

CS5760 - Human Computer Interaction & Usability Testing

Spring 2023

Programming Analogies

Usability Test Report

Application name

Programming Analogies

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Undergraduate documents website

[Link](#)

App link - Programming Analogies

[go to app →](#)

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Usability Test of **Programming Analogies**

Introduction

The Programming Analogies application is a tool designed to help instructors enhance their students' understanding of programming concepts by providing them with real-world analogies. The usability of this application was tested to evaluate its effectiveness in achieving its goal of simplifying programming knowledge.

UI Description

The Programming Analogies application has a user-friendly interface that is easy to navigate. The home page is where users can access the search bar to look up programming analogies, the create button to create new analogies, the profile button to view their profile, and the favorite button to view their favorite analogies. The application also includes a compare feature that allows users to compare two analogies side by side. The analogies are presented in an accordion format, and users can click to expand and view the full analogy. Overall, the application's interface is simple, easy to navigate, and well-designed, making it easy for users to accomplish their tasks.

Usability Tests

Test Scenario 1

1. **Name:** Log in and Register
2. **Description:** The user will log in if the user is a registered user. Users should be able to register/create a new account if they are not registered with the application.
3. **Goals:**
 - a. Successfully log in if the user is registered with the application
 - b. Successfully register/create an account if the user is not registered with the application
4. **Task List:**
 - a. Initially, the user is ready and all set to log in with the login page in front of the user.
 - b. If the user is registered with the application then the user will proceed to log in.
 - c. If the user is not registered with the application then the user will proceed to register/create an account.
 - d. The user inputs the credentials to log in.
 - e. The user enters the information to register an account with the application.
 - f. After creating/registering the account the user will proceed to log in.
5. **Quantitative Measurement:**
 - a. Time taken to log in.
 - b. Time taken to register/create an account.
6. **Qualitative Measurement:**
 - a. Clarity of instructions.

- b. Ease of navigation.
- c. Did you receive an email in order to verify the account?(Indicated good security practice)
- d. Was the user prompted with instructions or rules when it comes to the specifics of account registration/creation such as the format of username or password?

7. **Observations:**

Participant	Facial expression & UI log	Body Language	Observations
1	Confused at one point(tried logging in without registering an account first.)	The task of creating an account and logging in did not appear to pose any difficulties for the user.	The user completed the login and registration tasks smoothly and confidently without encountering any errors.
2	User successfully completed the registration process by clicking on the registration button, entering his email as the username, and setting a password. He then logged into his account and effortlessly checked the 'remember me' option without any unnecessary clicks.	The user appeared self-assured during the account creation process, but there was a hint of perplexity when a red pop-up notification appeared after the account was created. Even though it was a success notification, it resembled an error message, which caused confusion for the participant. Additionally, the user seemed a bit disoriented while navigating the home/search screen and expressed a desire for a help prompt or a description of how to use the app.	The user successfully completed the tasks, but encountered some confusion with certain UI components.
3	Nodding in agreement. The user successfully completed the tasks of registering and logging in, but appeared to be confused about certain aspects of the login process.	The user was eager to log in as soon as navigating to the page for creating an account, the user demonstrated confidence in creating a new account with minimal instruction beyond what was explicitly told. However, the user was confused by the "Successfully registered" text being in red and also by not being immediately logged in after creating the account.	User inquired about logging in with Tech ID and expressed confusion about the red 'successful registration' alert, lack of password reset option, ability to access the home page without logging in, and not being redirected to a login screen after logging out.
4	Nodding in agreement. The user was instructed to register an account and log in. Firstly, the register button was clicked and a username and password were entered. Then, the user logged into their account without any problems. Next, they were asked to log out, which was done successfully. Overall, all the tasks related to account creation were completed without encountering any significant issues.	The user initially seemed unsure about whether to use the login or register page to create an account, but became more confident after receiving guidance. They did not appear frustrated while logging in and were able to find the login button on the main page easily after creating their account.	The user was able to create an account and login without any issues, and later successfully logged out from the account.
5	Confidence. The user successfully registered by providing account details, clicked the register button and signed in. Afterwards, the user logged out successfully.	The user completed the first task without encountering any difficulties.	The user successfully registered and logged into the application after filling out the registration form. Google Autofill was utilized to facilitate the process.
6	Nodded in agreement. Confidence. The user clicked on the register button and entered their information in the required fields. They then clicked the register	The user was able to find the register button and log in to their account without difficulty. However, they were slightly confused about the use of red	The user was able to successfully register and log in to their account. They did not choose to save their

	button to create an account. The user then clicked on the login button and entered their login information in the required fields. They then hit the enter button to log in to their account. Finally, the user clicked on the logout button to end their session.	text and the lack of an email address requirement. The user had some concerns with password visibility while setting up a new password, particularly they 'Re-type Password' field and thought that it was a security risk.	password with autofill. They logged out of their account after they were finished using it.
7	Confidence. The user began by accessing the login screen. They entered their username and password, clicked on the register button and then reentered their username and password before clicking sign in. Afterward, the user clicked the logout button.	The user demonstrated confidence in performing the login and registration tasks. They were able to easily find the register button from the login page and successfully created an account by entering their username and password. After reentering their username and password, they were able to log in without any issues. When it came to logging out of their account, the user demonstrated a clear understanding of the logout button and was able to log out without any trouble.	The user seemed to find the process of providing information during registration fast and easy. They also mentioned that all the information asked for was necessary. Additionally, the user noted that they have not seen a front page like the one presented before, which could indicate that they found the design and layout of the front page unique or interesting.
8	Nodding in agreement. The user began on the login screen and entered their username and password. They clicked the sign-in button but got an error popup because it was not the register screen. They clicked the register button and re-entered their username and password before clicking the register button again. After that, they clicked sign-in and then logged out.	The user uses hand gestures while describing her modifications to the home page.	The user attempted to use their personal login credentials before logging into the application. While the administrator was explaining what programming analogies are, the user started filling out the registration form. The user successfully filled in the required fields, registered for the application, logged in, and then logged out. Although the user believed that a username and password were sufficient for security purposes, they suggested that a security question would be necessary.

8. Potential Problems:

- a. Unable to register/create an account.
- b. Unable to log in even if the user is registered.
- c. The login and Register pages are not loading.

9. Interview:

- a. Did the application ask for too much or extra/unnecessary irrelevant information to create an account?
- b. Is the application asking you for any personal/sensitive information such as credit card details or social security numbers?
- c. Did you expect the home screen of the application after logging in to be different from what you had in mind?

Test Scenario 2

1. **Name:** Search, view, and 'Add as favorite' an analogy
2. **Description:** The user will search, view and favorite an analogy based on a keyword associated with a particular programming concept.
3. **Goal:** Successfully search, view, and add as a favorite the analogy.
4. **Task List:**
 - a. Once the user is logged in, the user is successfully directed to the home page.
 - b. Users can clearly see the Search bar on the home page and proceed to search the analogy.
 - c. The user enters the search term(s) into the search bar and clicks on the search button.
 - d. Users can see one or multiple results based on the search and views/open the analogy the user is looking for.
 - e. The user then favorites the analogy by clicking on the 'heart' symbol on the top of the page.
5. **Quantitative Measurement:**
 - a. Time taken by users to complete each step of the search, view, and add favorite analogy process (e.g. time to enter a search query, time to view results, time to add to favorites)
 - b. Number of analogies searched
 - c. Number of analogies viewed
 - d. Number of analogies added to favorites
 - e. Number of errors encountered by users during the search, view, and add favorite analogy process
6. **Qualitative Measurement:**
 - a. Is the user presented with the right results regarding the search?
 - b. Is the user able to view the desired analogy after the search results were displayed?
 - c. Is the user able to favorite an analogy?
 - d. User satisfaction with the ease of finding analogies
 - e. User satisfaction with the relevance and quality of analogies displayed
 - f. User satisfaction with the ease of adding analogies to their favorites list
 - g. User feedback on the overall user experience of the search, view, and add favorite analogy features
 - h. User feedback on any potential issues or confusion encountered during the process

7. Observations:

Participant	Facial expression & UI log	Body Language	Observations
1	Nodding in agreement. Confused at one point. The user successfully searched for analogies related to arrays.	Users seemed slightly confused with the difference between Like and Favorite button.	The user felt that context/label needs to be added underneath the buttons.
2	Confidence. The user searched for the concept 'rmf' and got no results. They then scrolled down to search for a concept instead. They clicked a topic about array size being able to be changed later to view more information about it. Then, they went back to the home page. When asked to favorite an analogy, they realized they were logged out and were asked to log back in. After logging in, they went back to the analogy from earlier and favorited it.	The user was able to navigate through the analogies smoothly and did not encounter any difficulties when adding an analogy to their favorites.	The user attempted to search for the concept 'rmf' but did not find any related analogies. They subsequently explored analogies for concepts they were already familiar with, without using the search function.
3	Confidence. The user was tasked with searching for an introductory programming concept and adding it as a favorite. Initially, there was some confusion about the process of favoriting an analogy. However, after clicking on an analogy and seeing the favorite button, the user proceeded to search for multiple analogies related to 'class' without difficulty. They were able to successfully favorite an analogy and return to the home page, and once they figured out the location of the favorite button, they had no further issues completing the task.	The user appeared confident while using the search function, and started typing even before the instructions were fully given. However, they seemed a bit unsure about whether an analogy can be clicked or not. The user was thrown off by the fact that their search was not saved when they went back, and also appeared slightly confused about some of the text having *G. Nevertheless, they seemed happy with the ability to favorite and like analogies.	The user was able to successfully search for analogies related to the "class" concept. However, they were unsure about how to mark an analogy as a favorite and initially thought the upvote button was the way to do so. They also noticed that their search was not saved when they went back to the home page, which caused some confusion. Once they found the favorite button, they had no issues marking an analogy as a favorite. Lastly, the user mentioned that they would have appreciated code examples to be included with the analogies.
4	Confused. The user was instructed to login and search for a programming concept. They were then asked to read multiple analogies and mark them as favorites. However, when searching for analogies using the keyword 'variable', the user did not immediately realize that they could click on an analogy to read more about it. After being informed of this, they were able to easily mark analogies as favorites.	The user initially seemed confused about the purpose of the page and searched for a specific function instead of a general concept. However, once the user understood how to read more about an analogy and mark it as a favorite through the guidance of the test administrator, there were no issues and the user easily accomplished the tasks without any difficulty.	The user conducted a search for a specific function from R rather than the more general concept. When searching for 'variable', they were initially unaware that they could click on a row to read the analogy, but quickly grasped this feature when it was pointed out to them. They identified two analogies with similar misconceptions and desired knowledge, and were unsure whether the heart or thumbs up button was for favoriting. They also tried several different search terms during their session.
5	Slightly confused. The user entered the keyword "array" in the search bar and pressed the enter key to submit the search. They clicked on an analogy to	The user's behavior suggests that they are processing information when they protrude their tongue at the corner of their mouth. Additionally, there is some	The user clicked on the search bar and started to scroll through the list of all analogies. When told to

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	<p>view it and then used the back button in the browser to go back to the search results. They clicked on several analogies and used the back button multiple times until they found one that they wanted to like. The user appeared confused that they could not like the analogy directly from the search list. After being prompted, they successfully favorited an analogy. Finally, they returned to the home page.</p>	<p>slight bouncing and biting of the lower lip, particularly in areas where they may be processing more heavily.</p>	<p>search for a concept, they clarified that they wanted to search for the concept itself. They searched for arrays and clicked on one analogy. They were then instructed to view multiple analogies and pick their favorite. The participant clarified with the administrator if they just needed to go through analogies of the searched term. They clicked through a few analogies and read through their contents. They liked one analogy and the administrator clarified that they have likes and favorites.</p>
6	<p>Nodding in agreement. The user typed the phrase "hello world" into the search field and hit enter to search. They clicked on the first analogy to view it. On the first analogy, they clicked the favorite button. They then clicked the browser back button to go back to the search page. They clicked on another analogy to view it. They clicked the browser back button to go back to the search page. They clicked on another analogy to view it. They clicked the favorite button. They clicked on another analogy to view it. They clicked the favorite button on the current analogy. They then clicked the browser back button to go back to the search page.</p>	<p>The user seemed unsure about the concept of analogies. They searched for a specific instance of an analogy, "hello world," instead of a more general concept, such as "method" or "variable." The user also seemed slightly confused about the individual components of an analogy. They did not seem to know what the "target" or "source" of an analogy were. Finally, the user was not quick to use the search feature after typing "hello world" and having no results show.</p>	<p>The user seemed unsure about the concept of analogies. They searched for a specific instance of an analogy, "hello world," instead of a more general concept, such as "method" or "variable." The user also seemed slightly confused about the individual components of an analogy. They did not seem to know what the "target" or "source" of an analogy were. Finally, the user was not quick to use the search feature after typing "hello world" and having no results show.</p>
7	<p>Nodding in agreement. The user started by clicking on the search bar and entering the term 'array', then hitting enter. They clicked on the first analogy that appeared and read it. After that, they clicked on the home button and proceeded to upvote an analogy before clicking on another one. They clicked on home again and then clicked on the login button. Once prompted, they entered their username and password and clicked the login button. They clicked on another analogy, read it, and liked it. Returning to the home page, they performed another search for 'array', clicked on an analogy, and favorited it. Finally, they clicked on the home button to finish.</p>	<p>The user showed confidence in searching for analogies using the keyword "array". However, the user was not sure about viewing the analogies and had to rely on reading the information displayed on the search page. The user also expressed confusion about the like icon and compare button when viewing analogies. Additionally, the user was confused about the create button when attempting to "like" an analogy. After receiving clarification from the administrator about the difference between "liking" and "favoriting" an analogy and how to use these features, the user felt confident in navigating to an analogy and favoriting it.</p>	<p>The user pressed the enter key to search for an analogy and was prompted to fully open the search results. They were initially confused and distracted by the compare button, and also had some confusion about where to find the like button as they had not logged back in. The user was further distracted by the create button.</p>
8	<p>Confidence. The user clicked on the login button and successfully signed in after entering their username and password. Then, the user clicked on the search bar</p>	<p>The user appeared to have a relaxed facial expression throughout the task and did not show signs of confusion or frustration. They were able to</p>	<p>The user utilized the search bar and typed in the keyword "string". They proceeded to select an analogy and read</p>

	<p>and typed 'string' before hitting enter. They clicked on an analogy and then clicked on the search bar again to select the recent search for 'string' on an analogy. They clicked on the search bar once more to select the recent search for 'string' on an analogy and then clicked the favorite button. Finally, the user clicked on the home button.</p>	<p>confidently navigate through the process of searching for an analogy using the search bar, clicking on an analogy, and favoriting it after the administrator explained the task.</p>	<p>through it. Afterwards, the user used the search bar to search for more analogies related to "string" and browsed through multiple analogies. They then decided to favorite one of the analogies. Although the user felt that the analogy provided basic information, they thought that definitions or examples would have been helpful to better understand the content.</p>
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8. **Potential Problems:**

- a. Incorrect search results.

9. **Interview:**

- a. Did the user find the desired result(s)/information regarding their search?
- b. Was the user satisfied with the speed and the ability of the application to produce the desired result(s)?

Test Scenario 3

1. **Name:** Comparing Analogies

2. **Description:** The user will pick two different analogies to compare.

3. **Goal:** Select two analogies to compare and close the analogy windows after comparing.

4. **Task list:**

- a. The user either logs in or is already logged in.
- b. The user is on the home page.
- c. Users can see the Compare button on the page. Users will click the button of a particular analogy.
- d. After that, the user selects a different analogy to compare it with the previously selected analogy.
- e. After the comparison, the user closes the analogy windows and returns to the home page.

5. **Quantitative Measurement:**

- a. Time taken to complete the process of comparing analogies, closing the analogy windows, and returning back to the home page.
- b. Completion rate of the analogy comparison task: measured as a percentage of users who successfully completed the task
- c. The error rate in completing the analogy comparison task: measured as a percentage of users who made errors or mistakes during task
- d. Number of analogies compared per session

6. **Qualitative Measurement:**

- a. User satisfaction with the analogy comparison feature
- b. User perception of the usefulness and effectiveness of the analogies
- c. User feedback on the clarity and relevance of the analogies

- d. User feedback on the overall usability and design of the analogy comparison feature
- e. Is the compare button able to show the selected analogy properly on the screen?
- f. Are the analogy windows presented properly to the user for easy viewing, understanding, and readability?

7. Observations:

Participant	Facial expression & UI log	Body Language	Observations
1	Nodding in agreement. Confidence. The user was able to successfully compare two analogies.	Tiles in the compare page were collapsible/expandable and were not obvious to the user.	As the administrator of the test guided the participant to perform the task, the participant seemed to like the feature and appeared to think it was intuitive.
2	Confidence. The user was able to successfully compare two analogies and clicked on the analogy context, source domain, target domain, and common structural elements buttons to compare the parts. They mentioned that comparing analogies was relatively easy. However, when asked to navigate back to the home page, they almost clicked on the log out button instead of the 'X' button to close the analogy comparison, and tried clicking on the MTU logo in the top left corner. It appeared that the user was not aware that they could click the 'X' button to close the analogy comparison, or that the 'Home' button was located next to the MTU logo.	The user demonstrated proficiency in comparing analogies and found the comparison page to be intuitive.	The user proactively opened the sections in the compare screen without any assistance. The user provided positive feedback about the comparing process, indicating that it was straightforward and easy to use.
3	Nodding in agreement. The user was requested to compare two analogies. Initially, they clicked on an analogy to view its description and liked it with the intention of saving it for later. However, instead of using the comparison button, they opened different analogies in new tabs to compare them. Although the user noticed the comparison feature later, they did not pay attention to it initially as they were not expecting it. Once they realized the comparison feature, they used it without any significant difficulty.	The user appeared to be uncertain about how to compare analogies and initially resorted to clicking on an analogy to compare it directly instead of using the side-by-side view. They were interested in whether they could compare each section of the analogies separately. They did not feel the need to compare analogies side-by-side unless the topics were related. The user did not expect to be able to compare analogies on the main search page.	The user navigated to the view page to select analogies for comparison. They asked about the meaning of 'G*' in the analogy, which was a leftover from Dr. Bri's research notes. They also tried to save analogies for later viewing, but the function did not work. They asked why some analogies did not have constraints. Initially, they did not use the compare button, but manually switched between two analogies to compare them. After it was pointed out by the administrator, they used the compare button and also collapsed and expanded the accordion views. The user did not feel the need for a side-by-side view for two different analogies, as the concepts were too different. However, they acknowledged that it could be valuable for more similar concepts. The user saw the comparison button, but did not initially

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			realize its purpose.
4	<p>Lots of confusion. Difficulty in understanding. The user was asked to compare analogies and initially clicked on an analogy instead of using the compare button. When guided to the compare button, they did not seem to understand how to use the context, domain, and common elements buttons to compare different parts of the analogy. This suggests that the user had some difficulty in comparing the analogies.</p>	<p>The user seemed unsure about how to compare analogies and initially clicked on an analogy to view all its data instead of using the compare button. When guided to the compare button, the user did not immediately understand that the context, domain, and common elements buttons could be clicked on to compare different parts of the analogy. The user did not seem as interested in exploring the comparison feature and spent more time on the analogy context box.</p>	<p>The user was initially unsure about how to compare analogies and appeared confused about what to compare. The administrator had to point out the compare button, explain the different parts of an analogy, and suggest side-by-side comparison. It was noted that the Zoom video may have been covering that part of the screen. The user's eyes seemed to go to the green thumbs up and then to the two information columns on the left, skipping over the compare button. The user also mentioned that the comparison button did not explain what it was comparing between.</p>
5	<p>Nodding in agreement. The user clicked on the "compare" button for one analogy, and then another. They did not expand the sections of the analogies until they were slightly prompted. They then closed the compare sections.</p>	<p>The user's behavior suggests that they are processing information when they protrude their tongue at the corner of their mouth. Additionally, there is some slight bouncing and biting of the lower lip, particularly in areas where they may be processing more heavily.</p>	<p>The user clicked on the "compare" button for one analogy. They started to read through the first analogy's contents. They needed clarity if the analogies needed to be of the same topic. They thought each section was broken down in a clear way to focus on one of the four sections individually. They thought they wouldn't have gotten that quickly to the comparing analogies if the administrator had not guided them.</p>
6	<p>Curious. The user clicked on the compare button for one analogy, then another, and was able to navigate the accordion view without any difficulty. They particularly liked the ability to view the sections of the analogies in an accordion format. However, the user did note that it wasn't possible to view different sections of two different analogies at the same time, as the sections open and collapse together. To exit the comparison view, the user clicked on the browser's back button.</p>	<p>The user showed curiosity about the compare button and was examining it even before reaching the compare test. Once the user clicked on the first analogy, there was no difficulty in understanding that two analogies can be compared side by side. However, the user appeared slightly unsure about why it is not possible to compare different sections of analogies such as Analogy Context <-> Target Domain.</p>	<p>The user was able to click the "compare" button on two different analogies without difficulty. They were also able to locate the accordion option when comparing the analogies, and expressed a preference for the section-by-section view. However, they did note that it was not possible to compare different sections of two different analogies, as the sections open and collapse together.</p>
7	<p>Nodding in agreement. The user clicked the compare button for two different analogies and then proceeded to explore the different tabs available for comparing the two analogies. After this, the user clicked on the home button.</p>	<p>The user was comfortable using the compare button for the first analogy, but felt unsure about using it for the second analogy. However, the user had no difficulty clicking on the accordions to view the different sections of the analogies.</p>	<p>The user needed guidance from the administrator for this test.</p>

8	Confidence. The user interacted with the application by opening and closing various buttons and tabs. They closed the compare button for multiple analogies, as well as the X button for a second analogy being compared. They also closed an analogy itself, and navigated to the home button where they closed the create button and flipped through some of the create tabs. The user then reopened the compare button for an analogy, closed another analogy, and finally closed the home button.	The user appeared to be confident in their ability to compare analogies, as they navigated through multiple comparisons with ease and proficiency. They were able to closely compare buttons for various analogies, as well as the X button for the second analogy being compared. Additionally, the user was able to close the other analogy and navigate back to the home button, where they explored the create tabs before returning to comparing analogies.	The user had no issue clicking on two compare buttons and exited both analogies without any trouble. Then, the user clicks on the home and creates buttons on the navigation bar. The user suggested having an indicator to compare two similar topics, but did not click on accordions to view each analogy section. Lastly, the user felt they could not complete the task without verbal instruction from the administrator.
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8. Potential Problems:

- a. The user is not able to understand how to compare two analogies: the app as of now does not clearly guide the user to make this happen.
- b. There is no “help” page for the user to refer to, to understand how to compare analogies.

9. Interview:

- a. Can the user comprehend the process of comparing analogies without a guide or instructions?

Test Scenario 4

1. **Name:** View profile
2. **Description:** The user will check their profile to view information about the profile or anything related to the app.
3. **Goal:** Navigate to your profile to go through or read the analogy the user has created and favorited.
4. **Task list:**
 - a. The user logs in or has already logged in.
 - b. The user is on the home page.
 - c. The user navigates to the ‘username’ on the top right and clicks on the username.
 - d. The user lands on the profile page.
 - e. Users can see the created and favorited analogy on the profile page.
5. **Quantitative measurement:**
 - a. Time taken to visit the profile and view the contents on the profile page.
 - b. Number of clicks required to access the profile page
 - c. Time taken to load the profile page
6. **Qualitative measurement:**
 - a. Is the user able to see the created and favorited analogy on the profile page?
 - b. User satisfaction with the layout and design of the profile page
 - c. User feedback on the ease of navigating the profile page

- d. User perception of the relevance and usefulness of the information provided on the profile page

7. Observations:

Participant	Facial expression & UI log	Body Language	Observations
1	Confident and surprised at a point.	Users seemed confident in navigating the profile and understanding the intention behind the Favorited Analogies section on the profile page.	User successfully navigated to the profile page but expected the page to have password and privacy management features.
2	Confidence. After reviewing the profile page, the user expressed appreciation for the Favorited Analogies table and found it to be a useful feature. However, when attempting to navigate back to the home page, the user initially clicked on the MTU logo instead of the 'Home' button located to the right of it, indicating some confusion regarding the navigation options.	The user hesitated to find the profile page and expressed a desire for more detailed information to be displayed, such as their bio, personal information, and privacy & password management.	Overall, user appeared to have no other issues when navigating to the profile page.
3	Confidence. The user had no difficulty understanding the tables for created and favorite analogies when viewing the account page.	The user was able to navigate to the profile page by clicking on their name in the top-right corner. However, they were unsure if hovering over the table headings had any effect. Additionally, they were uncertain about the necessity of having a search bar on the profile page.	The user easily found the profile page and viewed their favorited analogies. They even favorited more analogies to have them show up on the profile page. However, the user was confused about the hover effect on table headers and suggested having a "change password" button and a settings button. They also found it strange that the search bar on the profile page searches the whole app and not just the analogies on the profile page. The user compared the profile page to Reddit, where you can see posts you've made and upvoted.
4	Slightly confused. The user had difficulty finding the account page at first, but eventually found it. Once on the page, they seemed to understand the tables of favorite and created analogies.	The user had difficulty locating the profile page and had to search for it. After finding it, they seemed to be puzzled by the lack of personal information on the profile page compared to the created and favorited analogies tables.	The user visited the profile page and had a good understanding of the favorited analogies, but required more information on the created analogies. They then proceeded to visit the create page and were asked to create an analogy.
5	Confidence. The user navigated to their profile quickly and easily, without having to think about where to find it. They then returned to the home page and logged out.	The user seemed satisfied with the website's relatively quick processing speed. They did not appear to be struggling or under a high mental load while performing the task.	The user quickly navigated to their profile page. They correctly identified the created and favorite analogy sections. They also expected to see more profile information, such as profile details and the ability to change their password.

6	Confidence. The user clicked on the profile button, then clicked on the home button to go back to the home page, and finally clicked on the logout button.	The user expressed confusion about why favorite analogies were located on the profile page instead of the main search page, and asked about where the favorites were shown earlier in the test. However, they did not encounter any difficulties in understanding the information presented on the profile page.	The user clicked on their account username to access their profile page, where they were able to see their favorited analogies. They then returned to the home page and suggested that it would be helpful to have the favorites section separated from the other displayed information. After this, the user clicked on the logout button and inquired about whether or not the accounts would be email-based for security reasons.
7	Confidence. The user clicked on their username to navigate to their profile page. From there, they clicked on their favorited analogy and read it. After that, they clicked on the home button to go back to the main page. Finally, the user clicked on the logout button to sign out of their account.	The user clicked on their username to access their profile page, then successfully clicked on one of their favorited analogies. The user did not experience any difficulties understanding the information presented on the profile page. Finally, the user clicked on the home button to return to the main page and then clicked on the logout button to end their session.	The user did not seem confused and completed this test successfully.
8	Slightly confused. The user navigated to their profile page by clicking on the profile button. From there, they accessed their favorited analogies and clicked on one of them. After reading the analogy, they navigated back to their profile page and clicked on the analogy again. This process was repeated, and the user eventually clicked on the home page.	The user demonstrated agreement or understanding through nodding their head during most of the interaction and also successfully completed the task.	The user was able to easily navigate and view their profile page without any issues. They also clicked on one of their favorited analogies. However, they expressed a desire for more information on the user.

8. Potential Problems:

- a. The user profile page is not loading.
- b. Created analogy and favorite analogy are not showing up on the profile page
- c. Users might wonder about how to change their username or password and then not find options to change the password or username on the profile page.

9. Interview:

- a. Do you expect that the profile page would have different information other than your favorite analogy(s)

Pre-test

Survey

1. What's your educational background?
 - a. High School
 - b. 1st year
 - c. 2nd year
 - d. 3rd-year
 - e. 4th-year
 - f. Graduate
 - g. Ph.D.

2. What's your major?
 - a. Computer Science
 - b. Software Engineering
 - c. Electrical & Computer Engineering
 - d. Data Science
 - e. Cyber Security
 - f. Management Information Systems/Business
 - g. Other

3. Experience with programming?
 - a. Novice
 - b. Beginner
 - c. Intermediate
 - d. Advance
 - e. Expert

4. What is your preferred medium for learning a new programming language?
 - a. Official Documentation
 - b. Tutorials on websites
 - c. YouTube videos
 - d. Online platforms like Coursera, Udemy, Pluralsight, etc.
 - e. Other

5. Would you like or are you open to learning programming through analogies?
 - a. Yes
 - b. No

Questions

Please indicate your level of agreement with the following statements.

1. Do you have any disabilities that may hinder your ability to participate in this test?

- a. Yes, I have a disability
 - b. No, I do not have any disability
2. Your experience with using software applications such as web apps or websites in general.
 - a. Novice
 - b. Beginner
 - c. Intermediate
 - d. Advance
 - e. Expert
 3. What device are you using to test this application?
 - a. Laptop
 - b. Mobile phone
 - c. Desktop
 - d. Tablet

Post-test

Questions

1. On a scale of 1 to 10, how would you rate your understanding of the overall purpose of this application?
2. How would you rate the simplicity and ease of use of the application?
3. How highly do you rate this application as a good source to learn to program?
4. Would you recommend this application to your friends/peers/colleagues?
5. On a scale of 1 to 10, how would you rate your overall experience with this application?

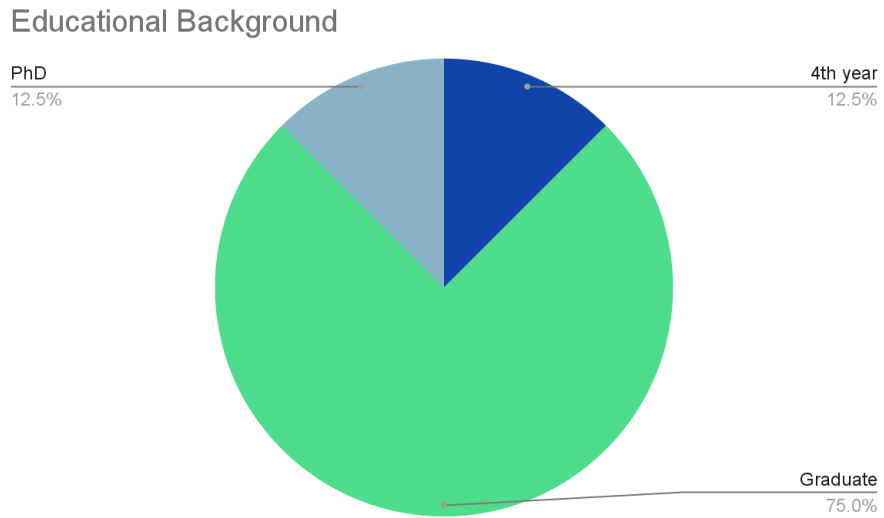
Interview

1. Were you able to complete all the tasks that were assigned to you? If yes, describe your experience, if no, list down the difficulties you encountered.
2. What particular task did you find most difficult?
3. Based on your overall use of the application, which is your favorite aspect/feature of the application?
4. Please list down any suggestions and improvements for the application.

Results

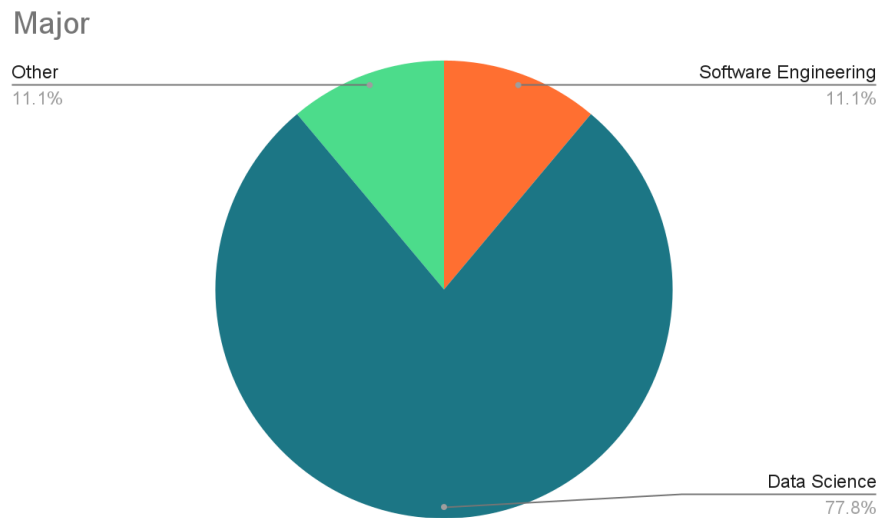
Demography

1. What is your educational background?



The educational background of the participants was surveyed to analyze the age distribution and academic competency of the participants. This indicated that all the participants were seniors or have almost completed their bachelors.

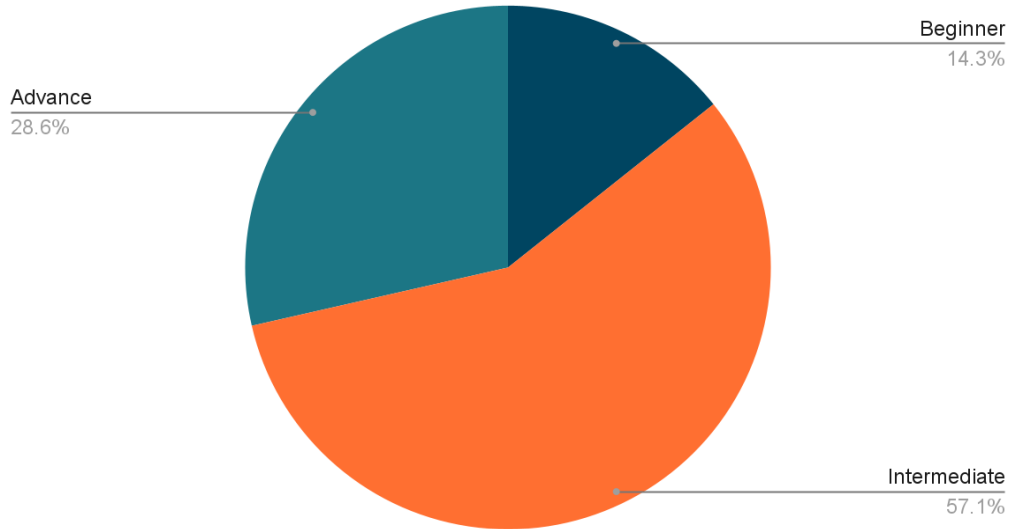
2. What is your major?



The majority of the participants were surveyed to analyze the academic and knowledge background of the participants. Maximum participants belonged to the Data Science major.

3. Experience with programming.

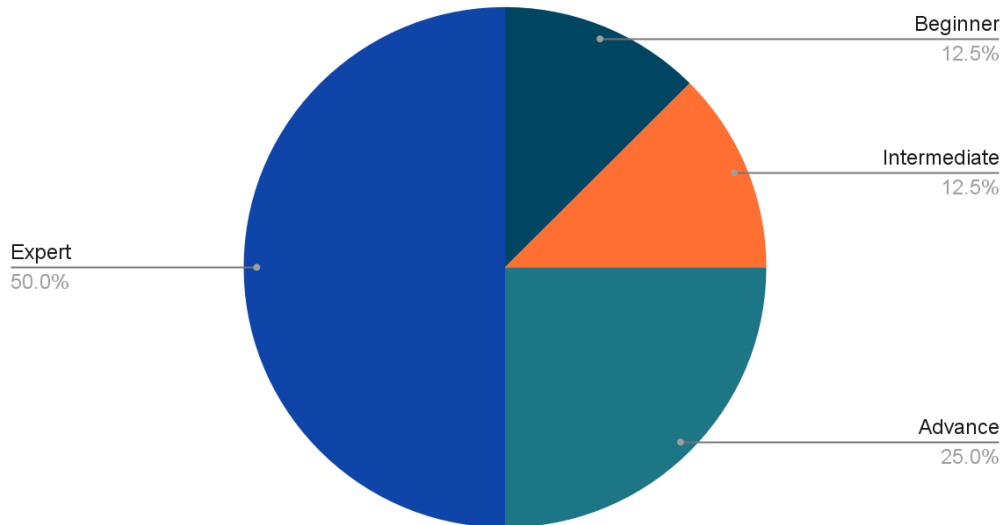
Experience with Programming



The experience of the participants with programming was surveyed to know whether participants would understand the purpose and scope of the application. Almost all the participants knew what programming is and what concepts are involved in programming.

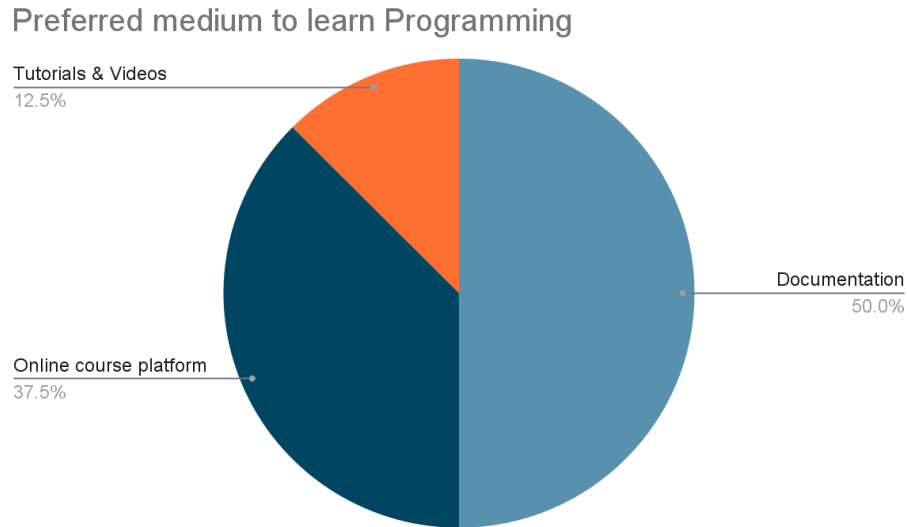
4. Experience with using web applications, websites, and software applications in general.

Experience using web and mobile apps/software in general



The experience of the participants with using software was surveyed to know whether the participant would find it easy and comfortable to use the application during the usability testing. We thought someone with less experience would struggle using the application and would not be able to perform the tasks of the usability testing. However almost all the participants seemed comfortable using and navigating the application.

5. What is your preferred medium for learning a new programming language?



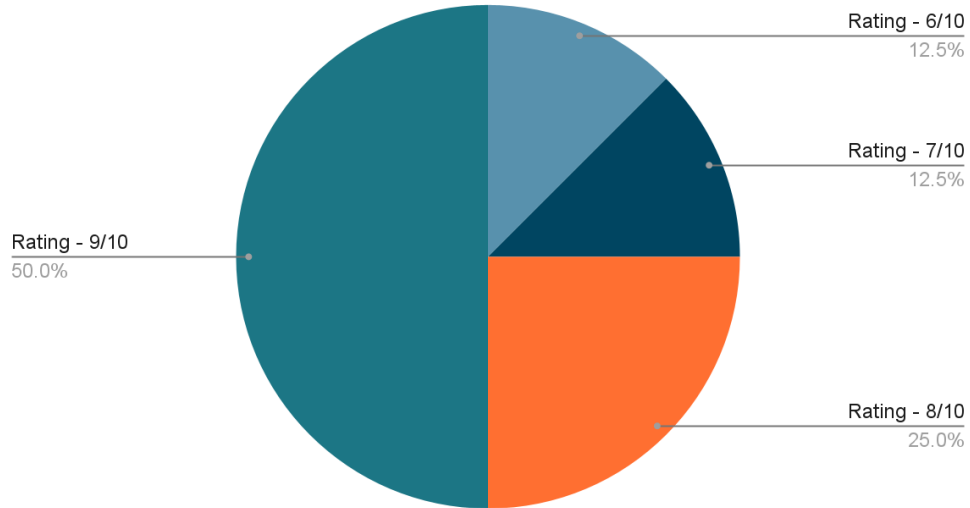
The preferred medium of the participants when it comes to learning programming was surveyed to know whether the participant is open to learning programming through Programming Analogies. Participants had varied tastes with most of them referring to the documentation when it comes to learning programming.

Feedback and rating

Understanding

1. On a scale of 1 to 10, how would you rate your understanding of the application.

User ratings - App's purpose

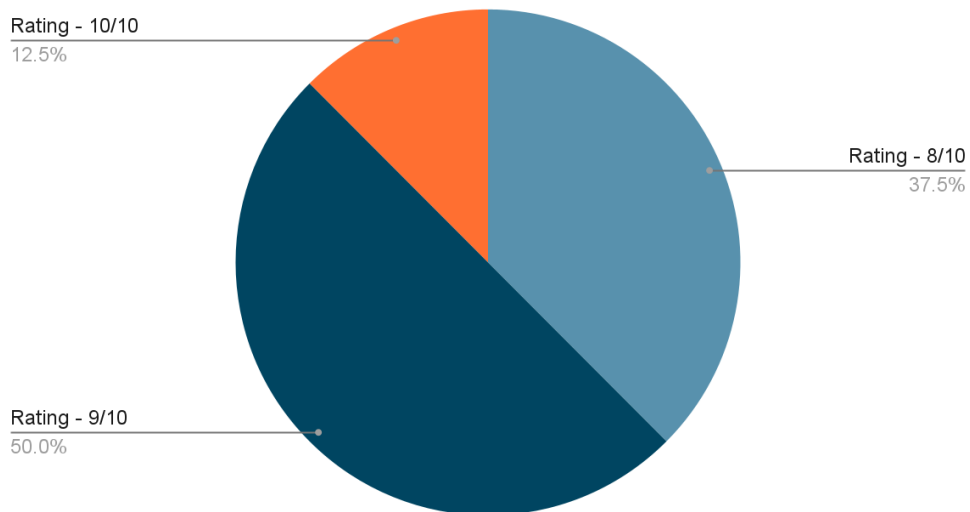


Participants rating on a scale of 1 to 10 was surveyed to know whether the participant understood the purpose and end goal of the application. Overall, these scores suggest that the participants understood the goal and use cases of the application.

Simplicity

2. On a scale of 1 to 10, how would you rate the simplicity of the application.

User ratings - App's simplicity

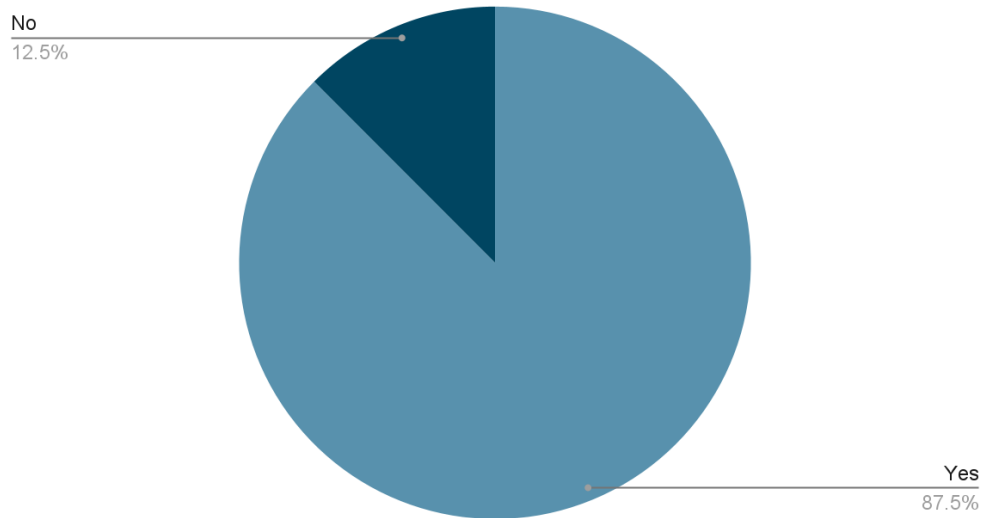


Participants rating on a scale of 1 to 10 was surveyed to know whether the participant enjoys the simplicity and ease of use of the application. Overall, the application received a good rating when it comes to using the application without the hassle of going through a long tutorial or documentation.

Recommendation

- 3. Would you recommend this application to your friends/peers/colleagues as a good source to learn to program?

Recommend the app as a good source to learn Programming



Participants' opinions were surveyed to know whether the participant would recommend the application to their friends/peers/classmates/colleagues as a good source to learn to program. This is a good indicator that programming could also be learned through analogies.

Analysis of Strengths and Improvements

This section of the usability test report highlights the positive aspects of the software and identifies areas where it could be improved. It will provide an overview of the software's strengths, as well as suggestions for making it more user-friendly and efficient. By analyzing the software's performance during the usability test, we can identify what worked well and what needs to be improved to enhance the user experience.

Strengths

1. Favorite features of the application:
 - a. Comparing Analogies
 - b. Popularity of Analogies indicated by a thumbs up
 - c. Favorited Analogies
2. Search is fast and produces the desired results.
3. Application is easy to use.
4. The UI is simple to understand.

Improvements

1. Michigan Tech icon should redirect to the Home page of the application. It's the natural tendency of the user to click on a brand/company/app logo on the top right or top left corner to return to the home page quickly.
2. Profile page needs privacy and password management features.
3. Sorting analogies and results after the Search by topic.
4. Eliminate the extra white spaces on the pages.
5. Provide more information into what the application is used for and what kind of information one would get from the application especially for non Computer Science or non tech people.
6. Keyword suggestions for searching analogies before making the search directly.
7. Flowchart and code examples that would help with understanding the syntax.
8. Guide on how to use the application on the Home page or a separate Help page to navigate around and understand the features of the application.
9. One user suggested not having the 'eye'(password visibility) to see the new typed password since it could potentially be a security risk.
10. Favorited Analogies on the Home page to quickly view them instead of navigating to the user profile page.
11. A guide was hinted at to explain what are the terms(Analogy context, Target domain, Source domain, Common elements) when creating an analogy.
12. More clarification on the Comparing Analogies feature(again an Help page to understand the primary features of the application is implied.)
13. UI could be more attractive and responsive in terms of design.

14. One user suggested that considering 'clickable' cards like the ones on 'Quizlet' would make understanding and reading the analogy related to a particular programming concept easier.

Appendix A: Undergraduate Team Attendance

Day/Time	Location	Grad Student	Undergrad Students	Name	# Tests
4/7 5:00 PM	Zoom	Ketan Patil	Jack Grant, Dee Paulson, Grayson Wagner	Emilie Rummer	7
4/7 6:00 PM	Zoom	Ketan Patil	Dee Paulson, Ethan Jones, Grayson Wagner	Ethan Jones	7
4/8 1:00 PM	Zoom	Ketan Patil	Emilie Rummer, Ethan Jones, Josh Staples	Jack Grant	7
4/8 2:00 PM	Zoom	Ketan Patil	Emilie Rummer, Ethan Jones, Josh Staples	Kevin Kulich	7
4/9 1:00 PM	Zoom	Ketan Patil	Kevin Kulich, Dee Paulson, Jack Grant	Dee Paulson	7
4/9 2:00 PM	Zoom	Ketan Patil	Jack Grant, Kevin Kulich, Josh Staples	Grayson Wagner	7
4/10 7:00 PM	Zoom	Ketan Patil	Dee Paulson, Grayson Wagner, Kevin Kulich	Josh Staples	7
4/10 8:00 PM	Zoom	Ketan Patil	Kevin Kulich, Grayson Wagner, Dee Paulson		

Pointers:

1. For participant 6,7, and 8 respectively:
 - a. 9th April session rescheduled to 11th April at 6 pm | Assigned undergrad team members attended? - Yes
 - b. 10th April session rescheduled to 11th April at 7 pm | Assigned undergrad team members attended? - Yes
 - c. 10th April session rescheduled to 11th April at 8 pm | Assigned undergrad team members attended? - Yes
2. All of the undergrad team members attended all of the usability tests over the course of five days.

Appendix B: Bug Report

List of all the encountered bugs in the application.

1. Application bug 1

- 1.1. Bug name: Search keyword persists after navigating to the previous page
- 1.2. Bug location: Search Bar
- 1.3. Bug description: The search term persists in the search bar even when the user navigates back to the previous page, and it doesn't automatically clear itself from the search bar.
- 1.4. Expected behavior: The search term should automatically clear itself from the search bar as the user goes back after the search. Going back is a quick natural action to go to the home page.

Appendix C: Testing Challenges

Technical challenges encountered by the administrator or the participant with the testing environment not involving the application.

1. Technical challenge 1

- 1.1. Challenge name: Zoom meeting time limit
- 1.2. Challenge description: Zoom allows only 40 minutes for a basic version of Zoom. Each test had to be assigned with a fixed time limit in order to finish all the test scenarios before 40 minutes.

2. Technical challenge 2

- 2.1. Challenge name: Speaker issues and connectivity
- 2.2. Challenge description: Some participants had connectivity problems and issues with their speakers which led to distorted voices.

Acknowledgments

I would like to express my gratitude to all the participants who took part in the usability testing of the Programming Analogies application. I would also like to thank our development team for their hard work and dedication in creating the app and for providing invaluable support and feedback throughout the development and testing process.