is not running (meaning the stops are not being serviced) in the design. The bus stops should still be places where people want to congregate, which means considering design elements that would be considered non-traditional at most bus stops and thinking of the spaces more in terms of parks or small plazas. Playful seating like swings and rocking chairs, as well as the incorporation of art and gardening were two elements that were deliberated here.
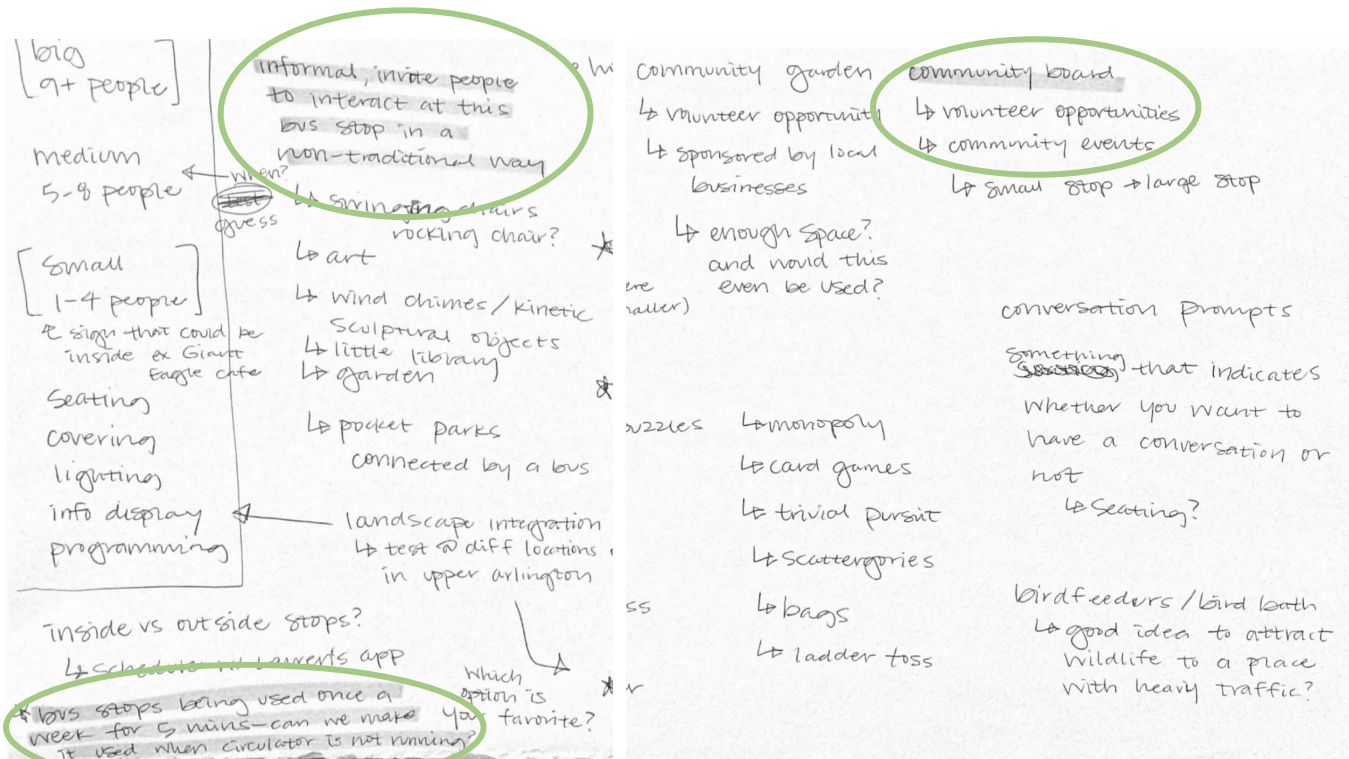


Programming that would foster a stronger sense of community at the stops was also considered. Based on space and location constraints, the incorporation of a community bulletin board at the stops has the strongest potential, along with games and conversational prompts designed to encourage socialization amongst users of the bus stops.

not enough buses to service everyone @ Carmack S. OSU vows a bus will arrive every 8 minutes. I wait 15-20 minutes on average

some "stops" are just signs, not physical stops

forgetting a mask

knowing what bus goes where/ when

finding the right stop

timing up schedule

not comfortable

no late night options; forced to use uber/lyft

• dont know occupancy speed before boarding (until doors open) either have to: wait for next bus or squeeze in bus, risk uncomfortable social situations

seats being wet

bus pain points

making 1st time bus users comfortable/ knowlegeable about how to use the service

weather conditions/ not having any coverings

actual bus seats being gross, I've sat on a wet one before

no T.V.s

crazy people hanging around

some stops dont have coverings 4 also makes it hard to find

getting to stop on time- not too early, not too late

• feels unclean

• sometimes uncomfy on bus, especially when by myself

doesn't feel super friendly (when riding alone especially)

awkward feeling or silence next to strangers

buses taking too long to get to stop

no really, as a female I've had some really scarey & very uncomfortable encounters. low key kind of dangerous

This mind map documents some of the pain points of a typical bus system. The participants here are industrial design and visual communications fourth year students. While they aren't the target users for this project, their responses were still useful in getting an idea of some of the common problems surrounding bus stops that needed to be considered. Some issues are physical, like wet seats and overhead covers. Some are more interpersonal, like feeling uncomfortable with the strangers at the bus stop.

This is a list of things the participants of the codesign sessions said that they wanted out of a bus stop. The list is very practical and very short. It allows room for plenty of exploration, but on the other hand it doesn't provide much information about what kinds of elements would make the experience enjoyable rather than just endurable.

Codesign Participants Want:
- Seating
- covering
- lighting
- "if cost isn't an issue", a board that displays schedule and routes

Connect other things to bus stop
↳ Justify making them bigger
↳ hub for transportation, food, community info rather than just a stop along the way

things to consider:
- public vs semi-private seating
- storage area
- real time tracking
- weather (hot sun, rain, snow)
- comfortable furniture, appealing to those w/ limited mobility
  ↳ rounded edges
  ↳ armed chairs (prevent falls, help get out)
  ↳ plush (or at least contoured)
  ↳ security poles/grab bars
  ↳ handles, not knobs
  ↳ nothing too tall or short (difficult to sit in)

Another key thing to think about is designing furnishings for the bus stop that is designed for those with limited mobility in mind. The main idea here is creating sturdy furniture with features that minimize injuries.

# methodology

The Shifting Perspectives method was one of the generative design methods used for this project. This method involves thinking about the problem space from six different perspectives that heavily influence design: the domestic world, the world of opinion, the civic world, the industrial world, the market world, and the world of inspiration.

ACCESSIBILITY

End goal: reach other communities
 ↳ model for other places; use UA as sandbox since it has resources

Bus stop: non-profit
 ↳ donate to non-profit partners @ stop

Planting / community garden
 ↳ something to do while there

bus stop was something you grew
 ↳ influence trees to grow certain way

volunteering / mentoring

Civic World

clear scheduling

intuitive

make it easy to get people w/ mobility issues on bus, easy to get around stop
 ↳ ramps

punctual, consistent circulation of buses
 ↳ ok to miss bc another one will come soon

Incorporate civic programming, integrate into community
 ↳ gardens help local businesses, ppl

co-op (can get things @ bus stop if you help bring people to appointments)

Solar panels on stops (ensures lighting)
 ↳ blue light system, panic button, security measure

Industrial World

Since it supports a service that is for the community, the project naturally lends itself to the perspective of the civic world. Here, things like incorporating a community garden into the stop, as well as using it as a way to generate funding or find volunteers for local nonprofits were considered.

The industrial perspective is heavily influenced by efficiency. Many of these ideas are based on scheduling (which is important, but not the focus of this particular project), but in terms of a bus stop, programming the space to be a major asset to the community, and ways for the stop to generate its own power were examined.

bus stop by Pomerene Hall

seclusion, organic borders
 ↳ glass so you can see others but
   still secluded
stained glass
chalk wall / bulletin board
 ↳ encourage graffiti (Sohud Collective)
 ↳ community mural

board games
 ↳ puzzles, card games
   ↳ large scale
unique form/material choices
biophilia → flowers
art installation made of things from town (newspapers from UA in glass)
 ↳ enjoy reading old newspapers @ stop
immersive furniture that mimics a certain time period

| World of Inspiration | bus stop / local artist gallery wall ↳ farmers market |

Bodega / vending machine
vendor spaces (Sohud)
advertisements
coffee shops
city pays for people to take the bus instead of driving
 ↳ walking / riding bus, gives passengers incentives
   ↳ subsidized by govt for reducing carbon footprint
sponsored furniture
community center by night
 ↳ on on weekends
 ↳ would this be an issue if bus stop is running 24/7?
umbrellas, ponchos, gloves, hats for sale @ bus stop (essentials, weather protectors)

[ Market World ]

The world of inspiration (or artistic perspective) produced quite a bit of community-based ideas, like a chalk/bulletin board, a gallery wall for local artists, and ways to incorporate the history of UA into the design through the inclusion of artworks or murals.

The market-driven perspective led to thinking about advertising space (already a common concept at bus stops) as well as leasing out space at the stop for vendors to sell their goods (like the Sohud Collective in Columbus). Incentives/subsidies for taking the bus instead of driving were also considered.

The fourth conjecture (the all in one bus stop, marketplace, and community center) was used as a jumping off point for the domestic world perspective. Ways in which the bus stop could become more than just a bus stop as a way of cementing its place in the neighborhood were considered.

Bodega & Bus Stops
⤷ essentials
⤷ transportation
⤷ vending machine vs store

attendant at bus stops
⤷ train assistants, flight attendants
⤷ punching tickets, getting luggage/bags

Seating, covering, lighting, signs

wheelchair-level chairs and tables

glass - see through bus stop (safety)

Current bus stops pretty traditional
⤷ how to make these more traditional?

Stops feel separated from bus
⤷ bus stop more connected to getting on bus
⤷ overhang?
⤷ bring stop and bus together
⤷ ramp up to bus level?
⤷ not a stop to bus, but like you don't even realize you're getting on the bus

glass          bigger bus stops
concrete       ⤷ more seating
steel
wood          doorways to small for wheelchairs, then where does wheelchair go?

The world of opinion perspective generated ideas like a bus stop that would function similar to space station or shipping port. Another interesting thought to come out of this perspective is different types of programming that would give the stop another purpose beyond just a bus stop. Some ideas, like a library or small cafe, would be more feasible than say, a zoo or bed and breakfast.

hub conjecture

stair chairs
⤷ connected tracks
⤷ amusement rides

double decker bus pull through
⤷ space station w/ multiple ships
⤷ port
⤷ modern                    bathrooms?
⤷ flipping the signs
⤷ gold finished              subway
⤷ marble, shiny         system

combos w/ bus stops:        underground tunnels
bed & breakfast
mini golf
library
cafe
movie theatre
zoo
bird sanctuary
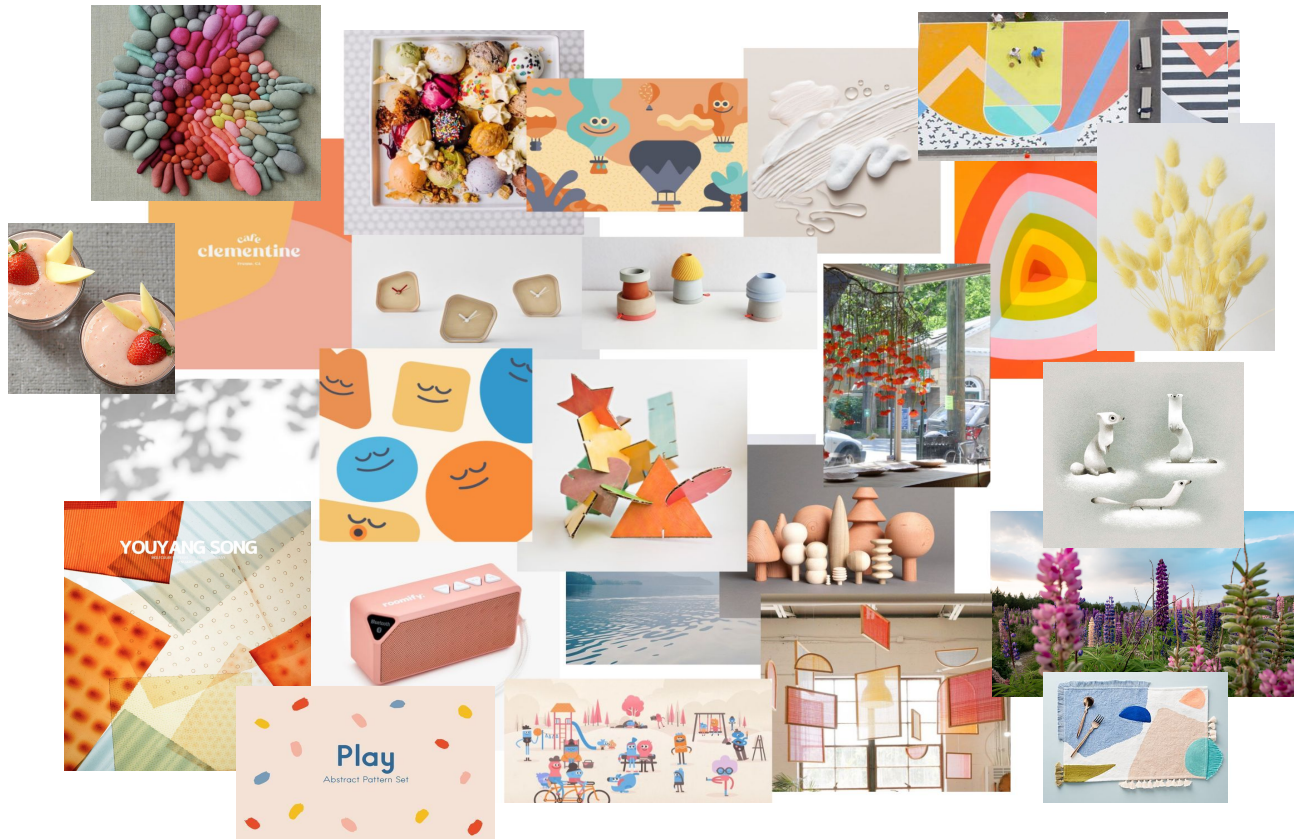
This first iteration of the moodboard focused on images that conveyed the playful, informal feel that I wanted the bus stops to have. It was designed to tie into the aesthetics of my classmate Lauren's app, which also supports the Community Connector system by allowing older adults to plan and schedule their rides on the Community Connector.

When shown to others, however, many people expressed reservations with this direction. While the colors were appealing, respondents wondered how these aesthetics would fit in with the rest of Upper Arlington, especially in the Old Arlington neighborhood and commercial spaces around the city.

"I like the colors and the patterns, but to me it feels really youthful, like something that would be designed for kids rather than seniors"
*- fourth year college student*

"It really stands out against the traditional architecture in my neighborhood"
*- Old Arlington resident*

After receiving this feedback, revisions of the original direction were needed. Collecting images of the types of architectural styles, materials, colors, amenities, and motifs around Upper Arlington generated a sense of the aesthetics that already exist in the city.
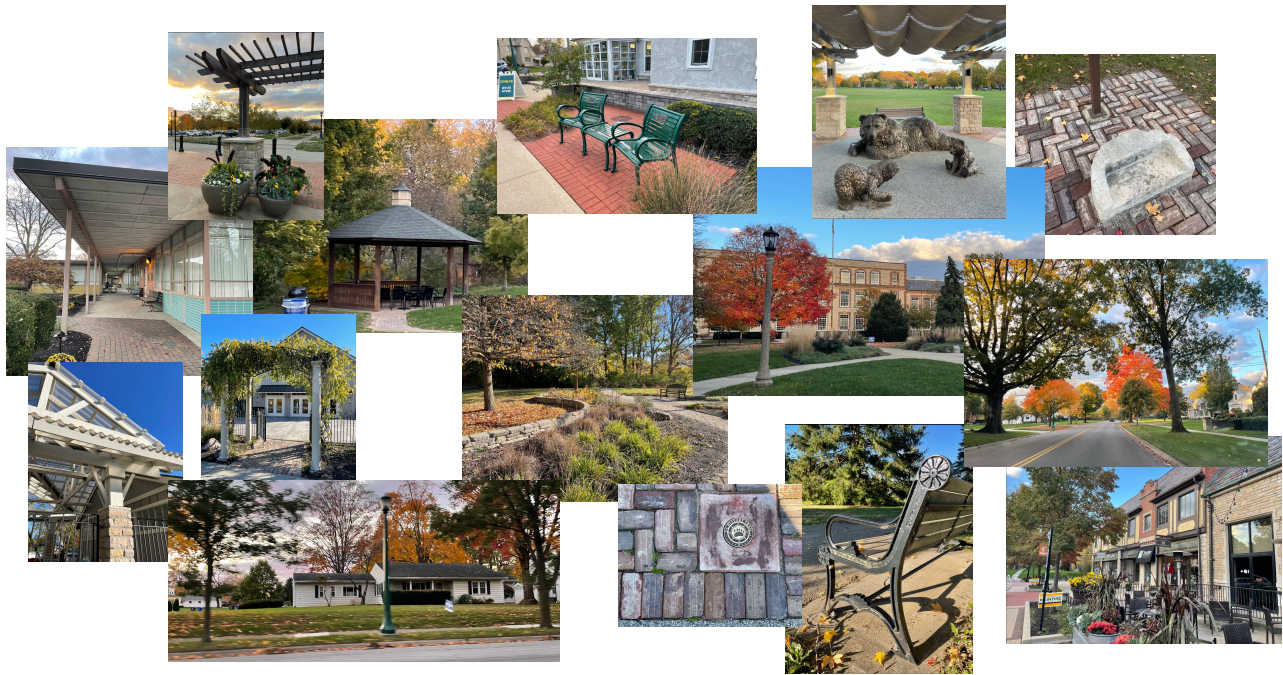
The final assemblage of images is a mix that combines the playful spirit of the first iteration with the more traditional existing infrastructure in Upper Arlington.
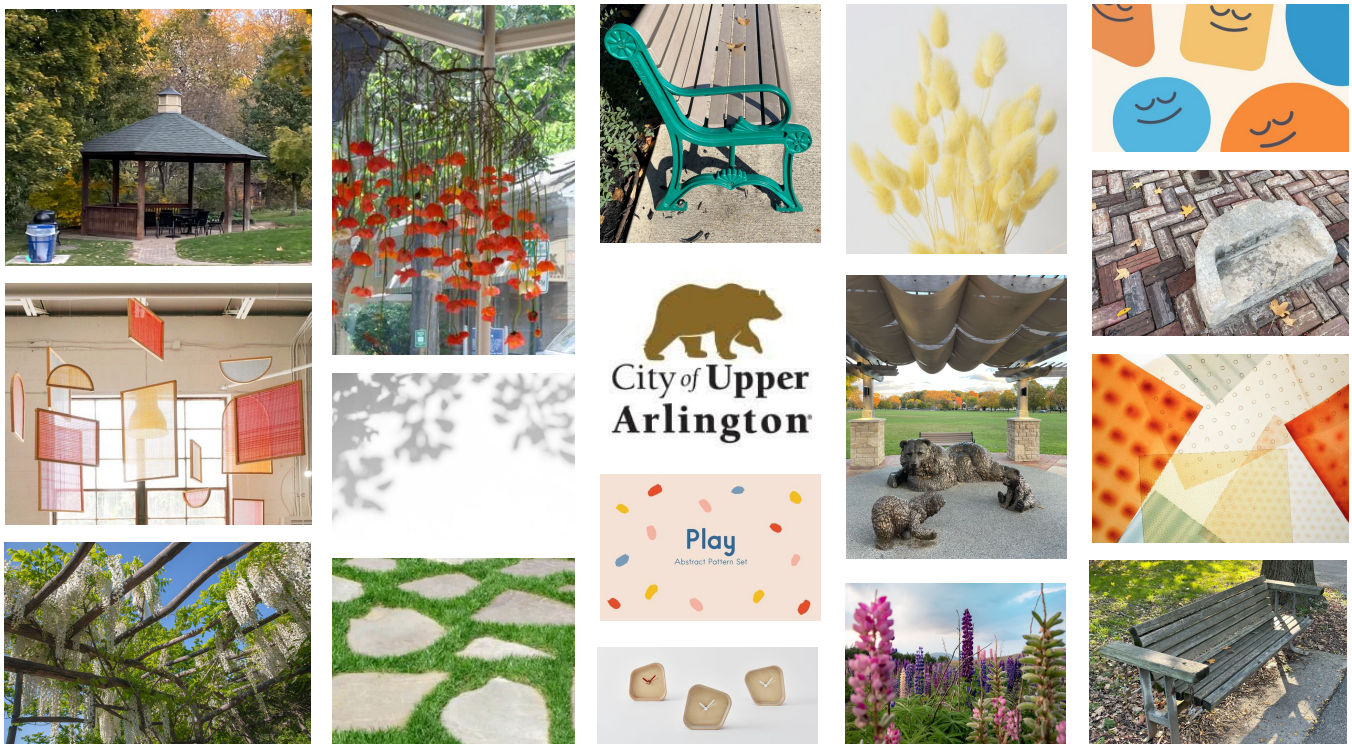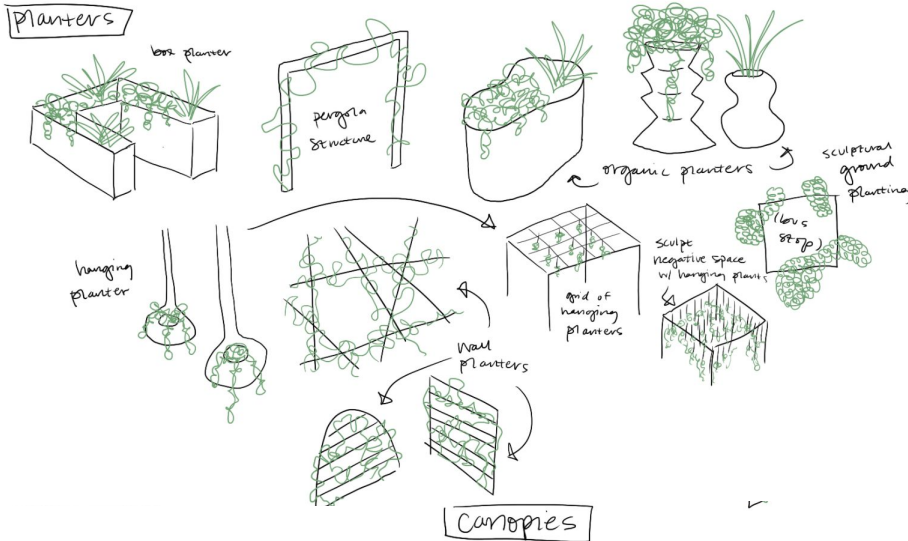
Bus stop elements were divided up to allow each component to be developed individually, but in parallel. Here are initial iterations on planters, which largely explored planter form.

Here are iterations on canopy shape and structure. The types of shadow patterns the canopies created were also explored.
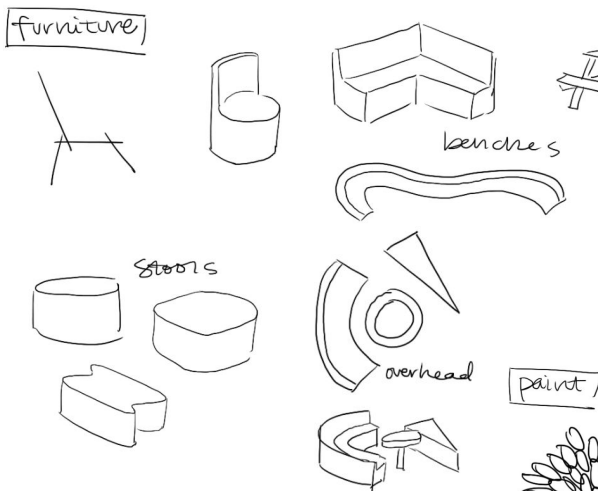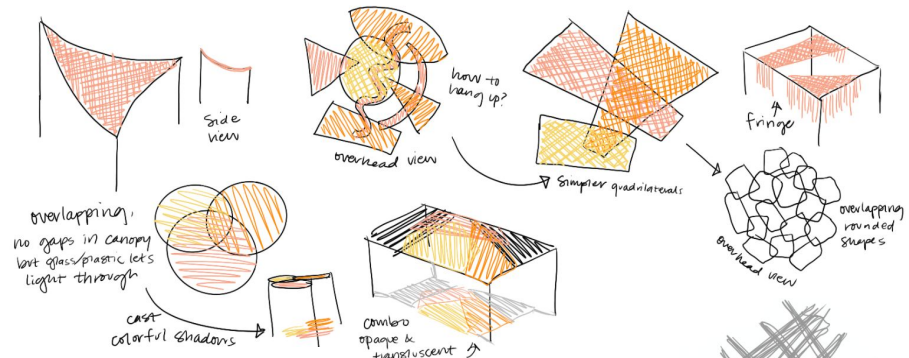
These early iterations on furniture explored different types of seating, including chairs, benches, and stools.

The combination of furniture and an application of paint on the ground was also explored at this time, with a focus on how these different elements would overlap and create different compositions when the furniture was moved.
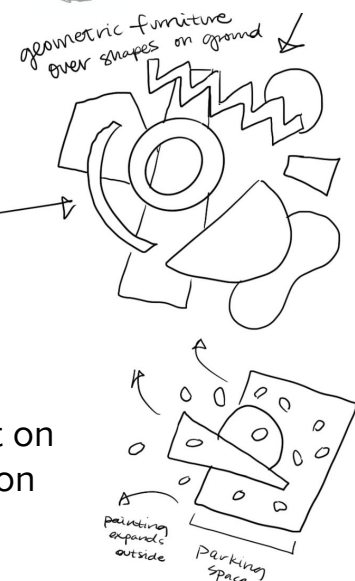
These sketches explored a few ways to address storage solutions at the stop, as well as tracking and schedules for the bus routes.
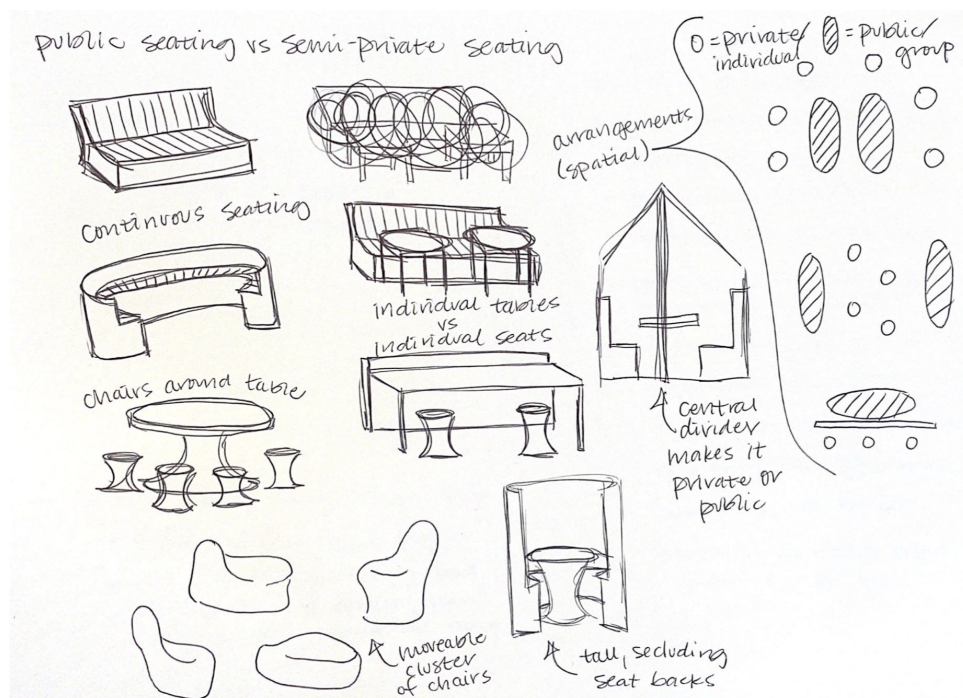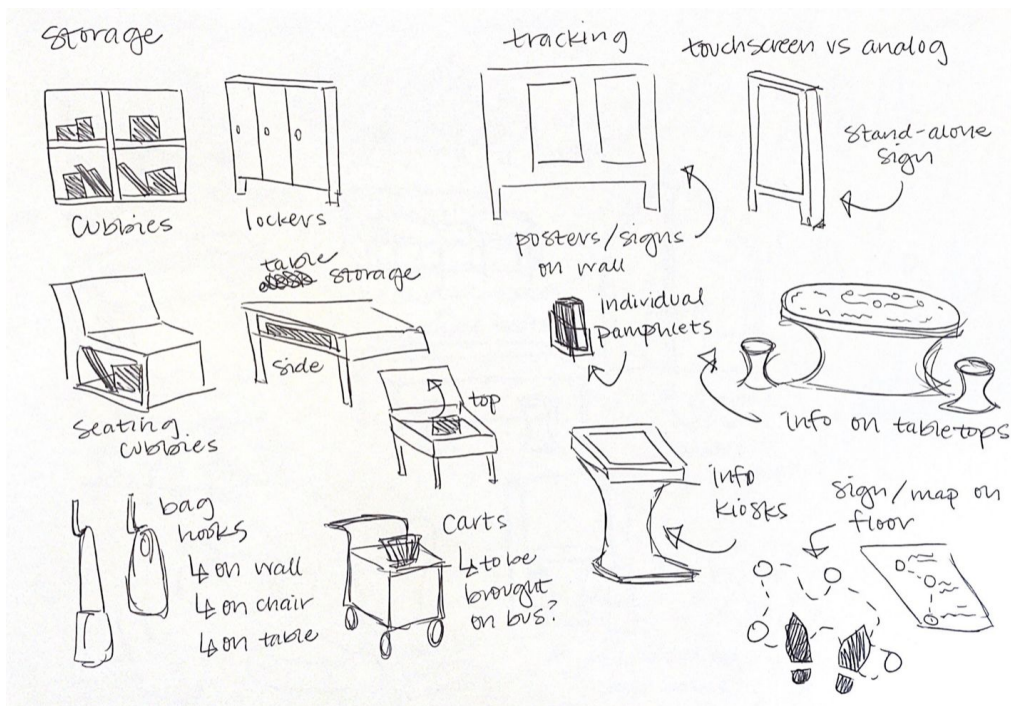


These sketches are for public versus private seating in a public space that would allow for people who want to meet others and socialize to do so while still creating space for people who would rather keep to themselves. While both situations are important to consider, only the seating the encouraged socialization was further developed for this project.

In these iterative sketches different types of seating, overhead structures, the integration of plants, and ways of defining the space are being explored and combined to create a breadth of designs. At the same time, practical things like safety, theft, and effective use of space are being assessed in each design.
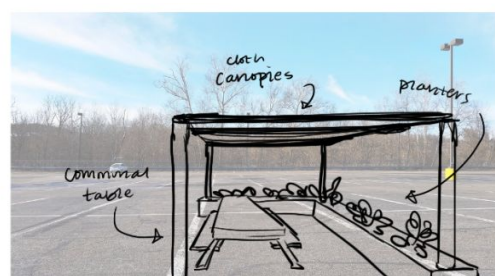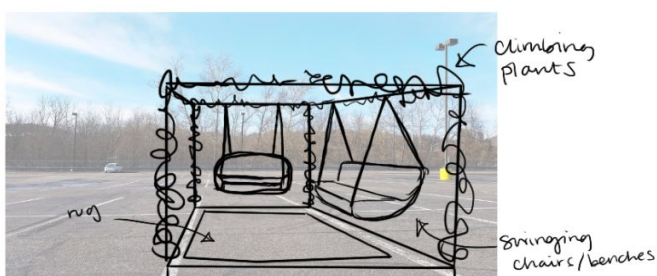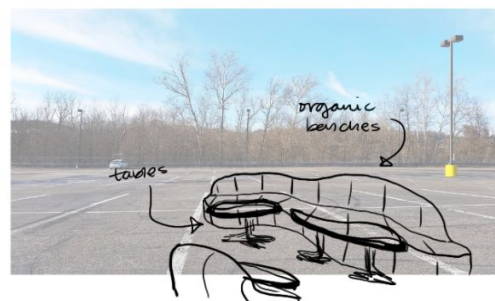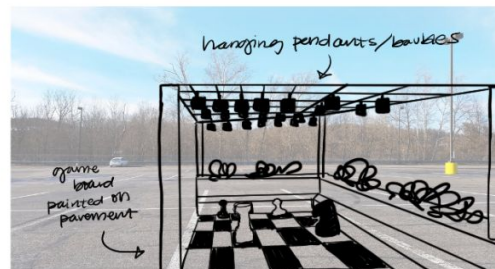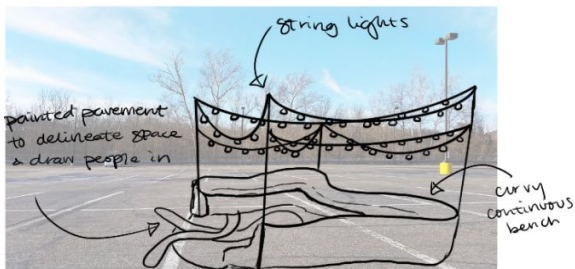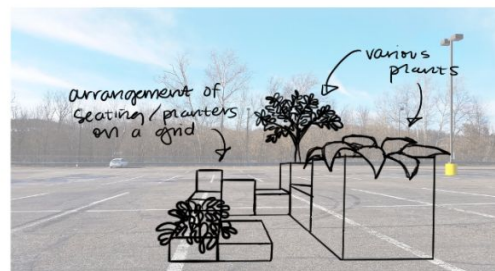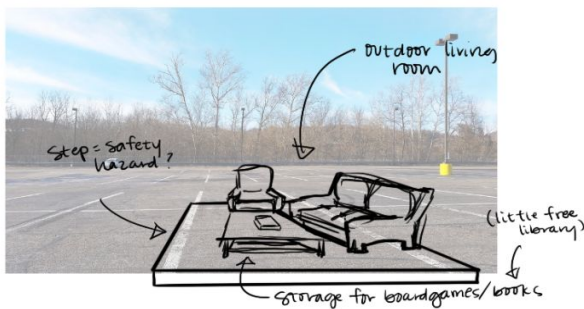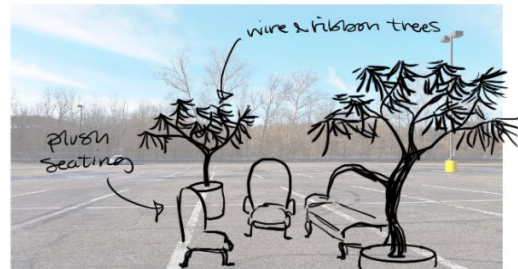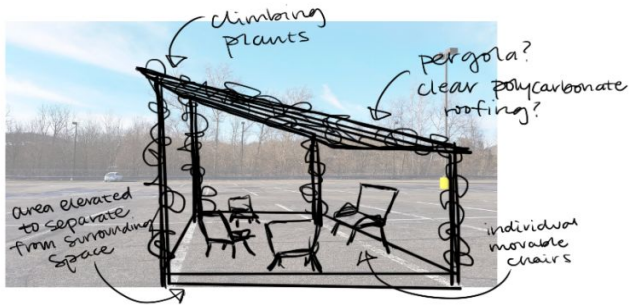
An early concept for the bus stop design. Elements from a few of the previous sketches were selected and combined to create this concept. The concept was judged against the design brief to make sure that the criteria that was included in the brief was being addressed by the design. Aspects of the brief that are being addressed by this design can be found in the blue boxes.

Americans are more likely to use public transit if they can walk to it and have a comfortable place to wait

aesthetically appealing, fits in with neighborhood aesthetics

draped cloth canopies

pergola structure

climbing vines

glider benches

planters of colorful flowers

stone pavers with splashes of color

coffee table

comfortable, ergonomic furniture

Amenities at bus stops make the wait easier to endure and can make riders feel safer

Bus stops market the existence and quality of the service itself
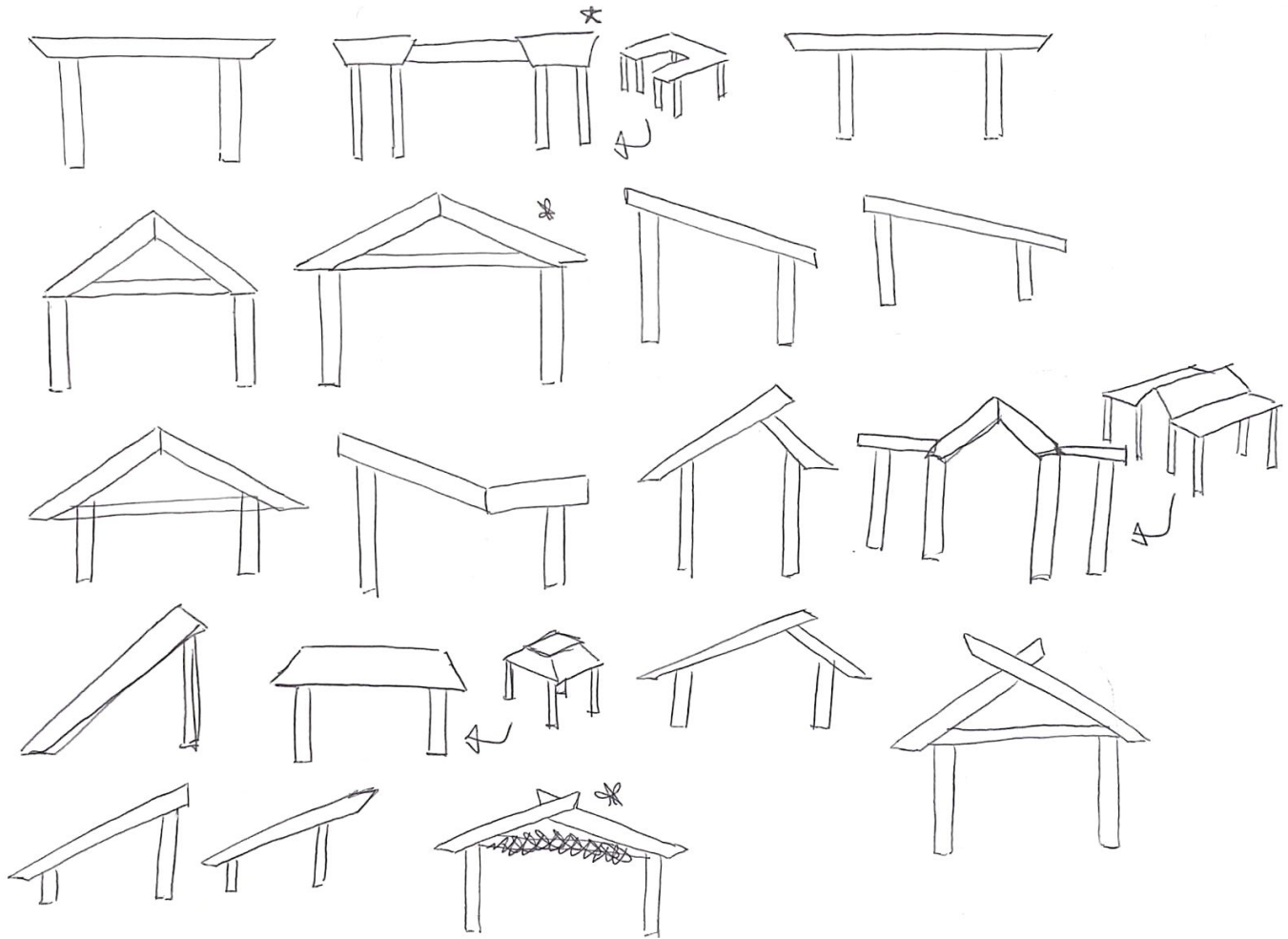
Here different roof lines for the pergola are being assessed. The pergola and the canopy provides shade and introduces color to the stop. The design of the pergola is more traditional and draws from elements of the traditional romantic revival architecture styles that are common in the houses and shops in Upper Arlington south of Lane Avenue.
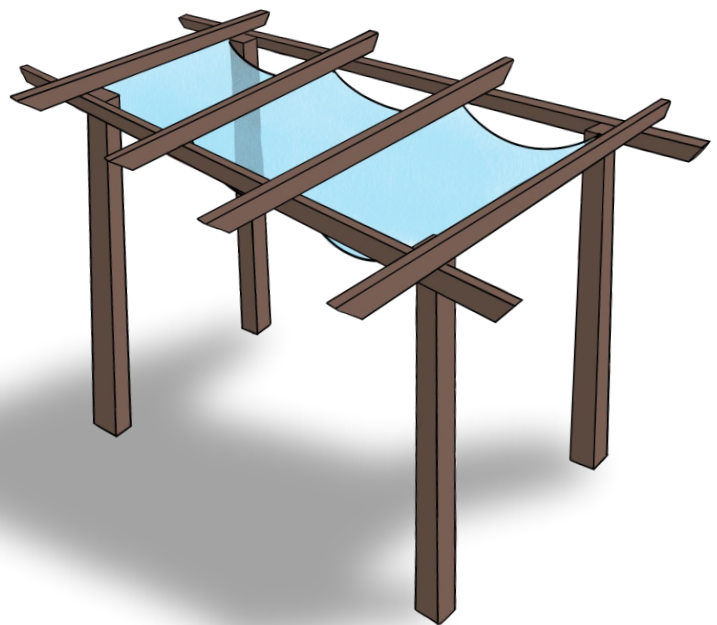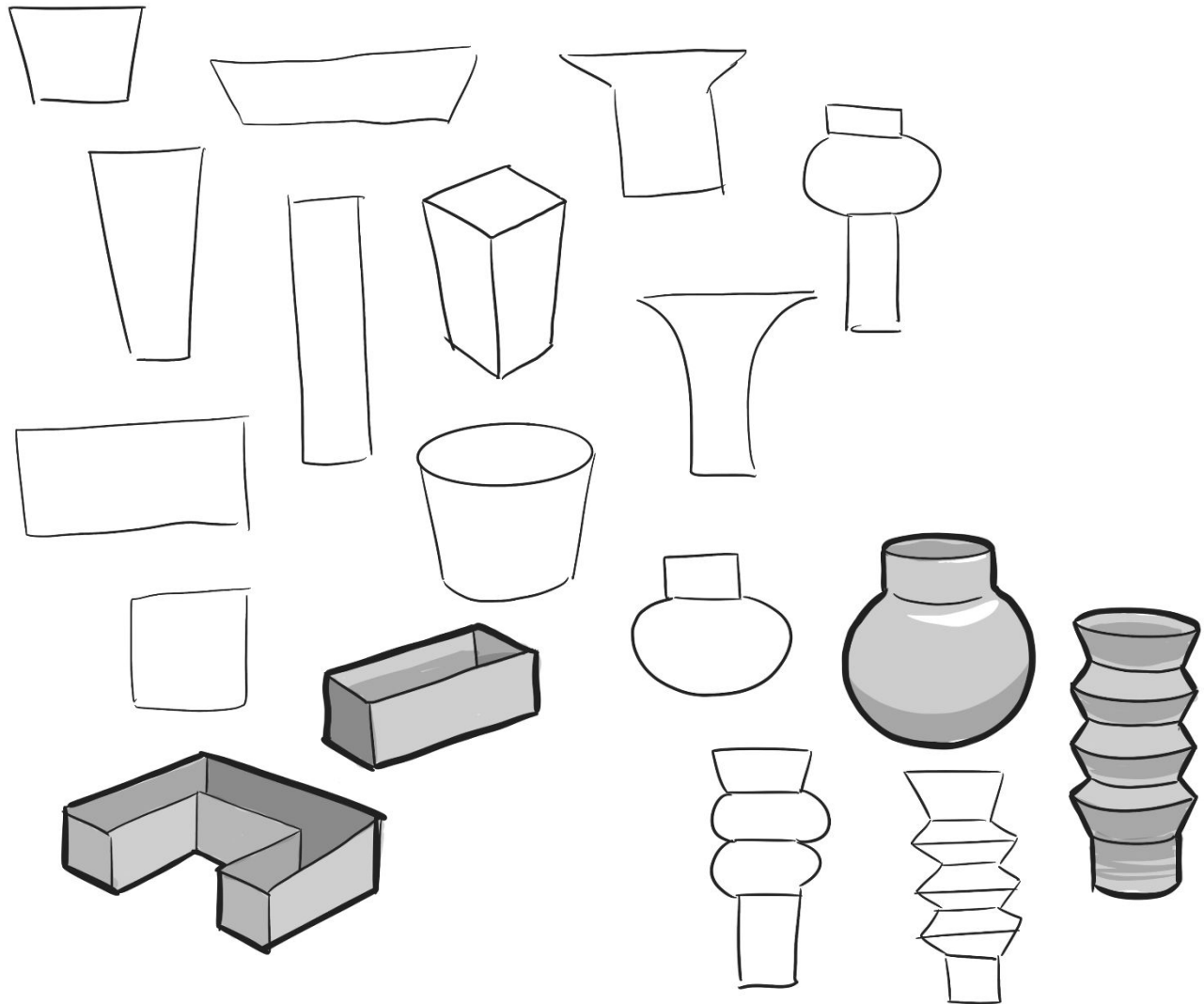
Here is further development on the form of the planters. The planters sit along the edge of the the bus stop and define the space while also providing support to the pergola. The simple form of the contemporary planter boxes draws out the contemporary elements of the more traditional pergola.

Here is further iterations on the seating. The final design consists of two benches and a table that complements the design of the benches. Perforations in the metal on the horizontal surfaces of the benches and table allows for water drainage, while the bright color and rounded back contribute to the informal and welcoming feel of the bus stop.
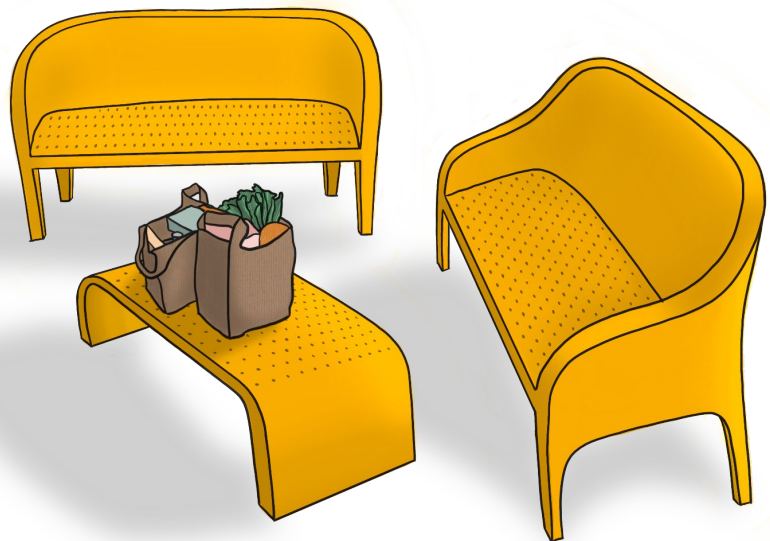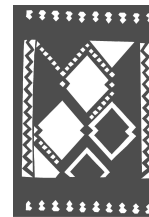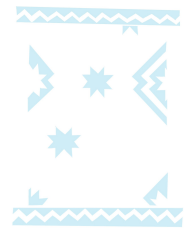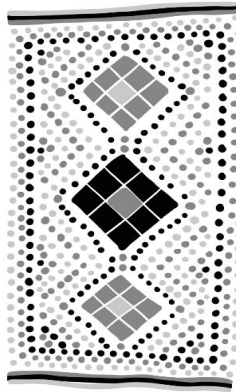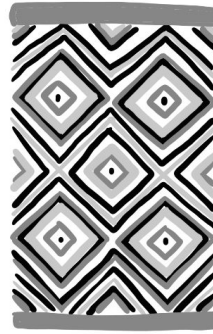
Here different rug patterns are being assessed for painting on the pavement at each bus stop. The rug patterns are reminiscent of Kilim rugs, which are rugs with geometric patterns that originate in the Middle East. These rugs are designed to be painted with a series of three stencils which makes the application of the intricate and precise patterns relatively simple.
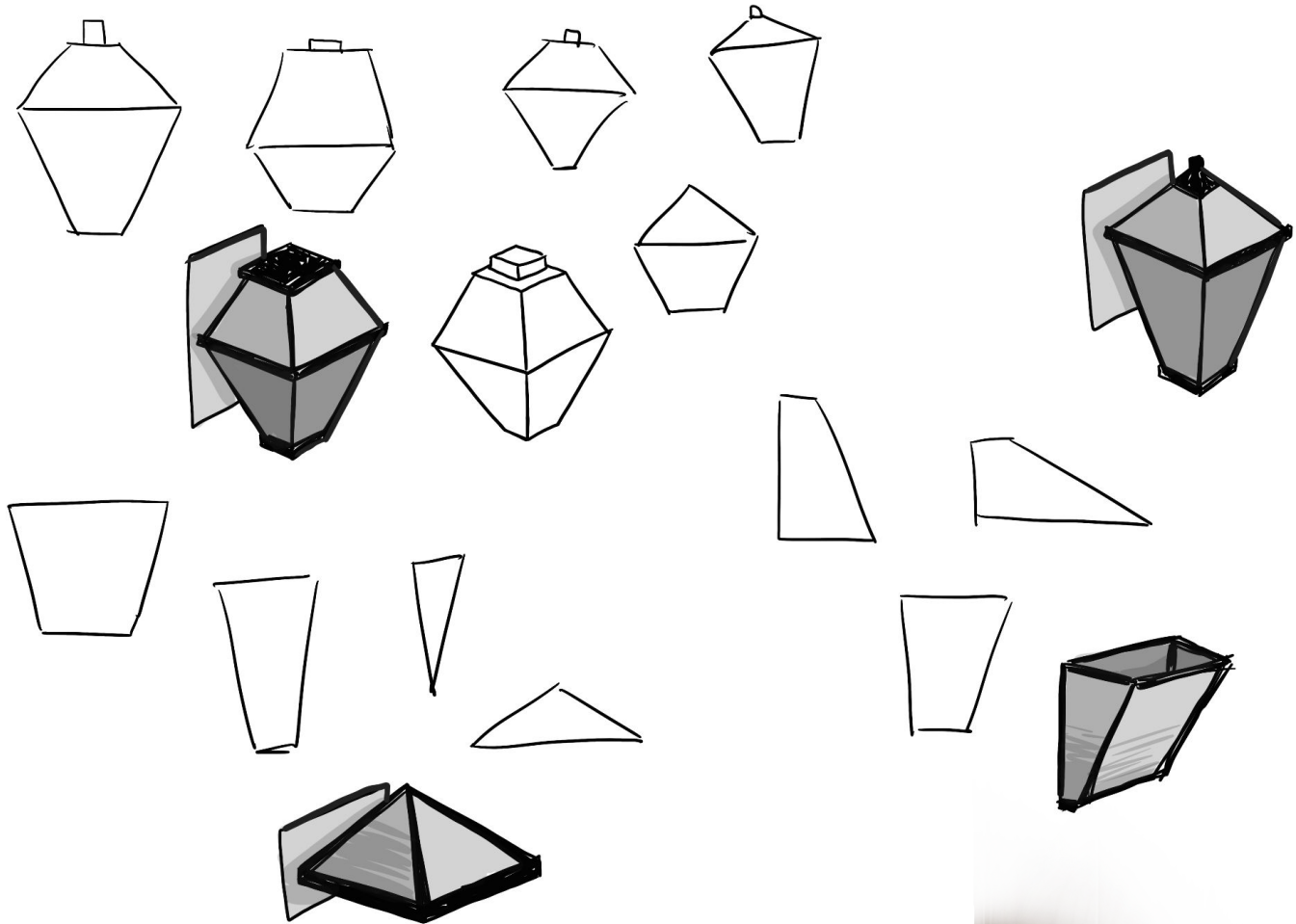
Here are form iterations of the bus stop lighting. The inspiration for these light sconces comes from gas lanterns that can be found coupled with the romantic architectural styles in Upper Arlington and in places around the world that have old-world charm. The sconces for the bus stop, however, have been designed with a simplistic and geometric take that allows the sconces to pair with the contemporary planter boxes.

# solution

- final design
- prototype
- scenario of use
- materials selection
- maintenance
- alternative solution

Each Community Connector bus stop has benches that can comfortably seat 2-3 people and are angled slightly towards one another to encourage conversation. Bags or boxes that are picked up while people run errands can be placed on the bench, which prevents them from being set on the ground where they might otherwise become wet, dirty, or a tripping hazard. The painted rug defines the space and contributes to the informal, community living room-type feel. The sconces provide light to help visitors at the stops feel safer as it gets dark. Elements such as the rug pattern and plant varieties can be easily interchanged with different variations, which allows each stop to be differentiated from other stops in the system.

These stops will be located around Upper Arlington along the Community Connector's route. The stops are designed to fit within the dimensions of a standard parking space, which means they can be installed in the parking lots of popular destinations like grocery stores, restaurants, banks, parks, libraries, doctor's offices, and more. The exact number of stops depends on the route, which has yet to be planned. As the service expands, the number of CC stops would increase accordingly.

The design of the stops includes architectural plants which have bold and distinctive shapes, while the integration of bright flowers acts as another source of color in the design. Here you can see some suggested varieties for planting. Suggested varieties take into account the mature size of each plant, whether they attract wildlife like butterflies, and the time of year in which the plant blooms.


Evergreen Boxwood

- full sun
- little upkeep
- typically grows only 1-2 inches annually
- hearty to -10 F
- 2-4 ft tall to 3 ft wide
- medium moisture


Yarrow

- full sun
- well drained soil
- 1.5 ft-6 ft tall
- drought resistant
- blooms July-October
- food source for birds and butterflies


Dichondra Silver Falls

- full sun to partial shade
- heat and drought tolerant
- tendrils grow 2-4 ft long
- dry to average soil moisture


Plume Celosia

- full sun
- well drained soil
- approx 1 ft tall
- blooms all summer until first frost (10 weeks)
- two varieties: plume and cockscomb


Dwarf Fountain Grass

- full sun
- 2 ft tall, 2 ft wide
- dry to average moisture
- somewhat tolerant of urban pollution


Black-eyed Susan

- full sun
- average moisture soil
- 1-3 ft tall
- drought and pollution tolerant
- red, yellow, white


Butterfly Weed

- full sun
- may have to wait 2-3 years for blooms
- 2-3 ft tall
- blooms mid to late summer, great in fall
- average to dry soil moisture
- attracts butterflies

The physical prototype gives a sense of how all of the elements of the bus stop relate to one another spatially. Adjustments in the arrangement of the furniture are easier to make in a physical model than they are in a drawing or in a digital model. Viewing the physical model also gives one a better grasp of the materials and textures used in the design than a drawing or digital rendering would, and allows for an assessment of those materials used and how they might play together in the actual, full size design.
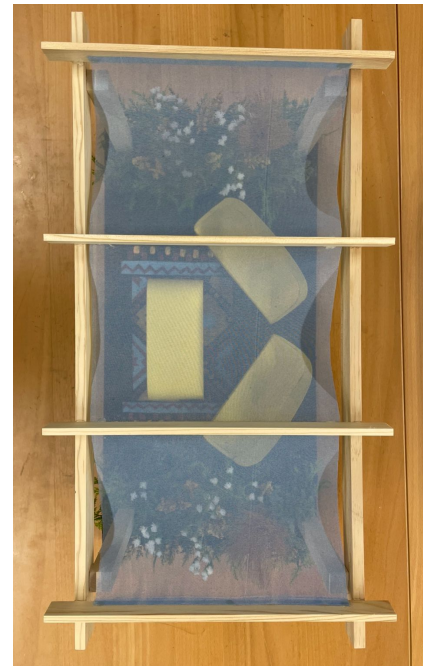
The bus stops have two primary functions: serving as a bus stop for the Community Connector and creating a space for the community to gather. Older adults who are waiting to board the Community Connector are able to socialize with one another at the stops. When the bus service isn't running, the stops can be visited not only by the older adults who use the service, but also by older adults who don't, as well as community members of other age groups. When the bus isn't in service, these spaces could be used by local community organizations to host events like book clubs, play board games, or hold picnics, further solidifying their statuses as hubs for community engagement and interaction between neighbors.
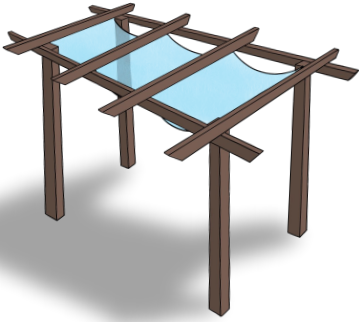
1.  Social Space for Older Adults
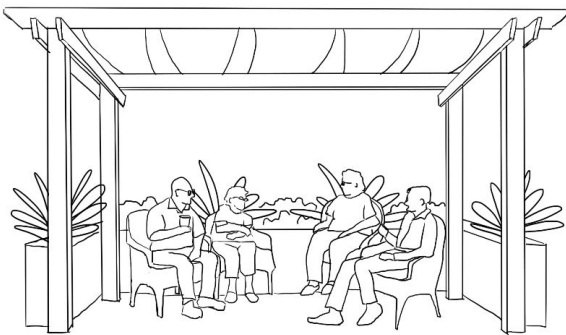


2.  Community Cruiser Bus Stop
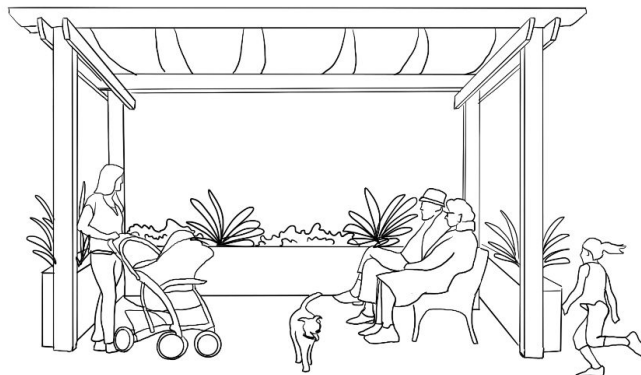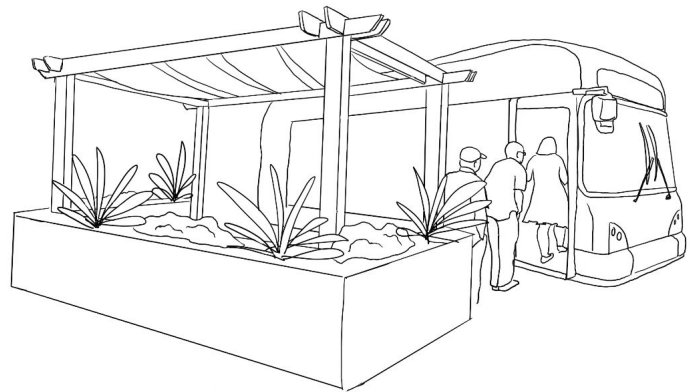




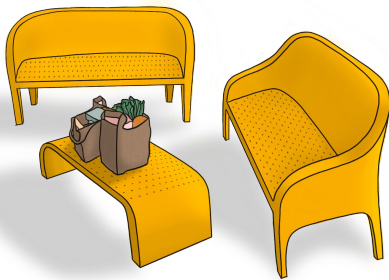3.  Community "Living Room"
    for UA residents of all ages

wood pergola structure

- easy to find, relatively inexpensive
- easy to work with
- can be stained a variety shades

high density polyethylene canopy



- resists mold and mildew
- knitted construction resists tearing and fraying
- provides protection from UV rays
- breathable fabric
- easily cleaned with water

powder-coated aluminum planters



- powder coat is durable and prevents rust
- powder-coated aluminum is cheaper and lighter than steel, but weight of plants and soil makes planter heavy enough to deter theft
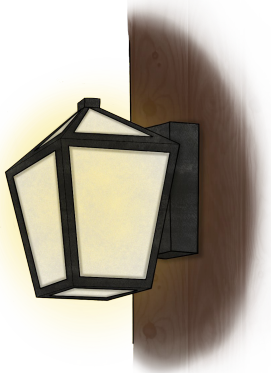
powder-coated steel benches

- powder coat is durable and prevents rust
- powder-coated steel is incredibly strong and durable
- heaviness of steel furniture deters theft

painted rugs



- acrylic: go-to for asphalt professionals
- water-soluble, won't cause damage to asphalt
- easy to find in a variety of colors

lighting sconces



- frosted glass panels allow light through without seeing bulb
- powder coated aluminum frame is relatively durable and inexpensive

Many of our codesign participants mentioned that they enjoyed volunteering in their community. As such, much of the maintenance could be done by older adult volunteers who use the Community Connector service. Maintenance performed by volunteers would include tasks such as planting and watering the plants and to a lesser extent, maintaining the furniture. The furniture at the stop is designed to be durable, but when the furniture eventually breaks or needs repair, businesses could be contracted to perform this maintenance.

The painted rugs wouldn't necessarily need to be cleaned, but they would likely need a fresh coat of paint every few years depending on wear.

The weight of the furniture pieces and planters deters theft, but additional anti-theft measures may include chaining the pieces together or bolting them to the asphalt, either permanently or on a nightly basis. Volunteers who live near each stop may be recruited to lock down furniture at night and unlock furniture in the morning if it occurs on a nightly basis. An incentive could also be given to volunteers who help maintain the stop, such as vouchers for local businesses.

An alternative stop design involves the removal of the pergola. This results in a less expensive design that still carries the essence of the original bus stop stops. While community members who visit these stops are less protected from the weather, they are still able to sit down and enjoy the company of others while they wait for their bus.

# conclusion

- further exploration
- impact

# further exploration



weather · accessibility · route

signage · programming

There are still plenty of opportunities for further exploration in regards to the final solution. One opportunity is assessing how this space functions in adverse weather conditions, namely rain and snow. Further testing regarding the accessibility of the stops is also needed: Is there enough room for older adults to get around? Can they get in and out of the benches alright? Is the stop wheelchair accessible? Is the bus itself wheelchair accessible? An additional opportunity for exploration is consideration for the exact location and number of bus stops, which depends on the route for the Community Connector route- another space that is not fully developed yet. Another important element that has not been designed yet is signage that would indicate that these are bus stops for the Community Connector service. Lastly, once the stops are in use it would be interesting to evaluation how they are being used. Do the stops do their job to encourage socialization, or is additional programming needed?

# impact

The Community Connector bus stop network supports the Community Connector service and its tenets of mobility, social connection, and sustainable practices by providing older adults with a casual and comfortable place to wait for their bus. This project began with a focus on designing bus stops that provided older adults with a place to socialize with one another, but over time it evolved to become not just a bus stop, but a place to meet with friends and neighbors of all ages. The bus stops were initially designed for implementation in the city of Upper Arlington specifically, but the concept could easily be adapted for implementation in other towns. The project opens up an opportunity to explore future evolutions of bus stops that address the unique social and economic needs of all kinds of communities locally, as well as in a much broader context.

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