Usability Test Report

Green Space Team

Team members:

Undergrad students:

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By Haoyang Chen

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1 Introduction

In this section, the App description, the goal the usability test, and the detailed test process are presented. The main focus is on the description of the usability test, in which all the details and information about the procedures are systematically illustrated.

1.1 App Description

This app allows users to locate and track green spaces such as wetlands, public gardens, greenways, etc. Users can upload information such as photos, location, green space categorization to update the database of the app. There are several purposes of the app: 1) improve general population's knowledge and awareness about the green infrastructure; 2) improve the quality of data points from users via the user interaction; 3) provide a large amount of high-quality data for research in term of wetland map, indicators, and model.

1.2 Test Goal

Since the UI Domain of the Green Space application is focused on educational purposes, which improves the general population's awareness particularly middle school students' knowledge about green infrastructure, the usability test focused on testing the simplicity, functionality, and educational aspect of the application. The data collected in this test are using behaviors, subjective using experience, and evaluation from the participants. All data collected in this test is used to help improve the features and functionality of the App.

1.3 Outline of the Usability Test

1.3.1 Test Procedures

The ordinary test procedures are as follows:

a. Welcome and greet the participant to make the atmosphere relaxed.
b. Briefly introduce the App and state the purpose of the usability test.
c. Confirm the participant has read the consent form before the test.
d. Ask for formal permission from the participant.
e. Fill the Pre-test Questionnaire.
f. Describe test scenarios and let the participant start the test scenario.
g. Ask scenario corresponding questions via semi-structured interviews.
h. Fill in the Post Experiment Questionnaire and Bug Report Form.
i. Thank the participant.

1.3.2 Test Description

The test consists of 8 sessions that were conducted online using the Zoom application. Each session lasts for around 30 minutes to 50 minutes (depending on the participants' using situation). In each session of the test, there were 3 conductors (one is the UX consultant who hosts the test, two are App developers who assist the UX consultant). All sessions of the test follow a standardized protocol that was prepared before the test.

At the beginning of the test, participants are required to turn on the video camera and be told that the recording (includes participant's face and the screen of the participant's device) will be on progress and last to the end of the test. Then the host introduces the App and the usability test, after that formally asks for permission from the participant. Once the participants formally agreed, they were then asked to fill out the Pre-test Demographic Questionnaire. After completing the Demographic Questionnaire, the host and the assistants guide the participant to implement 3 test scenarios. For each test scenario, there are independent semi-structured interviews, questions are almost the same but a little different related to different scenarios. There is also a Post Experiment Questionnaire and Bug Report Form (if participant finds bugs during the test) for the participants to fill in after the last test scenario.

Since the video recording is on during the whole test of each session. Participants' testing behaviors, facial expressions, and time spent on each functionality had been recorded. These video records were used to do the quantitative and qualitative analysis for the usability test.

Dates and time for testing sessions:

1. 4/9/2023 1:00 PM
2. 4/11/2023 12:00 PM
3. 4/11/2023 1:00 PM
4. 4/11/2023 1:00 PM
5. 4/13/2023 11:00 AM
6. 04/14/2023 2:00 PM
7. 04/14/2023 3:00 PM
8. 04/14/2023 4:00 PM

1.4 Instructions to Participants

Prior to conducting the test sessions, the host of the test provides an explanation of the purpose and procedures of the application to the participants. The tasks that the participants will be performing were also briefly explained to them. The host ensures that there are no risks associated with using the application, and that all data obtained from the application will be kept confidential. All participants noted that this application has educational purposes, and information about it may be shared with the professors of the class for educational and real testing purposes. However, there is no risk involved in using the application. At the end of the session, the participants were asked about their experience with the usability tasks.

1.5 Consent Form Signing

Participants must sign a consent form acknowledging that they can withdraw from the experiment at any time if they feel uncomfortable with the test or for any other reason. The privacy of their identity will be safeguarded throughout the test. Participation in the test is only permitted once the consent form has been signed. The consent form was sent to the participants before the test one day before testing day attached to the formal invitation email. From the email, participants are encouraged to read the consent form before the test.

1.6 Usability Questions

Two different types of questionnaires were provided for the usability test. The first questionnaire is a demographic questionnaire, which is to be completed prior to the scenarios experiment. The second questionnaire is the post-experiment questionnaire, which will be given after the scenarios experiment has been conducted and tested.

1.6.1 Demographic Questionnaire

Once the consent form has been filled out, participants will be asked to complete a demographic questionnaire. This questionnaire includes basic tasks such as the participant's gender, age, major, and level of familiarity with using smartphones or laptops (mostly smartphone experience is required).

1.6.2 Post Experiment Questionnaire

Upon completion of the experiment, participants will be asked to fill out another questionnaire regarding their experience with using the application. This questionnaire will also include a section where participants can provide any suggestions or comments about their experience with the application.

1.7 Bug Report

If an error occurs during the program running, it is considered a bug. Every time a participant encounters an error during the program running, a unique bug number and name will be given. If a bug appears for the first time, an asterisk will be placed next to the bug. For multiple occurrences of the same bug, no description will be written except for the bug’s name. Additionally, the bug location will be provided to indicate which part and page of the website/application has the bug.

2 Test Scenarios

There are four test scenarios on the original usability test plan but only three were executed in the real test because the develop team failed to complete the upload functionality before the test day. Each of these test scenarios has been described in the following sections.

2.1 Test Scenario 1:

2.1.1 Test Goals

- To check if website page's style is feeling comfortable for the user.
- To check if the App description on the homepage is easy to understand for the user.
- To test the time for user to complete reading the App description on the homepage.
- To check if the navigation bar is working properly for the user to access different sections of the App.

2.1.2 Scenario Description

We suppose the user has no idea about what the App is used for. The user must read the introduction of the App on the homepage to understand the App background knowledge. Then the user will begin to explore the website and learn more about the App.

2.1.3 Task List

- Open the App and login to the personal account.
- Click on the education page and read the information.
- Click on the map page.
- Try some manipulation like zoom in and zoom out on the map.
- Click some location on the map to view location information.

2.1.4 Quantitative Measurement List

- The time the user spends on reading the introduction information on the App.
- The number of the times the App crashed.

2.1.5 Qualitative Measurement List

- User's understanding about the development motivation of the App.
- User's understanding about the different functionalities of the App.
- User's ease to navigate different pages of the App website.

2.1.6 Potential observations of participants

- The user does not understand what the App is used for.
- The user is confused about the information that is provided on different pages.
- The user has difficulties using the navigation bar to go through different pages on the website.

2.1.7 Bug Report Form

To report functional software problems, a Bug report form will be used. This form will include information about the person reporting the problem, the nature of the problem, and instructions for replicating the problem.

2.1.8 Post Experiment Questionnaire

Once all the tasks have been completed, participants will be asked to fill out a post-experiment questionnaire.

2.1.9 Test Set up Details

To conduct the online usability testing, we have set up and scheduled a Zoom meeting. At the beginning of the session, participants will be asked to fill out the consent form and demographic questionnaire. The instructor and students will run the application on their laptop or mobile, with a preference for laptops to better see the details on the shared screen. Verbal instructions will be given to the participants during the explanation parts of the test. Each participant will be given a turn to share their screen and perform the tasks on the application. After the test is completed, participants will fill out the post-experiment questionnaire.

2.2 Test Scenario 2:

2.2.1 Test Goals

- To check if the App is useful for user's educational purpose.
- To check if the App really helps users to learn knowledge about green space and infrastructure.
- To check if the quiz functionality works properly.

2.2.2 Scenario Description

We suppose the user made their effort to learn as much as possible knowledge about green space and infrastructure from the provided information. Thus. Based on this information we set a quiz for the user to exam the learning effect. The user will do the quiz after they go through the information.

2.2.3 Task List

- Open the App and login to the personal account.
- Click on the education page and read the information.
- Read and learn the provided information.
- Finish the quiz and submit it.
- Note the score and compare the response answer with the correct answer.

2.2.4 Quantitative Measurement List

- The time the user spends on doing the quiz.
- The score the user attained in the quiz.
- The number of the times the App crashed.

2.2.5 Qualitative Measurement List

- User’s understanding about the contents of the App.
- User’s learning experience through the App.
- User's performance in the quiz.

2.2.6 Potential observations of participants

- The user is confused about the information that is provided on the App.
- The user shows difficulty in selecting the answer in the quiz.
- The user does not perform well in the quiz.

2.2.7 Bug Report Form

To report functional software problems, a Bug report form will be used. This form will include information about the person reporting the problem, the nature of the problem, and instructions for replicating the problem.

2.2.8 Post Experiment Questionnaire

Once all the tasks have been completed, participants will be asked to fill out a post-experiment questionnaire.

2.2.9 Test Set up Details

To conduct the online usability testing, we have set up and scheduled a Zoom meeting. At the beginning of the session, participants will be asked to fill out the consent form and demographic questionnaire. The instructor and students will run the application on their laptop or mobile, with a preference for laptops to better see the details on the shared screen. Verbal instructions will be given to the participants during the explanation parts of the test. Each participant will be given a turn to share their screen and perform the tasks on the application. After the test is completed, participants will fill out the post-experiment questionnaire.

2.3 Test Scenario 3:

2.3.1 Test Goals

- To evaluate the functionality of the map feature in the Greenspace app.
- To check if the location functionality is working properly.
- To check how accurate the location displays.
- To check if the App is useful for the user to locate a specific green space and infrastructure.

2.3.2 Scenario Description

We suppose the user is interested in using the App to look for green space information and place. The user will try to use the App to locate some green space and infrastructure. They will identify the place on the map.

2.3.3 Task List

- Open the App and login to the personal account.

- Click into the map page and try to manipulate the map.
- Allow the App to locate the user's location.
- Search for some green spaces on the map.
- Check the detailed information that is displayed on the map.

2.3.4 Quantitative Measurement List

- The time the user spends on using the map functionality.
- The time that takes to load the map.
- The time that the user identifies a green space on the map from start to search it.

2.3.5 Qualitative Measurement List

- User's understanding about how to use the map features.
- User's ease to locate and identify a specific green space.
- User's understanding about the information that is displayed on the map.

2.3.6 Potential observations of participants

- The user is confused about the information that is provided on the map.
- The user shows difficulty in some manipulation on the map.
- The user finds that the location feature does not work properly.

2.3.7 Bug Report Form

To report functional software problems, a Bug report form will be used. This form will include information about the person reporting the problem, the nature of the problem, and instructions for replicating the problem.

8.3.8 Post Experiment Questionnaire

Once all the tasks have been completed, participants will be asked to fill out a post-experiment questionnaire.

2.3.9 Test Set up Details

To conduct the online usability testing, we have set up and scheduled a Zoom meeting. At the beginning of the session, participants will be asked to fill out the consent form and demographic questionnaire. The instructor and students will run the application on their laptop or mobile, with a preference for laptops to better see the details on the shared screen. Verbal instructions will be given to the participants during the explanation parts of the test. Each participant will be given a turn to share their screen and perform the tasks on the application. After the test is completed, participants will fill out the post-experiment questionnaire.

2.4 Test Scenario 4: (Note: This scenario was originally on the test plan but was not applied on the real test because team can complete the corresponding functionality before the test)

2.4.1 Test Goals

- To evaluate the functionality of data uploading in the App.
- To check if the upload feature works properly with the map feature.
- To check if the data uploading process is user-friendly.

2.4.2 Scenario Description

We suppose the user is interested in sharing green space information and places on the App. The user will try to upload some photos of green space and infrastructure. They will also provide the location and categorize the green space they upload.

2.4.3 Task List

- Open the App and login to the personal account.
- Click into the upload pictures page and try to begin the upload process.
- Select a green space photo from their device to upload.
- Allow the App to locate the user's location.
- Enter the location and category information.

2.4.4 Quantitative Measurement List

- The time the user spends on using the upload pictures feature.
- The time that takes to load the map.
- The time that the user identifies a green space on the map from start to search it.

2.4.5 Qualitative Measurement List

- User's understanding about how to complete the upload process.
- User's understanding about the information that required to upload a new data point for green space.
- User's understanding of the importance of their uploaded information for the research purpose.

2.4.6 Potential observations of participants

- The user is confused about the upload data process.
- The user does not understand the importance of their uploaded information for research purposes.
- The user has difficulties in reselecting a photo that is going to upload.

2.4.7 Bug Report Form

To report functional software problems, a Bug report form will be used. This form will include information about the person reporting the problem, the nature of the problem, and instructions for replicating the problem.

2.4.8 Post Experiment Questionnaire

Once all the tasks have been completed, participants will be asked to fill out a post-experiment questionnaire.

2.4.9 Test Set up Details

To conduct the online usability testing, we have set up and scheduled a Zoom meeting. At the beginning of the session, participants will be asked to fill out the consent form and demographic questionnaire. The instructor and students will run the application on their laptop or mobile, with a preference for laptops to better see the details on the shared screen. Verbal instructions will be given to the participants during the explanation parts of the test. Each participant will be given a turn to share their screen and perform the tasks on the application. After the test is completed, participants will fill out the post-experiment questionnaire.

3 Results and Discussion

This section provides data analysis results for the usability test. Data is collected from the Pre-Test Questionnaire, Post-Test Questionnaires, Verbal Interview, and observation of participants' behaviors during the test.

3.1 Pre-Test Questionnaire Results

There was a total of 8 participants attending the usability test. Each attended an independent session in a specific time. There are 6 male and 2 female, the age among all participants is from 19 through 20.

Answers situation for 3 questions in the Pre-Test Questionnaire:

1. How many years have you used a smartphone?
    - The range among all answers is from 6 to 10 years.

2. Do you have any difficulties with viewing colors, contrast, or fonts on a smartphone or computer screen that you are aware of? (A) Yes; (B) No.
    - All answers are (B).

3. I am very interested in the testing of this application. (A) Strongly agree; (B) Agree; (C) Neutral; (D) Disagree; (E) Strongly disagree.
    - All answers are (B).

3.2 Results of Test Scenario 1

Participants were asked to briefly go through the contents on the homepage and try using the buttons in the navigation bar to click in other pages of the App. Basis tasks for the participants are: 1) make evaluation on the App style; 2) try to understand as much as possible the contents on the homepage; 3) check whether or not the different functionalities are working properly.

The result from the semi-structure interview after the test scenario shows that:

a) No participants think they have difficulty in navigating through the website.

b) Most participants think the homepage and educational page are easy to navigate through, but the map page and login page are challenging to navigate through.
c) (7/8) of the participants think information provided on the education pages is easy to understand.
d) No participants encounter any technical issues while using the website.
e) (7/8) of the participants think the background color of the website is too harsh and needs to be changed.

The quantitative measurement of this scenario is the time participants spend on reading the contents of the homepage. Figure 1 shows that among all participants, the time spent on reading the homepage ranged from 60 seconds to 190 seconds.

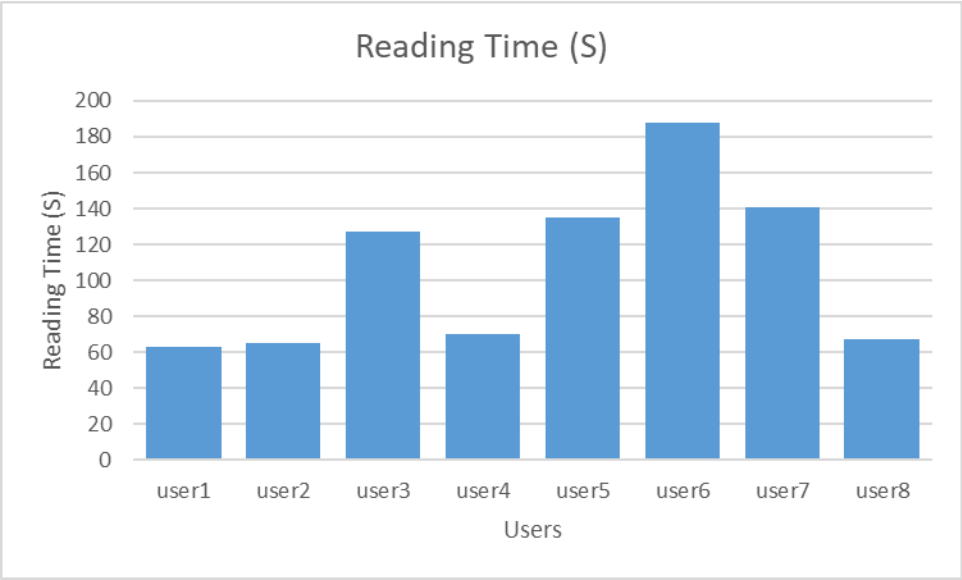

Figure 1. Distribution of reading time spent on the homepage among all participants.

3.3 Results of Test Scenario 2

Participants were asked to examine the effect of the App's educational purpose. The main task for the participant is: 1) learn as comprehensive as they can the knowledge provided on the educational page; 2) complete the quiz that is below the reading materials; 3) make evaluation on the effect of the educational functionality of the App.

The result from the semi-structure interview after the test scenario shows that:

a) All participants think that the content provided on the website is helpful for solving the quiz.
b) Most participants think the challenging level of the quiz is appropriate.
c) (3/8) of the participants think a question about the stream runoff is confused.
d) (2/8) of the participants found technical issues (correct answers display issue) while taking the quiz.

e) (1/8) of the participants suggested to arrange the questions of the quiz between paragraphs so that people can easily correlate the question to the corresponding paragraph.
f) All participants believe that the quiz is useful for learning about green infrastructure.

The quantitative measurement of this scenario is: 1) the time participants spend on reading the contents of the educational page; 2) the incorrect answers participants got in the quiz. Figure 2 shows the time distribution that participants spent on reading the content. Figure 3 shows the incorrect answers they got among all participants. Comparing Figure 2 and Figure 3, it shows that more reading time contributed to a higher accuracy in the quiz.

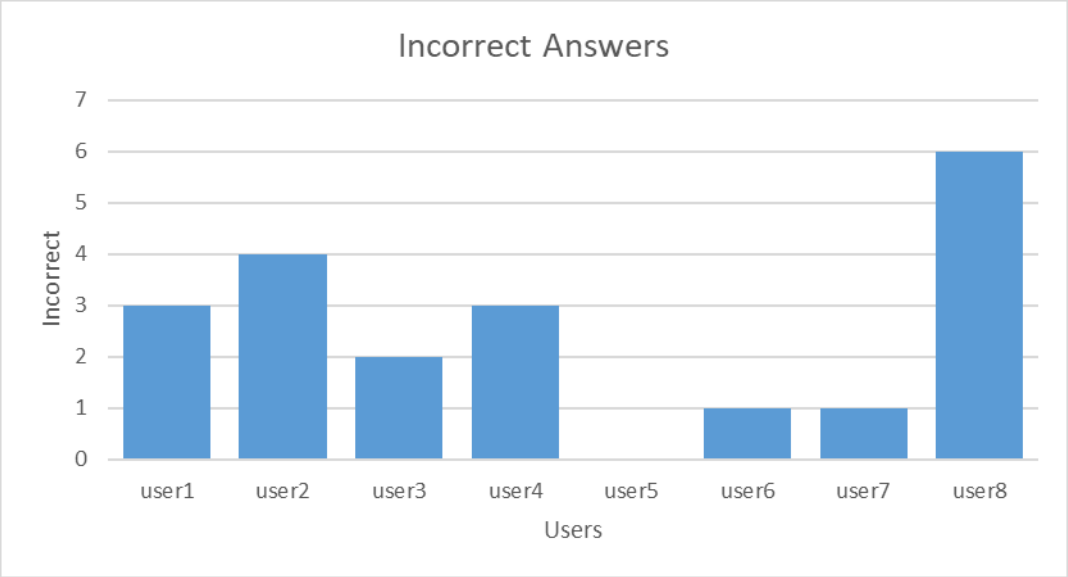

Figure 2. Distribution of reading time spent on the educational page among all participants.

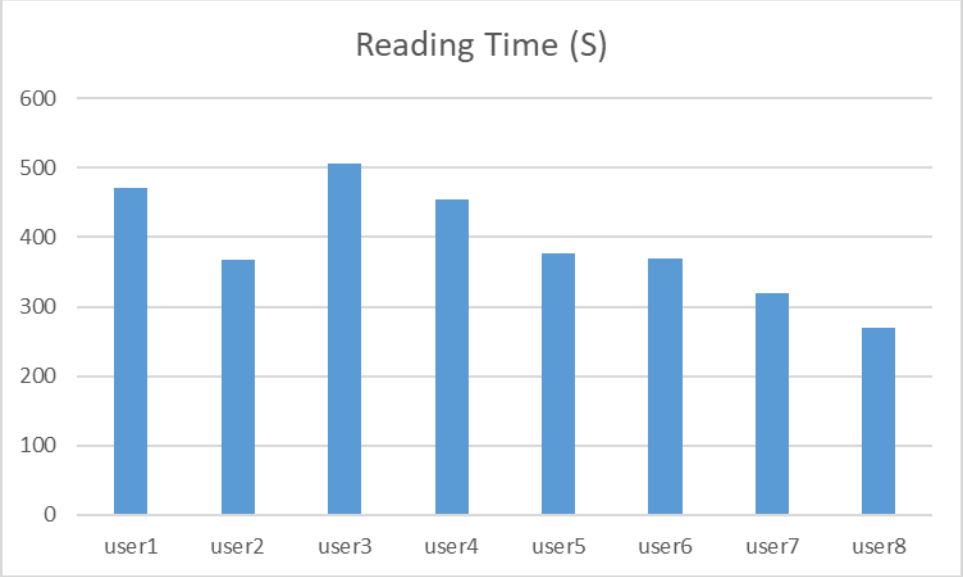

Figure 3. Distribution of incorrect answers they got in the quiz among all participants.

3.4 Results of Test Scenario 3

Participants were asked to evaluate the functionality of the map feature of the App and check whether the location functionality is working properly. The main tasks for the participant are: 1) click on different green places on the map to see displayed information; 2) identify some green space locations; 3) make evaluation on how useful the feature to locate a specific green space and infrastructure.

The result from the semi-structure interview after the test scenario shows that:

a) All participants totally understand the functionality of the map feature of Greenspace App.
b) All participants have used Apps that with a similar map feature, but none of them make the map feature like Greenspace does.
c) All participants think that it is easy to navigate the map feature in the App.
d) (2/8) of the participants found difficulty allowing the App access his/her location.
e) No participants found incorrect locations displayed on the map.
f) All participants can view more information about a green infrastructure location by clicking on it.
g) Most participants suggest that the map feature can be improved by adding more location and functionalities like “go back to current location” button.

The quantitative measurement of this scenario is the time participants spend on exploring the map feature. Figure 4 shows that among all participants, the time spent on exploring the map feature ranged from 100 seconds to 170 seconds.

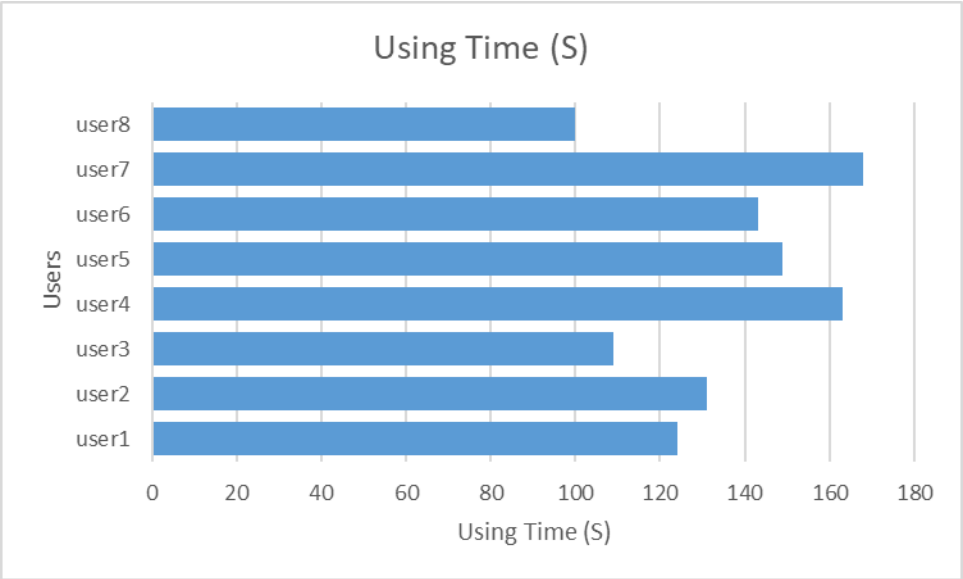

Figure 4. Distribution of exploring time spent on the map among all participants.

3.5 Post-Test Questionnaire Results

After all the test scenarios, all participants are asked to fill in a Post Experiment Questionnaire. These questions cover the overall using experience of the App. Questions and answers situations are as follows:

1. Overall, this application was easy to perform the task.
2. I enjoyed using this application.
3. The toggle buttons are clear and easily navigable.
4. The text was easy to read and understand.
5. I was able to complete my tasks efficiently.
6. I would like to use this application again.

All these questions are closed questions with a 5-degree answer choice. The choices for each question are: (A) Strongly agree; (B) Agree; (C) Neutral; (D) Disagree; (E) Strongly disagree. Figure 5 shows the number of selections from participants among different questions.

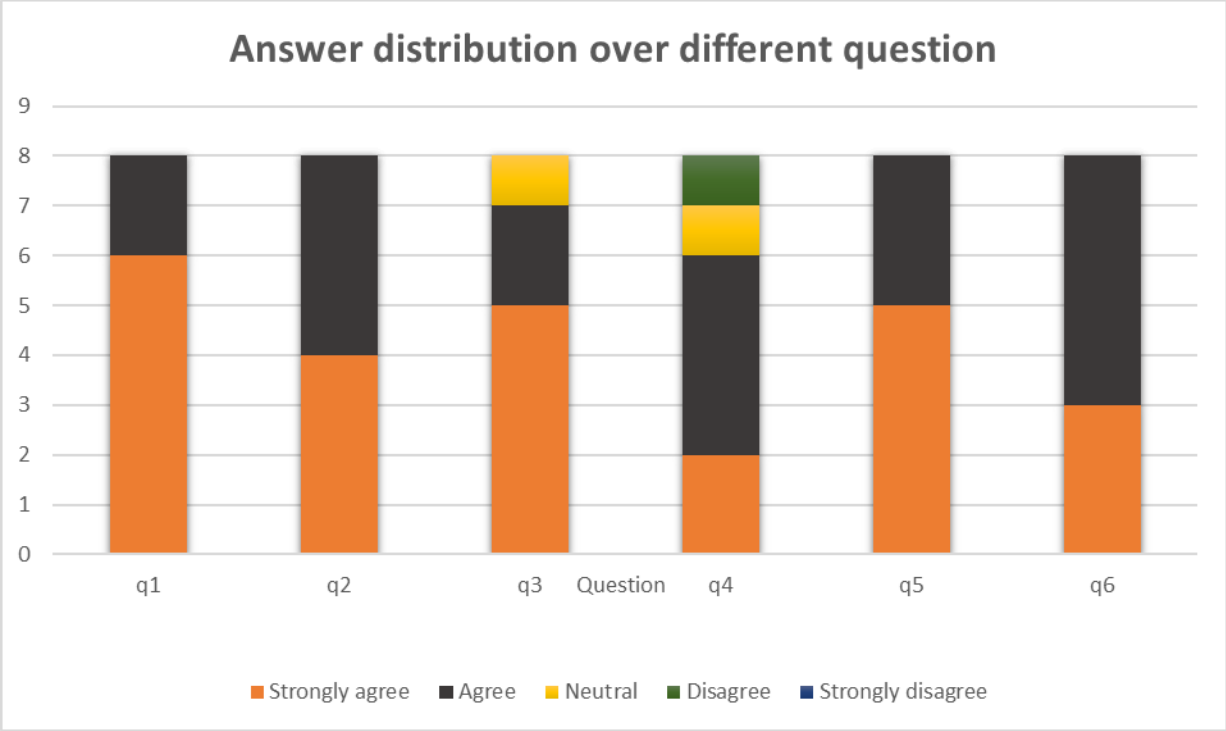

Figure 5. Number of answer selection from participants among all questions.

3.5 User Comments

There are two open questions in the Post-Test Questionnaire, all participants gave their subjective answer to these two questions. The questions and answer situations are as follows:

1. What did you like most about this application?
   - "I liked that there was a lot of in the education section to learn from."
   - "I really like the map feature, and its indication of where the green space are."

- “I like the application's intended purpose and the style of the map. the map was very visually appealing and did a good job of visually describing the types of green spaces in that location.”
- “How informative it was and how easy it was to navigate, especially on mobile.”
- “I liked how the application shows the green spaces around you or any other location.”
- “I like the mission of the application itself, I really enjoyed reading the background and learning about green spaces as alternatives to the abundance of gray spaces we currently have.”
- “I liked the map function of the app.”
- “The map feature was nice and the top navigation bar.”

2. Do you have any suggestions for the improvement of this application?

    - “Improve the UI, the UI is a bit outdated and it’s all green making it hard to see some text.”
    - “Button on the login page to take user back to the homepage. Make login page same style as other pages. Add information about runoff calculation. Modify the quiz so there aren’t repetitive questions.”
    - “Adjust the main color of the website's background, as the green feels a little harsh to look at for extended periods of time, and revising the layout of the text would also be a good idea. A format where the images that the text relates to are closer to the text so it is more obvious which images are related to which blocks of text may be good.”
    - “Have a home button or something similar on the map.”
    - “Having a search bar to look for specific information or words might help people who are looking for very specific information. In the Map page, it may be useful to be able to have a “navigate” option where you could see a route to walk to a certain green space that is within a certain distance.”
    - “The only big suggestion I would make is to change the background color and font color so that the page is a little less jarring to look at while you are reading through things.”
    - “Adding color coordination to the pins in the map.”
    - “Improve the alignment of the navigation labels, align the images better, and remove dead space on the side. Additionally, a dark mode or other layout option would be nice as I found the green coloring harsh.”

4 Conclusion

This usability test was designed perfectly and executed successfully following the standardized protocol. All invited participants finally attended our test even some of them have rescheduled the time with us. Most of the process of the test follows our original usability plan except that the fourth test scenario has

not been implemented because the development team cannot complete the corresponding feature on time. The result above shows there is still room for improvement particularly in the UI design of background color, and functionality of the map feature. From the statistics result of the Post-Test Questionnaire, most of the participants expressed a positive opinion to the overall App using experience.

5 Appendix A - Undergraduate team members attendance

Administrator	Testing Date	Undergraduate Assistant
Haoyang Chen	4/9/2023 13:00	Austin Gennrich & Kyle McIntyre
Haoyang Chen	4/11/2023 12:00	Austin Gennrich & Kyle McIntyre
Haoyang Chen	4/11/2023 13:00	Colin Dohne & Sid Regmi
Haoyang Chen	4/11/2023 13:00	Michael Romero & Jordan Bramer
Haoyang Chen	4/13/2023 11:00	Austin Gennrich & Kyle McIntyre
Haoyang Chen	4/14/2023 14:00	Sid Regmi & Michael Romero
Haoyang Chen	4/14/2023 15:00	Austin Gennrich & Kyle McIntyre
Haoyang Chen	4/14/2023 16:00	Colin Dohne & Jordan Bramer

6 Appendix B - Bugs Report

All participants are asked to fill in a Bug Report Form if and only if they find bugs during the test. (2/8) of the participants report the same bug.

Bug description:

Some of the questions wouldn't display if they are right or wrong answers in the quiz.

Steps to reproduce:

Take the quiz in the Types of Green Space section of the app.

7 Appendix C – Testing Challenges

Although we believe that our usability has been successfully implemented, some challenges are still obvious.

Challenge Name	Challenge Description
Testing time arrangement	A participant fails to show up on time in our scheduled time slot. At the beginning, we cannot get response from him, but finally we contacted him and rescheduled another time slot for him.
Screen sharing	A participant's testing device could not share her screen. We tried to help her fix the issue but failed. We finally rescheduled another time slot for her, and she took the test in another device in the rescheduled day.