Final Project Report

Group 10 Members: Royce, Lauren, Yadel, Kennedy

Alexa App Name: Study Muse

Contributions

- **Lauren:** 25% - Did planner mode, tasks, revised interface design, video
- **Yadel:** 25% - Did flash cards, create card, problem/solution overview, video
- **Royce:** 25% - Did Lecture task, problem/solution overview, tasks, video
- **Kennedy:** 25% - Did quiz task, prototype overview, storyboard

Problem and Solution Overview

We want to address the difficulty for blind and visually impaired students in creating, navigating, and responding to conventionally text study materials.

First of all, blind and visually impaired students have to step through every line of the text at the speed of the voice synthesizer, reducing the rate of studying.

Furthermore, searching through a document is not natural and there are no indications of where students are in the text. Also, the rate of learning is lowered because only one resource can be opened and referenced.

Lastly, the text to speech interfaces must receive responses word for word. Most text to speech interfaces must finish before awaiting the user input and long sentences result in long waiting times.

We propose to solve this difficulty by using Amazon Alexa as a real time, dynamic interface which allows students to manipulate study materials by utterances. Alexa can make the interface between text and speech more manipulable through: listening to short lectures, creating audio test materials, and planning through an audio planner/to-do list solely for school assignments. These functions turn the study material creation process more like a conversation, increasing the rate of learning and giving the students more control.

Tasks (Short Descriptions)

- **Do the tasks cover the interesting features of the project?**
  - The tasks cover a full study cycle for someone visually impaired, without the use of any visuals and everything is hands-free (voice only)
- **Do the tasks have an appropriate difficulty/complexity specified?**
  - The task allows for something most Text to Speech interfaces for studying do not have, flexibility in what is in the notes.
  - Furthermore, Study Muse works in the same space, removing the very large costs of changing tasks from quizzing and rehearsing, to creating reminders.

    - Due to sample utterance/intent schema constraints, we have to tell the user exactly how to say something for example when creating an assignment in planner mode, they cannot say “Create” because Alexa thinks that goes to Flash Cards Intent, they have to say “Create Assignment” and so we tell the user to fill in the blank in the following... “Blank Assignment”
- **Do the tasks altogether form a compelling story for the project?**
    - Yes because a user can create their flashcards, quiz themselves, create study plans, and listen to recorded lectures all in the same Voice Interface.
    - They have all these study tools accessible in one app

- FlashCards support the creation of a flash card deck or to go to an existing deck, then once in a deck you can begin creating flashcards. The user can listen to all the flashcards in a deck, they can also edit the term/definition and delete cards.
- Quiz Mode is based on the cards that users created. The feature allows a user to test their memorization of his/her Deck. Alexa says the definition and the user responds with the term by saying “The answer is (TERM)” Alexa notifies the user right away whether they were correct or not. Then once at the end of the cards Alexa tells the user how many terms they got correct. For example, 7 out of 10 correct.
- Planner mode supports listening to all pending assignments, creating assignments, and modifying/deleting existing assignments. Each assignment consists of the name, due date, subject, and any details for this assignment (ie. essay due May 10th, subject is english, details are it has to be one page, single spaced)
- Lectures mode plays back saved lectures from Amazon S3, the user can say to listen to his/her computer science, business, or sociology lecture. Then they are given the choice to continue in lectures mode or go back to main menu.

3 Representative Tasks

Flash Cards (Medium Difficulty Task)

The flash card task allows users to create their study materials as audio cards and organize them through cards. This allows a user to convert bulky text to speech or braille materials into dynamic audio cards without the help of visuals or physical interaction.

The intents to pass are as follows:

User	Alexa
Open Study Muse	Elicits one of the tasks
Flash Cards	Elicits deck name

The deck is {New/existing deck name}	Goes to deck / Elicits action (create, edit, delete, quiz)
Create	Elicits term
The term is {term}	Elicits definition
The definition is {definition}	Elicits continuation yes or no
Yes/No	Restarts Intent/Sends you back to main menu

Quiz (Easy Difficulty Task)

The quiz task uses the created flash cards and allows users randomized practice of the material. This allows the user to test their self with the materials they just created, giving them flexibility to what pieces of information they process, compared to text to speech interfaces.

The intents to pass are as follows:

User	Alexa
Open Study Muse	Elicits one of the tasks
Flash Cards	Elicits deck name
The deck is {DECK_NAME}	Elicits action (create, edit, delete, quiz)
Quiz	Gives first definition (The definition is …)
The answer is {term}	Gives next definition You can stop request from here

Planner (Hard Difficulty Task)

The flash card task allows users to create reminders and notify a user when one is given. This allows a user to create reminders in the same study work space which gives users mental space when studying.

The intents to pass are as follows:

User	Alexa
Open Study Muse	Elicits one of the tasks
Planner	Elicits action (listen, add, edit, delete)

Add assignment	Elicits assignment name
The name is midterm	Elicits date
May 10th	Elicits subject
The subject is history	Elicits details
The details are covers weeks 1 thru 6	Saves response / Prompts continuation
Yes / No	Restarts Intent/ go back to main menu

Revised Interface Design

FLASHCARDS mode

- During lo-fi testing, a user suggested that a confirmation was necessary to see if the correct words were recognized before going onto asking for the definition by saying “What is the definition of {term}?” at this point if it’s wrong the user can state “the term is ___” again
- During the critical incident log of our hi-fi prototype, we revised Alexa’s first utterance in the flashcard creation process to make straightforward that a user needs to create a deck in order to create cards subsequently.
- We realized “the deck is blank” is a little unintuitive, so in order to prompt the user what to say we now say “fill in the blank in the following, the deck is blank” so now it allows the user to realize they need to give the name after “the deck is…”

Fig 1. Flash Cards mode (fill in the blank in the following added)

QUIZ mode

- From low-fi testing, we realized it would be beneficial to provide the user with a scoring method that keeps track of how many terms the user answered correctly and report the score as a fraction (eg. 7 out of 10 correct) once they have reached the end which helps them see the overall progress that they made when it comes to memorizing/understanding the material.

- At this prototype stage, we also noted it would be inefficient for Alexa to ask the term and the user has to provide the definition because if the user messes up even one word (even though getting the main idea correct) Alexa will mark it as incorrect because she needs the exact words.

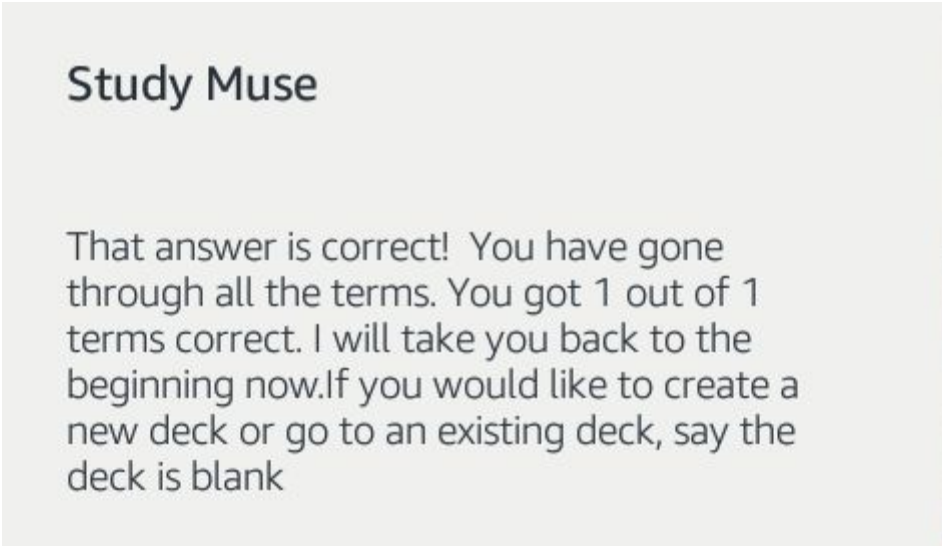


Fig 2. Quiz performance report

PLANNER mode

- A user noted that we should include subject as something Alexa asks for with the several tests that may happen at the same time.
- Alexa struggles with long details because of the limitations of Sample Utterances and AMAZON.LITERAL custom slots. For example, in our implementation both the Assignment Name and Assignment Details are AMAZON.LITERAL so Alexa wouldn't be able to tell which is which or the name would capture all the details. Now, we ask the user at each step for different information on the assignment and we ask the user to say "the name is…" "the subject is…" just to ensure we are capturing the correct data at each step
- Alexa gives confirmation at each step that she has received the previous information
- Alexa also gives a confirmation whenever a new assignment has been created by saying "{ASSIGNMENT_NAME} has successfully been added"

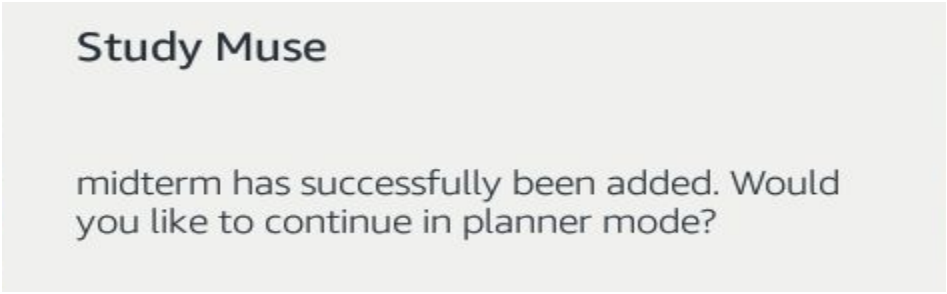


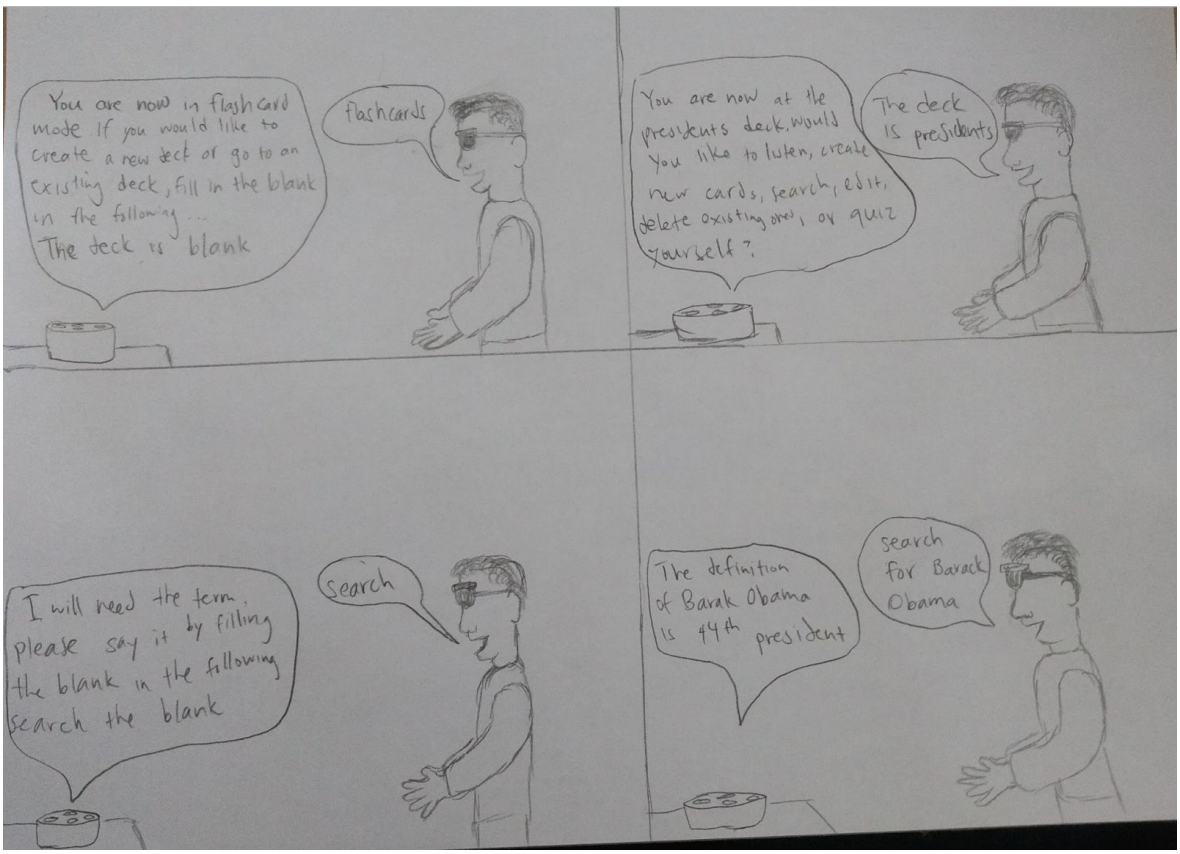
Fig 3. Display when assignment has been added

LECTURES mode

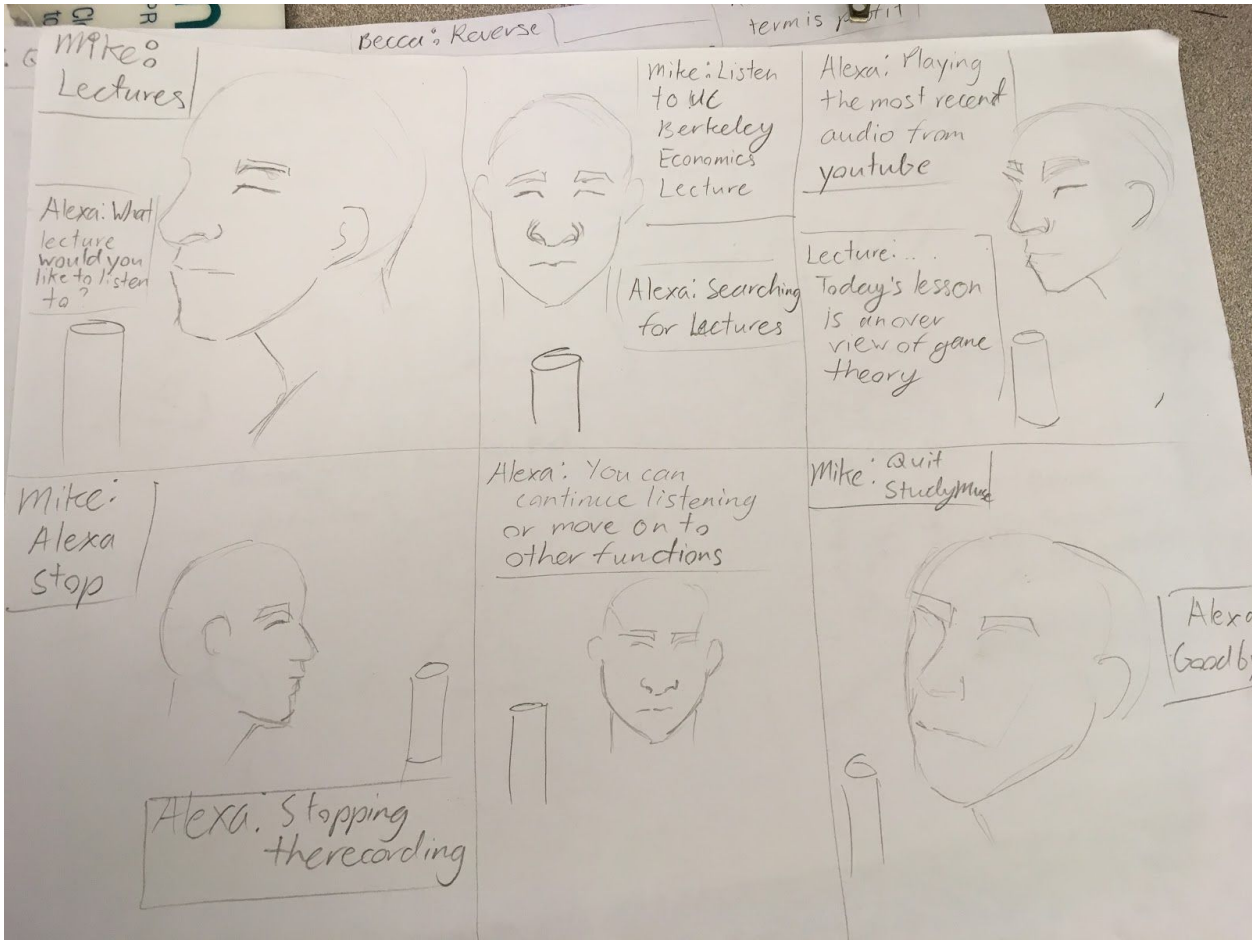
- We saved recordings in Amazon S3 because the Alexa audio tag requires the mp3 files to have a certain configuration that can only happen if you manually do it through audio converter software (such as setting bit rate to 48 kbps, saving as a valid MP3 file (MPEG version 2), and setting sample rate to 16000 Hz). The recordings we have saved in S3 have all been manually converted to comply with Amazon Alexa audio tag rules.
- Because of Alexa audio tag limitations and having to download audio software, a user cannot upload their own lectures solely voice only which would defeat our purpose, in the future we would have to use Amazon's new Audio Directives but for this prototype the user can listen to the lectures for the various subjects we uploaded

Sketches for Unimplemented Portions of the Interface

This implemented functionality sketch below is showing the search mode in flashcards. The user will say the deck, say search, give the term name they would like to look up, if it is present, Alexa will give the definition. If the term is not present, Alexa will ask the user if they would like to define it.



This implemented functionality sketch below is a revised way of asking the definition, given a term. Alexa gives a term and prompts the user to think of the definition. Then the user will note, correct or wrong, if the definition was right.



Storyboards

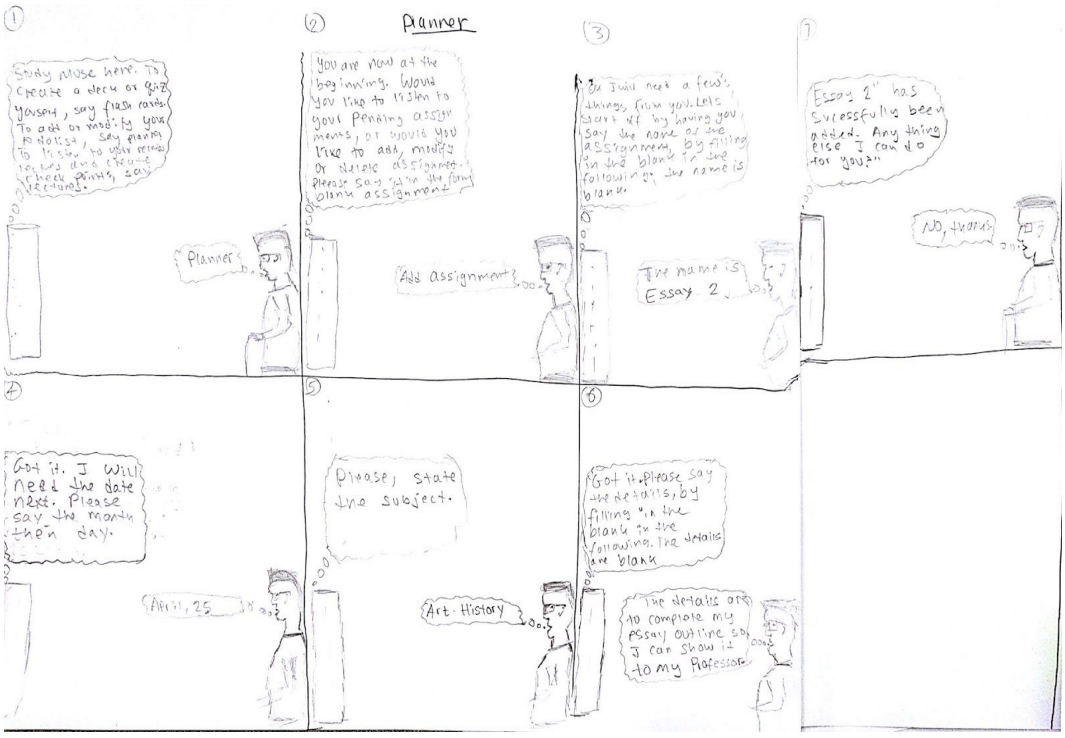


Fig 6. Adding an assignment in planner mode

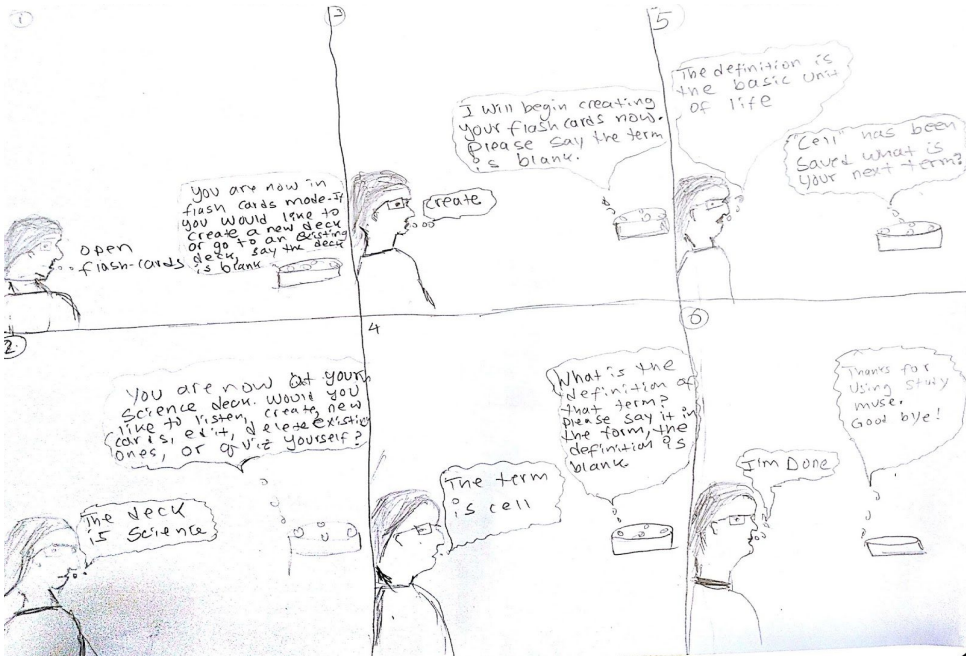


Fig 7. Creating a flashcard and quizzing

Fig 8. Listening to recorded lectures

Prototype Overview

In this prototype, we have developed functionality for four major tasks: planner, flashcards, quiz, and lectures. Since our application is voice based only, all the interactions that happen inside of the app are captured through the cards that are displayed in the Fire tablet. When the user first utters, “open study muse” they will get a response from Alexa providing them of all the possible tasks and how to exit (**Fig 9**). They can say “flash cards” to create a deck or go to an existing deck, then create, listen to their flashcards, edit, delete, quiz (**Fig 10**). Once they have at least one flash card in the deck, they can begin to quiz themselves (**Fig 11**). If the user says “planner” they can create, edit, delete, or listen to their assignments (**Fig 12**). Each assignment consists of name, due date, subject, and details. If the user says “lectures” they can listen to previously recorded lectures (**Fig 13**).

For the flashcards, we have created an edit and delete function for the final prototype, updating the second iteration prototype. The user can now add decks/flash cards, listen to them, edit, delete, and quiz at this current iteration of the prototype.

The checkpoint function for Lectures was removed from the prototype due to the limitation that we reached with Alexa audio directives.

The reverse function for the quiz task was left out because of the ineffectiveness that it had with the main functionalities of the application. The definition-term quiz works better than term-definition quiz because the User can miss a single word when saying the definition and they would not get the point for that question. We found that having Alexa say the definition with the User saying the term helps the User learn more

effectively since they will be able to hear a key word in the definition and recall the term that associates with the definition.

The flash cards and assignments will be stored in DynamoDB and will persist after a session has ended. With respect to our lecture feature, we will be using the Wizard of Oz technique of accessing a few sample audio recordings from Amazon S3 to demonstrate the functionalities of this feature.

From a user experience standpoint, we felt that it was easier for the user to utter “listen’ for both planner and flash cards which allows them to play back existing cards or todo lists, respectively. However, when implementing the two features with the same utterance it ended up creating a bottleneck because Alexa would get confused and automatically take the user to the flash card mode, since that's the first utterance it sees. Therefore, we needed to devise a work around where we have to instruct the user to say “{listen} to my assignments”/”{create/edit/delete} assignment” to hear their pending assignments on the planner or create, edit, delete assignments.

The limitations are that even when the user thinks they have spoken very clearly, because of accents or the way people say certain words Alexa (on the fire tablet) may hear differently and either bring up the error message and take the user to the beginning or not do what the user wanted. The sample utterances/custom slots also brought up a problem because Alexa may take the user to another intent if they thought they heard one of them. We tried to work around this by instructing the user exactly how to say the action. This brings up another limitation in that while Alexa is speaking, she is not listening so the user cannot “skip ahead” by saying what they want to do before she finishes speaking.

We didn’t use any libraries, we used the examples on Amazon’s DynamoDB website in order to get started and to see the functions we need to utilize.

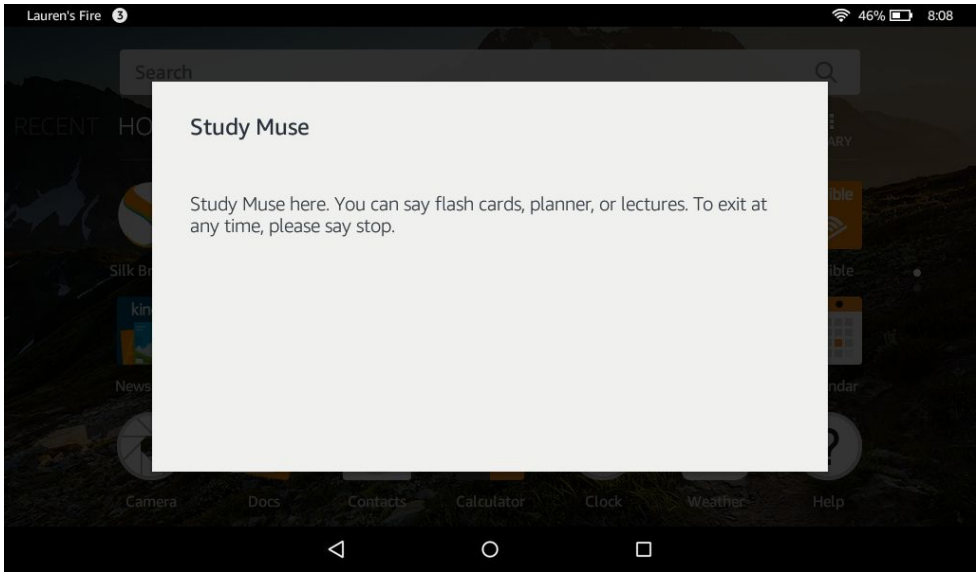


Fig 9. Hi-Fi on Amazon Fire Tablet

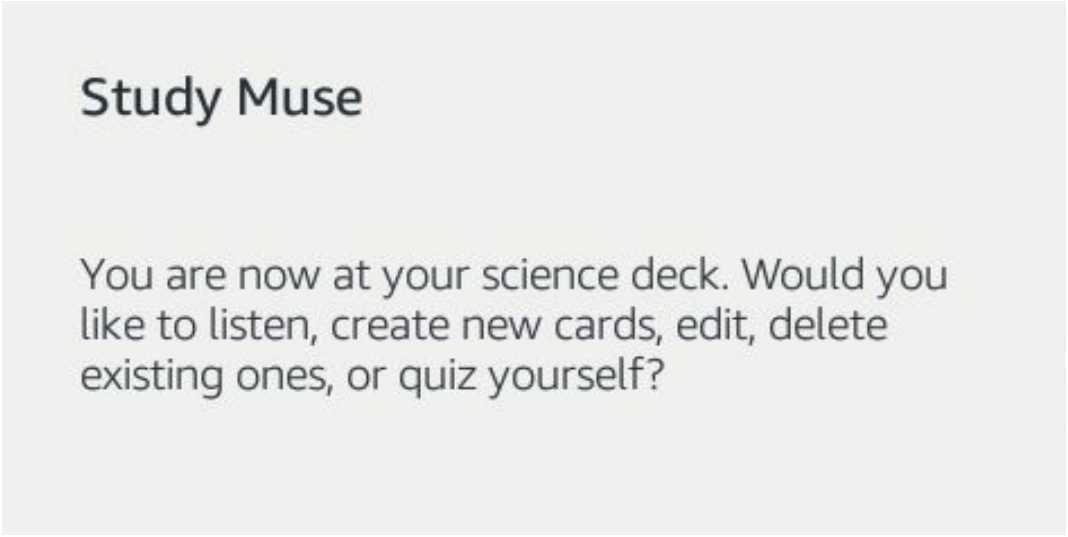


Fig 10. Flash Cards (in SCIENCE deck)

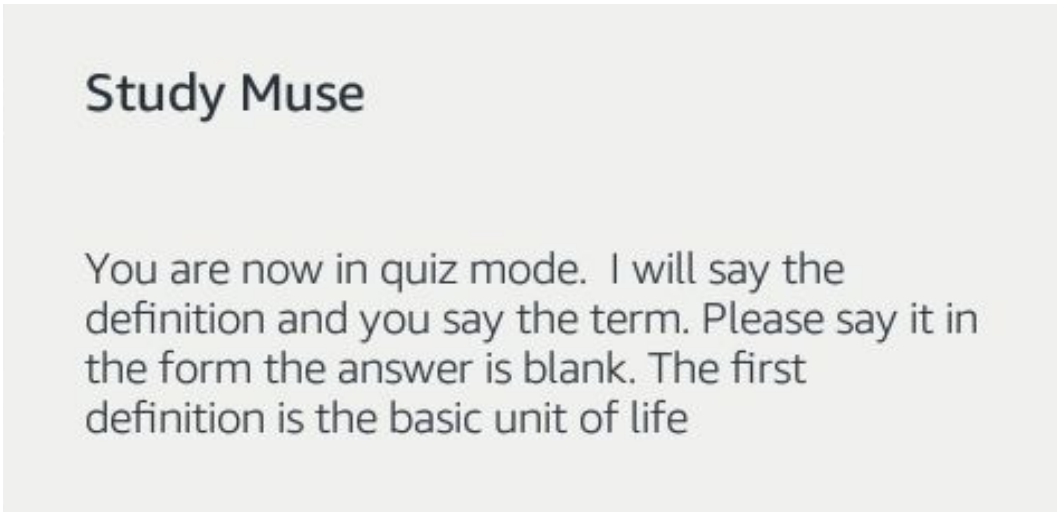


Fig 11. Quiz Mode

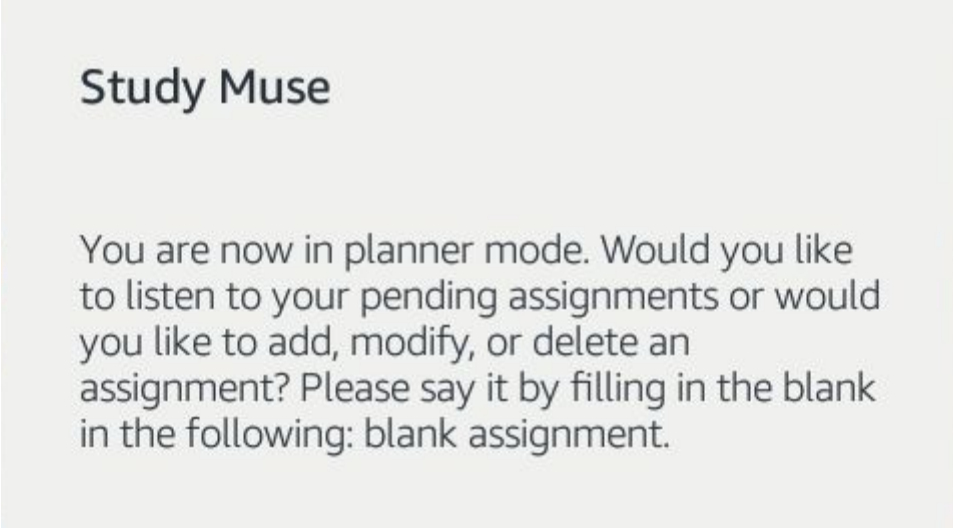


Fig 12. Planner Mode

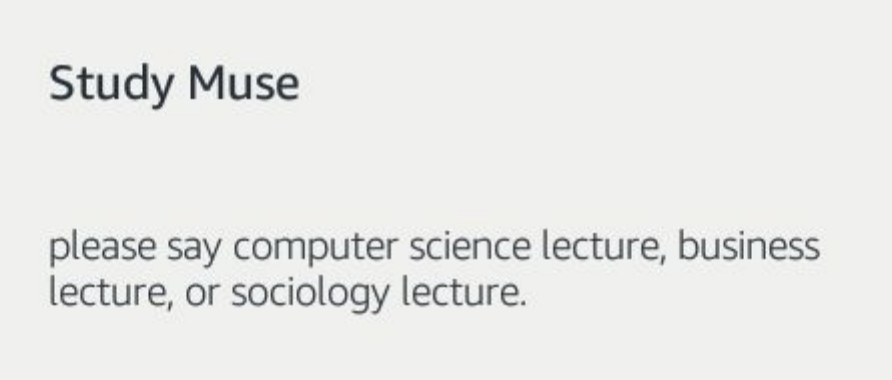


Fig 13. Lectures Mode

Prototype Video

https://www.youtube.com/watch?v=IuowMWHwTYw&feature=youtu.be