The Polymorphs

Project Milestone 4: Evaluation

Plot-to-Plate

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1. Participant Demographics

We intentionally recruited a diverse participant group for our evaluation, including individuals of different ages, majors, and academic levels (both undergraduate and graduate), rather than limiting the sample to computer science students.

1. Anuraag Nair- graduate student, mechanical engineering
2. Mary Gamble- undergraduate student, psychology
3. Maraya Garcia- undergraduate student, law
4. Virginia Ravindra- undergraduate student, chemical engineering
5. Virendra Teli- graduate student, industrial engineering

2. Evaluation Protocols

We evaluated our interface's usability with the think aloud protocol. We believed it was our best change at understanding our user's thought processes so we can best align the user's expectations. As a secondary means of evaluating heuristics, we also prepared and distributed a questionnaire.

2.1 Heuristic Evaluation

Two Evaluators must be present at all times to ensure that one may record and observe while the other conducts the interview. Note taking and audio recordings were the primary forms of taking record of the interviews. This seemed to be an optimal setup so long as the environment remained neutral. We booked a study room for the participants to avoid external distractions, afterwards the interviewers were able to discuss and reflect with each other. This provided an optimal time to write down any notable instances in the interview that otherwise may have been missed if not for the discussion.

2.2 Predictive Evaluation (Fitts' Law/KSLM/GOMS)

Method Selection and Analysis

We selected the Keystroke-Level Model (KLM) to predict expert user performance times for Plot-to-Plate's core workflows. KLM uses standard operators: K (keystroke, 0.20s), P (point with mouse, 1.10s), H (home hands, 0.40s), M (mental preparation, 1.35s), B (button click, 0.10s), and R (system response,

variable). We chose KLM over GOMS and Fitts' Law because it provides quantitative time predictions for multi-step tasks without requiring extensive task hierarchies, making it practical for our evaluation timeline while still offering precise efficiency measurements. We analyzed four representative tasks: (1) Claim a Plot, (2) Create a Forum Post, (3) Create a Garden, and (4) Edit Profile. For example, the "Claim a Plot" task requires: M (mentally prepare to select garden, 1.35s) + P (move cursor to garden card, 1.10s) + B (click garden, 0.10s) + R (wait for page load, 0.20s) + M (prepare to find plot, 1.35s) + P (move to plot, 1.10s) + B (click plot, 0.10s) + R (plot details appear, 0.30s) + M (prepare to claim, 1.35s) + P (move to claim button, 1.10s) + B (click claim, 0.10s) + R (confirmation, 0.30s) = 8.45 seconds total (all approximate from audio recordings and confirmation of clicks). Similarly, creating a forum post with an 18-character title and 250-character content predicted 68.45 seconds (with typing accounting for 53.6s or 78% of total time), creating a garden predicted 53.55 seconds, and editing profile to add name predicted 14.60 seconds.

Results and Recommendations

The KLM analysis revealed that navigation overhead dominates short tasks, with plot claiming spending 73% of time (6.35s) on navigation versus 27% (2.4s) on the actual claim action, while content creation tasks are necessarily dominated by typing time (75-78%). Our predictions aligned with usability testing observations: efficient workflows like forum posting (68.45s predicted) received positive feedback ("wasn't confusing"), while the garden creation button discoverability issue reported by 20% of users. We identified three high-impact optimizations: (1) Direct plot claiming from gardens view would eliminate intermediate navigation steps (though selection of a garden is necessary so this would likely not be implemented), reducing time from 8.75s to 5.80s, (2) Profile editing with auto-save would eliminate time needed on a confirmation button, reducing time from 14.60s to 14.50s; and (3) Auto-focus first form field would save 1.2s across all form tasks. Please note that all numbers are approximate based off interviews and evaluators personal recordings of navigation tasks.

2.3 Think-Aloud Evaluation

Protocol used :

1.Recruit representative users- 5
2. Assigning the users realistic tasks
3. Tell them to talk continuously/ narrate their experience

Script:

The users were asked to perform a set of 2 tasks, one after the other. Before beginning the evaluation, they were informed about the app, the idea behind it and what it essentially is.

The evaluation included instructions in the beginning, where the tester followed this script:

" Hi, I'm going to silently observe how you perform the following tasks, and you have to narrate your experience as you navigate through the various experiences/ steps you follow to achieve a particular task"

Post- evaluation, the user was asked for what their pain points were while they tried to perform the task assigned to them successfully. We made notes about the pain points, mental models, decision making and usability of the app from the user's perspective.

Tasks: The users were assigned realistic tasks to test the usability of the system

Task A : Create a garden (2* 2 space)

Task B: Post on the community forum that you have extra tomatoes that need to be given away

Task C: Claim a Post & Message Poster
Task D :Navigation Flow

Recording methods:

- Notes: notes were taken about user experience and feedback during tasks
- Voice recording: The audio recordings of the user's experience that they narrated whilst performing a task.

Results and observations:

We conducted a think-aloud evaluation with five participants to assess the usability of the Community Garden web application. Overall, participants were able to complete the core tasks, but they encountered several recurring usability issues.

First, **scrollability and navigation** were frequently mentioned as pain points. Participants described the site as requiring "a lot of scrolling" and felt that it was somewhat difficult to move through the pages efficiently. This affected how easily they could locate key content and complete tasks without losing context.

Second, reactions to the **bee cursor** were mixed. Most participants felt it was "okay" or neutral, novel but not particularly helpful. While it was not strongly disliked, it did not clearly support task performance and, for some users, bordered on being a mild distraction rather than a meaningful interaction cue.

The most significant issues arose around the **garden map and plot selection** features. Participants consistently reported confusion when trying to interpret the garden map. They found it difficult to understand how the visual representation corresponded to the physical layout of the garden, and they were often unsure which plots they were actually selecting. The connection between the map, the plot numbers, and the chosen garden space was not immediately clear, leading to hesitation and uncertainty during the selection process.

Overall, these observations indicate that while the concept of the application was understood, the current implementation of navigation, the garden map, and the plot selection flow needs refinement to better support users in understanding the layout and confidently choosing a garden plot.

Analysis: The think-aloud evaluation revealed that the main usability problems stem from misalignment between users mental models and the current interface design. Excessive scrolling and unclear navigation suggest that key information and actions are not surfaced prominently, forcing users to search and remember where things are instead of being guided through a clear, structured flow. Reactions to the bee cursor were generally neutral, indicating that while it is visually novel, it does not contribute meaningfully to task performance and can occasionally distract from core interactions.

The most critical issues centered on the garden map and plot selection. Participants struggled to understand how the map represented the physical layout

of the garden and were often unsure which plots they were selecting, indicating insufficient visual clarity, labeling, and feedback. Overall, the findings suggest that improving information hierarchy, simplifying or repurposing decorative elements, and redesigning the map and selection workflow with clearer labels and stronger visual feedback would better support users in understanding the system and confidently choosing a garden plot.

2.4 Usability Testing with Benchmark Tasks

Tasks

Task 1: Browse available gardens
Justification: Users need to explore available gardens to find community gardening opportunities; tests content organization and browsing experience
Success Criteria: User successfully navigates to and browses the gardens page

Task 2: Search gardens
Justification: Users need to explore available gardens to find community gardening opportunities; tests content organization and browsing experience

Success Criteria: User successfully navigates to and browses the gardens page

Task 3: Claim a specific plot
Justification: Core interaction for accessing community garden spaces; primary user goal

Success Criteria: User completes plot claim process

Task 4: Unclaim a plot

Justification: Users need ability to release plots they no longer want; tests reversibility and user control
Success Criteria: User successfully unclaims a previously claimed plot

Task 5: Create a Garden

Justification: Primary feature for administrators/organizers to add new garden locations; critical workflow
Success Criteria: User successfully creates a new garden

Task 6: Post to community forum

Justification: Community engagement is central to the app's value proposition; tests core social feature

Success Criteria: User successfully creates and publishes a forum post

Task 7: Reply to a post

Justification: Community discussion requires ability to respond to others; tests conversation threading

Success Criteria: User successfully replies to an existing forum post

Task 8: Edit your own profile

Justification: Users need to manage personal information, settings, and identity; tests profile customization

Success Criteria: User successfully accesses and edits profile information

Task 9: Find help/FAQ

Justification: Users need access to support documentation when confused; tests discoverability of help resources

Success Criteria: User locates help/FAQ section within reasonable time

Task 10: Navigate back to the home page in two different ways

Justification: Multiple navigation paths provide users with control and prevent feeling trapped; tests navigation flexibility

Success Criteria: User identifies and uses two different methods to return to homepage

Confidence and Ease of Use:

Navigation Confidence: 100% (5/5) felt confident navigating
Feeling Lost: 0% (0/5) felt lost or unsure about where to go next
Found Expected Elements: 100% (5/5) found everything expected in navigation

Layout Clarity Rating:

Note: Scale interpretation varied among participants

Visual Appeal Rating:

Scale: 1 (Not Appealing) to 5 (Very Appealing)

Responses: 5, 5, 5, 1, 4 (Average: 4.0/5)

Feature Ranking (1=Most Useful, 5=Least Useful):

Feature	Average Rank	Most Common Rank
Community Forum	1.0	1 (all participants)
Garden Creation	1.2	1 (4/5 participants)
Plot Claiming	1.4	1 (4/5 participants)
Profile Page	2.0	1 or 2 (equally)

Interpretation: Community Forum, Garden Creation, and Plot Claiming are seen as core valuable features with nearly equal importance.

Most Organized Sections:

Section	Votes
Gardens Page	3
Forum	2
Home Page	1

2.5 Questionnaire

- Analysis of responses

We commissioned five participants separate from the previous usability studies to evaluate our interface via questionnaire. We asked a group of participants to . Below is a list of included questions along with their available choices and what we hoped to glean from them.

Question 1

Did you feel confident navigating the main pages of the app?

Type: Multiple Choice
Answers:

a. Yes
b. No

Question 2

Did you ever feel lost or unsure about where to go next?

Type: Multiple Choice
Answers:

a. Yes
b. No

Question 3

Were you able to find everything you expected in the navigation bar?

Type: Multiple Choice
Answers:

c. Yes
d. No

Question 4a

Rank the **Community Forum** features from most useful to least(1) to least useful(5)?

Type: Scalar
Answers: 1 to 5

Question 4b

Rank the **Plot Claiming** features from most useful to least(1) to least useful(5)?

Type: Scalar
Answers: 1 to 5

Question 4c

Rank the **Profile Page** features from most useful to least(1) to least useful(5)?

Type: Scalar
Answers: 1 to 5

Question 5

How easy was it to understand the overall layout of the app? Very confusing(1) to Very Clear(5)?

Type: Scalar
Answers: 1 to 5

Question 6

How visually appealing did you find the interface? Not appealing (1) to very appealing(5).

Type: Scalar
Answers: 1 to 5

Question 7

How visually appealing did you find the interface? Not appealing (1) to very appealing(5).

Type: Scalar
Answers: 1 to 5

Question 8

If you could change one thing about the interface to make it easier or more enjoyable to use, what would it be and why?

Type: Open-Ended

Question 9

Was there any point in the interface where you had to stop and think about what to do? If so, where?

Type: Open-Ended

Question 10

Which part of claiming a plot was the hardest?

Type: Open-Ended

Question 11

Which changes would make plot claiming feel clearer?

Type: Open-Ended

Question 12

Which part of posting felt most confusing?

Type: Open-Ended

Question 13

What did you expect to see on the profile that wasn't there?

Type: Open-Ended

Question 14

Which section felt the most organized to you?

Type: Multiple-Choice

Answers:

a. Garden's Page
b. Forum
c. Profile
d. Home Page

3. Synthesis of Findings

Here's what we were able to glean from the results.

All participants were confident in navigating the page and none of them got lost. From what our participants knew of our application, all of them were able to find what they expected. This gives confidence that our new users will be able to use our application with minimal effort and based on intuition alone.

In terms of the usefulness of our three main pages, that being the forum, garden creation window, and plot claiming page, we had resounding success. Most of our participants thought the community forum was very useful. Only one thought it wasn't useful to include. Our participants found the garden creation very useful, and again only one participant thought it was useless. The plot claiming page had mixed results, with one saying it was not useful, another thinking it was halfway useful, and the rest thinking it was very useful. The profile page had the worst ratings, with most of our participants being split between our maximum and minimum values, and only one believing it was sort of useful.

In terms of appearance and layout, we were overall successful. Most of our participants believed we enforced good page layout while also maintaining great visuals. Only one participant completely disagreed. Our primary complaints were that exiting the plot creation window was difficult, and that plot claiming did not feel like you were actually claiming a plot of land. The following is a list of our four main pages ranking from what our participants believed to be the most organized: Community Forum, Gardens Page (even 50-50 split between the two), Home Page, Profile Page(no participants believed this page was the most organized).

Overall, users found the posting experience mostly straightforward, with only a few noting confusion around the information tab. Expectations for the profile varied, with some wanting clearer name sections, sign-out options, and especially the ability to upload or change a profile photo. When asked what they would change,

users mentioned improving the placement and appearance of the info icon, adding visual feedback when selecting header sections, reducing the amount of information on the homepage, and incorporating more plant-themed aesthetics. A few users reported moments of hesitation, particularly around the info tab, locating the “create garden” button, finding the FAQ (which they expected near the bottom of the page), and exiting the plot-claim menu due to the lack of a quick help link.

4. Recommendations and Future

Overall, it seems our interface is on the right track, but some major changes are needed to make Plot-to-Plate a success. The page that needs the most development is the profile page. According to users, we need to add the following for our profile: Large labels displaying first and last name, sign in and out options, a user photo front and center, and an option to change the picture. As for the plot claiming and garden creation pages, we need to improve the navigation so that users can easily exit the plot window and release claimed plots. A low priority change would be to the overall visuals. A participant in the questionnaire thought it would look nice to add some leaf and plant graphics in a consistent layout across all pages and would help reinforce the theme of gardening.

5. Conclusion

The results of our usability evaluation, benchmark testing, and questionnaire collectively highlight that the core concept and functionality of the Plot-to-Plate application are strong, but several aspects of the interface require refinement before the our system can be released. Participants consistently demonstrated the ability to complete essential tasks and navigate the primary features, indicating a solid foundation and a generally accessible design. However, repeated frustrations with navigation flow, the garden map, and the plot selection process reveal misalignments between users’ expectations and the system’s current structure. Likewise, the profile page emerged as the weakest component, lacking key elements users intuitively searched for, such as personal identifiers and customization options. While users responded positively to the visual appeal and the thematic direction of the app, feedback suggests opportunities to enhance clarity, reduce cognitive load, and strengthen the connection between interface elements and real-world gardening workflows. Overall, the findings reaffirm that

users understand and value the app's purpose, but targeted improvements particularly in navigation, visual hierarchy, and plot interaction design will be essential for creating a seamless and satisfying experience as the platform continues to evolve.

Appendices

- **Appendix A:** Raw Questionnaire Data
    - https://docs.google.com/spreadsheets/d/1iE07qsOzYYUaBr_ae6DYXMXGrpQ_DdRjt0IplXRSJXg/edit?usp=sharing