The Green Spaces Project

Usability Test Report

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Introduction

The Green Spaces Project is a Mobile-oriented web application meant to educate the people on the importance of Green Stormwater Infrastructure(GSI) in and around the Southeast Michigan area. GSI refers to all green spaces that can help mitigate the risk of flooding by harvesting the incoming storm water. The project is meant to provide valuable information to users showing GSI locations and will help school students identify and input the GSI locations. For the client, this application will be a data collection tool.

The app includes a Landing page where users can read about GSI and its importance. There is a Map feature that can be used to view GSI locations around the user and the app also has Login functionality for High School students, High School teachers and the Client, who is also the administrator.
The ability to add new GSI locations is only available for logged in users. The admin can create credentials for the teachers and the teachers can then create student credentials. Along with these functions, the admin also has moderation access to the app with the ability to edit/delete any post or user.

For the Usability Test, 4 scenarios were formulated to emulate the 4 different types of users for this app- General Public, High School Student, High School Teacher and Admin. In each scenario, the participants had to carry out tasks available to the type of user and then answer some rating-based questions. The participants also had to answer verbal questions after each scenario to describe their opinions and feelings while carrying out the tasks.
Before testing, each participant was provided a pre-test survey to gather demographics and other baseline information and after the test, they were provided with a post-test survey to gather feedback on some common usability questions.

Test Scenario 1: Public User

Test Goals: Validate the functioning of the Public View for the application

Quantitative Measurement List:
- Time spent on information pages
- Time taken to navigate the site
- Number of GSI locations accessed on the map

Scenario Description: You're a member of the general public(without an account) who navigates to the website to learn more about Green Stormwater Infrastructure(GSI) and view the Map having marked locations.

Task List:
1. Open the GSI website on a smartphone
2. Read through the landing page
3. Navigate to the Map section
4. Access the various marked GSI locations
5. Access the Contact page to get the scientist's information if you're interested to learn more.

Qualitative Measurements List:
- The information text is readable and engaging
- The images clearly educate what GSI is
- The Map shows accurate GSI locations
- The page elements are not distorted on a phone screen

Potential Observations:
- The participant spends time actually reading the educational content
- The participant is able to navigate among pages without issues on smartphones
- The participant opens their intended GSI locations accurately on a phone screen

Post-scenario Questionnaire:
1. On a scale of 1 to 5, rate the overall ease of using the app
2. Were you able to find and view the map locations properly?(Yes/No)
3. After reading through the app, how would you rate the educational value of the app?
   a. Not Informative   b. Somewhat Informative   c. Very Informative
4. Did you encounter any bugs/crashes while using the app?(Yes/No)
5. How likely are you to recommend this app to others?
   a. Not Likely   b. Maybe   c. Likely   d. Very Likely

Post-scenario interview:
- Was the app interesting?
- What were your favourite features?
- Would you use the app again and what suggestions would you give?

Test Scenario 2: High School User

Test Goals:
- To assess the ease of use for account creation, password setup, and password recovery.
- To evaluate the functionality and user experience of adding GSI locations to the map.
- To gauge the clarity and accessibility of viewing uploads by others and managing (editing/deleting) their own uploads.
- To understand the overall engagement and educational impact of the app on high school students.

Quantitative Measurements List :
- Time taken to create an account and set up a password.
- Number of attempts to successfully add a GSI location on the map.
- Time taken to find and view other students' GSI location uploads.
- The success rate of editing their own uploads.
- Overall app navigation time and completion of tasks.

Qualitative Measurements List:
- Perceived ease of use and navigational intuitiveness.
- Clarity of instructions for adding GSI locations.
- Engagement level with the educational content.
- Likelihood of recommending the app to peers.

Scenario Description:
High school students are given access to the GSI app for educational purposes and to allow them to interactively participate by adding GSI locations to a map. They can also view GSI locations uploaded by their peers but are restricted to editing or deleting only their uploads.

Task List:
1. Create an account and set up a password.
2. Navigate to the feature that allows adding a GSI location on the map and add one.
3. Explore the map to view GSI locations added by other students.
4. Find one of your uploads and go through the process of editing it.

Potential Observations:
- Difficulty in understanding how to navigate the app or complete tasks.
- Expressions of frustration or confusion during account creation or map interaction.
- The level of engagement or interest while exploring educational content.
- Ease or difficulty in distinguishing their uploads from those of others.

Post-Scenario Questionnaire:
- How easy was it to create your account and set a password? (Scale of 1-5)
- Were the instructions clear when adding a GSI location? (Yes/No; If no, what was confusing?)
- How engaging did you find the map feature and viewing other students' uploads? (Very engaging/ Somewhat engaging/ Not engaging)
- Was editing and deleting your uploads intuitive? (Yes/No; If no, why?)
- How likely are you to use this app again? (Very likely/ Likely/ Unlikely)

Post-Scenario Interview:
- What did you find most enjoyable or useful about the app?
- Were there any features or tasks that you found particularly difficult or confusing?
- How did you feel about the educational content within the app? Did it increase your interest in GSI?
- Can you suggest any improvements or additional features you'd like to see in the app?
- Would you recommend this app to your friends or classmates? Why or why not?

Test Scenario 3: High School Teacher
Test Goals:
- To evaluate the usability of the account creation process for students by teachers.
- To assess the ease and efficiency with which teachers can add GSI locations on the map.
- To determine the clarity of the process for viewing student uploads.
- To gather feedback on the overall user experience and potential educational benefits of the app.

Quantitative Measurements List:
1. Number of steps taken by teachers to create accounts for students.
2. Time required for teachers to successfully add a GSI location on the map.
3. Number of attempts to successfully view uploads by students.
4. The rate of successful logins and account creations on the first attempt.

Qualitative Measurements List:
1. Teachers' perceived ease of use of the app for educational purposes.
2. Perceived clarity of the interface and instructions for adding and viewing GSI locations.
3. Suggestions for improvements or additional features from an educational standpoint.

Scenario Description:
High school teachers, who have been added to the database by the Scientist, use a smartphone web app designed to educate about Green Stormwater Infrastructure (GSI). Their role involves creating student accounts using email addresses, after which students set up their passwords. Teachers can also log in to add GSI locations on an interactive map and view locations uploaded by students.

Task List:
1. Log into the app using your credentials.
2. Create accounts for students using their email addresses.
3. Add a GSI location on the map.
4. Navigate the app to view GSI locations uploaded by students.
5. Log out and attempt to log back in to ensure account credentials work properly.

Potential Observations:
- Challenges or confusion in navigating the app for account creation or map interaction.
- Reactions to the usability of the app, including any signs of frustration or satisfaction.
- Engagement level with the app's features and content.
- Any difficulties in distinguishing between different functionalities, such as adding GSI locations and viewing student uploads.

Post-Scenario Questionnaire:
  - How intuitive did you find the process of creating student accounts? (Scale of 1-5)
  - Was adding a GSI location to the map straightforward? (Yes/No; If no, what was confusing?)
  - How clear was the process for viewing student uploads? (Very clear/ Somewhat clear/ Not clear)
  - Did you encounter any technical issues during the test? (Yes/No; If yes, please describe.)
  - How likely are you to use this app in your teaching? (Very likely/ Likely/ Unlikely)

Post-Scenario Interview:
  - What was your overall impression of the app's functionality and educational potential?
  - Were there any aspects of the app that you found particularly beneficial or problematic for educational use?
  - How did you find the interface in terms of navigating between creating accounts, adding locations, and viewing uploads?
  - What improvements or additional features would you suggest to enhance the educational value of the app?
  - How do you envision incorporating this app into your curriculum or teaching activities?

Test Scenario 4: Scientist User(Admin)
Test Goals:
- To evaluate the ease and efficiency of managing high school teacher accounts by the admin.
- To assess the admin's ability to effectively moderate uploads, including banning users and editing uploaded content.
- To gauge the clarity and usability of the admin interface for viewing all users and performing user-level functionalities.
- To collect feedback on the app's overall functionality and its suitability for educational and scientific purposes.

Quantitative Measurements List:
1. Time taken to add a high school teacher using their email.
2. Number of steps required for the admin to ban a user or edit uploaded content.
3. Time required to view a comprehensive list of all app users.
4. Frequency of successful completion of tasks without requiring additional support or searching for instructions.

Qualitative Measurements List:
- Admin's perceived ease of use and efficiency of the moderation tools.
- Satisfaction with the admin's ability to interact with the app as a regular user.
- Perceived clarity and organization of the admin dashboard/interface.
- Suggestions for improvements or additional admin features from a scientific or educational standpoint.

Scenario Description:
The test participant is a scientist in civil engineering and serves as the admin for the GSI app. Her responsibilities include adding high school teachers to the app, moderating uploads for appropriateness, banning users for posting inappropriate content, editing uploaded information, and viewing all app users. She also retains the ability to perform all functionalities available to other users.

Task List:
1. Add a high school teacher to the app using their email.
2. Moderate recent uploads, identifying and editing an upload with inaccurate information.
3. Ban a user who has posted inappropriate content.
4. Use the admin dashboard to view a list of all app users.
5. Perform a regular user function, such as adding a GSI location on the map.

Potential Observations:
- Any confusion or challenges encountered while navigating the admin view.
- Reactions to the usability of moderation tools, including editing and banning functionalities.
- Ease of switching between admin functionalities and regular user activities.
- Overall comfort and efficiency in using the app for its intended scientific and educational purposes.

Post-Scenario Questionnaire:
- How intuitive did you find the admin features? (Scale of 1-5)
- Were the moderation tools (edit, ban) easy to use and effective? (Yes/No; If no, what improvements are needed?)
- How satisfactory was the process of adding teachers and managing users? (Very satisfactory/ Satisfactory/ Unsatisfactory)
- Did you experience any difficulties while performing regular user functions as an admin? (Yes/No; If yes, please describe.)
- How likely are you to recommend this app to your peers for educational or scientific use? (Very likely/ Likely/ Unlikely)

Post-Scenario Interview:
- What was your overall impression of the app's functionality from an admin perspective?
- Were there any admin features or tools that you found particularly useful or lacking?
- How did you perceive the balance between admin responsibilities and the ability to engage with the app as a regular user?
- What improvements or additional features would you suggest to enhance the app's value for scientific research or education?
- From a scientific and educational standpoint, how do you see this app evolving to better serve its users?

Pre-testing survey:

1. What year are you in your degree?
    a. 1st Year
    b. 2nd Year
    c. 3rd Year
    d. 4th Year
    e. Master's student
    f. PhD student
2. What is your major?
    a. Computer Science
    b. Data Science
    c. Cyber Security
    d. Other:
3. How well do you rank your comfort with technology?
   (On a scale of 1 to 5)
   Ans:
4. Rank your knowledge of Green Stormwater Infrastructure(GSI)
   (On a scale of 1 to 5)
   Ans:
5. Are you comfortable allowing the app to access your GPS co-ordinates?(Yes/No)
6. Do you have a disability or any other condition that can hamper your accessibility to the application? (Yes/No)
7. Please indicate your level of agreement to the follow statement:
   I am very interested in the testing of this application.
   1. Strongly agree
   2. Agree
   3. Neutral
   4. Disagree
   5. Strongly disagree
8. How many years have you used a smart phone?

Post test survey:

1. Please indicate your level of agreement to the follow statement:
   Overall in this application, it was easy to perform the tasks.
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

2. Please indicate your level of agreement to the follow statement:
   I enjoyed using this application.
   - Very much
   - A little bit
   - Neutral
   - Not very much
   - Not at all

3. Please indicate your level of agreement to the follow statement:
   I would use this application again.
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

4. Were you able to effectively learn about GSI through this app?
Answer:

5. Were you able to carry out the given tasks with minimal difficulty?
Answer:

Test Results

Scenario 1- Public User

On a scale of 1-5, rate the overall ease of using the app
8 responses
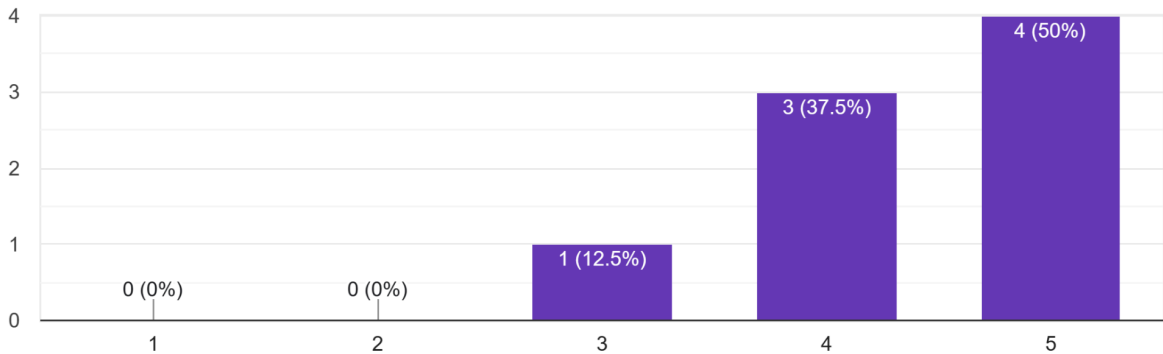
From a General Public perspective, the app was quite easy to use

Were you able to find and view the map locations?
8 responses
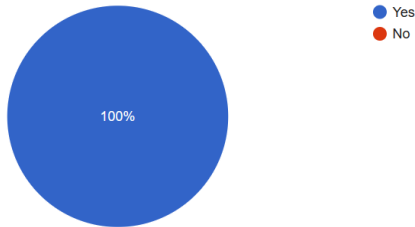
After reading through the app, how would you rate its educational value?
8 responses
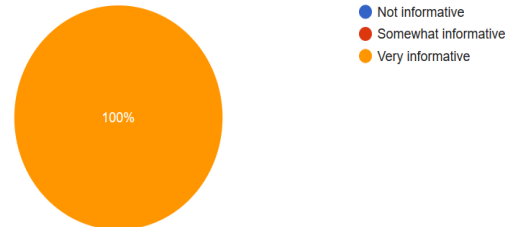
The app scored 100% in engagement and intuitive navigation based on user responses

Did you encounter any bugs/crashes while using the app?
(If yes, please report them using the Bug Report form)
8 responses
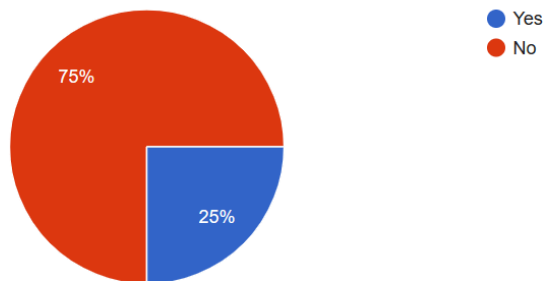
2/8 participants reported previously undiscovered bugs while the remaining participants only reported the incompleteness of the application

Scenario 2- High School Student

Were the instructions for adding GSI clear?

8 responses

- Yes
- No

87.5%

12.5%
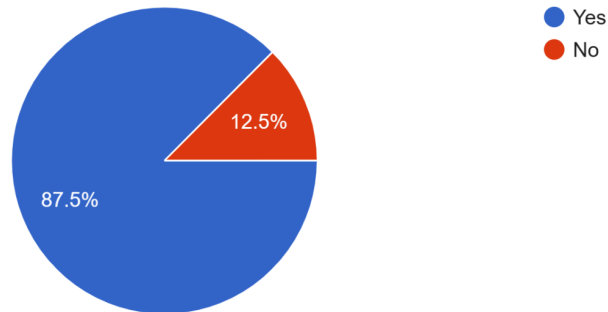
If above answer was "No", explain what was confusing.

The use of longitudinal and latitudinal coordinates were confusing

1 participant reported a lack of clarity in the "Add GSI" form mainly due manual entry of Latitude and Longitude values.

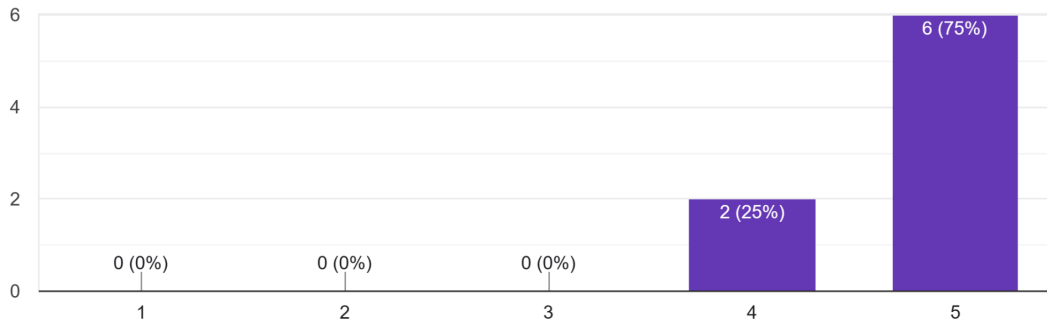How engaging did you find the map feature for learning about GSI?

8 responses

- Very Engaging
- Somewhat Engaging
- Not Engaging

50%

50%
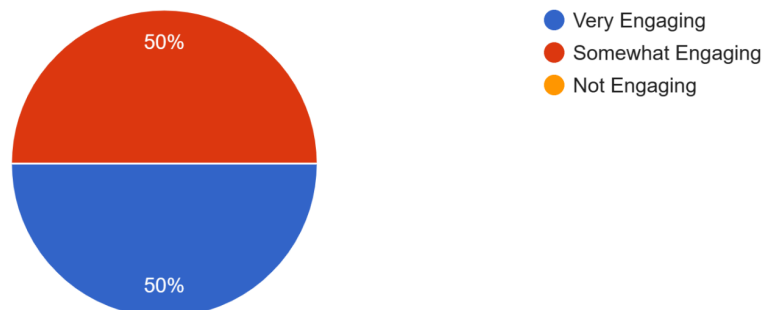
50% of the participants reported the map feature to be "somewhat engaging" as student due its lack of completeness

Scenario 3- High School Teacher

Rate the ease of creating Student Accounts

8 responses

The Student Account creation process was rated very highly by the participants.

How clear was the process of viewing Student Accounts?

8 responses

- ● Very Clear
- ● Somewhat Clear
- ● Not clear
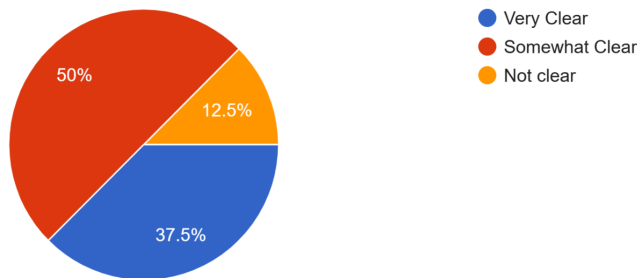
Conversely, the process of viewing existing student accounts was not rated highly by majority of the participants due to incorrect user counts shown on the panel

How Likely are you to use this app as a teaching tool?

8 responses

- ● Very Likely
- ● Somewhat Likely
- ● Unlikely
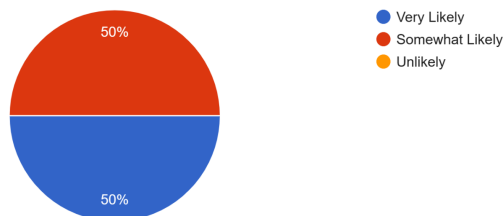
Participants did not show a unanimous acceptance of the app as an educational tool due to its incomplete nature.

Scenario 4- Client(Admin) user

Was the moderation dashboard easy to use and effective?

8 responses

- Yes
- No

50%

50%
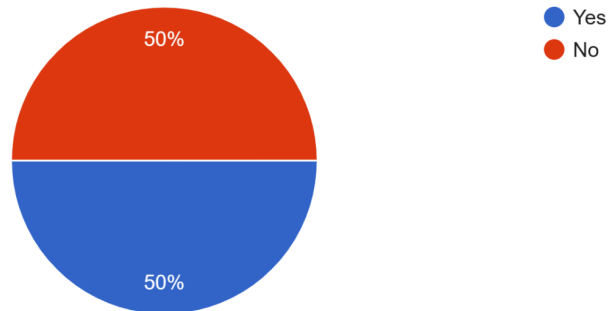
If above answer was "No", what improvements are needed?

Buttons or a drop down menu or something should be implemented, the current list of links is not easy to navigate

The management of the users is unclear for me. It has a few bugs and unclear things/options.

Moderation dashboard not implemented yet

The navigation back and forth for creating a teacher was confusing

The moderation dashboard had low acceptance due to lack of completeness. This included mobile-based usability issues like lack of buttons to functional issues like improper display of information.

How likely are you to recommend this app to your peers for educational and scientific use?
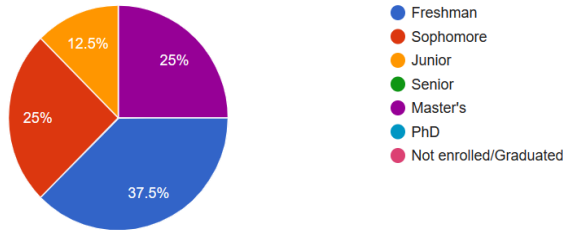
8 responses
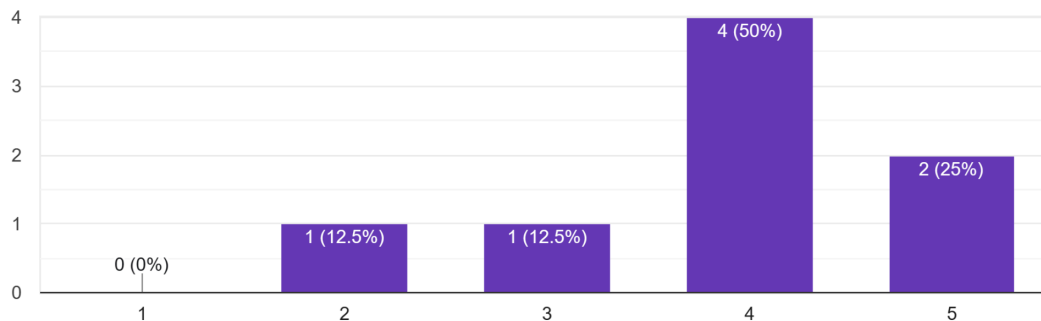
75% of the participants expressed eagerness to adopt this app for educational and scientific use while the remaining 25% were reluctant due to incompleteness of the features.
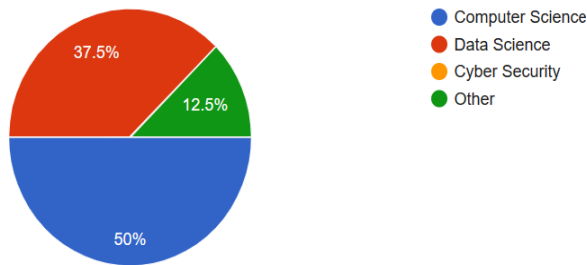
Pre-test Survey Results
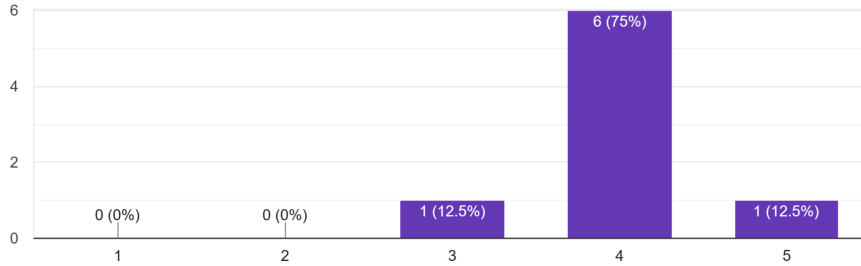
What Year are you in your degree?

8 responses

- Freshman
- Sophomore
- Junior
- Senior
- Master's
- PhD
- Not enrolled/Graduated

What is your major?

8 responses

- Computer Science
- Data Science
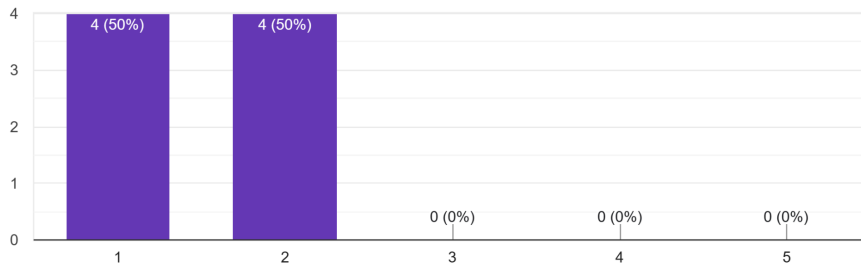- Cyber Security
- Other

How well do you rate your comfort with Technology?
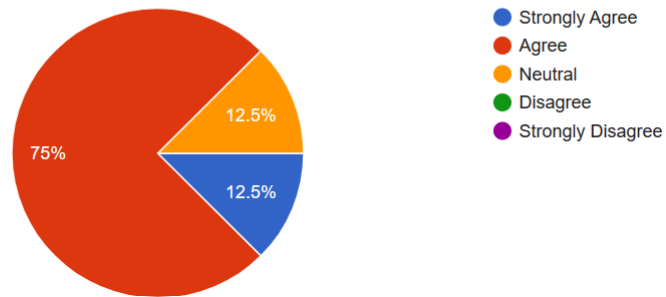
8 responses

Rate your knowledge of Green Stormwater Infrastructure(GSI)
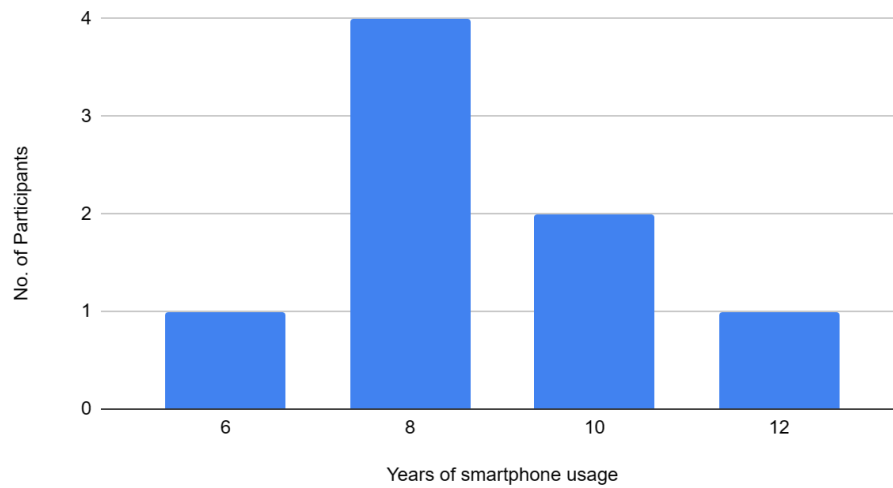
8 responses

Please indicate your level of agreement with the following statement:
I am very interested in testing this application.

8 responses
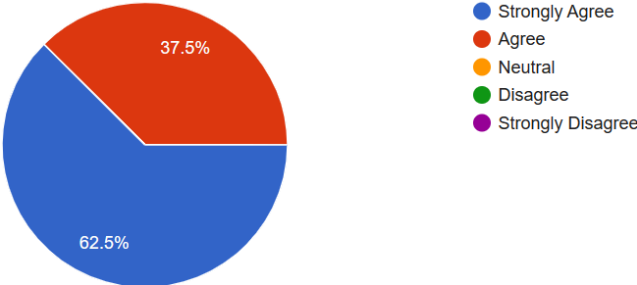

How many years have you used a smartphone?

The participants were all from IT background, having high level of comfort with technology and at least 6+ years of smartphone usage
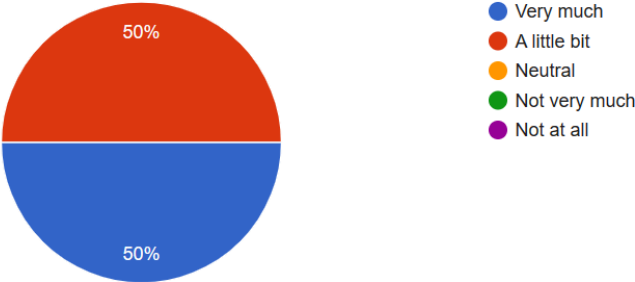
Post-test Survey Results

Indicate your level of agreement with the following statement:
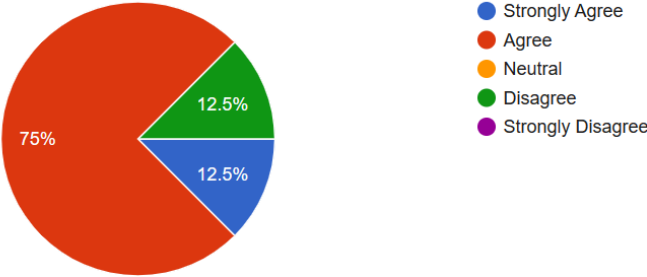Overall in this application, it was easy perform the tasks

8 responses

- ● Strongly Agree
- ● Agree
- ● Neutral
- ● Disagree
- ● Strongly Disagree

37.5%
62.5%

I enjoyed using this application

8 responses

- ● Very much
- ● A little bit
- ● Neutral
- ● Not very much
- ● Not at all

50%
50%

I would use this application again

8 responses

- ● Strongly Agree
- ● Agree
- ● Neutral
- ● Disagree
- ● Strongly Disagree

75%
12.5%
12.5%

Were you able to carry out the given tasks with minimal difficulty?

8 responses

- ● Yes
- ● No
- ● Moderate difficulty

87.5%
12.5%
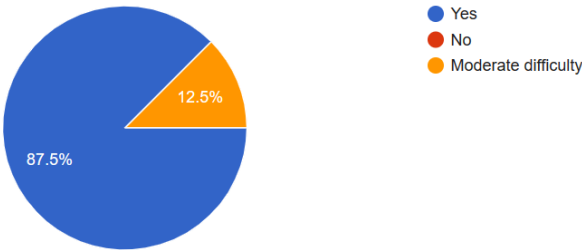
Conclusion and Suggestions

Overall, the app has great educational quality due to its engaging and easy to understand content. The usage of Leaflet in particular for implementing the Map feature gives the app a unique character which was a hit among the Users. The straightforward language used in various forms like "Add GSI", "Add Student" etc. was also easily understood by the participants.

However, the app lacked completeness, which resulted in dissatisfaction among the participants. The incompleteness also gave rise to functional issues which were promptly reported by the participant. These included problems ranging from unwanted cropping of information on a mobile viewport to security issues like absence of Session management for user logins.

Thus, based on reported issues, the following recommendations are being made to the Development Team for improving user experience:
- Prioritize completing the application- Since most reported issues are attributable to incompleteness, the development team will benefit greatly from completing the implementation according to the original design.
- Validation on user accounts- The app currently does not verify whether email is being entered correctly for an account and it also does not ensure the uniqueness of emails for each account.
- Implement Session Management- Lack of Session Management in the app is a security flaw with risks of exposing user data. Hence, it needs to be implemented.
- Collapsible sections on Landing page- To limit excessive scrolling on the landing page and to better engage the users, the information sections on the landing page can be made collapsible.

With the implementation of the above suggestions, the development team can resolve most of the usability issues reported during my testing process and can make the app ready for real-world deployment.

Appendix A

Development Team Attendances

Session Date	Scheduled Dev Team members	Attended?
04/09/2024	Maxim | Sean	Yes | Yes
04/09/2024	Kevin | Sean	Yes | Yes
04/09/2024	Kevin | Andrew	Yes | Yes
04/09/2024	Lela | Patrick	Yes | Yes
04/10/2024	Maxim	Yes
04/10/2024	Maxim	Yes
04/10/2024	Kevin | Maxim	Yes | Yes
04/10/2024	N/A	N/A

Appendix B

Bug Reports

S. No.	Location	Bug Description
1	Teacher and Admin Views	Multiple accounts created with same email
2	Landing page, View Posts page	Info sections/tables getting cropped on mobile
3	Login Page	No session management for logged in users
4	Admin Panel	Incorrect User counts after user creation/deletion
5	Add GSI form	GSI image upload only accepts camera input on phones(no option to "Browse Files")

Appendix C

Testing Challenges

No challenges were reported in the course of the testing. All tests were administered in person on a smartphone and were carried out without any roadblocks.