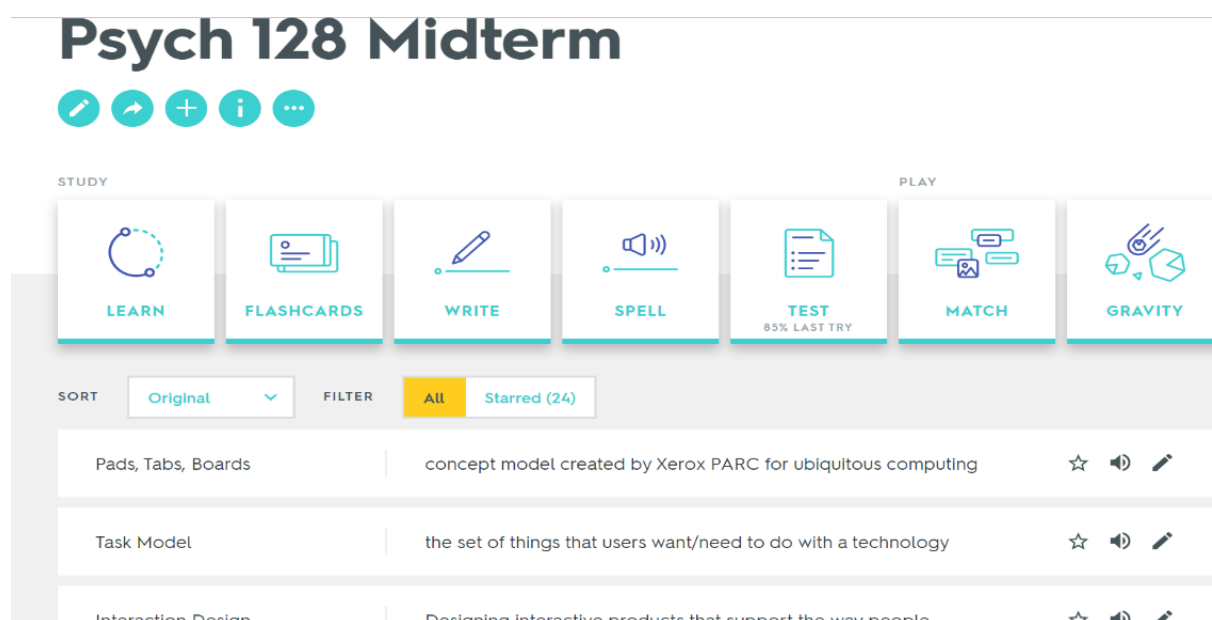


## Interface Evaluation of Quizlet



*Figure 1.* A display of the tools used to study a set of flashcards.

Oftentimes, students use self-testing methods such as flashcards to help them study. In a survey of 374 undergraduates, Wissman, Rawson, and Pyc (2012) showed that 67% of students reported using flashcards on a regular basis. With the increase in use of technology in the classroom, the implementation of technology used to study outside the classroom is also on the rise (Ross, Morrison, & Lowther, 2010). In 2005, Andrew Sutherland created Quizlet, which is an interactive online study tool that allows users to create virtual flashcards and aims to broaden the range of tools available with physical flashcards.

Quizlet is unique because it is a very customizable learning experience; Quizlet users can study their flashcards (called “study sets”) through a variety of seven different tools and games (see figure 1) that are designed based on cognitive science principles of learning and memory. For example, the “Learn” study tool is designed based on the spacing effect, which claims that information is better learned over multiple study sessions instead of crammed into one study session (Mulligan & Peterson, 2014). In addition, Quizlet allows users to upload images to their

flashcards and have their cards read to them by a computerized voice, allowing for dual coding of the material through the incorporation of linguistic (i.e. spoken text) and non-linguistic information (i.e. pictures) (Najjar, 1996). Another useful feature of Quizlet is that it allows users to study and edit other users' flashcards for a more collaborative learning process, which aids in conceptual learning (Mullins, Rummel, & Spada, 2011).

Quizlet is suitable for an evaluation because it is a great learning tool that is widely used with over 30 million users per month in over 130 different countries (Quizlet, n.d.). Any student can use Quizlet to study for tests from elementary school up through the university level. The purpose of this study is to evaluate Quizlet's most updated interface and suggest possible upgrades based on this data which may be beneficial to the millions of Quizlet users.

### **Experienced User Evaluations**

In order to identify user requirements, I conducted a semi-structured interview with two experienced users of Quizlet, which was audio recorded with an iPhone (See Appendix A for script). I have coded their names to maintain anonymity. User A is a 21-year-old female in her 4<sup>th</sup> year at UC Santa Cruz studying Intensive Psychology. She first started using Quizlet as a freshman in college, and she usually uses Quizlet whenever she has midterms, finals, or quizzes. She uses Quizlet at home, at the library, and other places on or off campus where she has access to her laptop computer. User B is a 20-year-old female in her 3<sup>rd</sup> year at UCSC studying games and playable media. She first started using Quizlet as a freshman in high school and usually uses it only to study for final exams. She uses Quizlet on her phone and her computer, whichever is more convenient at the time; if she were at the library, she would use her computer, and if she were on the bus or walking somewhere, she would use her phone.

When I asked User A what she uses Quizlet for, she stated that she mostly uses the website to create and study her own study sets, as well as look at other people's study sets. She also mentioned that when she is studying a set, she uses the "Flashcards," "Learn," and "Test" tools. She explained that the "Flashcards" tool is similar to using physical flashcards, which is what she is used to, while "Learn" and "Test" simulate practice tests and provide a way of testing and correcting yourself. She never uses the "Spell," "Gravity," or "Match" functions because "usually [she doesn't] need to learn how to spell things, and the games are just too hard." In order to further understand why she didn't like using the games, I asked her to play "Gravity" with an existing study set that she had previously learned. On multiple occasions, she knew the right answer but typed in the wrong form of the word (i.e. "binge" instead of "bingeing") and lost the game, which was frustrating for her. When she explained why she would use Quizlet over physical flashcards, she mentioned that she would always "lose [her] flashcards, and it takes longer to write out than it is to type or copy and paste information on Quizlet cards." She also prefers using Quizlet because of the ability to search other users' cards. Overall, she revealed that she likes Quizlet, but it is not her favorite way to study because it is limited to vocabulary-based learning.

User B claimed that she also uses the "Flashcards" and "Learn" tools the most "because it's a quick way to learn what you know and what you don't know." She further clarified that she uses "Learn" when she has a lot of time to study for a test and uses "Flashcards" to quickly flip through the cards if she does not have as much time. She does not use the game features because "learning games aren't fun." She uses Quizlet for classes that are memorization-based with a lot of vocabulary but can't use them for the classes in her major like game design, which are based on creation rather than memorization. When I asked her to tell me why she would use Quizlet

over physical flashcards, she explained that flashcards are “a waste of money and paper.” She also likes that Quizlet is more accessible than flashcards because “you can log in to Quizlet from any device, and you are more likely to have a device with you than your flashcards.”

When asked about how she felt about Quizlet overall, she revealed that “It’s alright. It’s pretty easy to use but it could be better.” She proceeded to reveal two of her frustrations with Quizlet—first, that it was “annoying you have to pay for special features like uploading photos,” and second, that the organization of the search results for other users’ flashcards could be improved. She explained that if she was trying to find a friend’s study set using the search feature, they wouldn’t show up in the search results; “You would think they would have an algorithm for those around you studying the same thing rather than just give you results of random people’s study sets.” Interestingly, Quizlet’s new features accommodate for these problems, but since she has not used the website since the update, she had not had a chance to use the features. With the “Classes” feature, Quizlet now filters study sets based on the user’s school and course they are taking in order to find the most relevant study sets for the user. In addition, the new “Diagrams” feature lets users upload photos and label them with terms and definitions to create a custom diagram, even without having to pay.

Upon analyzing patterns in the data and my own experiences with Quizlet, I was able to extract three main tasks that Quizlet users perform most frequently. Personally, I use Quizlet mostly to create and study my own sets because I learn best by rewriting my notes which is why I rarely utilize other users’ flashcards; however, both participants revealed that the feature they used most often was studying other users’ sets because it was easier and saved more time than creating their own set. In light of this data, two main user tasks were unveiled: creating a study set, and searching for other users’ study sets. In addition, I also use the “Learn” and “Flashcards”

functions the most when studying a set and never use the other tools, which aligns with both of the users' feedback. Because "Learn" has a clearly defined end goal (to "master" a set), I incorporated this tool into the third user task: using the "Learn" function to study a set.

### **Usability Testing**

After gathering data to uncover the three main user tasks of Quizlet, I proceeded to conduct a semi-structured interview with five participants who had never used Quizlet (see Appendix B for interview script). First, I asked background questions about the users' study habits and experience with other websites like Quizlet. Then, I conducted usability tests with the three main user tasks, which were recorded with screen-capture/audio recording software (see Appendix C for user tasks and Appendix D for detailed list of materials used). I recorded quantitative data (i.e. number of errors and task completion time) for each participant and each task (see Appendix E for data). Afterwards, I asked participants questions about their experience with the tasks and with Quizlet in general.

The participants are as follows. User C is a 28-year-old male who is a 4<sup>th</sup> year Ph.D. student at UCSC studying physical chemistry. User D is a 23-year-old female who is in her 4<sup>th</sup> year at UCSC studying math and education. User E is a 21-year-old male who is in his 4<sup>th</sup> year at UCSC studying bioengineering. User F is a 20-year-old female who is in her 3<sup>rd</sup> year studying politics at UCSC. And User G is a 25 year-old-male with a bachelor's degree in business management.

Task 1 was to use Quizlet to create a study set of flashcards that contains five predetermined word pairs (i.e. One – Cat, Two – House, etc.). I chose the number of flashcards carefully so that the participants weren't too overloaded with memorization in the second task but also to assure there were enough flashcards so that a study tool would be useful for learning

the cards. To complete this task, participants had to find the “create” button, enter a title, enter the terms and definitions, and then click another “create” button to finish creating the set, signifying the end of the task.

One source of struggle with this task was initially finding the first “create” button. User C took 1 minute 54 seconds to find the “create” button after mistakenly clicking on “create a folder”. From there, she couldn’t figure out the next step to take and expressed her confusion; “I guess I don’t really know what I’m doing.” When I asked her what led to her confusion in the exit interview, she attempted to retrace her steps through the website, but this time she saw the “create” button on the homepage and asked, “Was that there the whole time?” implying that she didn’t see the button the first time around. User E took 22 seconds to find the “create” button after making an error of clicking on the username first. Users D, F, and G found the “create” button in 5, 11, and 12 seconds, respectively, after scanning the homepage. This data implies that the create button is not visible enough to see right away.

The second source of struggle for task 1 was the loading screen after pressing the create button, which confused two participants (see Appendix F for screenshots of the loading screen). After participants pressed the “create” button, it took 2 seconds for part of the page to load (see figure 2) and took an additional 6 seconds for the rest of the page to load (see figure 3). During this time, User C clicked on the text box to enter the first term before the page fully loaded, which was replaced by the button to create a diagram after the page fully loaded. The click did not register until after the screen loaded, so it ended up opening “file explorer” in Windows for uploading an image to create a diagram. In this case, I stepped in to help the user exit out of the file explorer. When User D saw the partially loaded screen, he saw the text box to input the terms, but when the screen fully loaded, he became confused; “Wait, I don’t know what just

happened. It took me to a different page,” and then had to go back and retrace his steps. The loading screen caused confusion for both participants, which led them to make errors.

Other observations for task 1 included the time it took participants to find where to enter terms and definitions. It took participants an average of 18 seconds to scan the page and find where to enter terms and definitions after entering the title, revealing that this was not easy to find. Additionally, Users F and G hesitated to press the final “create” button. In the exit interview, User F mentioned that she hesitated because she was not sure if it would save her set or make her start over. This implies that having to press the “create” button twice is confusing for participants. Overall, it took users an average of 2 minutes and 9 seconds to complete task 1, and users made between 0 and 3 errors each.

Task 2 was to use the “Learn” study tool to memorize the five word pairs that were created in task 1. The “Learn” tool is an adaptive learning function that begins by showing a definition and then asking the user to choose the term that goes with the definition out of four multiple choice answers. As users get the answers right, the questions get harder for that particular card (i.e. asking users to recall and type in the term). “Mastering” a card means getting a correct answer to that card twice in a row. Once all cards in a set are mastered, Quizlet displays a “Congratulations” page which signals the end of task 2.

Overall, participants found this task to be very intuitive. All participants found the “Learn” button right away (within 3-4 seconds upon the start of the task), and there were no usability errors made in this task. On average, participants took 3 minutes and 46 seconds to complete this task. In the exit interview, most participants had positive feedback, saying that the “Learn” function was “straightforward,” and they found that multiple forms of inputting an answer was helpful for learning the cards. Although User E also thought the tool was easy to use,

he did not appreciate the negative feedback received in the form of a half-frowning emoji when he got an answer wrong. As he received the negative feedback, he laughed and commented, “Wow, frowny face, maybe be a little less disappointed in me.” In response to positive feedback from getting an answer right, User E said, “See, I like the happy face more.” User C and User F also commented that the positive feedback was fun and encouraging. I observed that participants had no trouble using the “Learn” function and seemed to be invested and engaged with the tool.

Task 3 was to find another user’s study set for a specific class (Psyc 1- Intro to Psychology at UCSC). There were multiple ways this task could’ve been achieved. The simplest path would be for participants to use the search bar to look up “Psyc 1 UCSC” and click on a study set that was relevant to the course, marking the end of the third task. However, most participants did not follow this path, either because errors were made along the way or because they used the “Classes” feature instead.

Users D and G conducted their search without the “Classes” feature. User D found the search bar within 6 seconds and found a relevant study set but made an error by clicking on the username of the person who created the study set instead of clicking on the study set itself. This task took him a total of 2 minutes and 30 seconds. User G struggled to find the search bar. He initially clicked 2 different study tools, but he eventually found the search bar after 58 seconds and then found a relevant study set after 2 searches. In total, the task took him 2 minutes 5 seconds. Both participants made 3 errors each.

Users C, E, and F utilized the “Classes” function to carry out their search. User C started out using the search bar but couldn’t find any relevant search results, so she clicked on the “Classes” button to find the study set. In total, it took her 2 minutes 26 seconds. User F followed the same path as user C, taking a total of 1 minute and 24 seconds. User E started by clicking on



the homepage and mistakenly used the search bar that filters your own study sets, which produced no results. He then decided to try the “Classes” method and was able to find a study set within 1 minute and 45 seconds. Each participant made 1 error. Since participants consulted the search bar first and used the “Classes” function as a backup, this implies that initially figuring out how to complete this task is not intuitive at first, but through exploration of the website, all users were able to find the correct study set. In the exit interview, User E and C revealed that the search using “Classes” produced more relevant results than expected.

Although participants reported that they really liked having the ability to search for other users’ flashcards, participants struggled the most with this task. Errors included typing in a search that didn’t produce relevant results (4), clicking a wrong button (3), using the wrong search bar (1), and clicking on an irrelevant study set (1). Contrary to expectations, I found that users who used the more direct route by using the search button took longer and made more errors than users who used the “Classes” feature. In addition, all errors from getting irrelevant search results came from using the search button. This implies that “Classes” may be more intuitive for novice users and produces more relevant results than directly using the search button.

## **Evaluation**

Overall, the website fulfilled many usability goals. The website is safe to use, as errors did not result in any dangerous or extremely undesirable situations. Users from both interviews claimed that the website was intuitive and easy to use in general. Naïve users were able to complete all tasks in a timely manner with relative ease. In addition, due to the limitations of physical flashcards, experienced users commented that Quizlet is very useful to them for conveniently and quickly learning material.

Quizlet also follows many design principles such as an interface that support recognition over recall, user control, proper feedback, recovery from errors, and matching. For example, There are many buttons displayed that make what functions are available more visible, such as the 7 study tools displayed as large icons in the center of the screen. The visibility of the functions on the screen ensures that users do not have to remember complex navigations to use a tool. Additionally, the combination of proper feedback from errors and user control (i.e. back buttons) allows users to recover from errors by quickly recognizing their mistake and knowing how to carry on. This prevented naïve users from getting stuck on a task. Furthermore, Quizlet's interface matches users' real-world knowledge of how to use physical flashcards, allowing users to have a good mental model of how the system works (i.e. "flipping" cards to see a definition).

On the other hand, Quizlet's design could improve with respect to visibility of system status, visibility of major functions, minimalistic interface, consistency of functions, and affordances. For example, users became confused with the loading screen that was displayed before creating a set because the system did not properly communicate to the user that the page was still loading. One other major issue for three participants was their inability to quickly find the "create" and "search" buttons because they only appear as small buttons in the top left-hand corner, even though these are major functions of the website. In addition, participants also struggled with finding the text box to enter terms and definitions because users didn't realize they needed to scroll down. I observed that although the numerous, large icons are helpful for knowing what functions are available, some objects, such as the text box to enter terms, were hidden by having to scroll down. The overall "busyness" of the interface also made it hard for naïve users to scan the website efficiently. Furthermore, in order to create a set, users need to press two buttons that say "create," one to start creating a set and one to finish creating a set.

This inconsistency was confusing for participants because they were unsure if pressing the second “create” button would save their set or make them restart. Finally, it is not evident that users can search other users’ study sets just by looking at the search button. In this way, searching for other study sets is a “hidden affordance” of the search button for novice users.

## **Discussion**

Based on the data from the usability test, improvements could be made to the website to further support the user experience. First, I propose that major features of the website, like the search and create buttons, should be bigger and more centered to enhance visibility of these features. Furthermore, the loading screen before the “create a set” page could be fixed by loading the whole page at once and adding a page-loading icon in order to improve the visibility of the system status. Also, fixing the amount of scrolling required by adding an option to make icons and features smaller or by hiding features that are not as important would make the interface less overwhelming and more minimalistic. In addition, I suggest modifying the search button to say “search other students’ study sets” in order to make this feature more clear as to what it offers. Lastly, in regards to creating a set, my recommendation is to change the second create button to “finish” or “done” to reduce user anxiety about the inconsistency of the two “create” buttons.

In general, people hold a positive regard towards Quizlet. Students have commented that the system is useful, intuitive, and more fun to use than physical flashcards when studying for tests. There are no major design flaws that prevent users from accomplishing certain tasks; however, the improvements listed above would introduce more design principles as well as balance between these design principles in order to make the Quizlet experience even more intuitive and enjoyable.

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## Appendix A

### Experienced User Interview Script

#### Introduction

Hi my name is Anna. The goal of this interview is to learn about your experiences with Quizlet and to help me understand how you use this tool. This interview should last 20-30 minutes. We can stop at any time if you need to take a break and you are free to end the interview at any point with no negative repercussions.

I would like to watch you interact with Quizlet on your own device, or we could use a test account if you feel more comfortable with that. Which would you prefer?

I would also like your permission to record this session for reference later when writing my report. Do I have your permission to video record? [If yes] Ok great! I'll start the recording now.

#### Questions

1. How old are you? What is your level of education? What do you study?
2. What is your preferred method of studying?
3. When did you first start using Quizlet?
4. When was the last time you used Quizlet?
5. How often do you use Quizlet?
6. When/ in what setting do you typically use Quizlet?
7. On what devices do you use Quizlet?
8. What kinds of things do you use Quizlet for? Anything else?
9. Which Quizlet's 7 study tools do you use?
10. Can you show me your most recent study set and how you would study these cards?
11. What else do you do with Quizlet?
12. Do you ever play the games? Why/ why not?
13. Which do you do most frequently: Make your own study sets or use other peoples' study sets?
14. Do you ever use diagrams? Why/why not?
15. Do you ever create folders?
16. Do you ever join or create classes?
17. Show me how you would typically go through a study set.
18. Do you use the star feature? What for?
19. What do you do with the study sets you've created?
20. Do you use physical flashcards or Quizlet more often? Why?
21. (If Quizlet is used more often): In what scenarios would use physical flashcards instead of Quizlet?  
(If physical flashcards are used more often): In what scenarios would you use Quizlet instead of physical flashcards?
22. Can you think of other websites that offer the same service as Quizlet?

23. Do you think Quizlet is intuitive and easy to use? Why/why not? Can you give me an example?
24. What feature of Quizlet do you use most often? Why?
25. Is there any feature of Quizlet that you never use? Why?
26. What types of classes does Quizlet help you with the most? Why?
27. Are there any classes that you wouldn't typically use Quizlet with? Why?
28. What features of Quizlet do you like the most?
29. Is there anything frustrating or confusing about the website? What?
30. Is Quizlet effective in helping you learn the material? How so?
31. Overall, how do you feel about using Quizlet?
32. Do you have anything else you want to share about Quizlet?
33. Do you have any questions for me?

Thank you for answering these questions! I'll turn off the recording now.

## Appendix B

### Usability Testing Interview

#### **Introduction**

Hi, my name is Anna. The goal of this study is to identify any design issues with Quizlet and to help me understand where this tool could be improved. This study should last about 30 minutes or less. No breaks are scheduled, but we can stop at any time if you need one. You are also free to completely stop this interview at any point with no negative repercussions.

First I will be asking you some background questions and then I will give you 3 different tasks to perform with Quizlet on this device using a test account [present device]. Afterwards, I'll ask you some questions about your experience with Quizlet. I want to emphasize that I am not testing you personally or your own ability to complete these tasks. The goal of this study is to see where this technology could be improved, so please be honest and don't worry about performing everything correctly.

Also, I would like your permission to record this session for reference later when writing my report. Do I have your permission to audio record and use screen capture? [if yes] Thanks, I will start the recording now.

#### **Background Questions**

1. How old are you? What is your year/level of education? What do/did you study?
2. What is your preferred method of studying? Why?
3. Have you used any systems similar to Quizlet like flashcards or other virtual study tools?  
(If yes to #3):
4. Which systems?
5. How frequently do you use these tool?
6. What do you like and dislike about these tools?
7. Are these tools helpful? How so?

Thank you for answering those questions. Now I am going to ask you to complete 3 tasks using Quizlet.

**[Give participants one task at a time and ask them to read the tasks aloud]**

#### **Exit Interview**

Now I'm going to ask you questions about your experience:

1. Were there any features of Quizlet that you liked?
2. If so, what were they? Why?
3. Were there any features of Quizlet that you did not like?
4. If so, what were they? Why?
5. Were there any features that were easier than you expected? How so?
6. Were there any features that were more difficult than you expected? How so?

7. Was there anything surprising or confusing to you?
8. Did you ever get frustrated when you were completing the tasks? If yes, When/why?
9. I noticed you struggled with \_\_\_\_\_. Can you talk me through why this confusing or difficult?
10. Do you think the “create a study set” feature could be improved? If so, How?
11. Was the “learn” feature effective or ineffective with helping you memorize the cards? How so?
12. Do you think the learn feature could be improved? How so?
13. Would you ever use Quizlet if you had to study for a test in the future? Why/ why not / in what situations? (or if you knew about Quizlet in the past, do you think you would have used it to study for tests?)
14. On a scale of 1-10 rate your experience with Quizlet with 1 being you hated it and 10 being you loved it
15. On a scale of 1 -10 rate how easy or hard Quizlet is to use with 10 being super easy and 1 being nearly impossible to use.
16. If you could change anything about Quizlet to improve your experience, what would it be?
17. Any final comments about your experience you would like to add?

Great! That’s the end of the interview, I’ll turn off the recording now. Thank you so much for participating, your feedback was extremely helpful. Do you have any questions for me?



## Appendix C

### User Tasks

**Task 1:**

Create your own study set of 5 flashcards with the following terms and definitions:

Terms: One, Two, Three, Four, Five

Definitions: Cat, House, Tree, Water, Pencil

Please name this study set "task one".

As you go through this task, I encourage you to vocalize your thought process and what your intention is with each move.

**Task 2:**

Use the “Learn” function to study the set of cards you’ve created until you’ve “mastered” the set. (Don’t worry too much about memorization, if you are struggling to master the cards, you may opt to move on to the next task.)

**Task 3:**

Imagine you are taking an intro to psychology course (Psyc 1) at UCSC. There is an exam coming up and you don't have time to create your own flashcards. Your task is to find a study set somebody else has made for that specific course to study from (you will not have to memorize these cards as in task 2). Please vocalize your thought process as you complete this task.

## Appendix D

### Materials

- laptop computer
- Quizlet
- FlashBack Express 5 screen recording software
- iPhone Voice Memos sound recording app
- Interview script for experienced user evaluations
- Interview script for usability testing
- 3 user task descriptions

Appendix E  
Quantitative Data

**Participant Summary**

<b>Participant</b>	<b>Task</b>	<b># Errors</b>	<b>Total Time (min:sec)</b>
<b>User C</b>	1	3	3:19
	2	0	3:46
	3	1	2:26
<b>User D</b>	1	1	2:29
	2	0	4:30
	3	3	2:30
<b>User E</b>	1	1	1:22
	2	0	2:15
	3	1	1:45
<b>User F</b>	1	0	1:50
	2	0	4:16
	3	1	1:24
<b>User G</b>	1	0	1:45
	2	0	4:03
	3	3	2:05

**Task Summary**

<b>Task</b>	<b>Total # of Errors</b>	<b>Average Total Time (min: sec)</b>
<b>Task 1</b>	5	2:09
<b>Task 2</b>	0	3:46
<b>Task 3</b>	9	2:12

## Appendix F

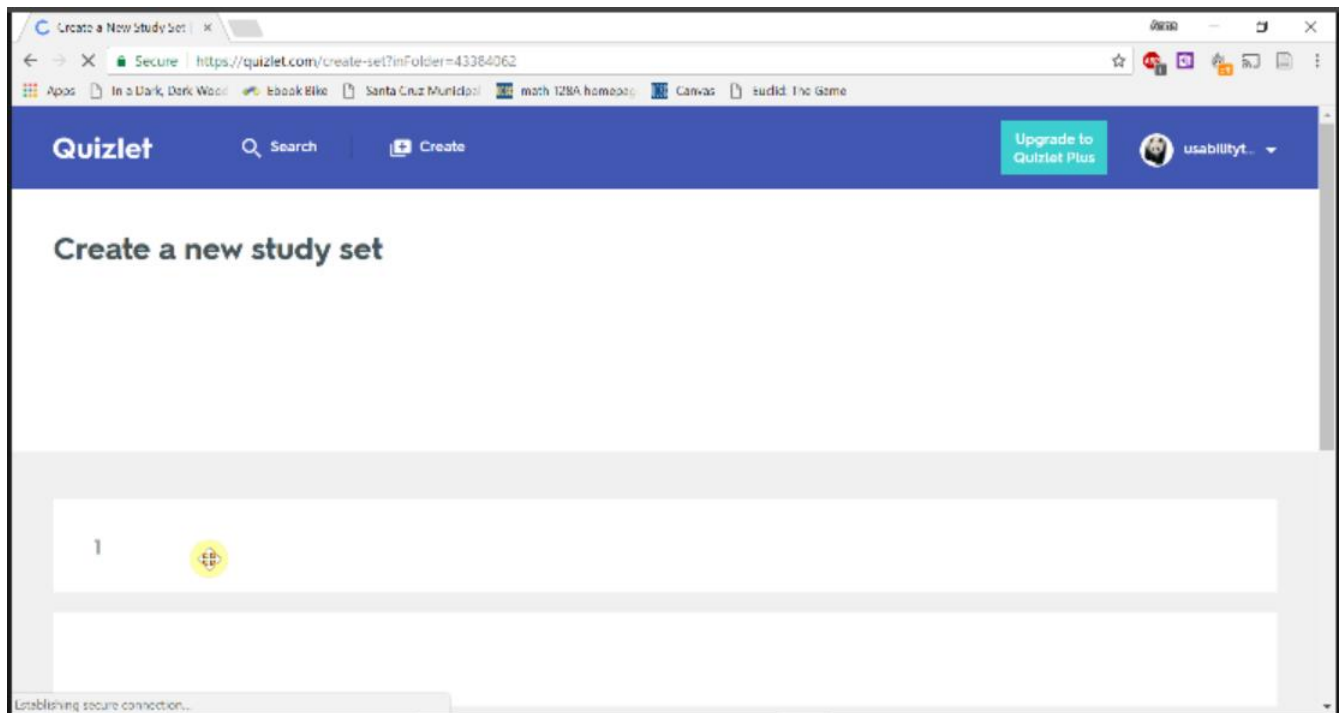


Figure 2. Screenshot before the “Create a study set” page has fully loaded.

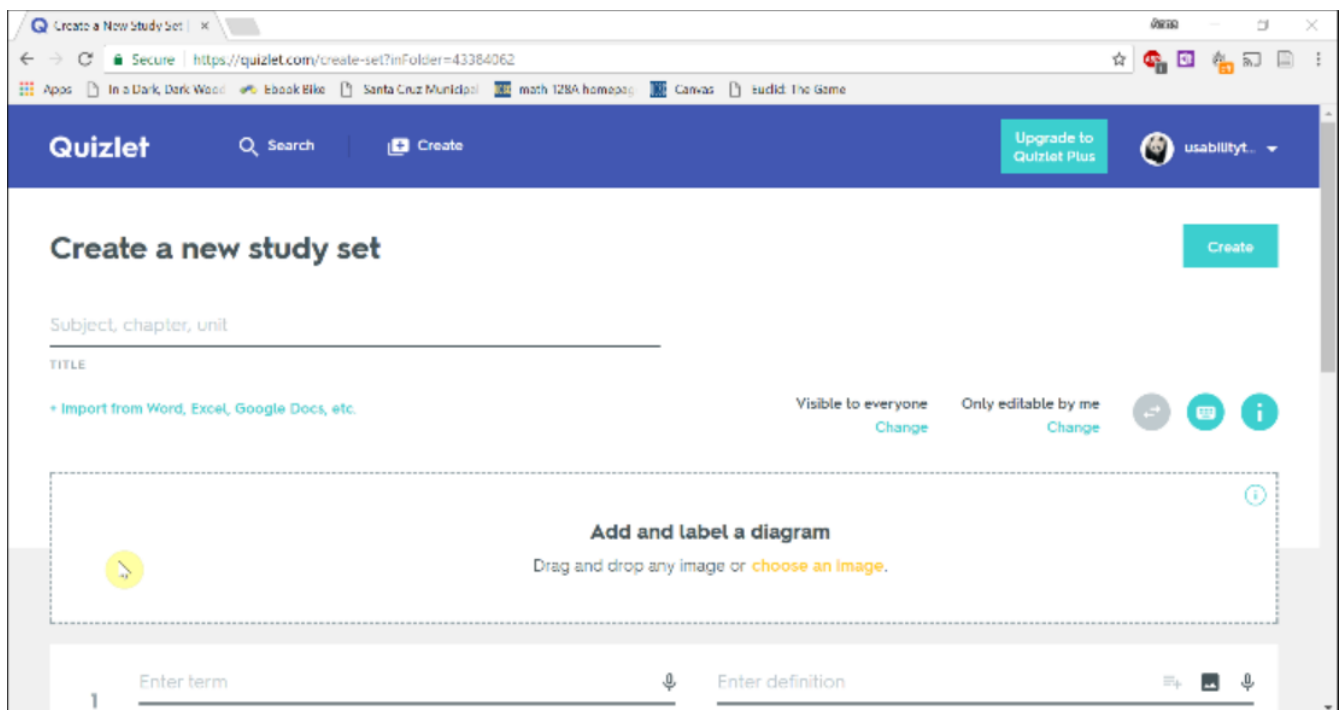


Figure 3. Screenshot after the “Create a study set” page has fully loaded.