



Collaboration Team

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The Problem

- ❖ Many students have questions in class.



The Problem

- ❖ Not all students ask their questions in class.



The Problem

- ❖ Instructors don't know if students have questions.



Who has a question???





<http://www.washington.edu/dreamproject/get-involved/join/>

The Problem

- ❖ Students don't remember every topic to study.



The Problem

- ❖ Students don't remember every topic to study.



The Problem

- ❖ Students don't remember every topic to study.



The Problem

- ❖ Many students have questions in class.
- ❖ Not all students ask their questions in class.
- ❖ Instructors don't know if students have questions.
- ❖ Students don't remember every topic to study.

The Tasks

- ❖ Community Driven Questions
- ❖ Data Driven Study Planning

Initial Paper Prototype - Home Screen

Your Classes

Fake Class 102



Initial Paper Prototype - Lecture List

Fake Class 102

Lecture #	Topic	Difficulty	Importance
2	Alpha, Beta, & Gamma	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★★
		0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★★
1	Introduction	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★
		1 ★	0 ★
		0 ★★	1 ★★
		0 ★★★	0 ★★★

Fake Class 1

Lecture #	Topic	Difficulty	Importance
1	Introduction	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★
		1 ★	0 ★
		0 ★★	1 ★★
		0 ★★★	0 ★★★
	α and β	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★



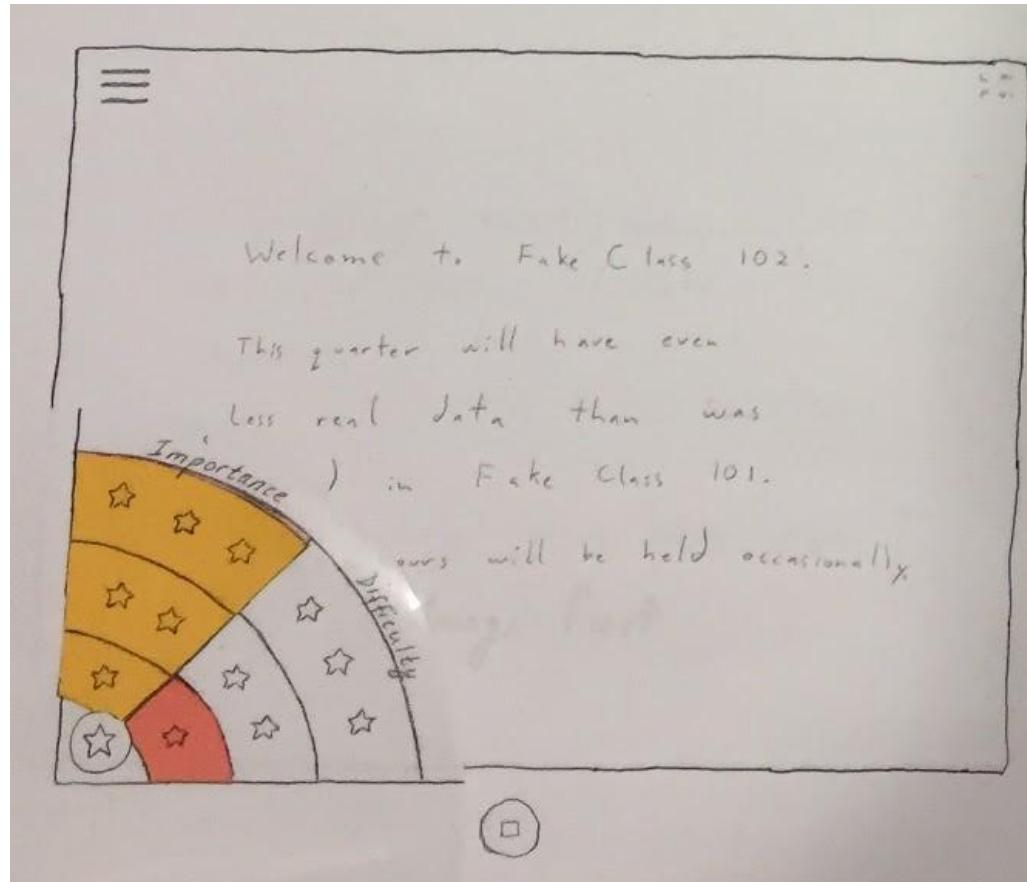
Initial Paper Prototype - Lecture Topics

A hand-drawn paper prototype of a mobile application interface. At the top, there is a title "Lecture 2". Below the title is a table with six columns. The columns are labeled "Slide", "Topic", "Importance", "Difficulty", "# of Questions", and "Notes/Questions". There are four rows in the table, each corresponding to a slide number from 1 to 4. The "Topic" column contains handwritten text: "Alpha, Beta, & Gamma" for slide 1, "Alpha, Beta, Gamma" for slide 2, "Unusual Equations" for slide 3, and "unusual Equations" for slide 4. The "Importance" and "Difficulty" columns are empty. The "# of Questions" column has a value of 3 for slide 1, 2 for slide 2, 1 for slide 3, and 0 for slide 4. The "Notes/Questions" column is also empty.

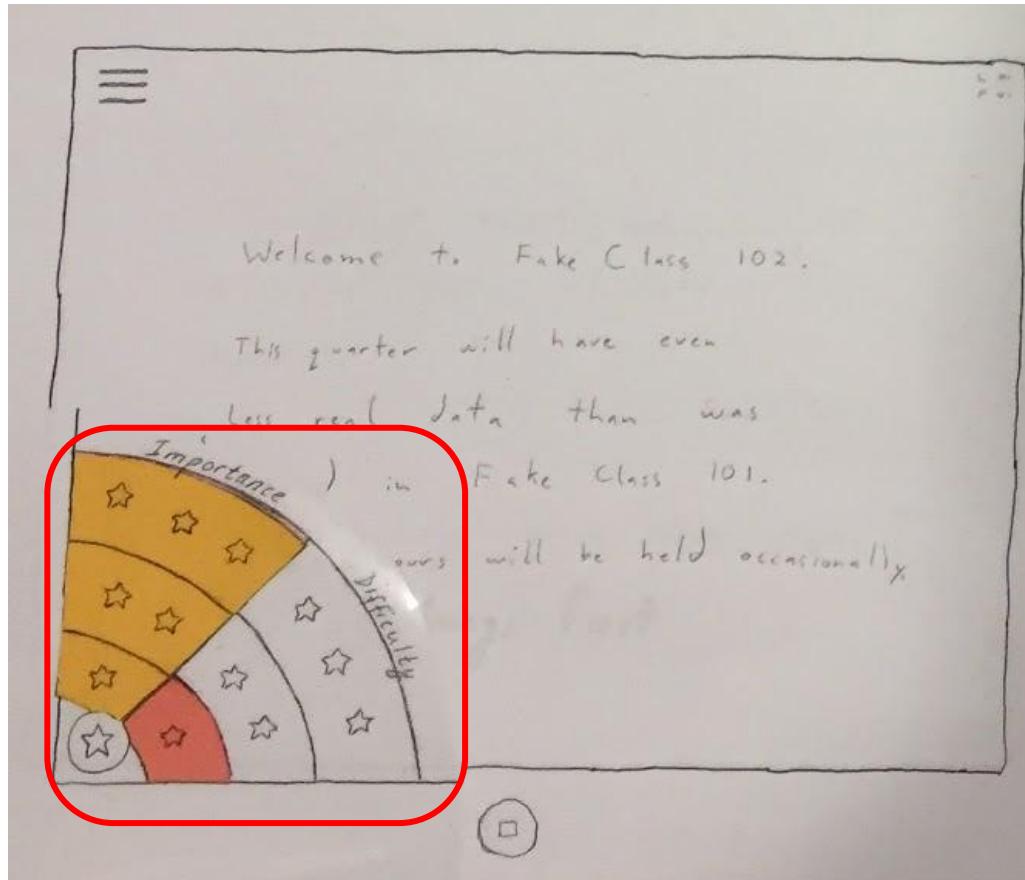
Slide	Topic	Importance	Difficulty	# of Questions	Notes/Questions
1	Alpha, Beta, & Gamma			3	
2	Alpha, Beta, Gamma			2	
3	Unusual Equations			1	
4	unusual Equations			0	



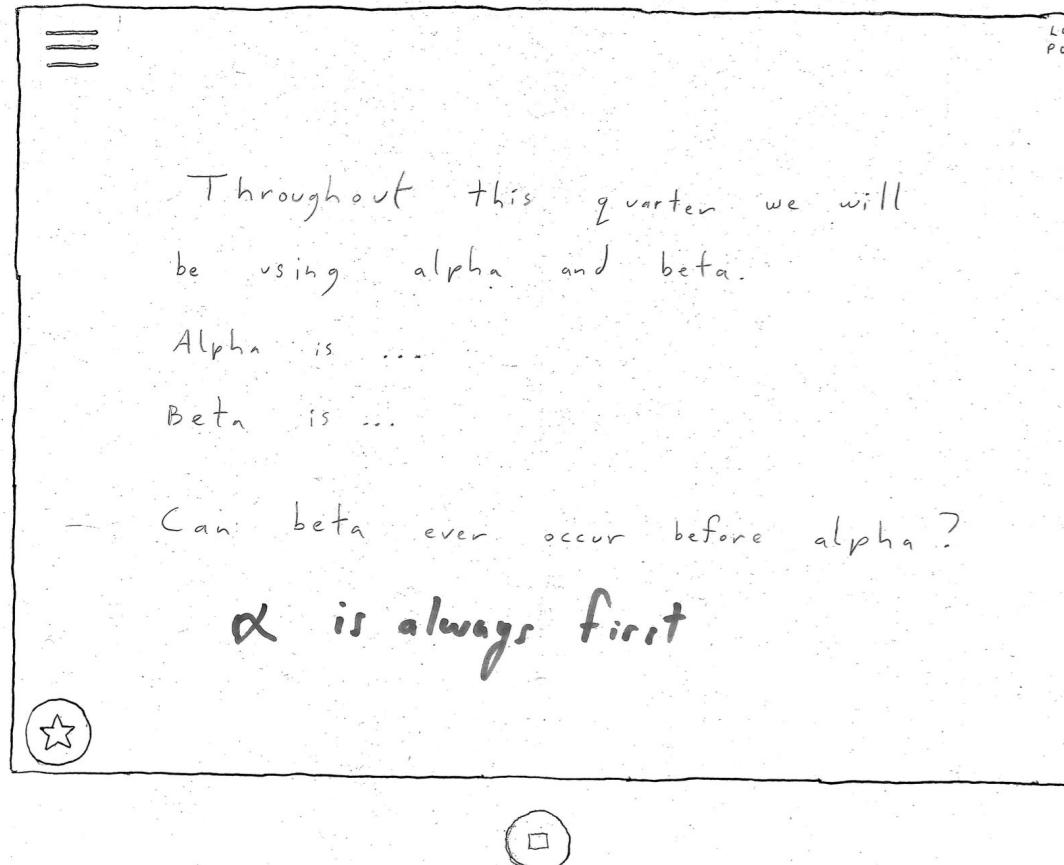
Initial Paper Prototype - Rating Screen



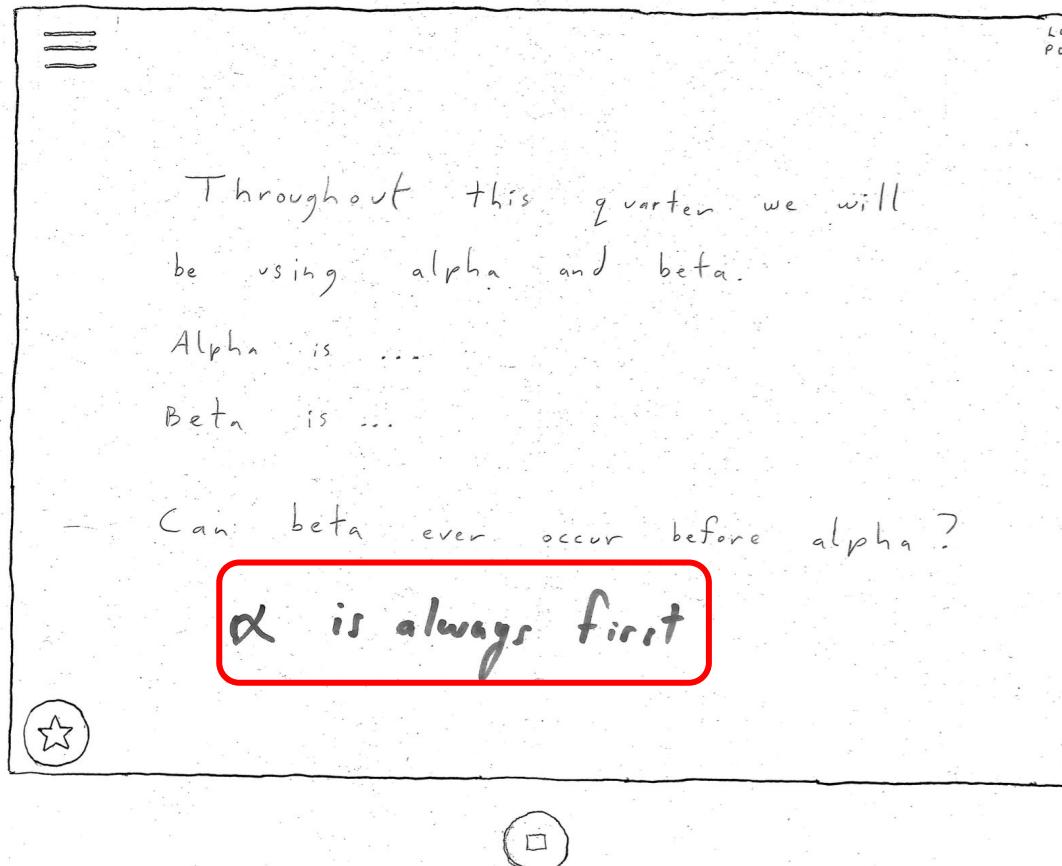
Initial Paper Prototype - Rating Screen



Initial Paper Prototype - Notes/Questions



Initial Paper Prototype - Notes/Questions



Initial Paper Prototype - Help Screen

How To Use Study^a



← FC 102

- Take notes directly on the slide.
- When you have a question, add a "???" to the end of the note.

What is x???

→ Common questions will be automatically sent to the instructor.

- Use the "★" in the bottom left corner to rate the slide to aid with studying in the future.

🏠 Home

🔚 Lectures

❓ Help

Initial Paper Prototype - Help Screen

How To Use Study^a



← FC 102

- Take notes directly on the slide.
- When you have a question, add a "???" to the end of the note.

What is x???

→ Common questions will be automatically sent to the instructor.

- Use the "★" in the bottom left corner to rate the slide to aid with studying in the future.

🏠 Home

↳ Lectures

❓ Help

Initial Paper Prototype - Help Screen



Initial Paper Prototype - Lecture info

A hand-drawn paper prototype of a lecture information card. The card has a header "Fake Class 102" and a sidebar with three horizontal lines. It contains two tables, one for Lecture 2 and one for Lecture 1.

Lecture #

Topic

Difficulty

Importance

2	Alpha, Beta, & Gamma	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★
		0 ★	0 ★
	Unusual Equations	0 ★★	0 ★★
		0 ★★★	0 ★★★

1	Introduction	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★
		1 ★	0 ★
	α and β	0 ★★	1 ★★
		0 ★★★	0 ★★★



Initial Paper Prototype - Lecture info

Fake Class 102

Lecture #	Topic	Difficulty	Importance
2	Alpha, Beta, & Gamma	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★
		0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★★	0 ★★★★
1	Introduction	0 ★	0 ★
		0 ★★	0 ★★
		0 ★★★	0 ★★★
		1 ★	0 ★
		0 ★★	1 ★★
		0 ★★★★	0 ★★★★



Initial Paper Prototype - Topic info

The image shows a hand-drawn paper prototype of a mobile application interface. At the top, there is a title "Lecture 1". Below the title is a table with six columns. The columns are labeled "Slide", "Topic", "Importance", "Difficulty", "# of Questions", and "Notes/Questions". There are two rows in the table. The first row contains the values: 1, Introduction, 2 stars, 1 star, 0, and nothing. The second row contains the values: 2, α and β , 2 stars, 1 star, 2, and α is always first. The entire prototype is enclosed in a rectangular border.

Slide	Topic	Importance	Difficulty	# of Questions	Notes/Questions
1	Introduction	2	1	0	
2	α and β	2	1	2	α is always first

Initial Paper Prototype - Topic info

A hand-drawn paper prototype of a table for managing topic information. The title "Lecture 1" is at the top. The table has columns for "Slide", "Topic", "Importance", "Difficulty", "# of Questions", and "Notes/Questions". The first row shows slide 1 with topic "Introduction". The second row shows slide 2 with topic "d and β". A red box highlights the "Importance" and "Difficulty" columns for slide 2. The "Importance" column for slide 2 contains two stars, and the "Difficulty" column contains one star. The "# of Questions" column shows 0 for slide 1 and 2 for slide 2. The "Notes/Questions" column for slide 2 contains the handwritten note "d is always fixed".

Slide	Topic	Importance	Difficulty	# of Questions	Notes/Questions
1	Introduction			0	
2	d and β	★ ★	★	2	d is always fixed

Testing Process

- ❖ Heuristic evaluations within our own team
- ❖ Heuristic evaluations with other students from CSE 440
- ❖ Usability testing with potential users of the end product
 - Aimed to get students of different backgrounds, within STEM
 - For the most part we got the process right
 - Biggest Change was how we presented context

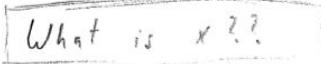
Testing Results

- ❖ At every step of the way, we caught a multitude of bugs
 - Made every effort to correct before the next testing, to ensure that we continued to find more issues with our design
- ❖ A couple areas that we struggled with the most:
 - Question asking Mechanism and associated help menu
 - Ratings on the lecture list screen
 - Lots of other additions based on user feedback

Question Asking System

- ❖ The Question asking mechanism wasn't clear
- ❖ Users didn't like the double questions mark setup, suggested something more graphic/interactive.

How To Use Study^Q

- Take notes directly on the slide.
- When you have a question, add a "???" to the end of the note.


→ Common questions will be automatically sent to the instructor.
- Use the "★" in the bottom left corner to rate the slide to aid with studying in the future.

Question Asking System

User Guide

- Take notes directly on slides
- when you have a question, drag question mark icon into circled, arrowed or written question.

Example asking questions:

$$x + \text{?} = z$$

$$x + y = z$$

what is y!

- To rate the slide, press the star and tap or drag to select rating



Final Iteration of Community Questions

How To Use



- Take notes directly on slides
- when you have a question, drag question mark icon into the drop target that appears after you circle, arrow, or ask a question with your pen.

Example asking questions:



$$x + \textcircled{y} = z$$

Drag me to your question

- To rate the slide, press the star and tap or drag to selected rating



$$x + y = z$$



what is y?

$$x + y = z$$

Question Submitted!

Ratings Screen

- ❖ Users thought it was too visually busy
- ❖ Difficult to read
- ❖ Lots of info/little insight

The sketch illustrates a user interface for rating topics across two lectures. The top section is for 'Fake Class 102', and the bottom section is for 'Fake Class 101'. Each section contains a table with columns for Lecture #, Topic, Difficulty, and Importance.

Lecture #2 Data:

Lecture #	Topic	Difficulty	Importance
2	Alpha, Beta, & Gamma	0 ★	0 ★
	0 ★★	0 ★★	
	0 ★★★	0 ★★★	
	0 ★	0 ★	
	0 ★★	0 ★★	
	0 ★★★	0 ★★★	
	0 ★★★★	0 ★★★★	

Lecture #1 Data:

Lecture #	Topic	Difficulty	Importance
1	Introduction	0 ★	0 ★
	0 ★★	0 ★★	
	0 ★★★	0 ★★★	
	1 ★	0 ★	
	0 ★★	1 ★★	
	0 ★★★	0 ★★★	
	0 ★★★★	0 ★★★★	



Ratings Screen

Combined the importance/difficulty,
columns now by stars

Issues persisted:

- ❖ Users thought it was too busy
- ❖ Difficult to read
- ❖ Lots of info/little insight

Fake Class 102

		Topic	Importance / Difficulty				
Lectures			★	★★	★★★	★★★★	
2	Alpha, Beta, &...	0 / 0 0 / 0 0 / 0					
	Unusual Equations	0 / 0 0 / 0 0 / 0					
1	Introduction	0 / 0 0 / 0 0 / 0					
	A and B	0 / 1 1 / 0 0 / 0					

Ratings Screen



Proposed Fix: Minimize number of stars and color-code differences.

Still difficult to read, not quite what we wanted

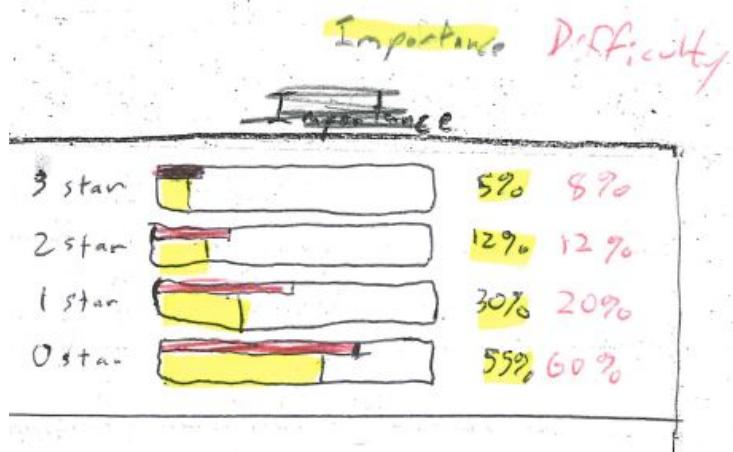
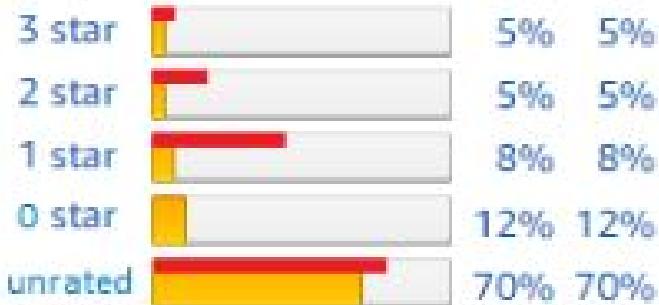
Ratings Screen

A hand-drawn rating screen for "Fake Class 102". The screen has a header with three horizontal lines and the text "Fake Class 102". Below the header is a table with four columns: "Lecture", "Topic", and "Importance & Difficulty" (with three sub-columns). The table is divided into two sections by a horizontal line.

Lecture	Topic	Importance & Difficulty		
		0★0	0★0	0★0
2	Alpha, Beta, &...	0★0	0★0	0★0
	Unusual Equations	0★0	0★0	0★0
1	Introduction	0★0	0★0	0★0
	α and β	0★1	1★0	0★0

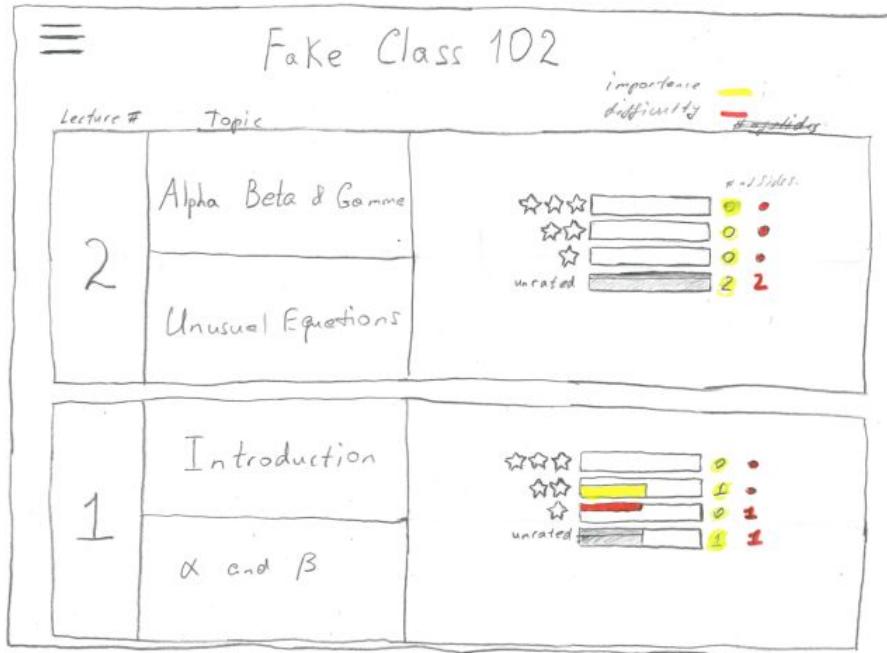
Too many zeros - feels like we are reinventing the wheel

Ratings Screen



Back to a common design pattern - users liked it much more

Ratings Screen



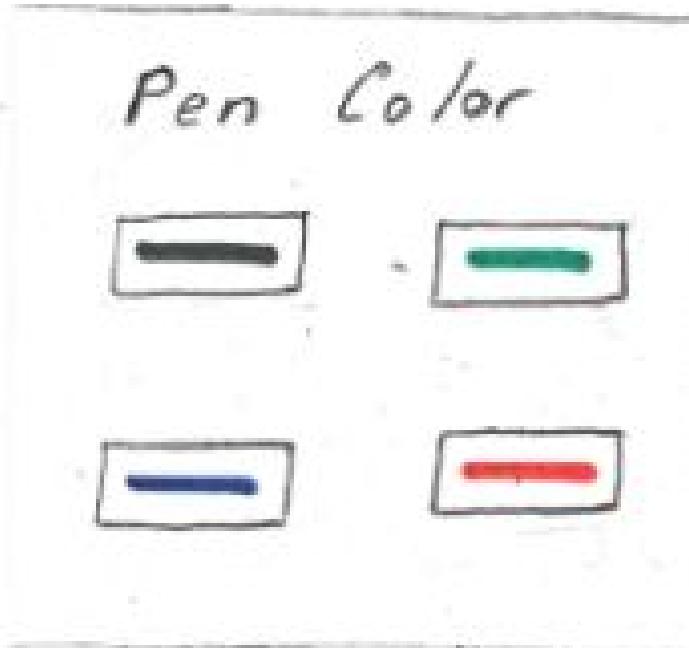
Almost there – percentages were ambiguous

Ratings Screen

Lecture #		Importance	# of slides	Difficulty	# of slides
2	Alpha Beta & Gamma	★★★	0	★★★	0
	Unusual Equations	★★	0	★★	0
		★	0	★	0
		unrated	2	unrated	2
1	Introduction	★★★	0	★★★	0
	α and β	★★	1	★★	0
		★	0	★	1
		unrated	1	unrated	1

Final iteration – Very readable, easy to interpret information

Testing led to numerous smaller changes



- ❖ Redesigned menu, added pen color options, changes/additions to gestures we supported, etc.
- ❖ Iterative design process meant we got better after each test - which led to users finding more sophisticated and minor problems with the application - didn't all just get hung up on the same thing

Final Paper Prototype

The following table summarizes the content of each screen in the grid:

Row	Column 1	Column 2	Column 3	Column 4
1	Class List	Your Classes	Fake Class 102	FC 102
2	Lectures	Lecture 2	Lecture 2: Alpha, Beta, & Gamma	How To Use
3	Throughout this quarter we will be using alpha and beta.	Lecture 2: Alpha, Beta, & Gamma	As you may remember:	FC 102
4	- Can beta come before alpha?	-	- Alpha is ... - Beta is ... - And we can introduce gamma!	FC 102
5	These new variables can be related and we can prove!	We can now begin the basic for exploring the field of unusual equations.	See you next lecture!	FC 102
6	$(\alpha + \beta)^2 = \gamma^2$	$\frac{\gamma^2}{(\alpha + \beta)^2}$		FC 102

Column 1: Lecture Mode

- Screen 1: Shows a list of classes: "Fake Class 102" and "Other Class".
- Screen 2: Shows a list of lectures: "Lecture 2", "Lecture 3", "Lecture 4", and "Lecture 5".
- Screen 3: Shows a detailed view of "Lecture 2" with sections: "Introduction", "Alpha, Beta, & Gamma", and "Unusual Equations". It also includes a note: "Welcome to Fake Class 102. No greater will have been taught than those who were around in Fake Class 102. Office hours will be held occasionally."

Column 2: Lecture Mode

- Screen 1: Shows a list of classes: "Fake Class 102" and "Other Class".
- Screen 2: Shows a list of lectures: "Lecture 2", "Lecture 3", "Lecture 4", and "Lecture 5".
- Screen 3: Shows a detailed view of "Lecture 2" with sections: "Introduction", "Alpha, Beta, & Gamma", and "Unusual Equations". It includes notes: "Throughout this quarter we will be using alpha and beta.", "Can beta come before alpha?", and "Alpha is ... Beta is ...".

Column 3: Lecture Mode

- Screen 1: Shows a list of classes: "Fake Class 102" and "Other Class".
- Screen 2: Shows a list of lectures: "Lecture 2", "Lecture 3", "Lecture 4", and "Lecture 5".
- Screen 3: Shows a detailed view of "Lecture 2" with sections: "Introduction", "Alpha, Beta, & Gamma", and "Unusual Equations". It includes notes: "As you may remember:", "Alpha is ... Beta is ...", and "And we can introduce gamma!".

Column 4: How To Use

- Screen 1: Shows a list of classes: "Fake Class 102" and "Other Class".
- Screen 2: Shows a list of lectures: "Lecture 2", "Lecture 3", "Lecture 4", and "Lecture 5".
- Screen 3: Shows a detailed view of "Lecture 2" with sections: "Introduction", "Alpha, Beta, & Gamma", and "Unusual Equations". It includes notes: "These new variables can be related and we can prove!", " $(\alpha + \beta)^2 = \gamma^2$ ", and " $\frac{\gamma^2}{(\alpha + \beta)^2}$ ".
- Screen 4: Shows a detailed view of "Lecture 2" with sections: "Introduction", "Alpha, Beta, & Gamma", and "Unusual Equations". It includes notes: "These new variables can be related and we can prove!", " $(\alpha + \beta)^2 = \gamma^2$ ", and " $\frac{\gamma^2}{(\alpha + \beta)^2}$ ".
- Screen 5: Shows a detailed view of "Lecture 2" with sections: "Introduction", "Alpha, Beta, & Gamma", and "Unusual Equations". It includes notes: "These new variables can be related and we can prove!", " $(\alpha + \beta)^2 = \gamma^2$ ", and " $\frac{\gamma^2}{(\alpha + \beta)^2}$ ".
- Screen 6: Shows a detailed view of "Lecture 2" with sections: "Introduction", "Alpha, Beta, & Gamma", and "Unusual Equations". It includes notes: "These new variables can be related and we can prove!", " $(\alpha + \beta)^2 = \gamma^2$ ", and " $\frac{\gamma^2}{(\alpha + \beta)^2}$ ".

Final Paper Prototype

Your Classes

Fake Class 102



Final Paper Prototype

Fake Class 102

Lecture #		Importance	# of slides	Difficulty	# of slides
2	Alpha Beta & Gamma	★★★	0	★★★	0
	Unusual Equations	★★	0	★★	0
1	Introduction	★	0	★	0
	α and β	unrated	2	unrated	2
1	Introduction	★★★	0	★★★	0
	α and β	★★	1	★★	0
1	Introduction	★	0	★	1
	α and β	unrated	1	unrated	1

Final Paper Prototype

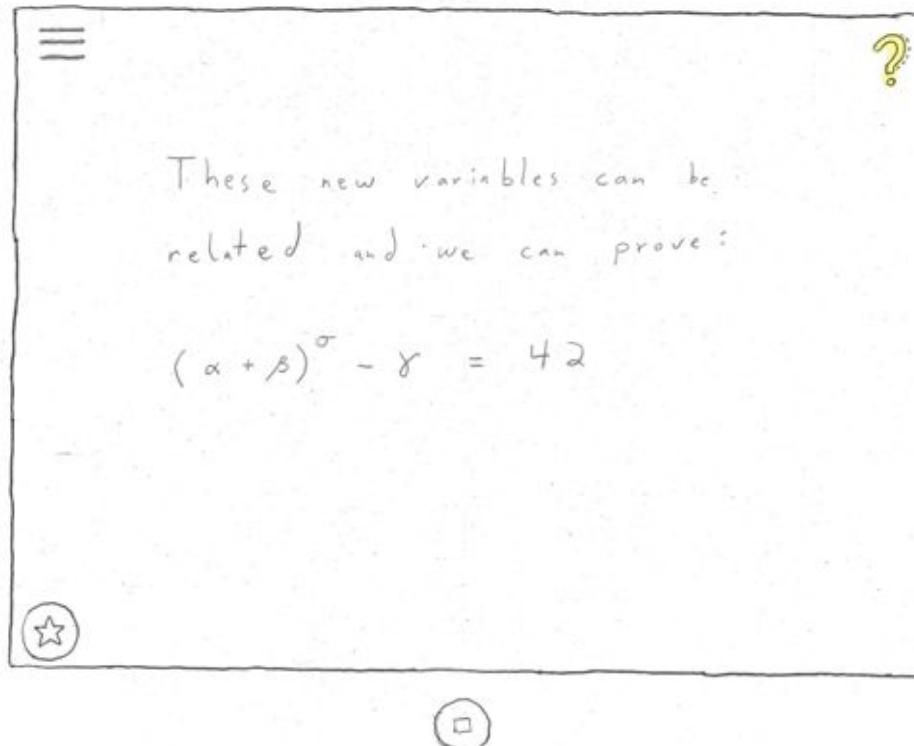
A hand-drawn paper prototype of a mobile application interface. The title "Lecture 1" is at the top. Below it is a table with six columns: "Slide", "Topic", "Importance", "Difficulty", "# of Questions", and "Notes/Questions". There are two rows of data:

Slide	Topic	Importance	Difficulty	# of Questions	Notes/Questions
1	Introduction			0	
2	α and β	★ ★	★	2	α is always fixed



Final Paper Prototype

a tablet



Final Paper Prototype

How To Use



- Take notes directly on slides
- When you have a question, drag question mark icon into the drop target that opens after you circle, arrow, or ask a question with your pen.

Example asking questions:

$$x + \textcircled{y} = z$$

$$x + y = z$$



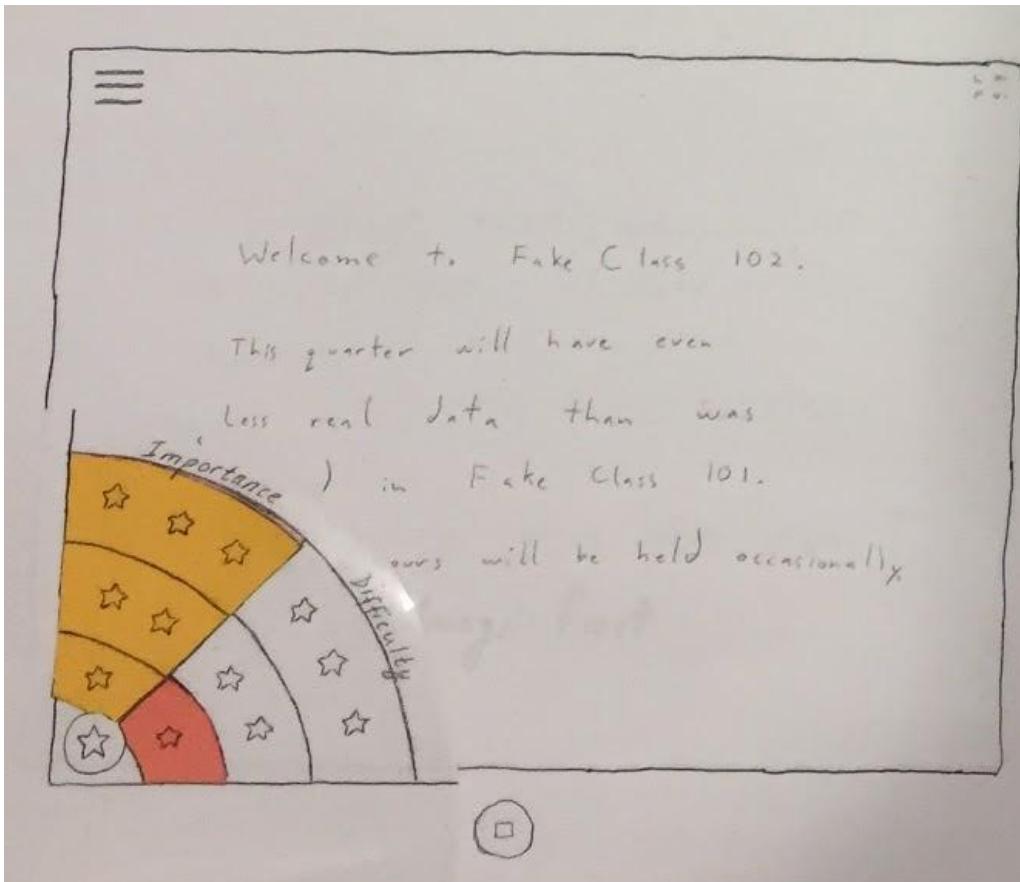
what is y?

$$x + y = z$$

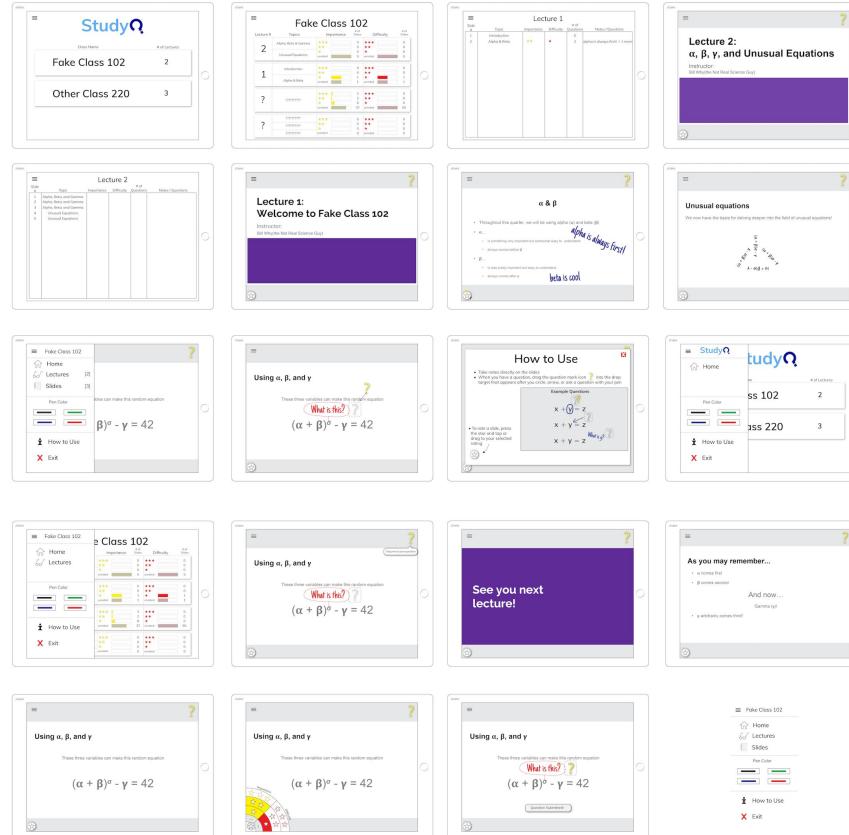
- To rate the slide, press the star and tap or drag to select rating



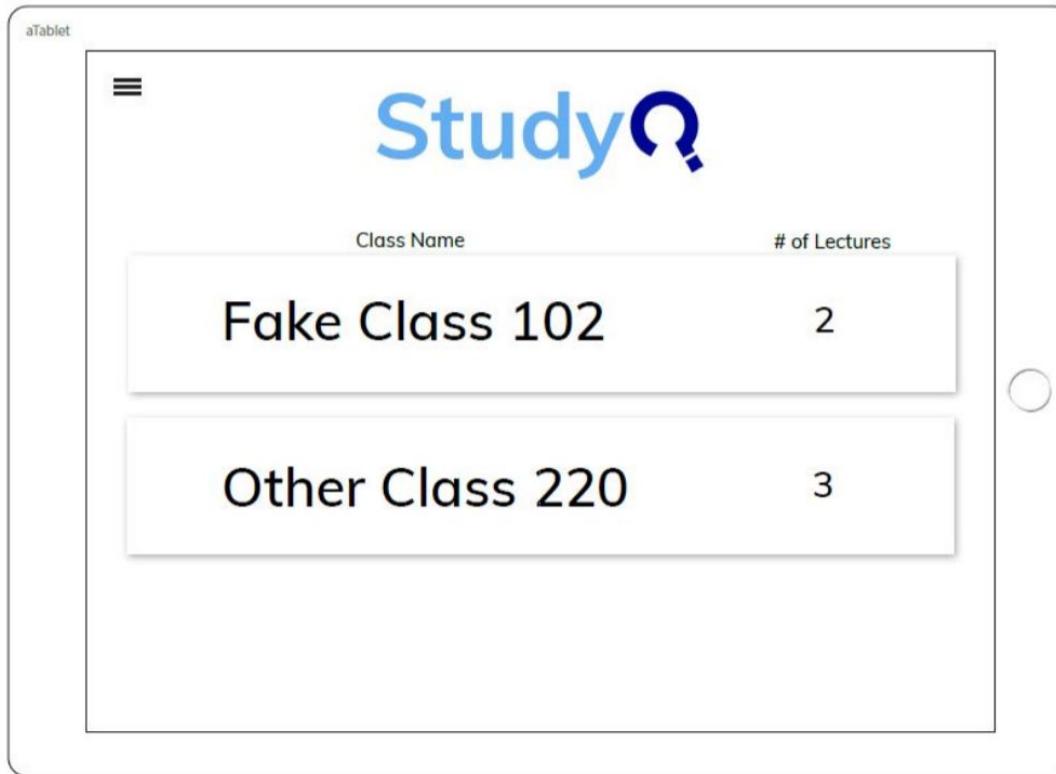
Final Paper Prototype



Digital Mockup



Digital Mockup



Digital Mockup

aTablet

Fake Class 102

Lecture #	Topics	Importance	# of Slides	Difficulty	# of Slides
2	Alpha, Beta & Gamma	★★★ ★★ ★ unrated	0 0 0 5	★★★ ★★ ★ unrated	0 0 0 5
	Unusual Equations				
1	Introduction	★★★ ★★ ★ unrated	0 0 1 1	★★★ ★★ ★ unrated	0 0 1 1
	Alpha & Beta				
?	?????????	★★★ ★★ ★ unrated	3 2 8 37	★★★ ★★ ★ unrated	0 0 0 50
	?????????				
?	?????????	★★★ ★★ ★ unrated	0 0 0 0	★★★ ★★ ★ unrated	0 0 0 0
	?????????				

Digital Mockup

aTablet

Lecture 1

Slide #	Topic	Importance	Difficulty	# of Questions	Notes / Questions
1	Introduction	★☆	★	0	
2	Alpha & Beta			2	alpha is always first!, + 1 more

Digital Mockup

aTablet

The digital mockup shows a tablet screen with a presentation slide. The slide has a light gray header bar with a menu icon (three horizontal lines) on the left and a yellow question mark icon on the right. The main content area has a white background. At the top center, there is a large, bold, italicized title $\alpha & \beta$. Below the title is a bulleted list of points:

- Throughout this quarter, we will be using alpha (α) and beta (β)
- α ...
 - is something very important but somewhat easy to understand
 - always comes before β
- β ...
 - is also pretty important but easy to understand
 - always comes after α

Handwritten annotations in blue ink are present on the right side of the slide:

- A large, slanted annotation reads "alpha is always first!"
- A smaller annotation below it reads "beta is cool".

At the bottom of the slide is a decorative footer bar featuring a small circular icon with a star and a yellow ribbon-like graphic.

Digital Mockup

aTablet

The digital mockup shows a tablet screen with a presentation slide. The slide has a header with a menu icon and a yellow question mark icon. The main title is $\alpha & \beta$. Below the title is a bulleted list. Handwritten annotations in blue ink are overlaid on the list, enclosed in red rounded rectangles. The first annotation says "alpha is always first!" and the second says "beta is cool". A small circular icon with a star is at the bottom left.

- Throughout this quarter, we will be using alpha (α) and beta (β)
- α ...
 - is something very important but somewhat easy to understand
 - always comes before β
- β ...
 - is also pretty important but easy to understand
 - always comes after α

alpha is always first!

beta is cool

Digital Mockup

aTablet

The digital mockup shows a tablet screen with a presentation slide. The slide has a header with a menu icon and a question mark icon. The title is $\alpha & \beta$. The content is a bulleted list about alpha and beta, with handwritten notes overlaid. A red box highlights the footer icon.

$\alpha & \beta$

- Throughout this quarter, we will be using alpha (α) and beta (β)
- α ...
 - is something very important but somewhat easy to understand
 - always comes before β
- β ...
 - is also pretty important but easy to understand
 - always comes after α

alpha is always first!

beta is cool

Digital Mockup

aTablet

≡ ?

Using α , β , and γ

These three variables can make this random equation

$$(\alpha + \beta)^\sigma - \gamma = 42$$

Importance

Difficulty

1

Digital Mockup

aTablet

The digital mockup shows a tablet screen with a white background. At the top left is a grey navigation bar with three horizontal lines. On the right side, there is a yellow question mark icon with a speech bubble pointing towards it, containing the text "Drag me to your question". Below the navigation bar, the main content area has a heading "Using α , β , and γ ". A text block states, "These three variables can make this random equation". Below this, a red oval contains the text "What is this?" with a red arrow pointing down to a dashed box around the variable σ in the equation $(\alpha + \beta)^\sigma - \gamma = 42$. At the bottom left is a circular icon with a star. The bottom of the screen features a grey footer bar.

Using α , β , and γ

These three variables can make this random equation

What is this?

$(\alpha + \beta)^\sigma - \gamma = 42$

Digital Mockup

The digital mockup shows a tablet screen with a white background. At the top left, there is a grey header bar with a menu icon (three horizontal lines) and a red question mark icon inside a rounded rectangle, which is highlighted with a red border. Below the header, the text "Using α , β , and γ " is displayed in bold black font. In the center, there is a text box containing the sentence "These three variables can make this random equation" followed by a question "What is this?" in red text inside a red oval, and a large red question mark icon. Below this, a mathematical equation is shown: $(\alpha + \beta)^{\gamma} - \gamma = 42$. At the bottom left of the screen, there is a small circular icon with a star inside.

Digital Mockup

aTablet

The digital mockup displays a tablet interface with a light gray header bar containing three horizontal lines. The main content area features a heading "Using α , β , and γ " followed by a text "These three variables can make this random equation". Below this, there is a red oval containing the text "What is this?" and a dashed yellow box containing a question mark. A red arrow points from the text "What is this?" to the question mark. Below the oval and dashed box is a mathematical equation: $(\alpha + \beta)^\sigma - \gamma = 42$. At the bottom of the screen is a button labeled "Question Submitted!" with a small circular icon containing a star on the left.

Using α , β , and γ

These three variables can make this random equation

What is this? ?

$(\alpha + \beta)^\sigma - \gamma = 42$

Question Submitted!

Summary

- ❖ Good context is more important than detailed instructions
- ❖ Iterate as many times as necessary
- ❖ One person's feedback isn't indicative of a design flaw
- ❖ Recognize problem with “paper” prototype vs. problem with design



Collaboration Team

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Sam
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Trevor
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