

Usability Test Report

Team 1 - Programming Analogies

Report by Kirk Thelen → [\[Link to Graduate Student Website\]](#)

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Undergraduate Documents Website → [\[Link to Undergraduate Website\]](#)

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Introduction

This report outlines the usability testing results for Dr. Briana Bettin's Programming Analogies application ("the App").

Description of the Programming Analogies Application

The App is web-based and allows users to create, share, and compare analogies. The primary use of the App is for users to gain help finding analogies related to programming concepts, although this scope ("problem domain") could easily be expanded upon in the future. The main users of the App are instructors looking to teach programming concepts, with students looking for independent learning resources being secondary users. Users of the App can rate and favorite the analogies that they like to save them for easy reference.

Description of the UI and Tests

The App has a simple UI designed to make it simple for users to create new analogies, search for existing analogies, or compare multiple existing analogies against each other. The UI provides labeled buttons such as "Home" and "Create" to direct users to different pages of the website while providing iconography for specific tasks, such as a "Thumbs Up" icon to rate existing analogies positively.

Despite the relatively few number of possible operations, some tasks require multiple pieces of UI that could potentially be confusing to a user (for example, creating an analogy requires a user to navigate a very large form). The tests are designed to test all the functionality of the website. The tests include registering and logging in to a new account, comparing two analogies, searching for analogies, rating and favoriting analogies, and creating and deleting new analogies.

Test Plans

There were 6 tests administered during the usability testing. Participants were asked to verbally agree to a consent form and complete a pre-test survey and questionnaire before starting any of the 6 tests. After completing all the tests, participants were asked to complete a post-test questionnaire and participate in a short, semi-structured interview.

Each test had three undergraduate team members performing data collection. The roles assigned are as follows:

Observer: Takes notes on the general progress of the test and whether or not anything unusual occurs during the test

GUI Logger: Tracks what the user does on the UI/how the user interacts with the UI during the test.

Body Language Logger: Tracks user's body language and facial expressions throughout the test.

Each role was provided with a "checklist" for each test to help aid them in their logging of the participants. The checklists will be provided with each test scenario.

Pre-Test Survey and Questionnaire

The following questions are all entirely optional and help us ensure that we are testing our application with a wide variety of potential users. Your responses will always remain anonymous and never be used to identify you. You are free to skip any questions you do not wish to answer.

Demographic Survey

1. What gender do you identify as?

- Man Woman Other: _____ Prefer not to say

2. What is your education level?

- 1st year 2nd year 3rd year 4th year+ Graduate

3. What is your level of programming experience?

- 0-1 year 2-3 years 4-5 years > 5 years

4. Have you ever thought about using analogies to explain programming concepts, or have you ever had a programming concept explained to you via an analogy? **(Check all that apply)**

- No, I have never considered using analogies for this purpose. I have considered using analogies for this purpose, but have not used them in this way. Yes, I have explained a programming concept via an analogy before. Yes, I have had a programming concept explained to me via an analogy before.

Questions

Please indicate your level of agreement to the following statements on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree).

5. I am interested in the testing of this application.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

6. I understand the purpose of the application.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. I understand where this application may be used.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Test 1: Participant Information

- **Test Name:** Registration and Login
- **Goals:** To assess the ability of a new user to (1) create a new account and (2) log into the application using the newly created account.
- **Scenario Description:** You are a new teaching assistant for Dr. Briana Bettin’s CS1121 course. Dr. Bettin has asked you to use some programming analogies to help teach struggling first-year students programming concepts. To aid with this, she’s told you about her “Programming Analogies” website, and she’s asked you to create an account. You see the Home page of the website in front of you, and you want to create a new account and log into it.
- **Task List:**
 1. The user will start the task on the Home page
 2. The user should navigate to the Login page by clicking on the “Login” button
 3. The user should navigate to the Registration page by clicking on the “Register” button
 4. The user should fill out the form on the Register a New Account page
 5. The user should click the “Register” button, taking them back to the Login page
 6. The user should enter the credentials of the account they just created into the form on the Login page and click “Sign In”

Test 1: Undergraduate Checklists

Observer:

- Was the user able to find the login page without assistance?
- Was the user able to register for an account without assistance?
- Was the user able to log in to the application using the account they registered?
- Did the user ask a clarifying question around what an element of the UI does?
- How many errors did the user make? (An error is defined as making a click or input that does not contribute to the completion of the scenario.)
- Did anything else unusual or unexpected happen during the test?

GUI Logger:

- Did the user follow the expected task list?
 - If “No,” what did they do differently?
- Did the user make any comments about the UI?
 - If “Yes,” what did they say?
- Did anything else unusual or unexpected happen with the UI?

Body Language Logger:

- How is the user’s body language best described?
- Did the user’s demeanor or facial expression change at some point throughout the test?
 - If “Yes,” how did it change?
- Did the user vocalize any thoughts or emotions?

Test 2: Participant Information

- **Test Name:** Analogy Comparison
- **Goals:** To assess the ability of a user to compare two analogies found in a list (either the Home page or Search results, as both use the same list style).
- **Scenario Description:** Now that you've created your account, you want to get familiar with the website so that you can use it to help students during your labs. You notice on the Home page that there are two analogies about "arrays" at the top of the list. One analogy's misconception is that "an array's size can be changed later" and the other analogy's misconception is that "an array's value is its contents." You think these misconceptions are very similar, so you want to compare them to each other to learn what's different about them. After you compare these analogies, you want to return back to the Home page.
- **Task List:**
 1. The user will start the task on the Home page
 2. The user should click on the "Compare" button next to either the analogy with the misconception "An array's size can be changed later" or the analogy with the misconception "An array's value is its contents"
 3. The user should click on the "Compare" button next to whichever analogy they did not select in step 2
 4. The user should close the compare view by clicking on the red "X" button in the top right corner of each comparison window

Test 2: Undergraduate Checklists

Observer:

- Was the user able to compare two analogies without assistance?
- Was the user able to close the comparison windows without assistance?
- Did the user ask a clarifying question around what an element of the UI does?
- How many errors did the user make? (An error is defined as making a click or input that does not contribute to the completion of the scenario.)
- Did anything else unusual or unexpected happen during the test?

GUI Logger:

- Did the user follow the expected task list?
 - If “No,” what did they do differently?
- Did the user make any comments about the UI?
 - If “Yes,” what did they say?
- Did anything else unusual or unexpected happen with the UI?

Body Language Logger:

- How is the user’s body language best described?
- Did the user’s demeanor or facial expression change at some point throughout the test?
 - If “Yes,” how did it change?
- Did the user vocalize any thoughts or emotions?

Test 3: Participant Information

- **Test Name:** Analogy Search and Review
- **Goals:** To assess the ability of a user to search for a specific analogy, view the analogy, rate and favorite the analogy, and then return to the search results.
- **Scenario Description:** You're in the CS1121 lab helping out a first-year student with their assignment. This student is working with objects for the first time in Java, and you notice that they are struggling with understanding how instance variables work. Luckily, you remember about Dr. Bettin's App and you find yourself on the Home page. You want to search for programming analogies related to "variables" so that you can find an analogy that helps you teach this student. After searching for "variables," you find the perfect analogy that helps you address the misconception that "objects have the same value for instance variables." You love this analogy, so you want to rate it positively and add it to your favorites. After doing so, you want to look at what other analogies you found when searching for "variables," so you return to the search results.
- **Task List:**
 1. The user will start the task on the Home page
 2. The user should type "variable" or "variables" into the search field
 3. The user should select the analogy with the misconception "objects all have the same value for instance variables"
 4. The user should click on the "Thumbs Up" button to rate the analogy positively and the "Heart" button to add it to their favorites (The order of operations does not matter for this step)
 5. The user should return to the analogy search results by using the browser's back button

Test 3: Undergraduate Checklists

Observer:

- Was the user able to search for an analogy without assistance?
- Was the user able to select an analogy without assistance?
- Was the user able to rate and favorite an analogy without assistance?
- Was the user able to return to the search results without assistance?
- Did the user ask a clarifying question around what an element of the UI does?
- How many errors did the user make? (An error is defined as making a click or input that does not contribute to the completion of the scenario.)
- Did anything else unusual or unexpected happen during the test?

GUI Logger:

- Did the user follow the expected task list?
 - If “No,” what did they do differently?
- Did the user make any comments about the UI?
 - If “Yes,” what did they say?
- Did anything else unusual or unexpected happen with the UI?

Body Language Logger:

- How is the user’s body language best described?
- Did the user’s demeanor or facial expression change at some point throughout the test?
 - If “Yes,” how did it change?
- Did the user vocalize any thoughts or emotions?

Test 4: Participant Information

- **Test Name:** Analogy Creation
- **Goals:** To assess the ability of a user to create a new analogy.
- **Scenario Description:** Dr. Bettin has tasked you with inputting a new analogy for her into her Programming Analogies App. Before she has you input this new analogy, she wants you to show her that you are capable of learning what information goes into each form field. You want to navigate to the Create Analogy page and, using the help features available to you on the page, learn about what one of the form fields means. Afterwards, Dr. Bettin wants you to show her that you know how to input each element of an OPAL table into the form, so she asks you to create a simple analogy that just has the word “test” in each of the form fields.
- **Task List:**
 1. The user will start the task on the Home page
 2. The user should click the “Create” button
 3. The user should hover over one of the ‘?’ marks on the page to learn what the respective field means
 4. The user should fill out all required fields with the word “test”
 5. The user should click “Create Analogy”

Test 4: Undergraduate Checklists

Observer:

- Was the user able to navigate to the Create Analogy page without assistance?
- Did the user utilize the help information available on the Create Analogy page (i.e., the small '?' circles that indicate what to enter in each field)?
- Did the user understand how to input the analogy into the form using only the information provided on the page as assistance (i.e., the user did not ask questions about how to input the data)?
- Was the user able to create an analogy?
- Did the user ask a clarifying question around what an element of the UI does?
- How many errors did the user make? (An error is defined as making a click or input that does not contribute to the completion of the scenario.)
- Did anything else unusual or unexpected happen during the test?

GUI Logger:

- Did the user follow the expected task list?
 - If "No," what did they do differently?
- Did the user make any comments about the UI?
 - If "Yes," what did they say?
- Did anything else unusual or unexpected happen with the UI?

Body Language Logger:

- How is the user's body language best described?
- Did the user's demeanor or facial expression change at some point throughout the test?
 - If "Yes," how did it change?
- Did the user vocalize any thoughts or emotions?

Test 5: Participant Information

- **Test Name:** View Favorite Analogies
- **Goals:** To assess the ability of a user to view previously favorited analogies.
- **Scenario Description:** Dr. Bettin had previously tasked you with using her Programming Analogies App to help teach struggling first-year students programming concepts. After using her App for a while, she wants to know which analogies you found helpful. Luckily, you have been favoriting analogies that you wanted to show her, so you want to navigate to your favorited analogies and select the one you previously favorited to show her. She then asks you to unfavorite the analogy since she's now seen it and taken note of it, and then return to your profile page for your next instruction.
- **Task List:**
 1. The user will start the task on the Home page
 2. The user should click on their username in the top right corner.
 3. The user should click on the analogy that they previously favorited.
 4. The user should click on the "Heart" button to unfavorite the analogy.
 5. The user should click on their username to return to their profile.

Test 5: Undergraduate Checklists

Observer:

- Was the user able to navigate to their profile page without assistance?
- Was the user able to review the analogy that they previously favorited without assistance?
- Was the user able to unfavorited the analogy that they previously favorited without assistance?
- Did the user ask a clarifying question around what an element of the UI does?
- How many errors did the user make? (An error is defined as making a click or input that does not contribute to the completion of the scenario.)
- Did anything else unusual or unexpected happen during the test?

GUI Logger:

- Did the user follow the expected task list?
 - If “No,” what did they do differently?
- Did the user make any comments about the UI?
 - If “Yes,” what did they say?
- Did anything else unusual or unexpected happen with the UI?

Body Language Logger:

- How is the user’s body language best described?
- Did the user’s demeanor or facial expression change at some point throughout the test?
 - If “Yes,” how did it change?
- Did the user vocalize any thoughts or emotions?

Test 6: Participant Information

- **Test Name:** Analogy Deletion
- **Goals:** To assess the ability of a user to delete a previously created analogy via their profile.
- **Scenario Description:** Dr. Bettin is ready for you to start creating real analogies, but she wants you to first delete the “test” analogy that you previously created. Luckily, you’re already on your profile page from your previous task.
- **Task List:**
 1. The user will start the task on the Profile page.
 2. The user should click on their previously created analogy from the “Created Analogies” list on the left side of the screen
 3. The user should click on “Delete Analogy”

Test 6: Undergraduate Checklists

Observer:

- Was the user able to access the edit/delete functionality of the previously created analogy without assistance?
- Was the user able to delete an analogy?
- Did the user ask a clarifying question around what an element of the UI does?
- How many errors did the user make? (An error is defined as making a click or input that does not contribute to the completion of the scenario.)
- Did anything else unusual or unexpected happen during the test?

GUI Logger:

- Did the user follow the expected task list?
 - If “No,” what did they do differently?
- Did the user make any comments about the UI?
 - If “Yes,” what did they say?
- Did anything else unusual or unexpected happen with the UI?

Body Language Logger:

- How is the user’s body language best described?
- Did the user’s demeanor or facial expression change at some point throughout the test?
 - If “Yes,” how did it change?
- Did the user vocalize any thoughts or emotions?

Post-Test Questionnaire

The following questions are all entirely optional. Your responses will always remain anonymous and never be used to identify you. You are free to skip any questions you do not wish to answer.

Questions

Please indicate your level of agreement to the following statements on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree).

1. I believe that the application is easy to understand and use.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. I feel like the application has a useful interface for explaining and comparing programming analogies.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I believe that I could use the application to perform these tasks again without any further assistance.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. I never felt confused, lost, or otherwise uncertain about how to perform a task.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. All of the functions of the website that I interacted with performed as expected, e.g., everything that I clicked on did what was expected and nothing that I clicked on did something unexpected.

- (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

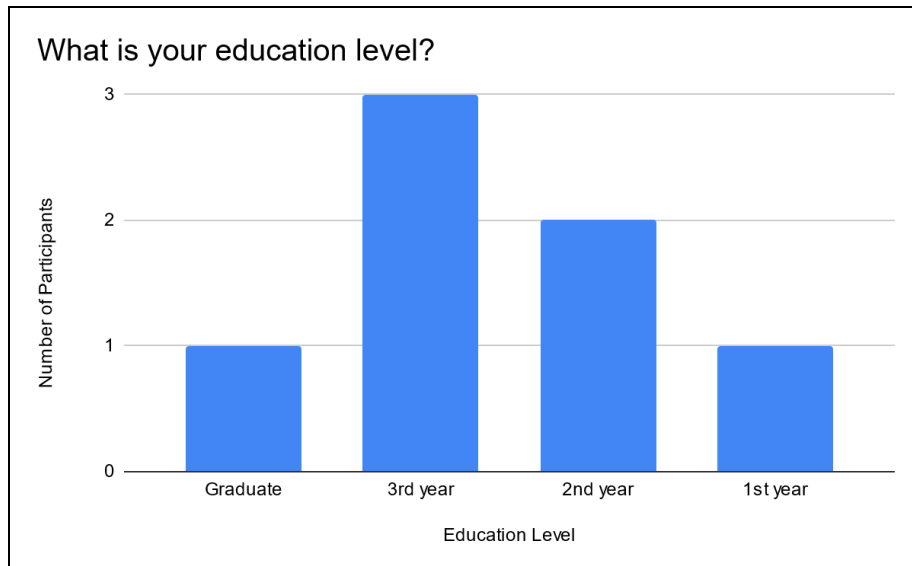
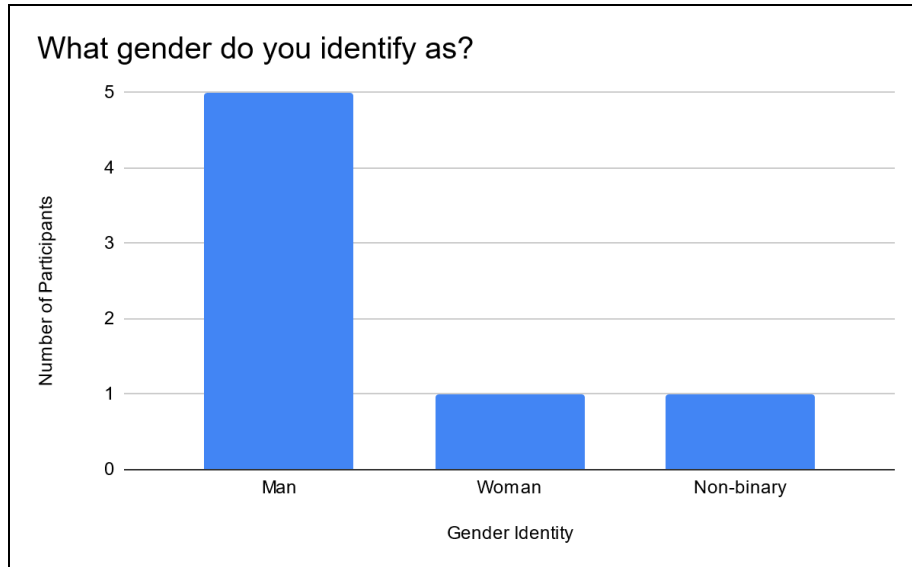
Post-Test Semi-structured Interview Questions

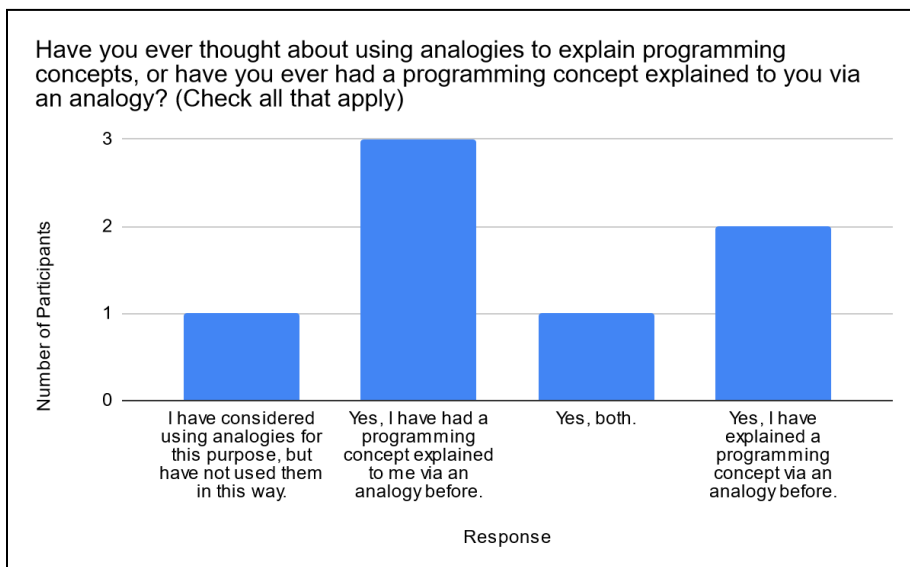
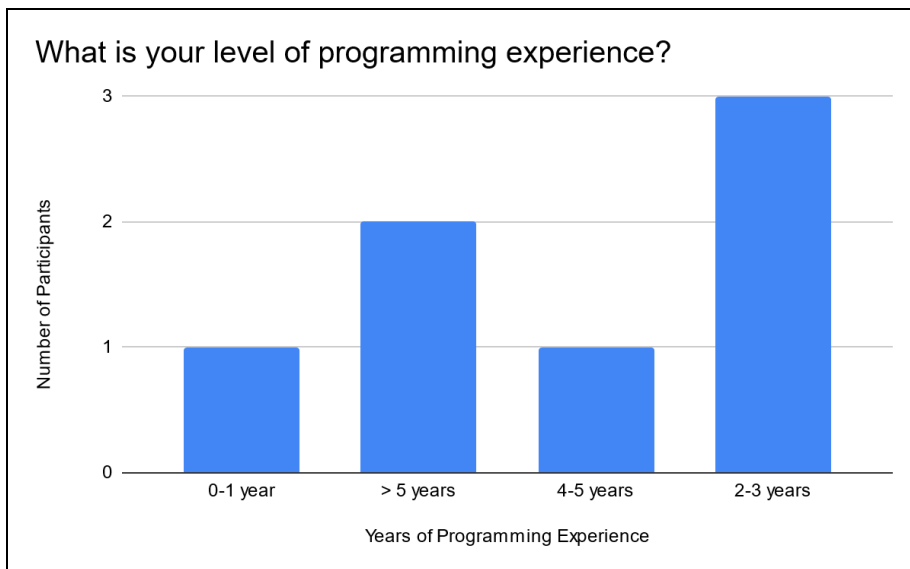
The following questions are all entirely optional. Your responses will always remain anonymous and never be used to identify you. You are free to skip any questions you do not wish to answer.

1. What, if anything, about the application did you feel made it easy to perform the tasks? (e.g., certain aspects of the design or functionality)
2. What, if anything, about the application did you feel made it difficult to perform the tasks?
3. Was there any specific task that you felt was particularly difficult to perform with the application in its current state?
4. Do you believe that this application accomplishes its goal? (i.e., do you think this application could be a useful tool for explaining programming concepts via analogy?)
5. Do you have any questions about the application or any other suggestions on what should change to improve it?

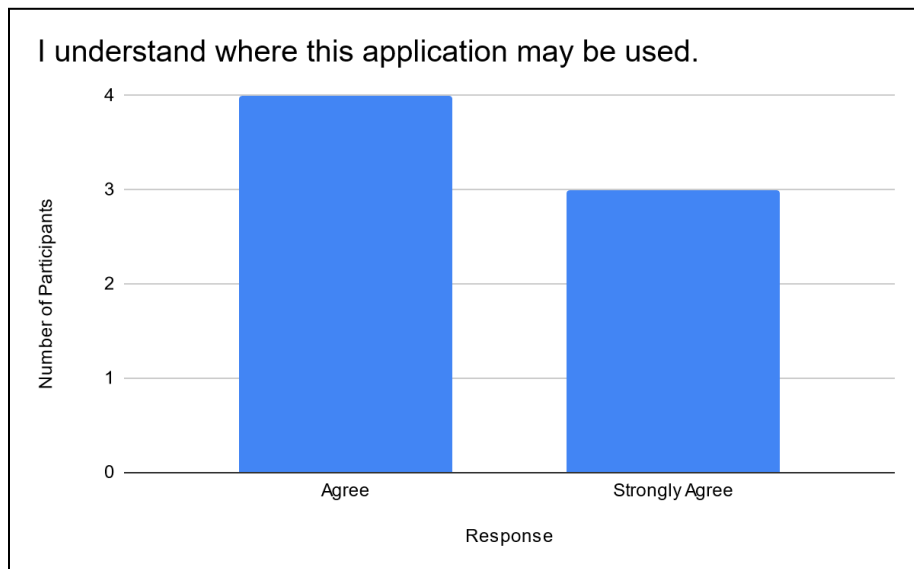
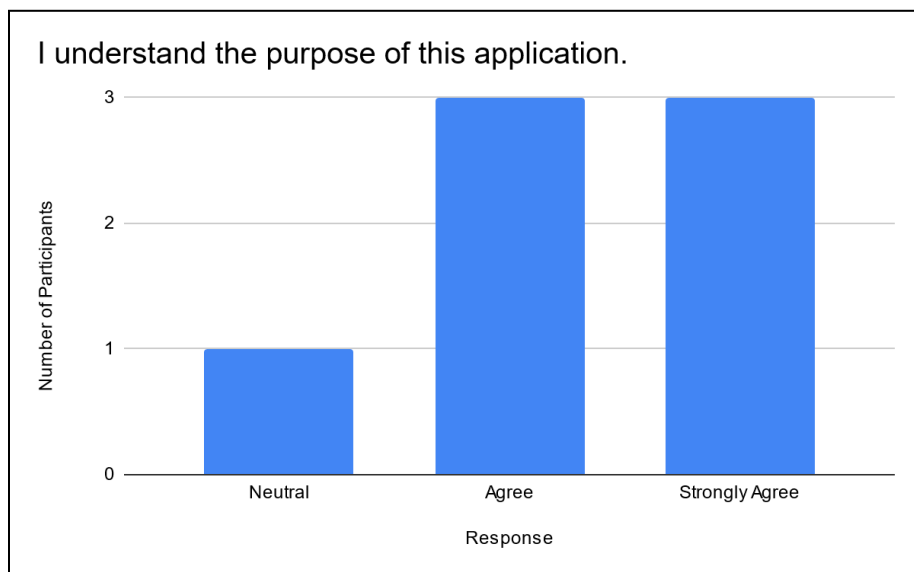
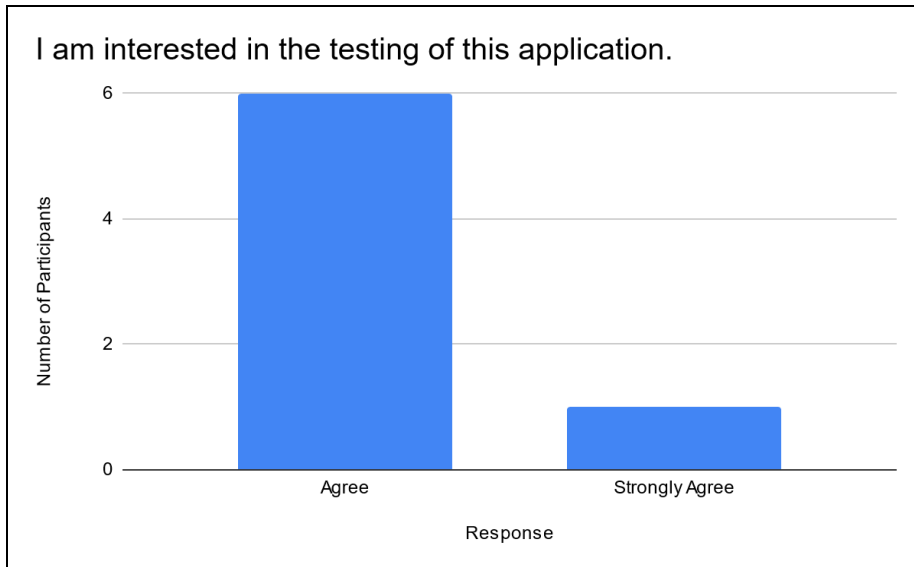
Pre-Test Survey Results

8 participants were contacted for usability testing and 7 participants showed up for their scheduled testing sessions.





Pre-Test Questionnaire Results



Test 1 Results

Observer:

- 7 users found the login page without assistance
- 7 users were able to register for an account without assistance
- 7 users were able to log in to the application using the account they registered
- 1 user asked a clarifying question around what an element of the UI does
- 1 user made an error
 - Participant 4 had to register for two accounts

GUI Logger:

- 6 users followed the expected task list
 - Participant 4 had to register for two accounts, which did not follow the expected task list
- 1 user asked a question about the UI
 - Participant 6 asked “Is the registration in the same place as login?”

Body Language Logger:

- 7 users were initially described as relaxed
- 2 users facial expressions changed at some point during the test
 - Participant 4 “squinted/tilted [their] head”
 - Participant 6 was “confused when dealing with web browser autofill”

Unexpected Behaviors that Occurred During the Test:

- Participant 2 clicked “Login” in the navigation after registering for an account (they were already on the Login page)
- Participant 4 had to register two accounts because they mistyped their password when registering for their first account
- Participant 6 had to ask for assistance finding the register button because it was hidden behind the auto-complete form dropdown

Test 2 Results

Observer:

- 5 users were able to compare two analogies without assistance
 - Participant 1 required assistance
 - Participant 2 only opened one analogy
- 6 users were able to close the compare analogy windows without assistance
 - Participant 1 required assistance
- 1 user asked a clarifying question around what an element of the UI does
- 3 users made errors
 - Participants 1 and 6 refreshed the entire page instead of utilizing the red 'X' buttons
 - Participant 2 did not open a second analogy to compare

GUI Logger:

- 4 users followed the expected task list
 - Participant 1 had to be prompted to open a second analogy
 - Participant 2 did not open a second analogy
 - Participant 6 refreshed the entire page instead of utilizing the red 'X' buttons
- 1 user asked a question about the UI
 - Participant 1 asked for clarification about the "Compare" button

Body Language Logger:

- 7 users were initially described as relaxed
- 2 users facial expressions changed at some point during the test
 - Participant 1 "looked confused while comparing"
 - Participant 2's "eyes were wandering, indicating struggle with comparing"

Unexpected Behaviors that Occurred During the Test:

- Participants 1 and 6 refreshed the entire page instead of utilizing the red 'X' buttons

Test 3 Results

Observer:

- 7 users were able to search for an analogy without assistance
- 6 users were able to select an analogy without assistance
 - Participant 1 required assistance
- 7 users were able to return to the search results without assistance
- 1 user asked a clarifying question around what an element of the UI does
- 3 user made errors
 - Participant 1 initially clicked “Compare” when attempting to select an analogy
 - Participants 2 and 4 did not favorite an analogy

GUI Logger:

- 4 users followed the expected task list
 - Participants 2 and 4 did not favorite an analogy
 - Participant 6 refreshed the page and retyped the search query instead of using the browser back button
- 0 users asked a question about the UI

Body Language Logger:

- 6 users were initially described as relaxed
- 1 users facial expressions changed at some point during the test
 - Participant 6 raised their eyebrows during the test, indicating surprise

Unexpected Behaviors that Occurred During the Test:

- Participant 1 disliked and favorited the same analogy
- Participant 6 retyped the search query instead of using the browser back button

Test 4 Results

Observer:

- 7 users were able to navigate to the Create Analogy page without assistance
- 5 users were able to input data into the form using only the information provided on the page as assistance
 - Participants 1 and 2 only filled out the first page of the form and required prompting to fill out the rest
- 6 users were able to utilize the help information provided on the page
 - Participant 2 was not aware that the ‘?’ bubbles could be interacted with
- 3 users asked a clarifying question around what an element of the UI does
- 4 users made errors
 - Participants 1, 2, 3, and 6 attempted to click Create Analogy without filling out the entire form

GUI Logger:

- 3 users followed the expected task list
 - Participants 1, 2, 3, and 6 attempted to click Create Analogy without filling out the entire form
- 4 users asked a question about the UI
 - Participants 1 and 2 asked where the “help functionality” was
 - Participant 3 asked “Do you have to fill out all the fields?”
 - Participant 6 asked “Should I fill in all the fields?”

Body Language Logger:

- 6 users were initially described as relaxed
- 1 user was initially described as confused
- 3 users facial expressions changed at some point during the test
 - Participant 1 “became slightly confused”
 - Participant 2 “started off confused, but seemed calm after instructions were clarified”
 - Participant 5 “became more focused during the test”

Unexpected Behaviors that Occurred During the Test:

- Participants 1, 2, 3, and 6 attempted to click Create Analogy without filling out the entire form

Test 5 Results

Observer:

- 7 users were able to navigate to their profile page without assistance
- 5 users were able to review the analogy that they previously favorited without assistance
 - Participants 2 and 4 did not previously favorite any analogies
- 6 users were able to unfavorite the analogy that was previously favorited
 - Participants 2 and 4 had to have an analogy favorited for them for this step of the test
 - Participant 2 was not able to unfavorite the analogy without assistance
- 3 users asked a clarifying question around what an element of the UI does
- 0 users made errors

GUI Logger:

- 7 users followed the expected task list
- 2 users asked a question about the UI
 - Participant 1 asked for help with how to unfavorite an analogy
 - Participant 2 asked why there was no analogy to unfavorite

Body Language Logger:

- 6 users were initially described as relaxed
- 1 user was initially described as stressed
- 0 users facial expressions changed at some point during the test

Unexpected Behaviors that Occurred During the Test:

- After Participant 1 unfavorited an analogy, it still appeared on their profile until they refreshed the page, making them think that they had not actually unfavorited it

Test 6 Results

Observer:

- 7 users were able to access the edit/delete functionality of the previously created analogy without assistance
- 7 users were able to delete an analogy
 - Participants 2 and 4 did not previously favorite any analogies
- 0 users asked a clarifying question around what an element of the UI does
- 0 users made errors

GUI Logger:

- 7 users followed the expected task list
- 0 users asked a question about the UI

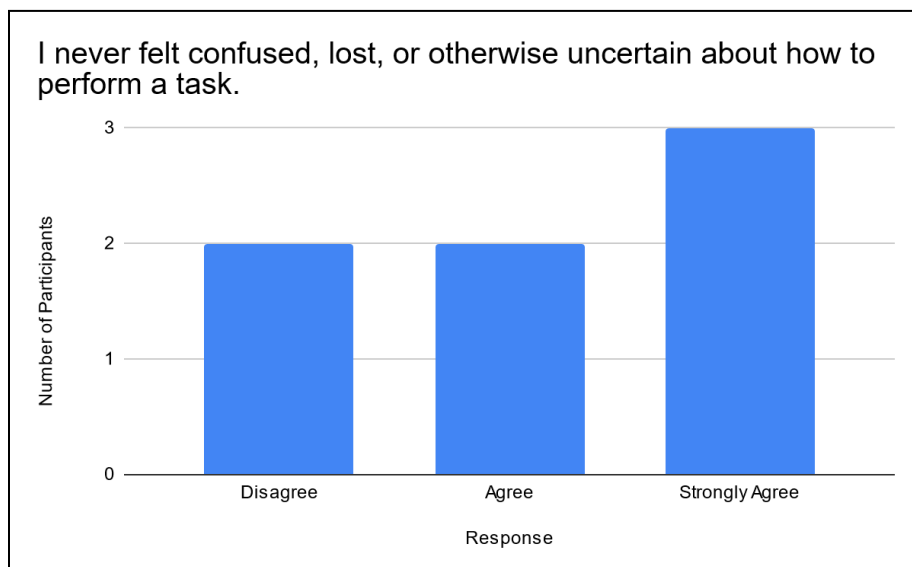
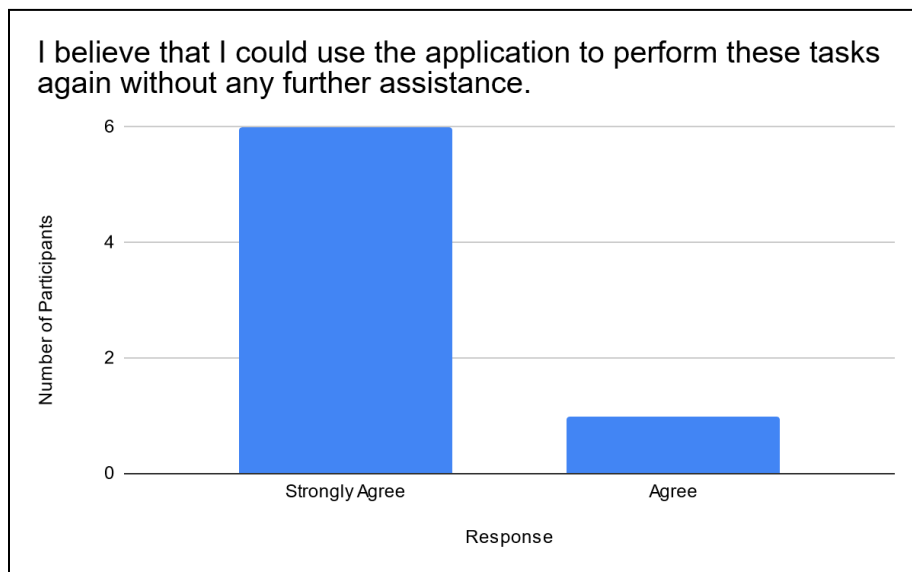
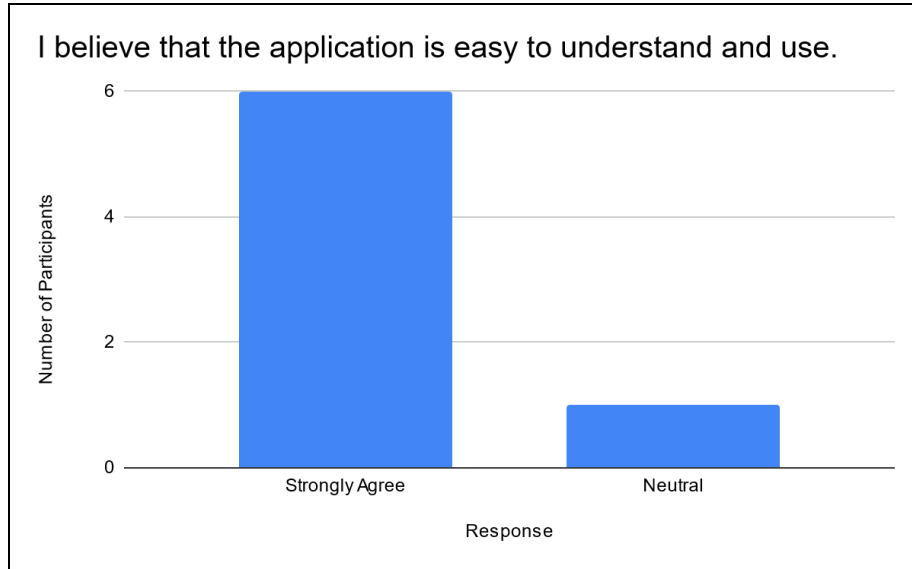
Body Language Logger:

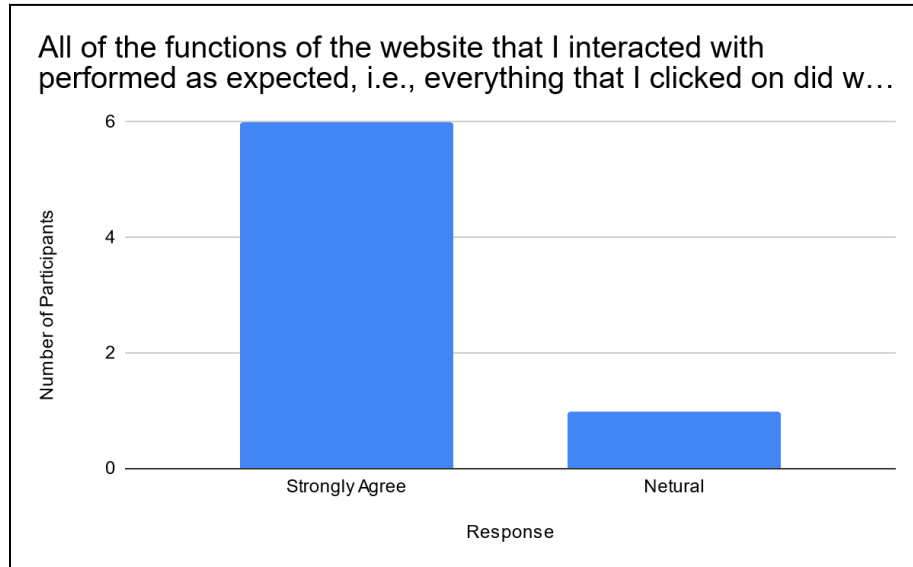
- 7 users were initially described as relaxed
- 1 users facial expressions changed at some point during the test
 - Participant 7 smiled after they were told they were done with the tests

Unexpected Behaviors that Occurred During the Test:

- The App automatically returned to the Home page after deleting an analogy, instead of returning to the Profile page

Post-Test Questionnaire Results





Post-Test Semi-structured Interview Results

1. What, if anything, about the application did you feel made it easy to perform the tasks?
 - Two participants said that they liked the simple design
 - Two participants said that they liked the navbar
 - Three participants said they liked the color scheme
 - One participant specifically pointed out that they liked the popup that confirmed that they had successfully deleted their analogy

2. What, if anything, about the application did you feel made it difficult to perform the tasks?
 - One participant said that the Home page had “too much” on it and looked “too busy”
 - One participant said that the help buttons on the Create Analogy page were too small
 - Three participants said that the “Heart” icon for favoriting analogies did not read as a “Favorite” button

3. Was there any specific task that you felt was particularly difficult to perform with the application in its current state?
 - Two participants felt that the Create Analogy task was difficult

4. Do you believe that this application accomplishes its goal?
 - Four participants responded “Yes”
 - One participant responded “Probably”
 - One participant responded that the “first-time experience is challenging”
 - One participant said “It’d be interesting to see students adding analogies and the difference between professor-added analogies and student-added analogies”

5. Do you have any questions about the application or any other suggestions on what should change to improve it?
 - Two participants suggested adding a category/tag system for different analogies
 - One participant suggested that the App should not redirect to the Home page on successful analogy deletion
 - This was a bug that was not supposed to occur

Conclusions

Overall, the usability testing helped to gather a lot of valuable feedback on the App and has informed my recommended changes. My recommendations are as follows:

General Recommendations

These recommendations are relatively easy to implement.

1. Replace the “Heart” icon with a “Bookmark” icon for favoriting analogies

Many users were confused about the meaning behind the “Heart” icon. These users felt that a “Heart” more closely resembled “Liking” an analogy (which we used a “Thumbs Up” icon for). Upon discussion with these participants in the semi-structured interview, they all responded favorably to the idea of using a “Bookmark” icon instead.

2. Add a UI “Return to Search” button on the Search page

Many users did not correctly utilize the browser’s back button to return to the search results. This is likely because the behavior of the browser’s back button is unpredictable to a user, and does not always operate as expected on websites. Adding a “Return to Search” button built in to the UI will help users navigate back to their search results confidently.

3. Changes to the Create Analogy page

Many users had different struggles with the Create Analogy page. First, the size of the help features (the “?” bubbles) should be increased to make them more visible to the user. Second, the “Create Analogy” button should automatically redirect users to the next tab of the form, if that tab has missing inputs. A common problem we saw among users is that they would click the “Create Analogy” button without filling out the entire form, because much of the form was “hidden” in other tabs that weren’t obvious to them. Having this button direct users to the missing inputs should help improve the flow of this page.

4. Highlight items in search lists on hover

One participant was confused about how to select an analogy from the list. This is likely because there is a button for “Compare,” but we expected users to just click on the entire listing to view an analogy. These conflicting interactions are confusing, since it’s not necessarily obvious to a user that they even *can* click on an analogy. If the analogy was highlighted when a user hovered over it, it would indicate to them that they can click on it and make the flow more clear.

“Stretch Goal” Recommendations

These recommendations would require more redesigning or programming to implement and are only suggested for scalability purposes. These would be great additions to the App if there was a longer period of development time.

1. An App tutorial or help page

Many users were initially confused at how to perform various tasks, but were able to do so easily after having slight hints from the test administrator. If the App had an onboarding tutorial or a dedicated help page, it would be easier for new users to utilize it.

2. A dedicated Create Analogy tutorial

The Create Analogy page requires a large amount of information related to Dr. Bettin’s work with OPAL tables and programming analogies. As many users may not be familiar with all of these fields, there are help bubbles next to each field to assist them. However, these bubbles do not provide examples and may still leave users confused. Having an in-depth tutorial for this page would be helpful for users.

3. A tagging system for analogies

Many users suggested having a “tagging” system (or “category” system) for grouping similar analogies together. Dr. Bettin also liked this idea when it was mentioned during one of the team meetings. This functionality would allow users to group similar analogies together, such as grouping analogies that they like to use in CS1121 and keeping those analogies separate from analogies that they like to use in CS2321. This functionality would also help address the concern that the Home page is too cluttered, as the results on the Home page could be grouped by category.

Overall Conclusion

All participants were able to complete the tests with varying levels of assistance from the administrator. The App could use some improvements, as outlined in this report, but overall is a very promising start. It is the opinion of the UX consultant that the undergraduate team did a great job developing the App for Dr. Bettin!

Appendix A

Undergraduate team member attendance for usability testing.

Test Session	Undergraduate 1	Undergraduate 2	Undergraduate 3
1	Ethan Jones	Dee Paulson	Grayson Wagner
2	Kevin Kulich	Dee Paulson	Grayson Wagner
3	Kevin Kulich	Emilie Rummer	Ethan Jones
4	Kevin Kulich	Emilie Rummer	Ethan Jones
5	Josh Staples	Emilie Rummer	Jack Grant
6	Josh Staples	Emilie Rummer	Jack Grant
7	Josh Staples	Emilie Rummer	Jack Grant

Appendix B

Bug reports.

Bug Number	Reported By	Application page	Replication Instructions	Expected Behavior	Actual Behavior (Bug)
1	Participant 6	Login page	Click on the “username” field after having logged into multiple other accounts previous	The “Register” button should not be hidden by the autocomplete information	The “Register” button is hidden by the autocomplete information
2	Kirk Thelen	Search page	Enter a search query, select a result from the list, then click the back button in the browser	The search query should be saved and still in the search form	Sometimes the search query clears itself when the back button is pressed in the browser
3	Dee Paulson	Profile page	Delete a previously created analogy from the profile page	The analogy should be deleted and the user should be redirected back to the Profile page	The analogy is deleted but the user is redirected to the Home page

Appendix C

Testing challenges.

There were no testing challenges.

Acknowledgements

I'd like to express my thanks to the undergraduate team for making this application and participating in the usability testing, as well as to all participants who participated in the testing, making this report possible. As well, special thanks to Dr. Bettin for her guidance and support with the development of this project, as she allowed our team to work on something very special to her and important to her research interests.

And of course, thank you to Dr. Pastel for instructing CS5760 and providing us with the opportunity to participate in this development and testing experience. The class has been great, and I've learned a lot about UX design and usability testing in the process.

Have a great summer!

Kirk