LearnIt

Spell it. Say it. Learn it.

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Introduction

There are numerous students in other countries who aspire to pursue their degree from abroad in order to get better economic opportunities. When students from non-English speaking countries go abroad, they face many challenges and difficulties. **Language barrier** is one of them. Many products and tools are available to help students build their English skills, but few value developing their language learning tools from **letters to words to sentences** as a whole cycle.

Our team aims to address this problem space of creating words from randomly generated letters, finding their definitions and pronunciations and creating their own English sentences with a portable and easy-to-use mobile application that gives international students a **tool to build their English knowledge**.

We hope you enjoy *LearnIt*!

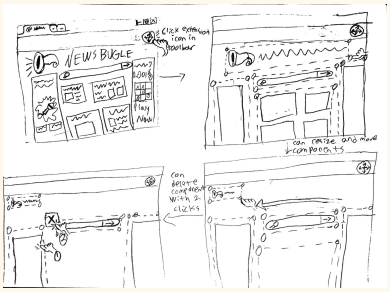
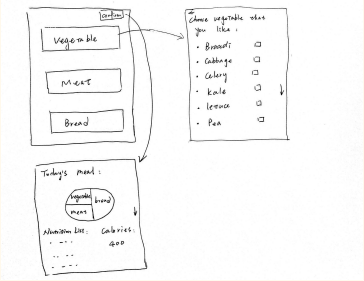
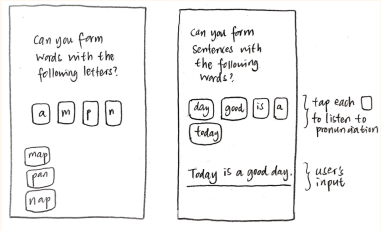
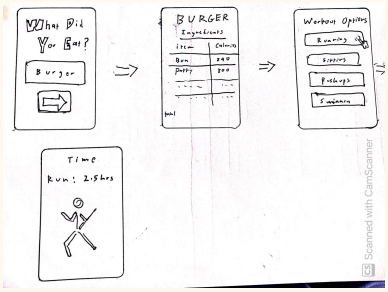
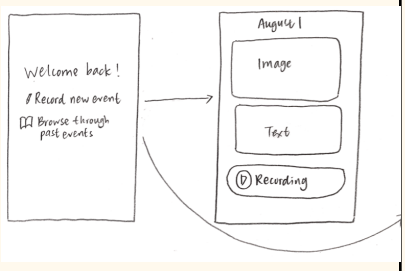
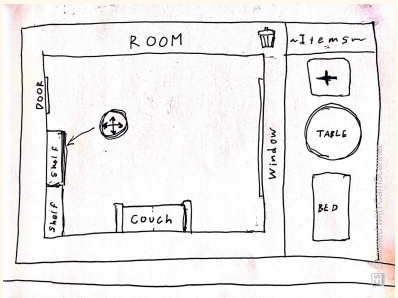
Designed by Team 20 (LearnIt)

Christopher Yang
Cody Ortega Quinnell
Ting Qi
Verena Yiu

Brainstorming

The entirety of the Summer 2021 semester occurred virtually due to the COVID-19 pandemic, so our team meetings took place online through Zoom. Over the course of a week, our team brainstormed a series of over 20 ideas relating to this semester's theme of **Deconstruction & Reconstruction**.

Before jumping into our various ideas, we need to understand what Deconstruction and Reconstruction means. "To *deconstruct* is to **dismantle**, **break apart**, or **reduce** something to its constituent parts in order to reinterpret it." On the other hand, "To *reconstruct* is to form an **impression**, **model**, or **reenactment** of a past event or thing from the available parts or evidence." Through this two-fold process, we hope to gain a better understanding of the inner workings of our chosen mechanism.

Personalized Custom User Interface	Creating Personal Food Plans	App for Reforming Words
		
Personal Workout App Based on Diet	Storytelling App for Dementia Patients	Room Organization App
		

Sketches of 6 of our original 21 brainstormed ideas

After considering all of our brainstormed ideas, we decided upon the app for learning words, now **LearnIt**. We chose to take this path because it was both personal to our team as well as impactful to communities with which we are familiar. Our **target audience** is those **learning English as a non-primary language**, a group we are familiar with given our backgrounds as second-generation immigrants or even international students. Given our close proximity, both physically and emotionally, to our target audience, we took to heart the need for a tool to help those struggling to grasp the technicalities of a new language.

Our initial idea was to present the user with **a word that is broken down into its individual letters** then scrambled. Then, the user was directed towards finding a word among the scrambled letters. Upon finding the word, the user was asked to create a sentence using their discovered word. We felt that this procedure promoted productive **language development** as users began to understand the various components of the English language as well as discovering patterns through trial and error. While our idea was rough in the early stages, we felt that it addressed an important issue for us while fulfilling the requirements of the project.

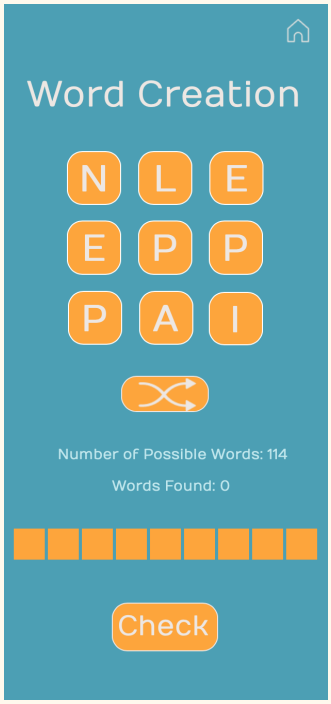
Deconstruction & Reconstruction in LearnIt

Based around deconstruction and reconstruction as a two-fold process, we **centered** our application around this theme and tied it into **every aspect** of our design.

Deconstruction

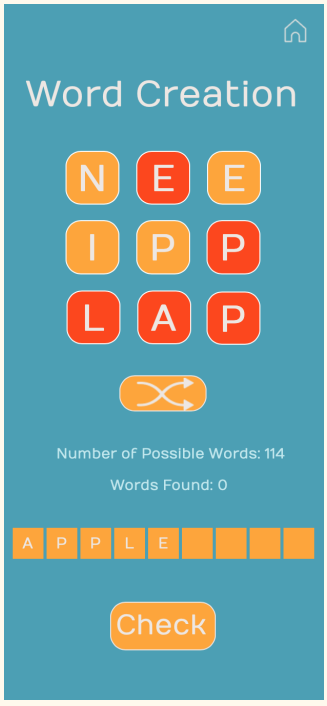
We knews from the start that the deconstruction side of our project would be centered around breaking down words into their individual letters. However, one thing we were unsure about was how we would **choose these letters**. An early idea that our group considered was extracting words from text at the level of the user and deconstructing the words from there. However, after much discussion we came to realize a few issues with this idea. First, choosing words based on the level of the reader causes much **variance** in the length of words depending. After all, we did not want our letter

scramble (based on shorter words) to only be able to be unscrambled into one word. This is because we wanted our users to be able to differentiate between which letters they needed to form a word rather than using a **process of elimination**. A second issue is that shorter words do not necessarily mean that a word is easier to find as a subset of this word's letter. In fact, sometimes it can be more difficult to find a word within a limited set of letters. As such, we needed to decide on a set of letters that we felt **balanced possible word combinations**. The optimal number of letters we decided upon is 9. As such in the deconstruction process, 9 letter words are deconstructed into their individual letters and generated on a 3x3 grid.



Reconstruction

Following deconstruction, we are brought to a process of reconstruction. The deconstruction process presents the user with a 3x3 grid that is made up of the letters of a deconstructed 9-letter word. To fully grasp the reconstruction process, the restrictions on words must be stated. First, a word must have a **minimum of 3** letters and a **maximum of 9** letters. Second, letters cannot be repeated; if there are duplicate letters on the grid(ie. 2 x g), then each g can be used once. Finally, the word formed by the user must be an existing word in the standard English dictionary. Once the user forms a word from their given letters that is a **display of reconstruction**. However, the reconstruction does not stop there; **step 2** of reconstruction is achieved by the user taking their word and formulating it into a sentence. This is how our application integrates the reconstruction side of the theme.



Persona & Scenarios

When creating *LearnIt*, we realized that a word construction application would be more helpful for **ESL learners** with **limited working proficiency**.

Persona:

Jane, is a 9th grader who has recently moved to America. They often get lost during class due to difficulty in understanding certain phrases; this causes them to become embarrassed. Jane realizes the limitations that this language barrier creates and hopes to become more **proficient in English**. Jane is looking for a tool that can improve their command of the English language so that they can succeed in their classes as well as in the future. As a whole, Jane is motivated to improve their speaking and is willing to spend time to develop their skills.

Scenario 1:

May, an international student, is currently in the middle of class. Suddenly, the teacher says a word that May does not understand, but she is too shy to raise her hand. After class, May expresses her frustrations to her friend, Joyce, who is an international student as well. Joyce tells May of an app that she finds quite helpful for her to learn English. When May goes home, she downloads the app and tries it out. After walking through the app and learning a couple words, May calls it a night. May continues to use the app every day and not only learns more words but also gains confidence in her use of the English language. A few weeks later, Joyce and May are having a conversation again, and May expresses how useful she finds the language app to be.

Scenario 2:

Lily is assigned an in-class activity in her ESL class. The teacher directs Lily to the application. She is told to generate 5 words, deconstruct them and build as many words from them as possible within 10 minutes. Lily opened the application and it randomly generated a 9-letter word for her. She sees a word that is deconstructed but she does not recognize it. The teacher explains that deconstruction of a word rather than being presented with random letters illustrates that it is possible to use the given letters as a word, but not necessarily new words. For example, if Lily were presented with "xchgdlj" and asked to construct words, then the task would be impossible. If she were presented with "student," then she could spell "stud, dent, dust, tent, nut, nude, etc." But, if she were presented with "sky," then she would go through the futile challenge but in the process think through that no alternative words could be reconstructed from the given word to deconstruct.

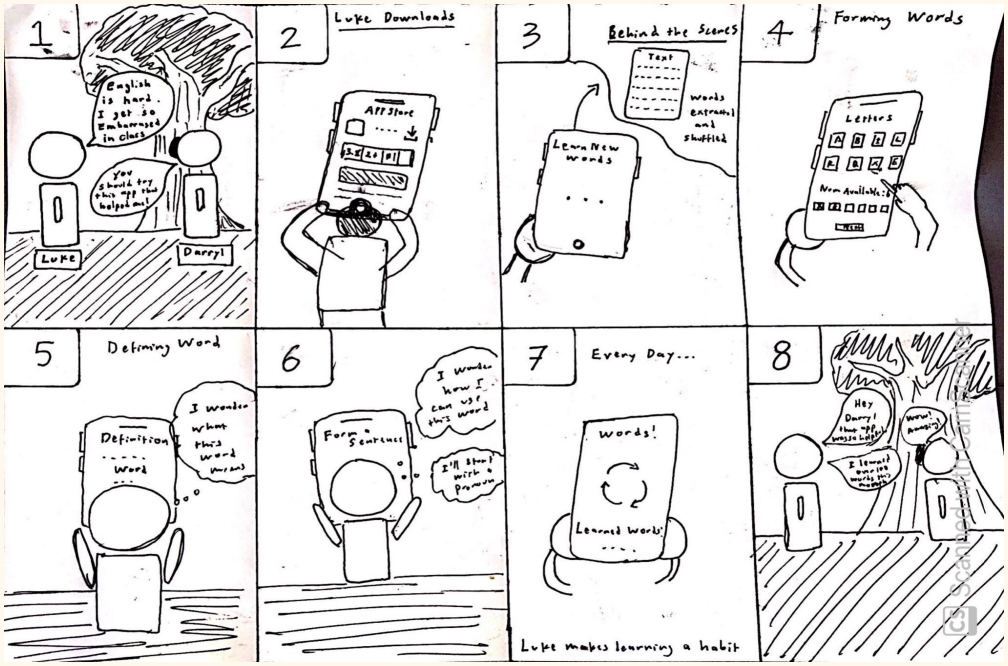
Overall, our aim behind *LearnIt* is that it's a **tool for international students** like May and Lily to simply build their English vocabulary from the tasks.

Storyboard

To communicate our vision for the application, we created a storyboard on how an international student would engage with and enjoy *LearnIt*.

1. Luke and Darry are talking about their school life. Luke asks for suggestions on learning English. Darry suggests to Luke an app that he is using.
2. Luke goes back home and downloads it.
3. Luke clicks "Start" and waits for the letters generator.
4. Luke tries to use those generated letters to build a word.
5. After he builds a word, the screen shows the definition of the word.

6. He tries to find out if some other words in his mind are also valid.
7. He enjoys the app and uses it everyday.
8. One day, Luke and Darry meet in school again. Luke compliments this app.



Observational Study Findings

To help test our design, we ran a study and asked four participants to assemble words using letter tiles. Out of respect for their privacy, we'll use the pseudonyms Claire, Sam, Jamie and Alex. Claire is a senior-age Peruvian woman who moved to the States about 30 years ago and has been learning English based on conversations she hears. Sam, Jamie, and Alex are all third-year college students, with Sam studying public health, Jamie studying mathematics, and Alex studying computer science. Sam and Alex spent their early years in other countries (Singapore for Sam, China for Alex) before coming to study in the US, while Jamie spent ~20 years in China before coming to study in the US.

From our interviews, we noticed two important themes:

- The application is ill-suited for people that are already somewhat fluent in English.
- There is nothing within the application that would compel repeat use. At the time, it seemed like the only use-case would be a teacher assigning an ESL student to use the application.

Based on these findings, we decided to change how the letters were generated in the app and increase the number of letters available to the user. Additionally, we decided to add a Saved Words page to help users keep track of the words they've made and learned. We also added a translatable Definition page so that the user can learn what their word means.

Selected Quotes:

"I kind of like it. It helps you think and remember the words you learned. I kind of wished that there were more letters, though."

- ***Claire***

"I can see the benefits of it; although I'm not really sure how much I would use it."

- ***Sam***

"If you can provide a dictionary, it will make the task easier for people like me who have a limited working English level."

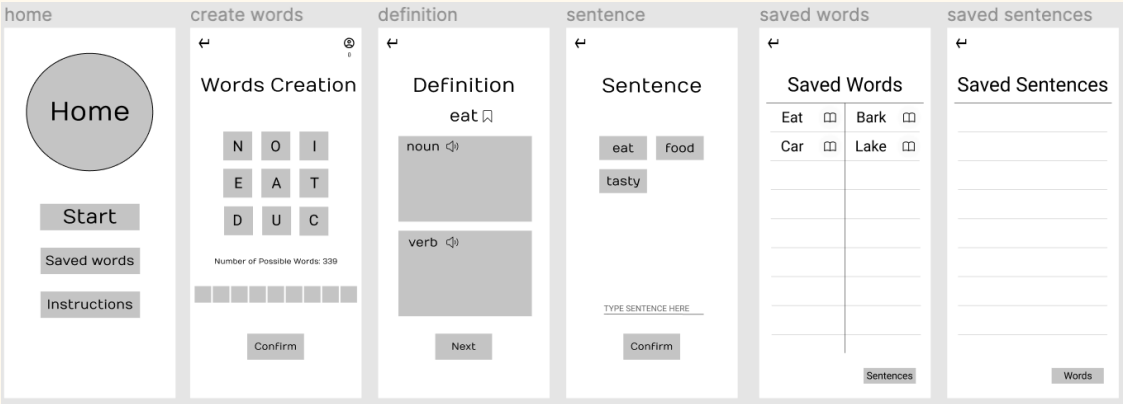
- ***Jamie***

"I prefer having it more than the first group of letters because there are more possibilities of words that can be constructed, but this also makes the task easier."

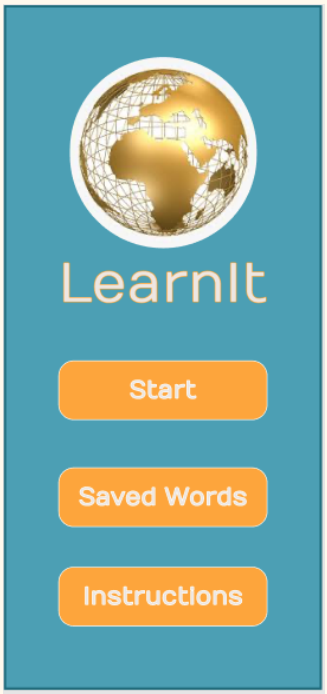
- ***Alex***

Wireframe

We designed our initial low-fidelity wireframe in Figma. The goal of the first wirefame was to imagine how a user would interact with our word creation application. Visit our [low-fidelity figma prototype](#).

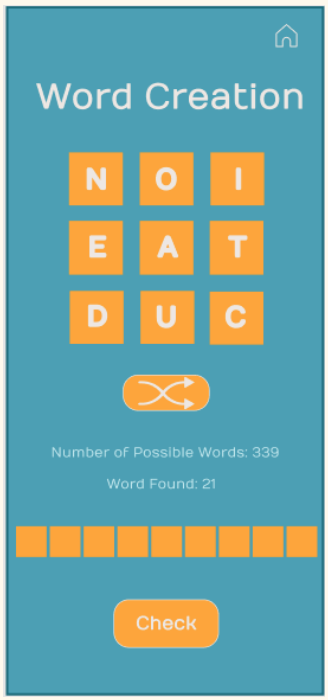


We decided on a color scheme for our high-fidelity wireframe. We used calming blue as the background and bright orange/red for most clickable buttons to form a stark contrast. This color scheme is also gender-neutral and professional which fits the educational purpose of this app. We received positive feedback from our peers for our chosen color scheme. We also used rounded corners for the buttons to reduce the cognitive load in viewing the corners of the buttons. Visit our [high-fidelity figma prototype](#).



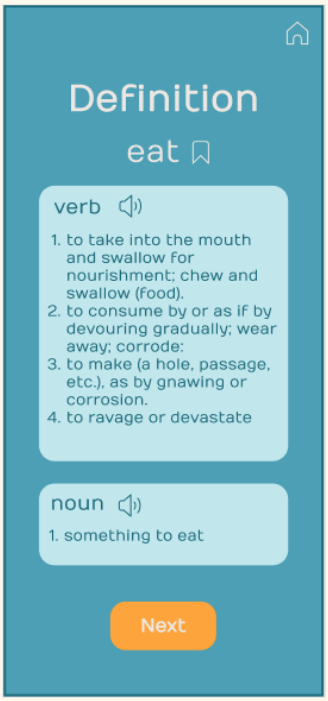
Landing Page:

We added a globe as the logo of our app to show that our app is available for anyone around the world who would like to learn English. To make our application as simple as possible, there are only three buttons with its description. “Start” button can lead users to the journey of “Words Creation”. “ Saved words” can give users all the words they built before. If users are struggling on how to use this application, they can always check the instruction page by clicking on “Instruction”.



Task 1: Unscrambling Words

Our primary function in the app was to **create words**. Once the user clicks the "Start" button on the main screen, the app randomly generates 9 letters. The user can create a word by clicking on those letters one by one. After the user confirms the word he/she builds, the user will be leading to the next task if the word he/she built is correct. Otherwise, the user needs to try again.

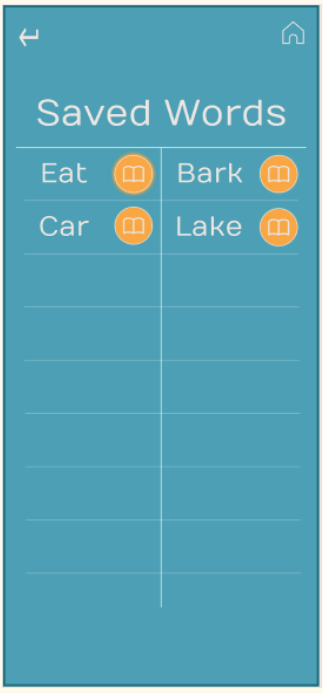


Task 2: Study the Definition

The user now can see the **definition** of the word he/she built. The user can also check the pronunciation by clicking on the audio button. Those definitions come from our back-end dictionary. By clicking "next", the user can go to the next task.

Task 3: Use the Word in a Sentence

After the user checks the definition of the word and clicks the "next" button, the user can steady his/her knowledge of the word by creating a **sentence** related to the word. Our system randomly generates two other words with the word the user built.



Task 4: Review Saved Words

In addition to reviewing the words the user already built, we added a feature that will automatically save the words that the user created before. The user can always find the "Saved Words" on the main page.

User Evaluation Findings

Once we had a prototype built, we asked 3 people to participate in a usability test and use our prototype to emulate using the final app. Out of respect for privacy and anonymity, we'll call these three participants **"Danny"**, **"Nickie"** and **"Greg"**.

- Danny is a male international Master's student in a University in SoCal. He completed his Bachelor's in China.
- Nickie is a Data Science major in UC Berkeley. They have been in the US for 10 years, coming to the US after graduating from high school in China.
- Greg is a third-year college student studying computer science. They spent their early years in China, but have lived in the US since high school.

By studying how Danny, Greg, and Nickie interacted with our app, we found that the following about our application and design:

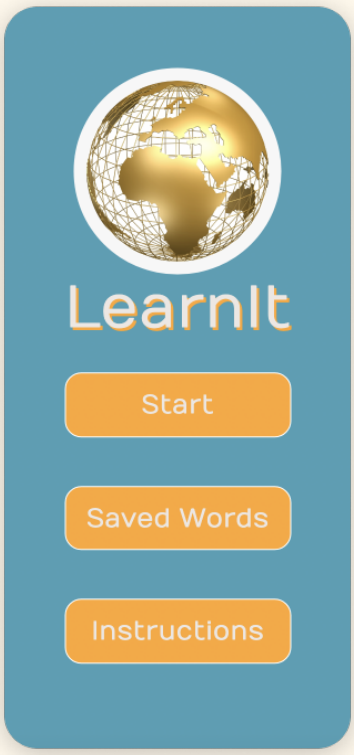
- The overall flow of the app is **relatively easy to follow** with slight confusion at some portions.
- The buttons were **clear signifiers** of their purpose.
- The sequence of pages were seen as **logical**.
- A feature that the users were hoping to see in future versions was a **greater indication of correctness/incorrectness** on words and sentences when hitting the check button.

Based on this feedback, we considered the clarity of our buttons beyond the flashing color indications that we currently have in place. This can possibly be done by adding subtitles for some of the buttons. We strive to improve our application as an educational tool.

Final Design

Our final design kept the same structure as our previous wireframes with some notable differences to **improve the usability and effectiveness** of our app. We added a home icon on each page for the user to navigate to the landing page anytime to restart the task, review the saved words, or study the instructions if needed. We also removed the back buttons on each page except for the sentence page to ensure the user fully understands the word created by studying its definition and forming a sentence before creating another word.

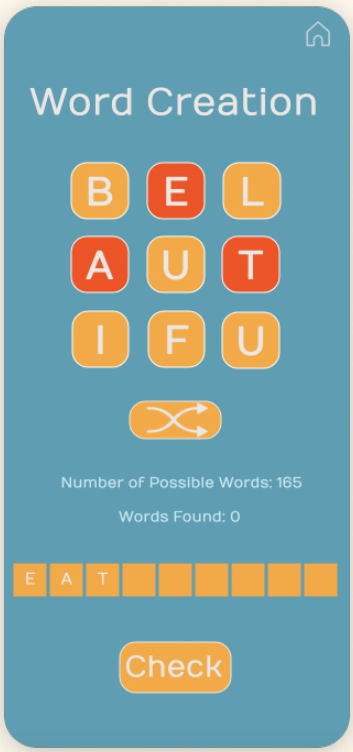
Landing Page



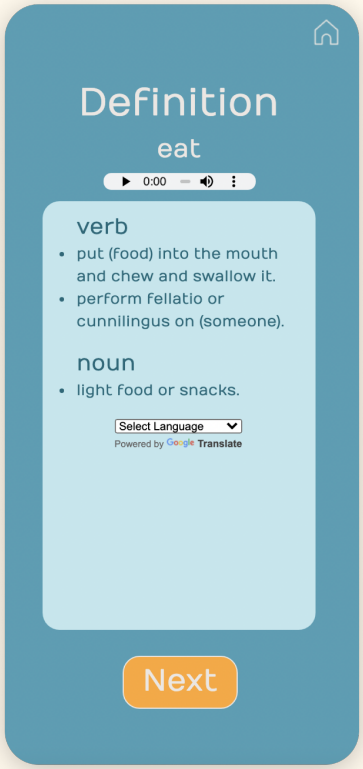
The landing page is kept the same since we received feedback in our usability tests that the buttons are clear signifiers of their purpose.

The letter buttons on the word creation page turn red when chosen for the user to better keep track of them. Based on our user's feedback. subtitles are also added under the check button to indicate the validity of the word created.

Task 1: Unscrambling Words



Task 2: Studying the Definition



Task 3: Use the Word in a Sentence

Task 4: Review Saved Words

We added a **Google translate button** on the definition page for the user to translate the definition section to any language that the user is more comfortable with for better understanding and comparison. We also used the **Free Dictionary API** to fetch the definition of the created words. For the sentence page, we used a large text box instead of a single text input line to accommodate for long sentences typed by the user. We included the **HTML spellcheck** attribute to the text box to alert the user of spelling errors. For the new saved words page, we placed only one word per row to allow for more space between the words to improve readability.

Our design decisions are based on a combination of our knowledge gained from class and the feedback from our peers and user testers. Watch our interactive video of the app here: https://youtu.be/Hc7QAoqaSPI

Technical Challenges

Front End Challenges

One such challenge involved getting the "saved words" list in the Saved Words page to function and render correctly.

We attempted using Bootstrap, but their table system was difficult to position and scale properly. The rows spanned across the screen and left little to no margins on the sides. This ended up making the screen look disorganized and cramped. Additionally, their container-row-col system didn't seem to support CSS changes outside of their presets.

We then attempted to simply use HTML. This was more or less better, but there was initially still some trouble with getting the table to function properly with JavaScript.

Grammar API Challenges

Another issue we faced was finding a grammar API for our Sentence Builder page. In spite of extensive searching we couldn't find one in time that could satisfy our needs. Currently, we still haven't found a grammar API we could use. As a result, our current version of LearnIt does not implement this feature.

Dictionary API Challenges

During our initial search, we struggled to find a free dictionary API that was usable. However, after digging through multiple potential dictionary APIs, we finally found one that fit our needs, which we currently use. Furthermore, another issue with dictionaries was finding one that supported translation, but we remedied this issue by adding in Google Translate.

Conclusion

During the timespan of this project, LearnIt has developed in many ways from brainstorming to our current version of the app. Through peer feedback, staff input, and insight from our target audience (user evaluations and observational studies), we have found ways to emphasize LearnIt as an **efficient** and **effective** learning tool. Furthermore, we have consistently pushed to have **clarity** at the forefront of our design.

In the design of our app, we strive for **flexibility** for users to create words as well as validation to verify that users are learning at each step of the way. Through the different versions of our application, we have integrated suggestions from both our target audience and peers. We have taken to heart ways in which we can continue to use LearnIt as a tool for helping those who struggle with the English language.

However, improvements to LearnIt do not stop here. As we move forward with our app, there are more things we wish to implement. First, we struggled to find a functioning grammar api, and this is something we plan to add in the near future as it is absolutely essential in learning a language. Furthermore, we hope to be able to expand LearnIt to **languages beyond English**. However, before embarking on that journey, we must gain understanding of these other languages. We will likely discover more improvements as we share LearnIt with a greater population.

Through this project, our team has come to understand the **power** and **understanding** that can be discovered through the theme of Deconstruction & Reconstruction. Thank you for taking this journey with us, and we hope you enjoy LearnIt!

Appendix

Github: https://github.com/cs160-summer-2021/p5-starter-code-team20

Slides:https://docs.google.com/presentation/d/1yt6JIKmtQMf0d0jh6qTxhnrIhGlQClAGWrgQHJRV_GU/edit?usp=sharing

Final Video: https://youtu.be/Hc7QAoqaSPI

Poster:https://drive.google.com/file/d/1Tdu2pItFDha8Bmo8q2EMk1jxSxSoQ2ZY/view?usp=sharing