



*Imagine learning from your peers made simple and fun.
Essentially addictive.*

Overview

PeerWise is an online e-learning platform that allows students to quiz each other on lecture topics to strengthen their understanding. The platform was set up by the University of Auckland and it's currently used by many institutions including UCL.

While the concept of the application is interesting, the implementation is outdated.

- The system is only accessible from a desktop computer.
- It requires an overwhelming number of interactions to perform any activity.
- Sections are not properly connected to each other.
- User Experience highly impacted.

I will introduce my approach to redesign PeerWise in the space of Ubiquitous Computing.

The image contains two screenshots of the PeerWise platform. The top screenshot shows the homepage with the UCL logo and a list of questions. The bottom screenshot shows a detailed view of a specific question.

PeerWise Home Page:

Click to view	Preview	Author's reputation	Question created	Number of answers	Author's answer popular?	Help
1 »	What will be the order we traverse through the following binary tree ...	60	11:09pm, 22 Feb	1	...	
2 »	Which is not a standard method in the sequence public interface?	22	9:40pm, 29 Feb	0	...	
3 »	If the stack pushing sequence is 1, 2, 3, ...	22	8:51pm, 29 Feb	6	<input checked="" type="checkbox"/> YES	
4 »	From the following data structures which one is non linear?	27	8:56pm, 22 Feb	5	<input checked="" type="checkbox"/> YES	
5 »	The following general tree can be represented by a binary tree ...	306	5:12pm, 19 Feb	2	...	
6 »	What is the best complexity of normal LUT and hash-table applied LUT?	176	7:12pm, 29 Feb	7	<input checked="" type="checkbox"/> YES	

Detailed Question View:

PeerWise evaluation studies.

- 1 » What will be the order we traverse through the following binary tree ...
- 2 » Which is not a standard method in the sequence public interface?
- 3 » If the stack pushing sequence is 1, 2, 3, ...
- 4 » From the following data structures which one is non linear?
- 5 » The following general tree can be represented by a binary tree ...
- 6 » What is the best complexity of normal LUT and hash-table applied LUT?

Final System Idea

My project aims at **keeping all current capabilities** of PeerWise while improving the user experience and transforming it into an **ubiquitous computing application** accessible from mobile devices and wearables.

Here are the top priorities for the final ubicomp system:

Keep all current functionalities.

Dramatically reduce number of clicks necessary to access every interface.

Implement gamification elements to UX.

Redevelop UI to suit mobile devices and latest design principles.



Keynote Summary

1

Analysis Stage

Initial User Research using interviews and surveys.

2

Design Stage

System Requirements, Persona, Storyboard and Initial Prototypes.

3

High Fidelity Prototype

Images and animated layers (video).

4

Evaluation

With and without users: cognitive walkthrough and usability test (Think Aloud technique).

Initial User Research – Aims

One of the issues Preece (2015) sets with data gathering is **Setting Goals**. The goals of my user research are summarised in the chart on the right. In particular:

Understand Current Issues

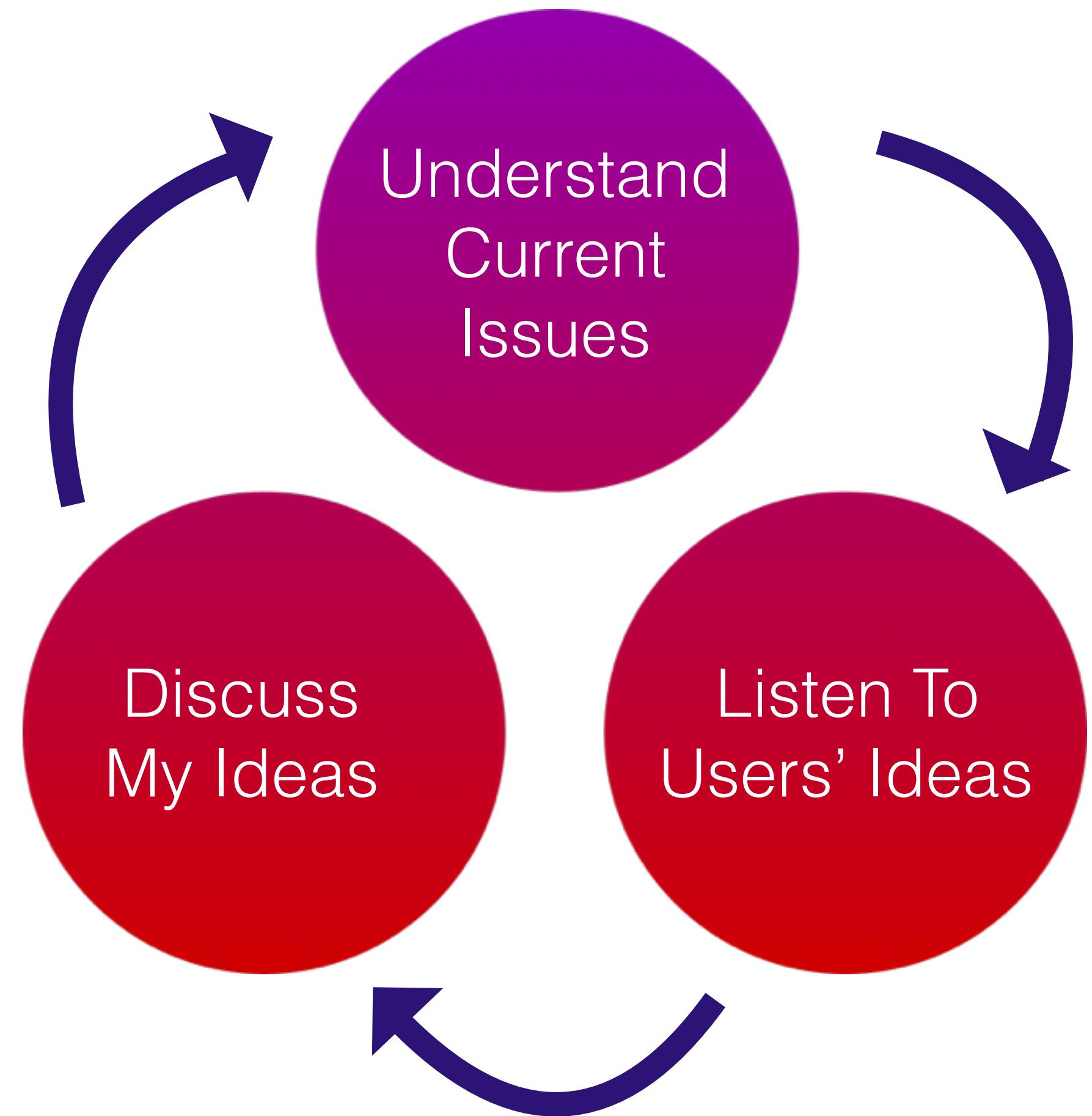
I will use Interviews and Questionnaires to identify the most problematic aspects of the current system. Interviews will be semi-structured to leave more space to the users to express themselves.

Listen To User Ideas

After identifying issues I will ask users to propose solutions that, in their opinion, would improve the system.

Discuss My Ideas

I will finally ask feedback to the users on my own ideas and use that feedback in the next phases.



Initial User Research – Interviews

I used semi-structured interviews as a way to provide users with more freedom to develop their ideas while being able to have a comparable outcome from all interviews that I could use to aggregate findings. I had 5 participants.

Identify Participants: Sample is my colleagues who used PeerWise for the module COMPGC05 Algorithmics.

Relationship with Participants: As we are all taking the same MSc programme, we know each other personally. However I made sure the relationship remained professional.

“

PeerWise is a great tool, however I cannot access it on the go. Also, it was difficult to explore all functions at first.

90% of users liked the concept.
73% expressed portability as key issue.

“

I would suggest to have notifications when I receive messages instead of emails.

Collected 10+ ideas for improvement.

Initial User Research – Questionnaire

I decided to use a second technique to gather data with the **purpose of having a larger sample**. To do this, I set up a Google Form and shared the link with my colleagues asking those who participated in the interviews not to participate according to Andrews' guidelines (2003). The participants' demographic is the same as the Interviews.

The questions on the survey were:

1. How much did you enjoy using PeerWise (1=not at all, 5=it was amazing)?
2. What was the most annoying feature?
3. Would you use more PeerWise if it was more fun and faster to get to key features?
4. Would you use more PeerWise if it was a mobile app?
5. How would you improve PeerWise? (Optional but would be great if you answer)

The survey is available at this URL: <http://goo.gl/forms/oZL3hdWpqh>

The screenshot shows a Google Form titled "PeerWise Questionnaire". The page has a purple header bar with the title. Below the header, there is a statement: "It won't take more than 4-5 minutes." followed by a note: "* Required". A question asks "How much did you enjoy using PeerWise (1=not amazing)?" with a scale from 1 to 5. The radio buttons for 1, 2, and 3 are checked, while 4 and 5 are empty. At the bottom, there is another question: "What was the most annoying feature?" with a dropdown menu showing options like "User interface", "Peer evaluation", etc.

docs.google.com

PeerWise Questionnaire

It won't take more than 4-5 minutes.

* Required

How much did you enjoy using PeerWise (1=not amazing)? *

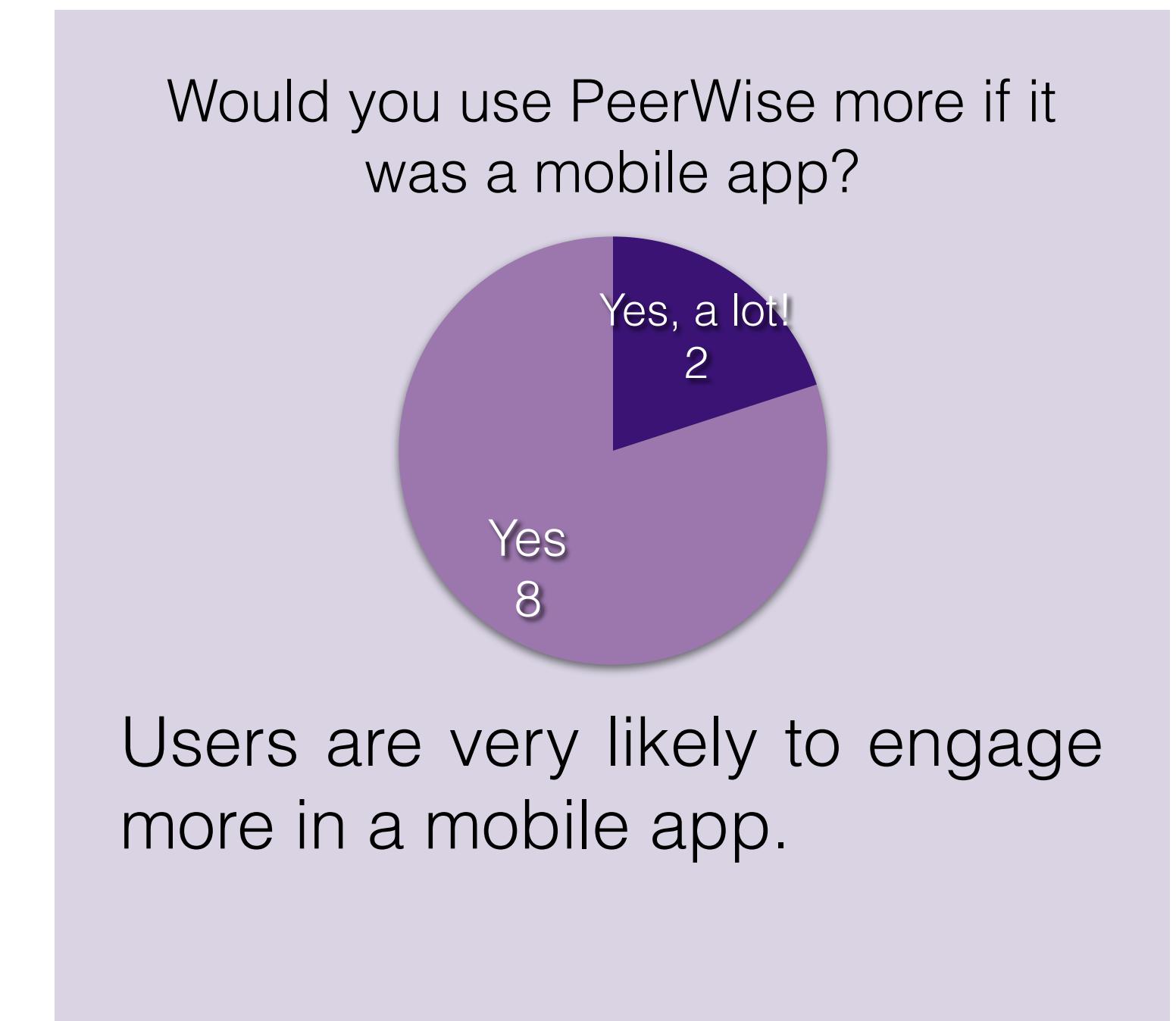
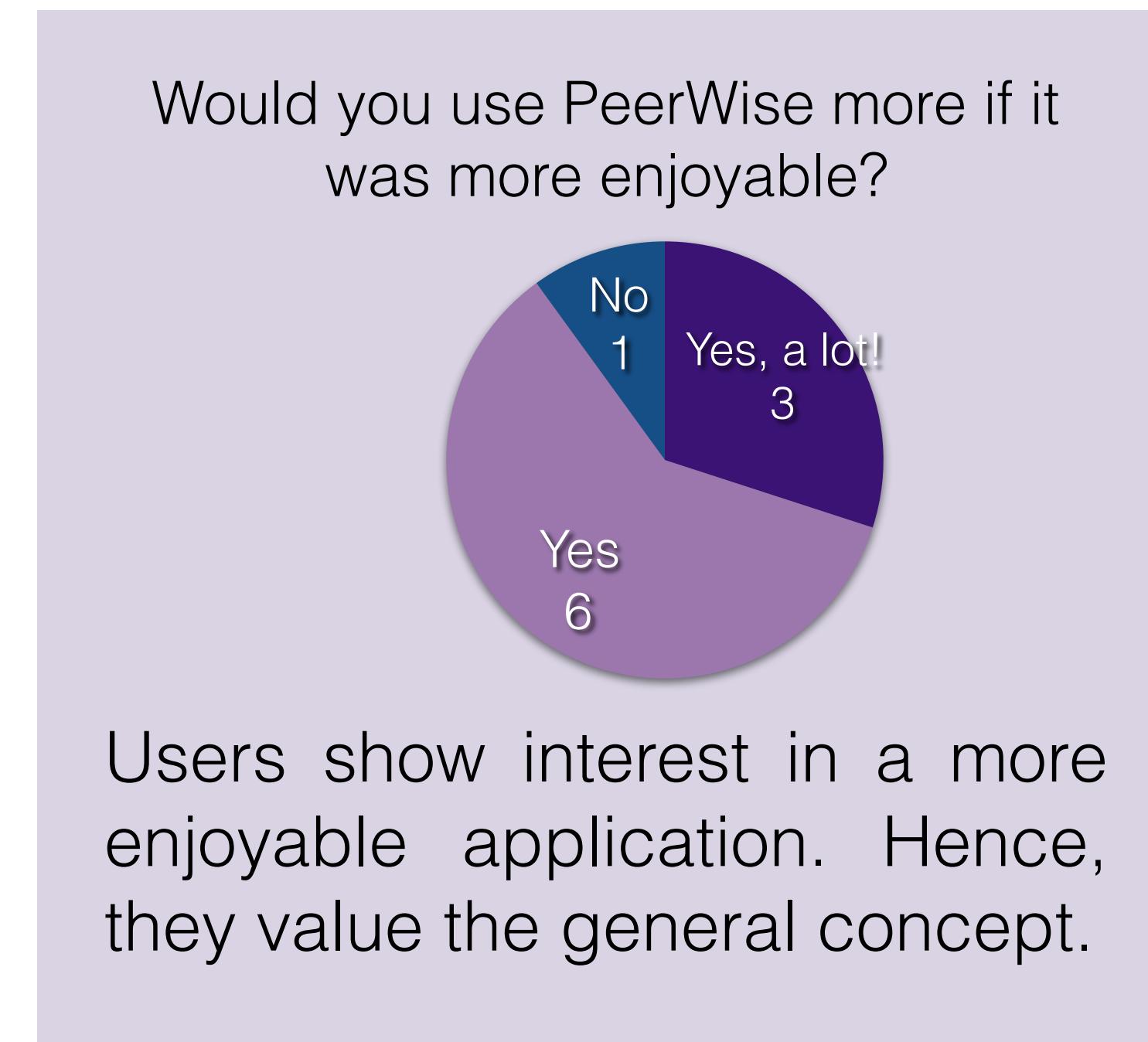
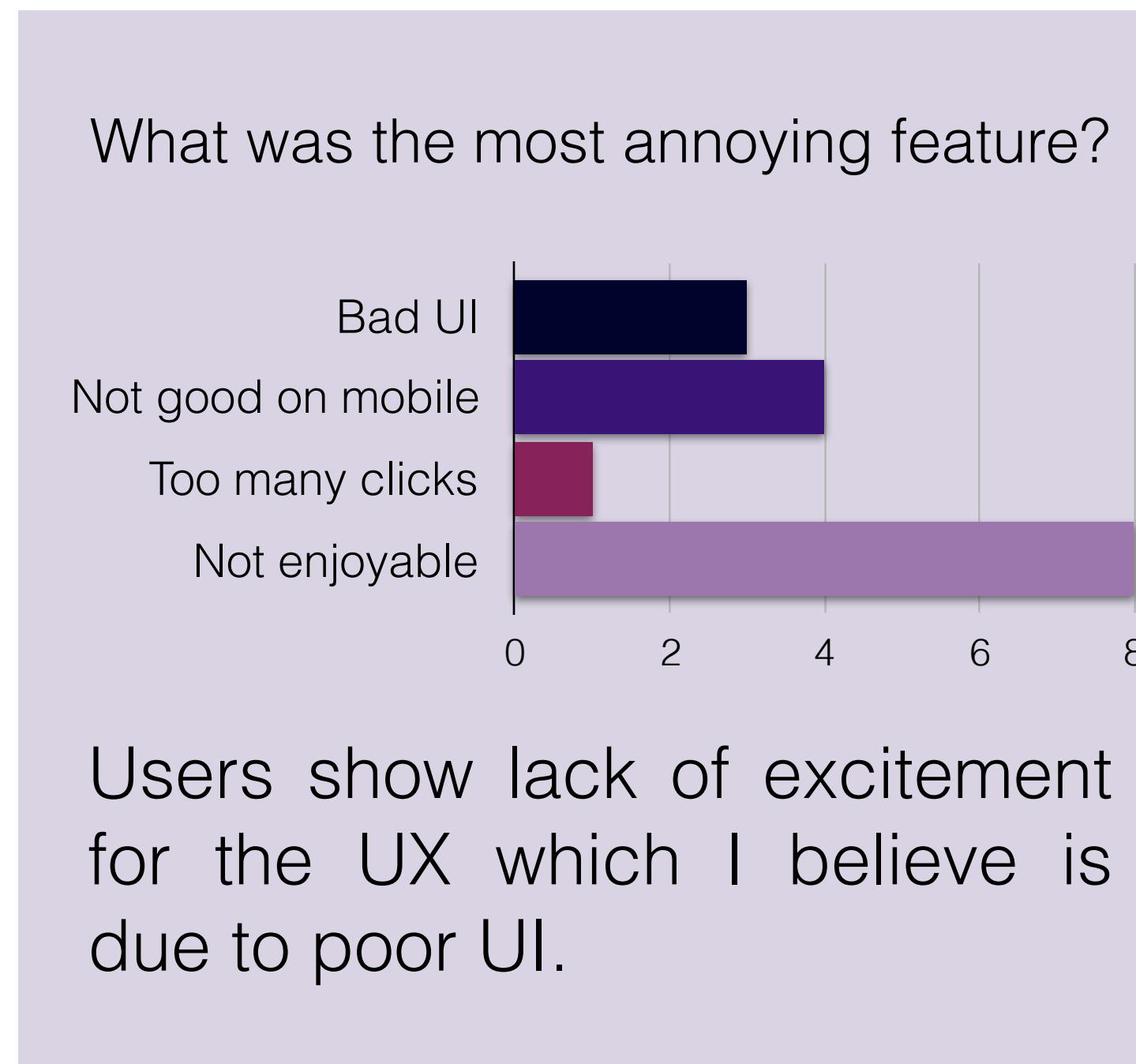
1 2 3 4

○ ○ ○ ○

What was the most annoying feature?

Initial User Research – Questionnaire

Here below are some selected findings from the questionnaire. Question 5 was open so no aggregated data is provided. Users' ideas are recorded and presented in the User Research Outcomes.



Initial User Research – Outcomes

1

80% do not find the experience enjoyable.

Action: Introduce gamification in the product to make it more enjoyable.

2

80% would use it more if it was a mobile app.

Action: The new PeerWise should be a mobile app running on phones and watches.

3

30%+ lament a poor UI

Action: Focus on creating a new reactive visual language for mobile.

4

Two users complained about login system

Action: The new login should just ask email and pw. Not school.

5

One user asked labels to questions

Action: I might implement this in a future iteration.

6

Few users noted too many clicks necessary.

Explanation: Clicks unconsciously deeply affect the UX.

From Analysis to Design: Establishing Requirements

After listening to the users I can now move to gathering the requirements. Here below is just a sample:

Requirement	Type	Old Site	New App
Users can ask and answer questions from other users.	Functional	Yes	Yes
Users receive badges when achieve milestones.	Functional	Yes	Yes
Users can ask questions to the writer of a question.	Functional	Yes	Yes
Users can upload explanation when they post a question.	Functional	Yes	Yes
Users receive push notifications when they have a new message.	Functional	No	Yes
Users can 'play' several courses at the same time.	Functional	No	Yes
Backend should manage mobile + watch + desktop applications.	Non Functional	No	Yes

From Analysis to Design: Establishing Requirements

Here below are two examples of requirements that follow the Volere template: one functional and one non-functional.

Requirement #: 3

Requirement Type: 9

Description: Users can ask questions to the writer of the question.

Rationale: By asking questions and receiving answers users learn more about the question's topic.

Fit Criterion: Every question posted by a user should appear instantly in the 'React' interface of the question's author.

Priority: 3

Dependencies: 'React' interface

Requirement #: 17

Requirement Type: 10a

Description: The system should have a modern user interface that aligns with modern Apple iPhone applications.

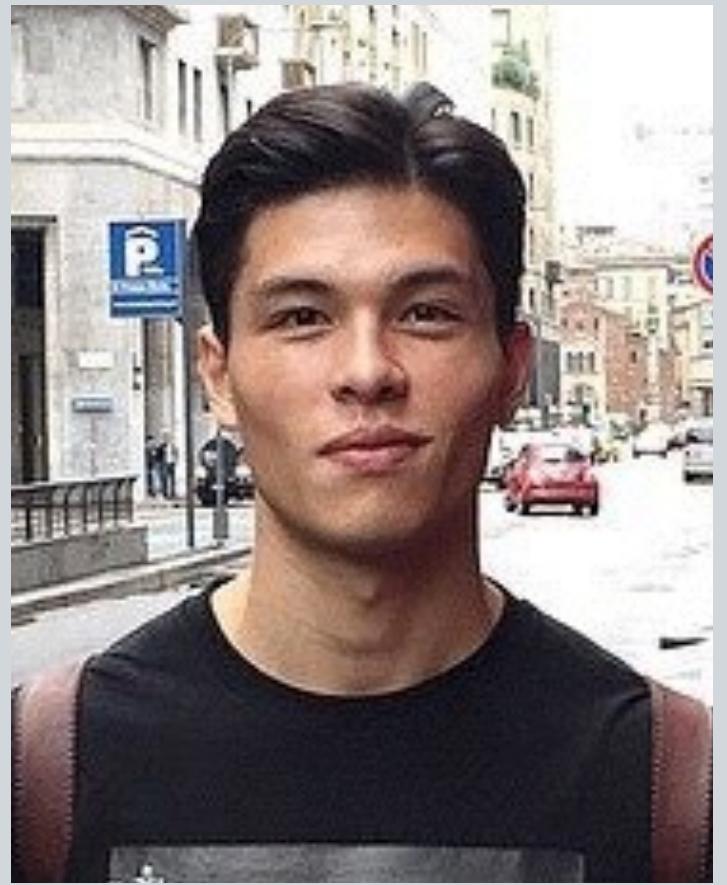
Rationale: The product shall be attractive to a teenage audience.

Fit Criterion: A group of university student users shall start using the app within minutes without guidance.

Priority: 2

Dependencies: UI design

Personas



Name: Jess

Role: Student, Political Science

Motivation:

- Teacher requires use of PeerWise for the module.
- He enjoys group studying.

Goals:

- Get grade from participation.
- Learn from other students.
- Spot areas he didn't revise.

Pain Points

- Cannot access from his phone.
- Annoying to click on too many pages.
- Initially confusing.
- Not very enjoyable experience.

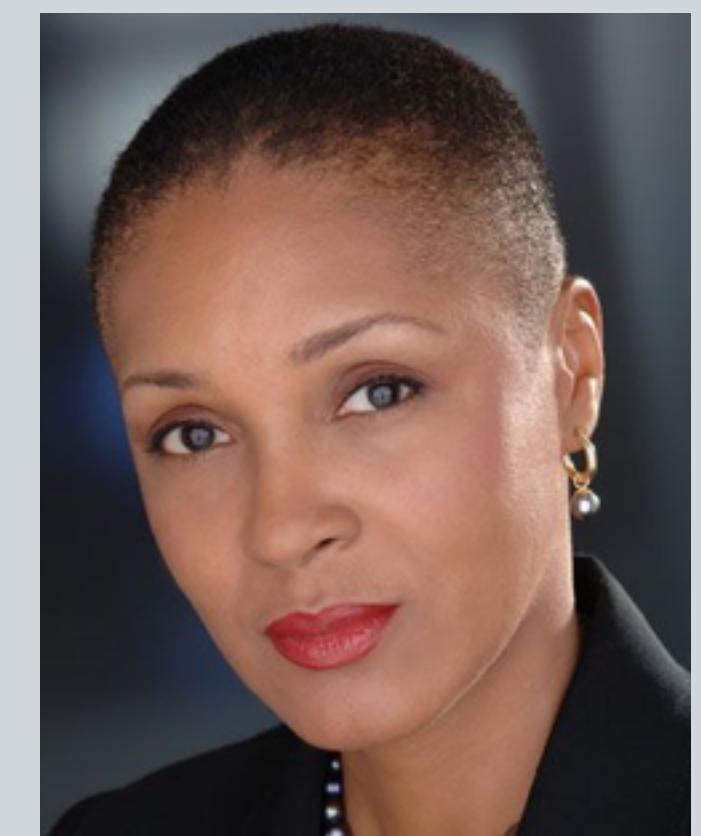
Ease of use



Portability



Enjoyability



Name: Luisa

Role: Teacher, Computer Science

Motivation:

- Keeping students study weekly material regularly.
- Self managed system.
- Provides measurable students engagement.

Goals:

- Minimise students unable to pass the module due to last-minute efforts.
- Improve teaching methodologies.

Pain Points

- Few students fully engage in the system due to lack of portability.
- Not enough analytics.

Ease of use



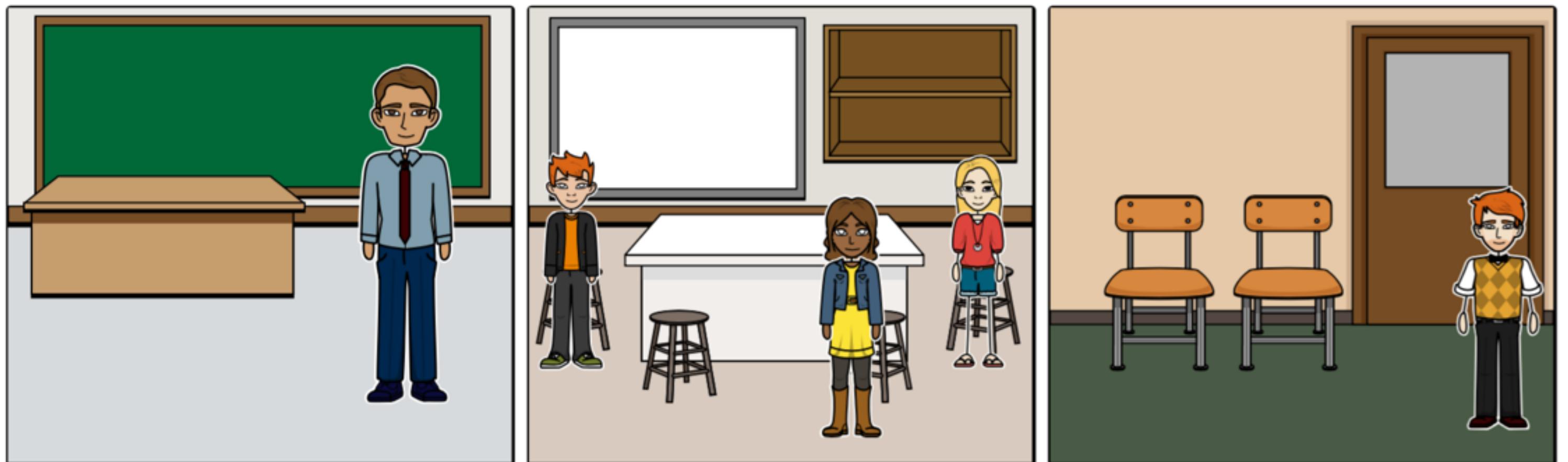
Portability



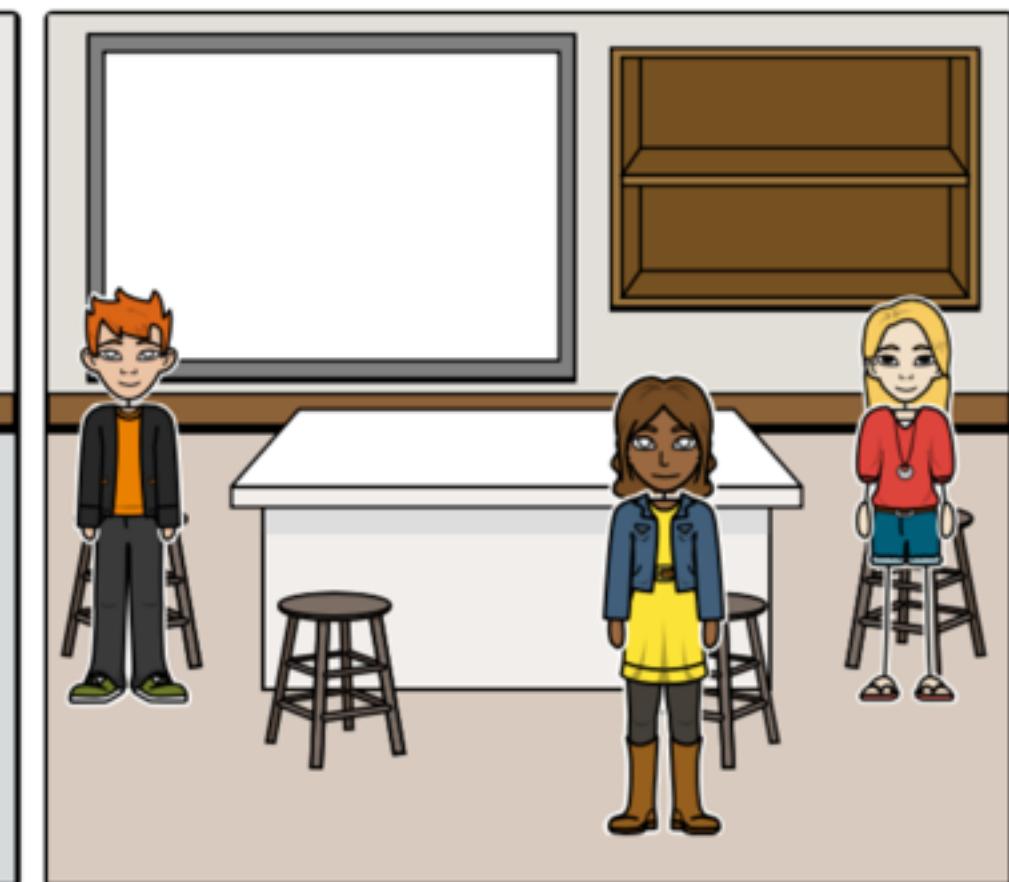
Enjoyability



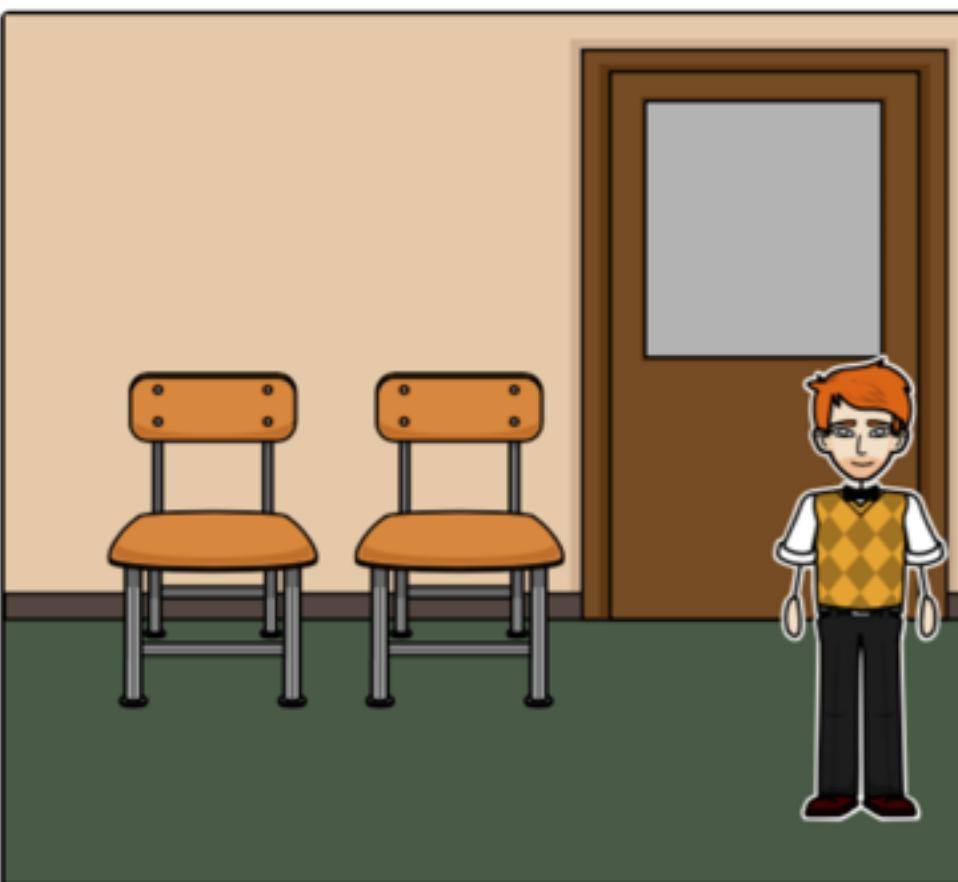
Storyboard



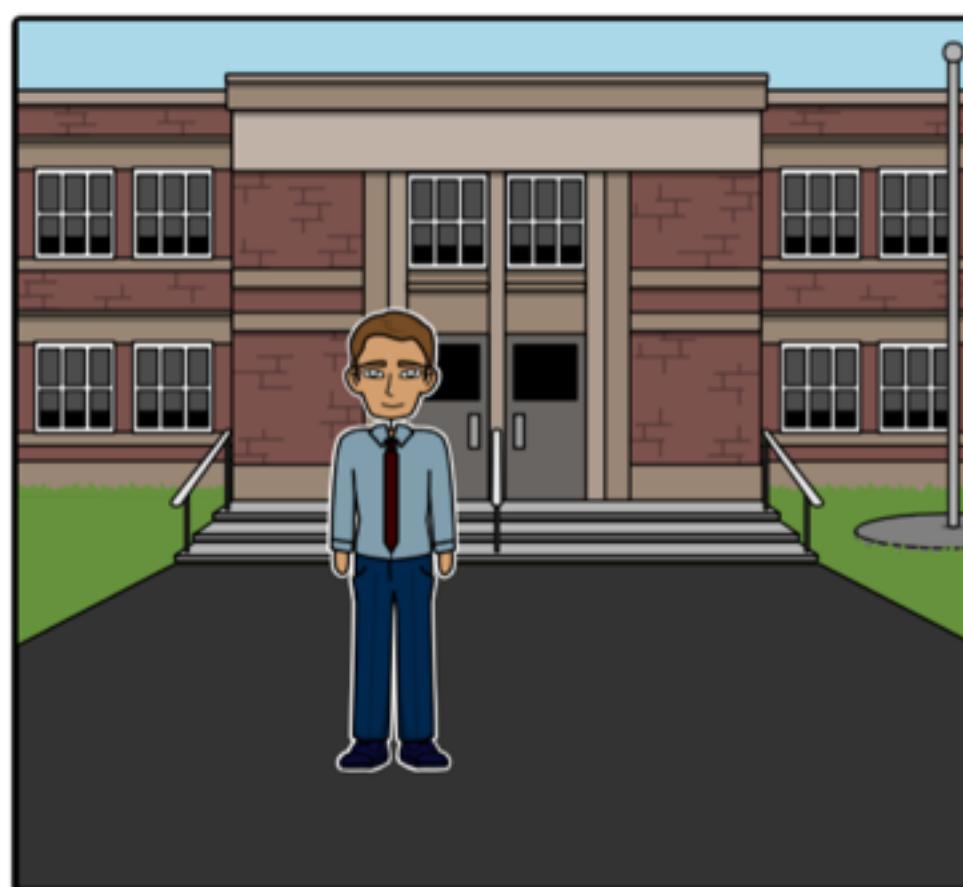
Frank is a teacher. He knows his students learn more when they are studying together and would like to introduce new forms of group study.



Gemma, Claudia and James are really enjoying studying together. However, they would prefer to have a tool to do that on a phone rather than having to physically be in the same place.



James is a student in the class. He gets better grades when he studies with others but his introverted personality prevents him from finding a study group.



Frank asked the school to pay engineers to build a new platform for group collaboration but the school board refused as it was too expensive.



Frank opted for PeerWise: it is free, easy to implement for teachers and he was able to set it up in minutes.



Now everyone, including James, are using group study as a way to learn better the course material. And they can access it from their phones, tablets and watches.

Truing, Hayes and Abowd (2006) present a useful framework for creating storyboards. In my example, I have defined the following characteristics:

- No need to specify time explicitly.
- Added text to explain situations since I did not have too many choices for background images and characters.
- Added characters as different types of persona were portrayed (teachers and students).

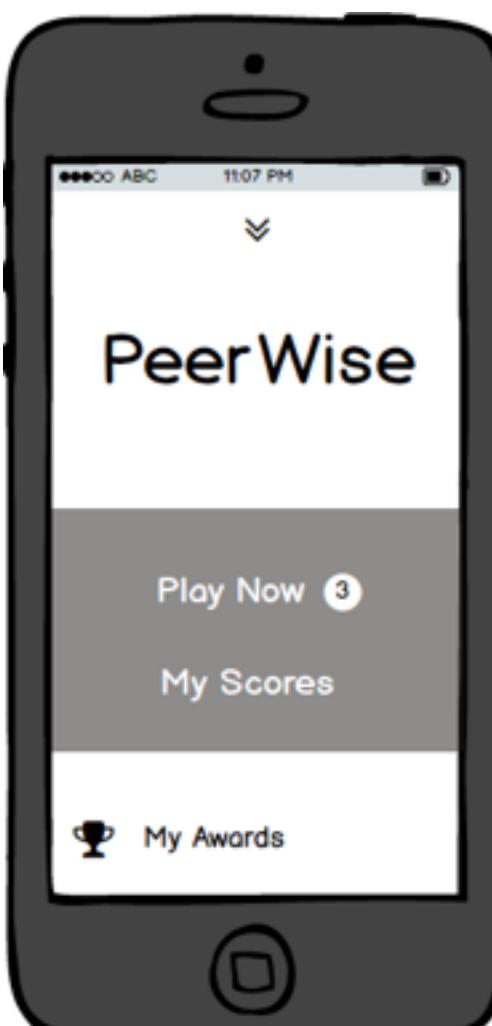
This storyboard represents a teacher, Frank, who is willing to introduce a group study online tool to help his students revise material for his class.

I used StoryboardThat to create the storyboard.

Initial Sketches

I used Balsamiq for initial sketches. My priorities were:

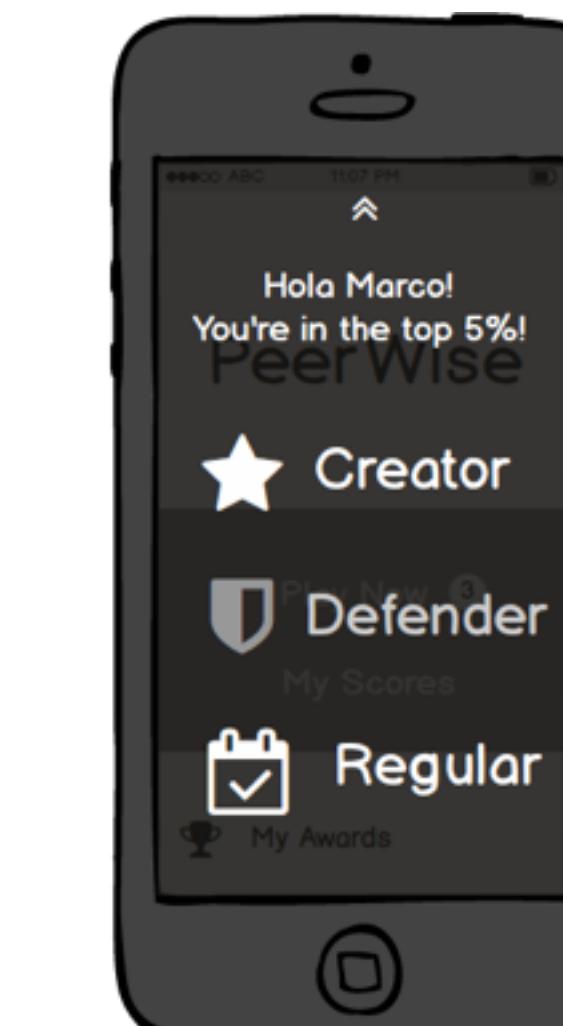
- Limiting frictions and interactions for the user.
- Introduce elements of gamification in the application.
- Selecting only key features.



Home Page



Account Interface



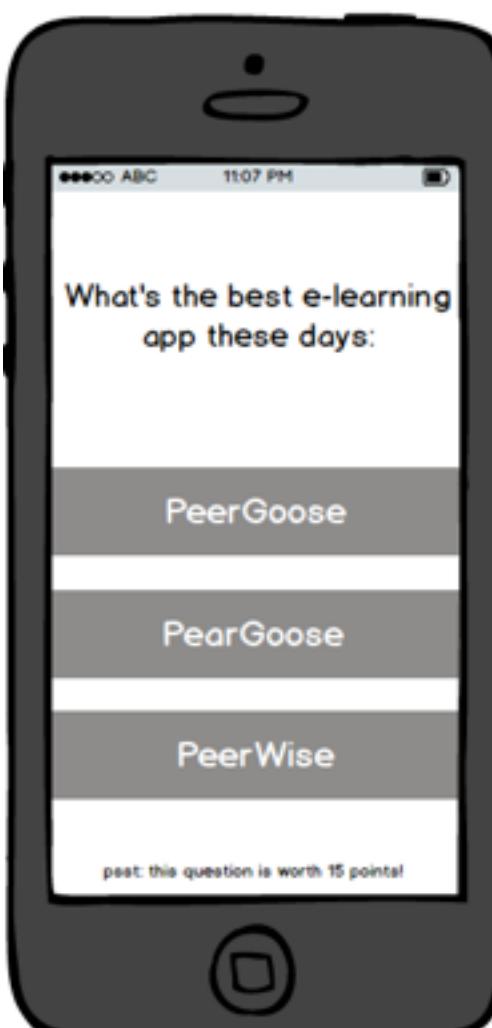
My Awards Interface



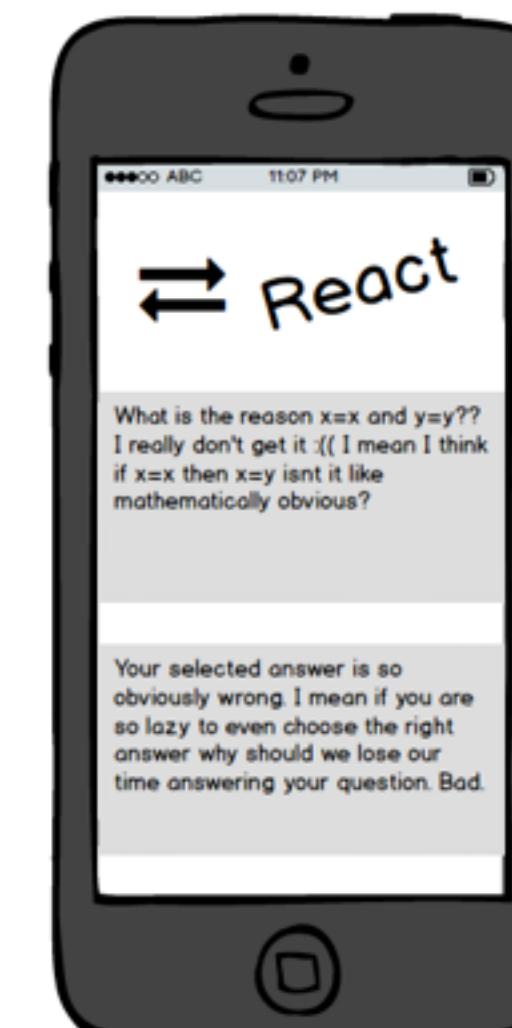
Play Now Interface

The user accesses the application from the Home Page (log in only required at the time of installation).

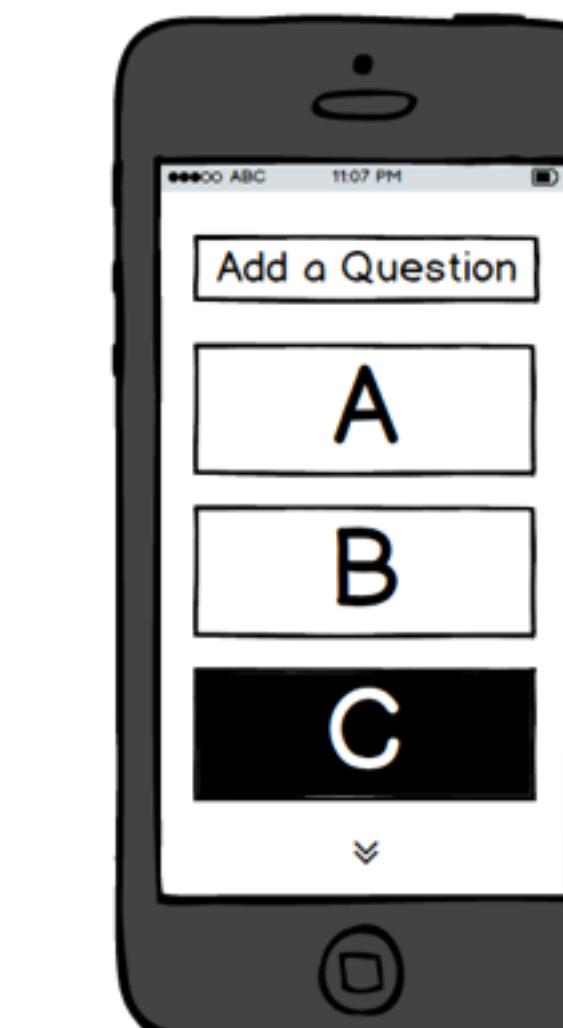
The Play Now button shows a new interface that brings together all the activities: asking or answering questions, and responding to reactions. The focus is on the number of points each activity would bring to the user. These points are dynamically allocated based on the current number of questions on the platform. Users can 'play' multiple courses at the same time.



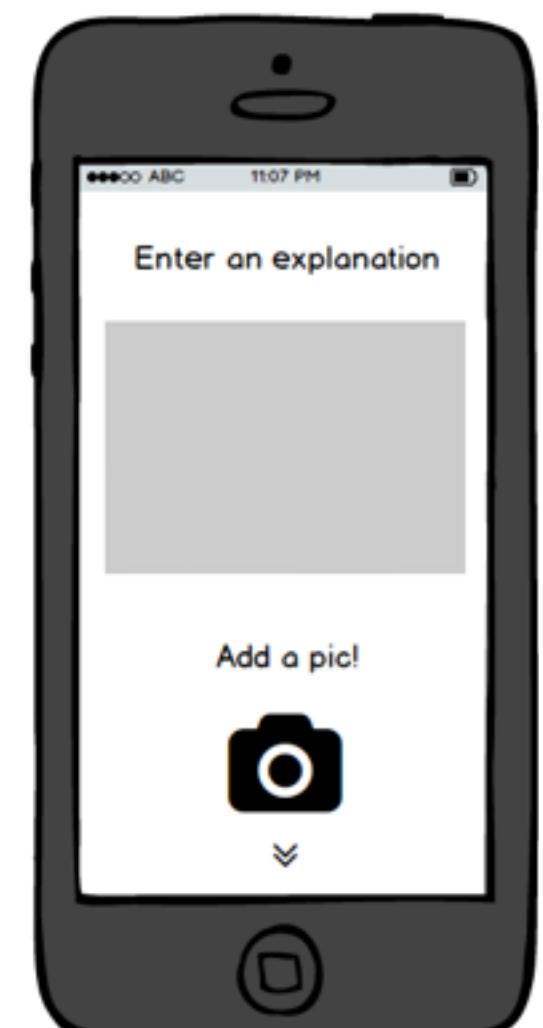
Question Interface



Reactions to your questions

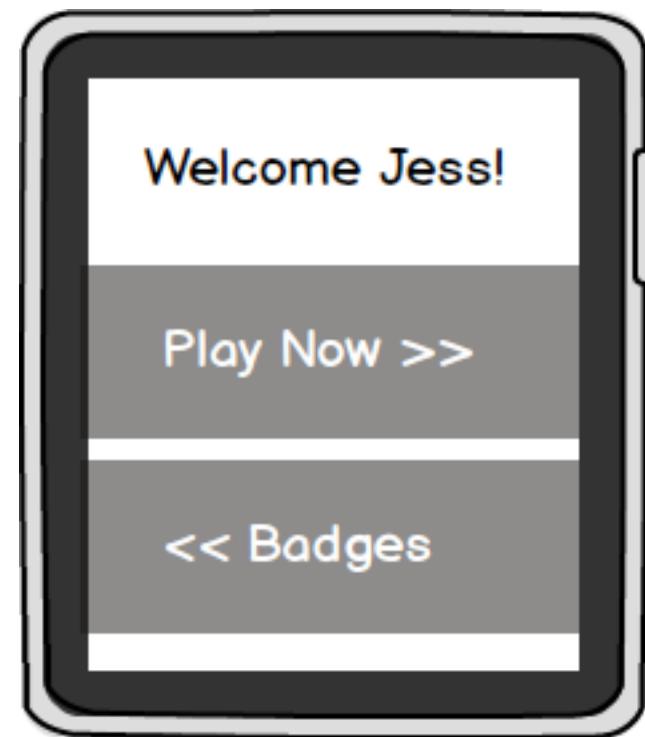


Create Question (1/2)



Create question (2/2)

Initial Sketches: WATCH



Home Page



Badges (tap for the name)



Play Now



Answer a Question

Wearables offer a reduced screen and are not suitable for multiple interactions. However, it was important to provide key functionalities and a **consistent user experience** with the mobile application.

A few characteristics of the UI for the Apple Watch:

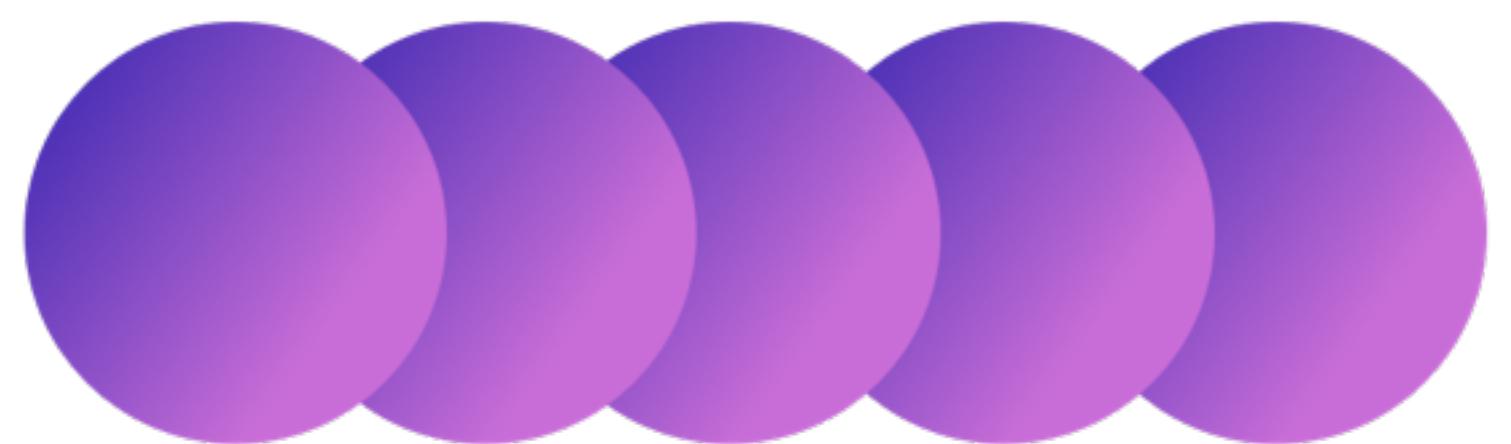
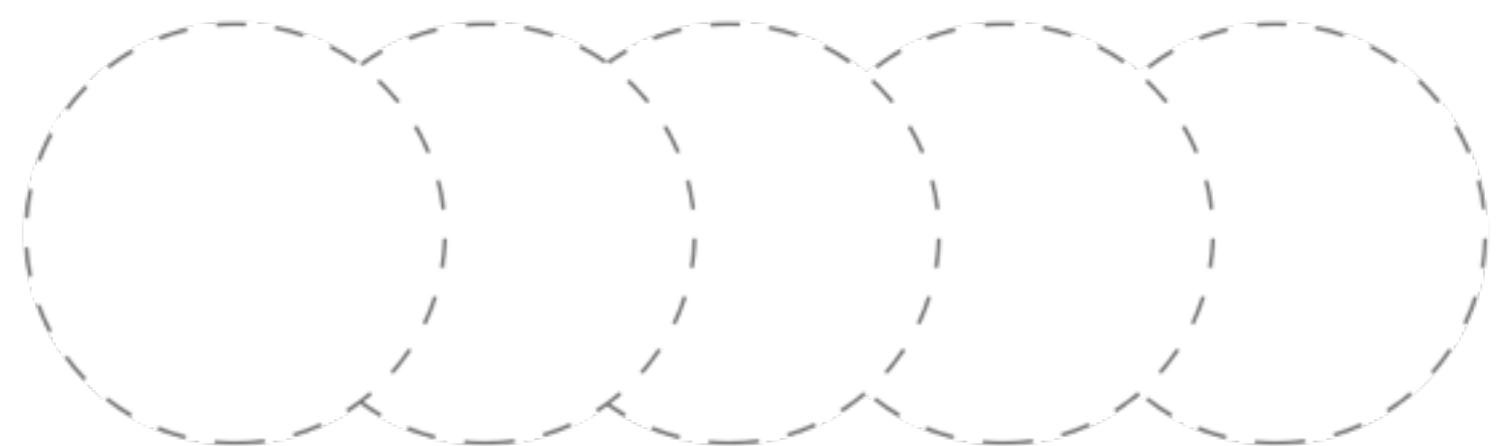
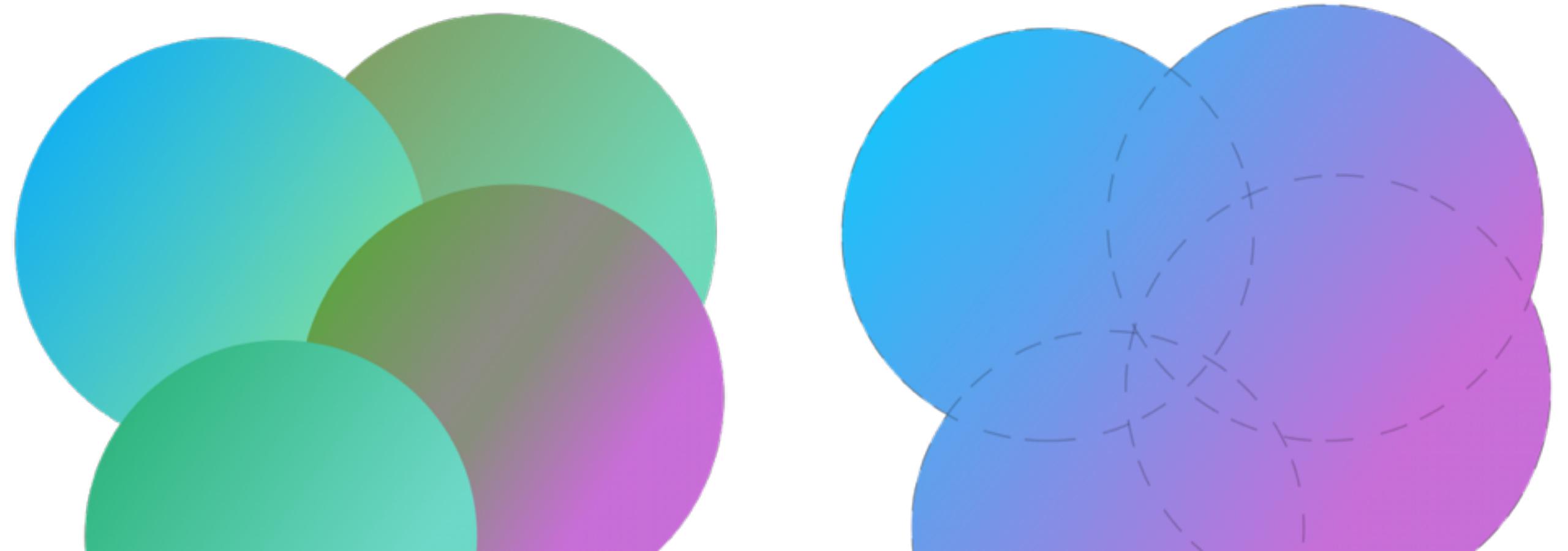
- Fewer functionalities.
- Less text due to reduced screen.
- Tap on elements to see more text.
- Fewer options on one interface.
- No account setting as this is done on the phone.

User Interface Design

The efforts to design the new User Interface begin with the concept of peering. Intersecting circles blend into a single shape while keeping their individual essence.

PeerWise aims at bringing different views, different understandings into a single place, enhancing everyone's learning into a holistic experience that goes beyond individual elements.

The gradient and the palette of colours are inspired by the design language of iOS 7 (Ive, 2013) and creates new dimensions to flat surfaces.



Mockups – Home

The following mockups are the translation of the initial sketches. I have used the Sketch application to create them.

The Account and Badges interfaces are accessible directly from the home screen by swiping from the top or the bottom.

Account Page

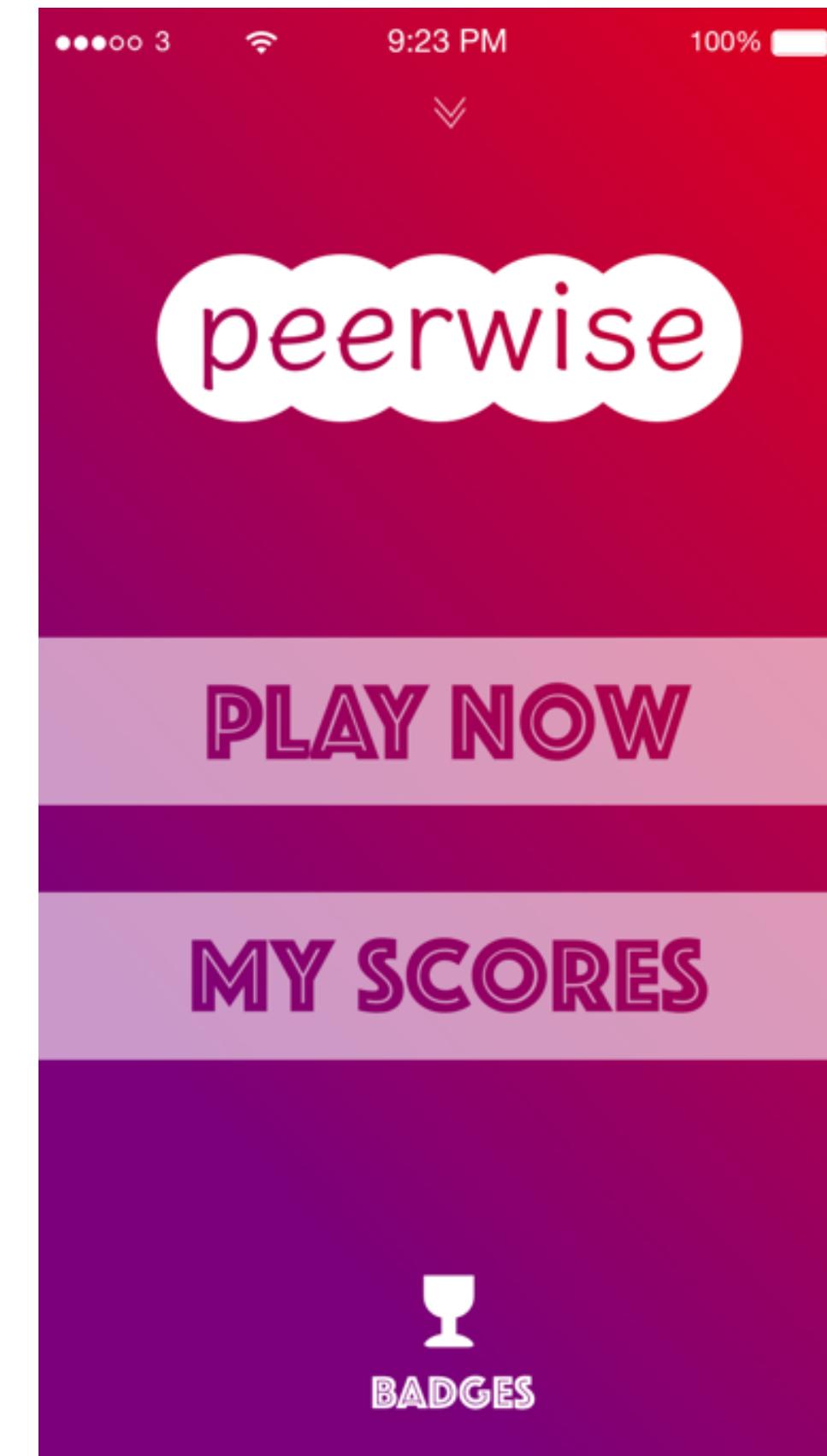
- Check/change current account.
- Change courses you are currently playing.
- Access help.

Badges page

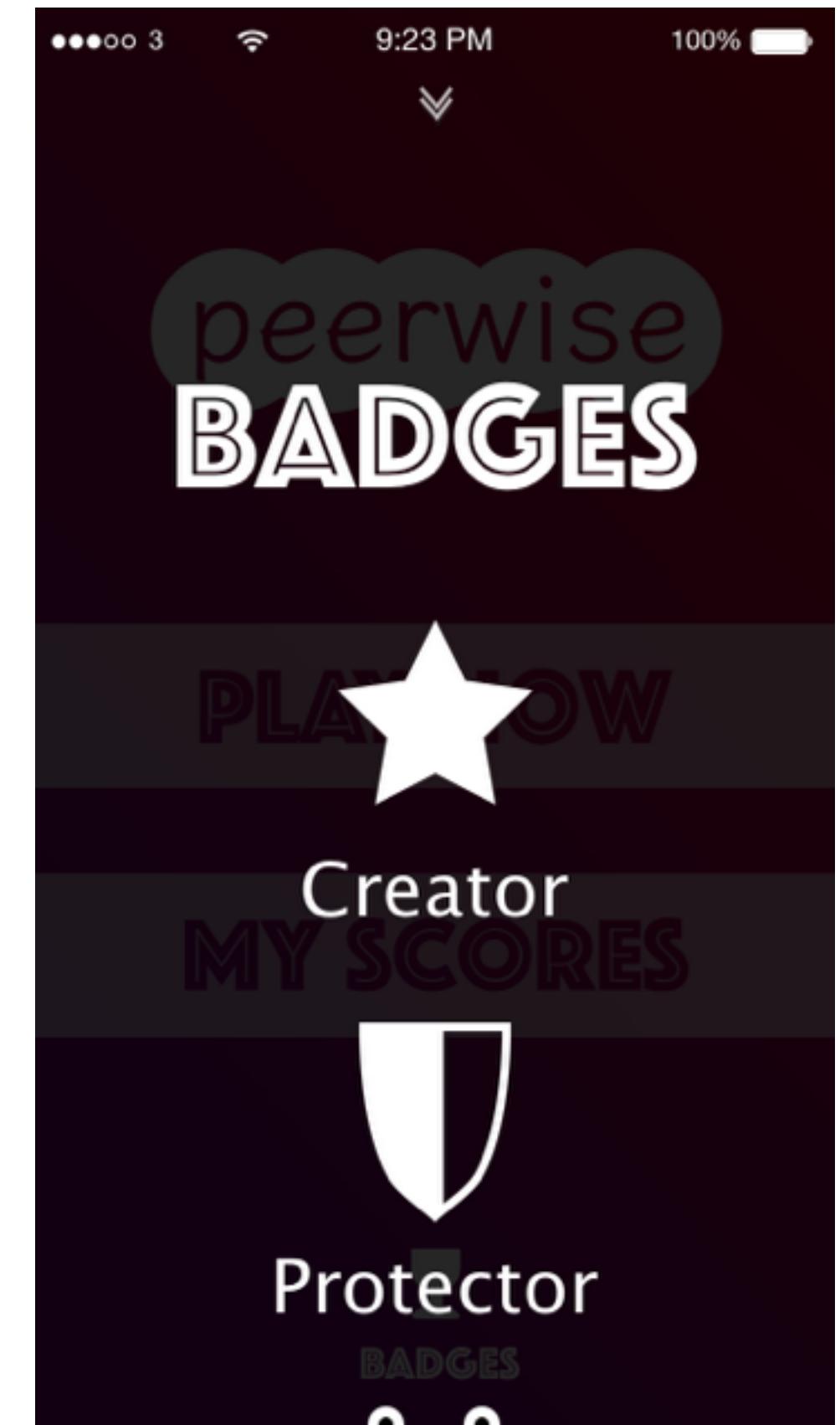
- Check awarded badges.



Account

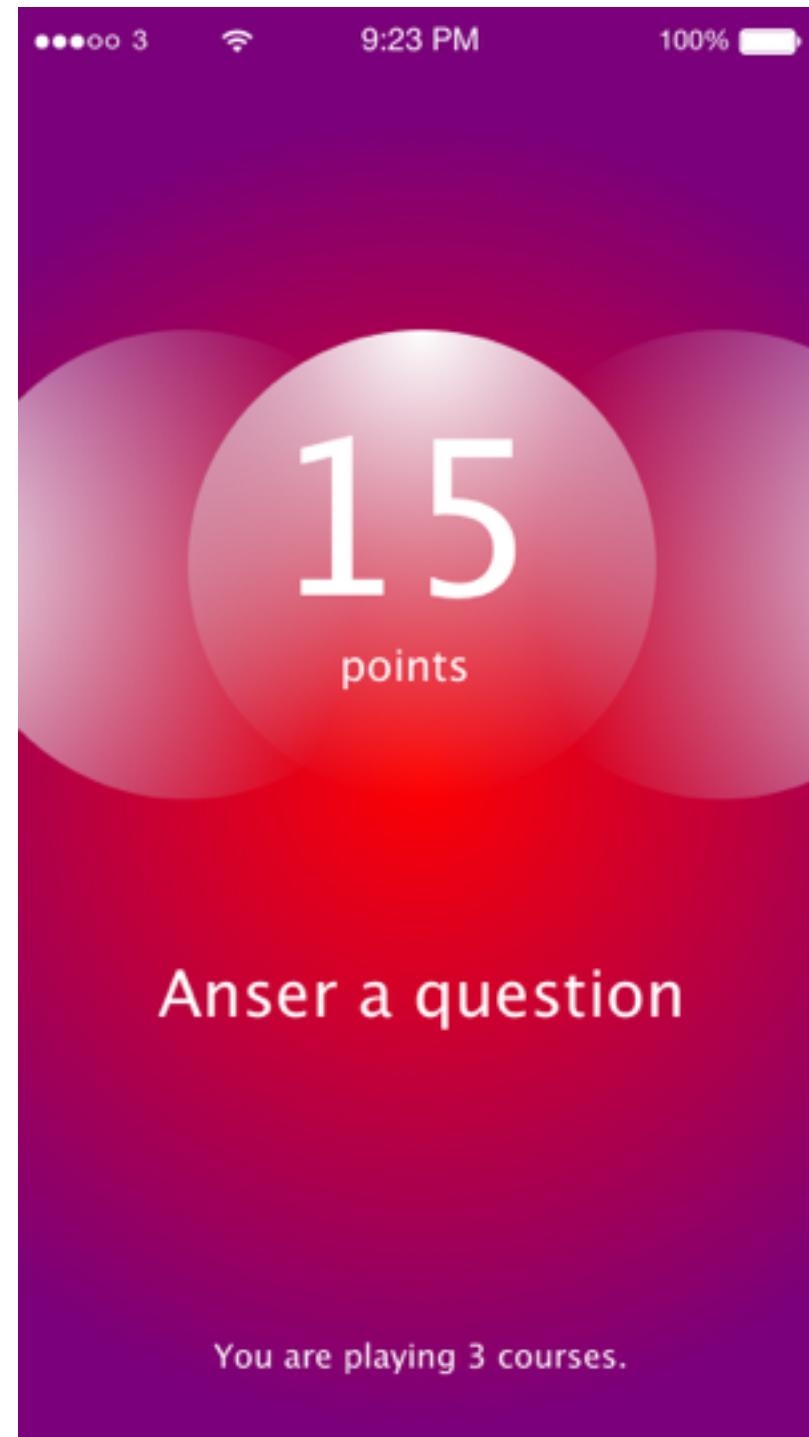


Home



Badges

Mockups – Play Now



Play Now



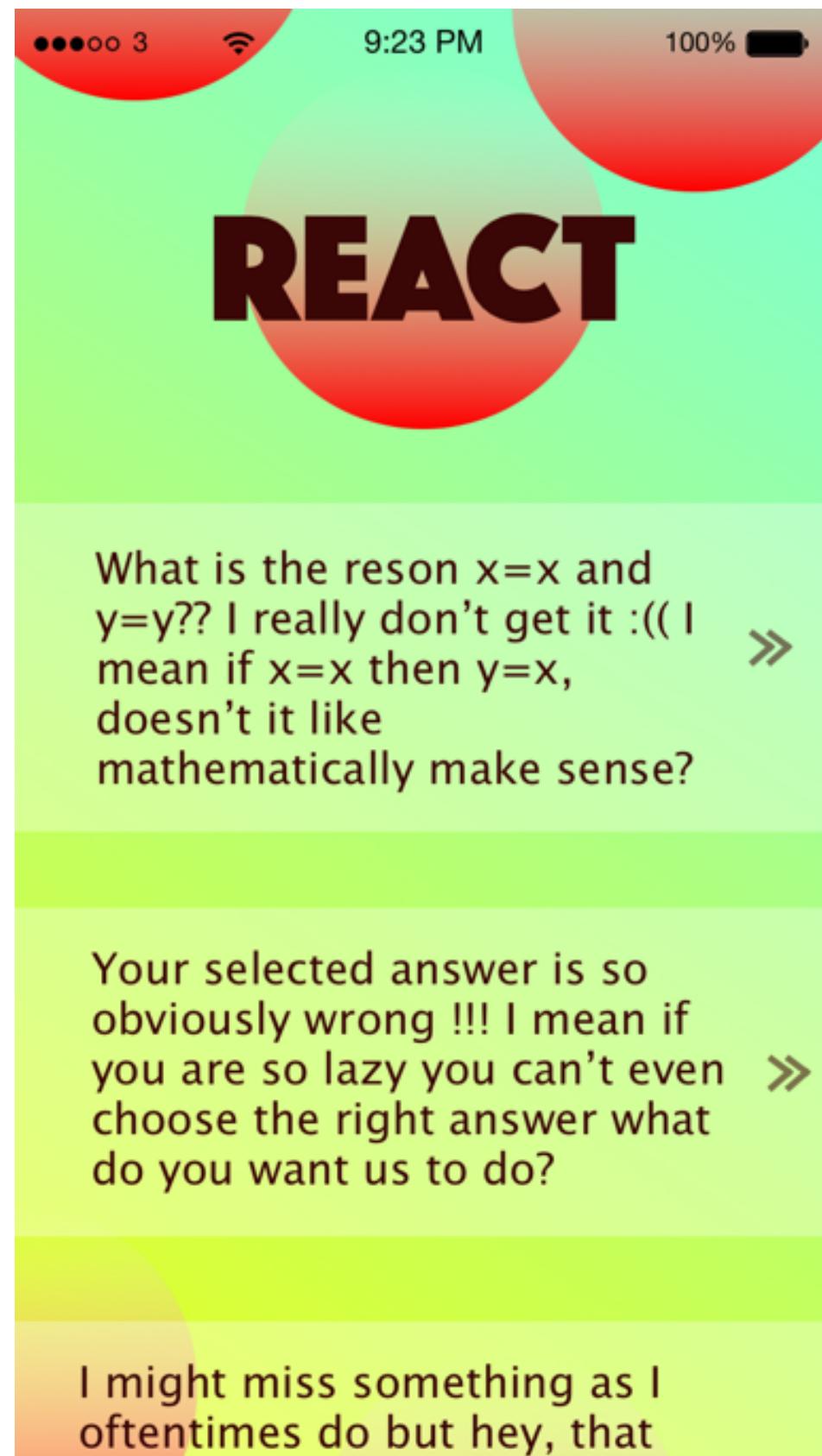
Ansver a question

When the user taps on 'Play Now' from the home, she will be able to choose which activity to perform from a menu that shows points for each activity. Activities include asking, answering questions and reacting to comments.

The allocation of points to each activity depends on the number of unanswered questions on the system. Sometimes the system doesn't need new questions hence answering questions will provide more points.

Answers can be scrolled horizontally. Animations enhance the experience.

Mockups – Play Now



React

Another key activity users can complete to gain points is answering comments to their own questions.

To serve this purpose I create the 'React' interface that collects in one single place all new comments.

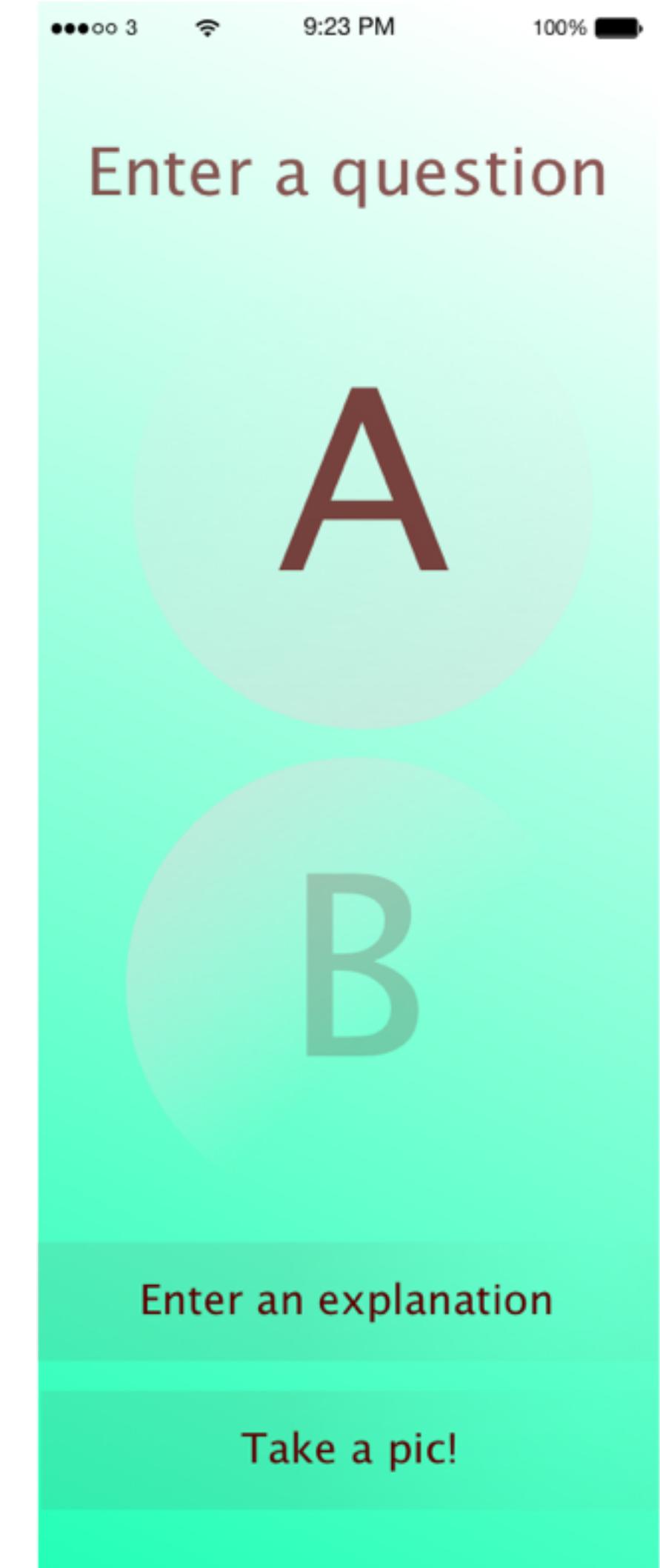
This interface can be accessed either from the play now interface or from the Account interface by tapping on the notification circle.

React

Enter a Question

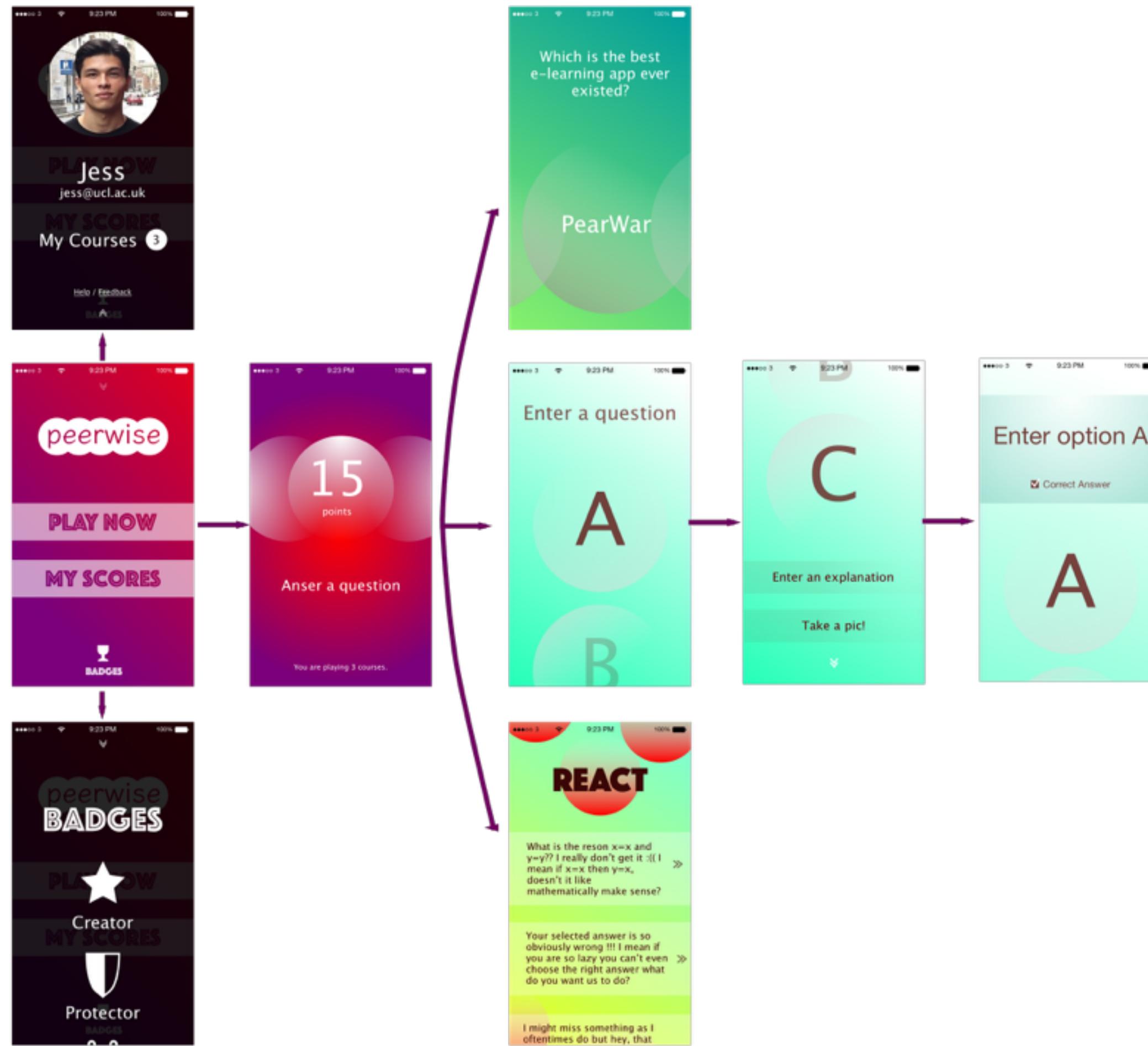
Finally, users can enter new questions in the system to gain more points. They can:

- Set the questions
- Set three options
- Select the correct option
- Add an explanation
- Add a picture to serve the explanation



Enter a Question

Application Wireframes



As the flow on the right shows I have reduced to the minimum the number of interactions required to access key features in the application. Here below is a comparison with the original website:

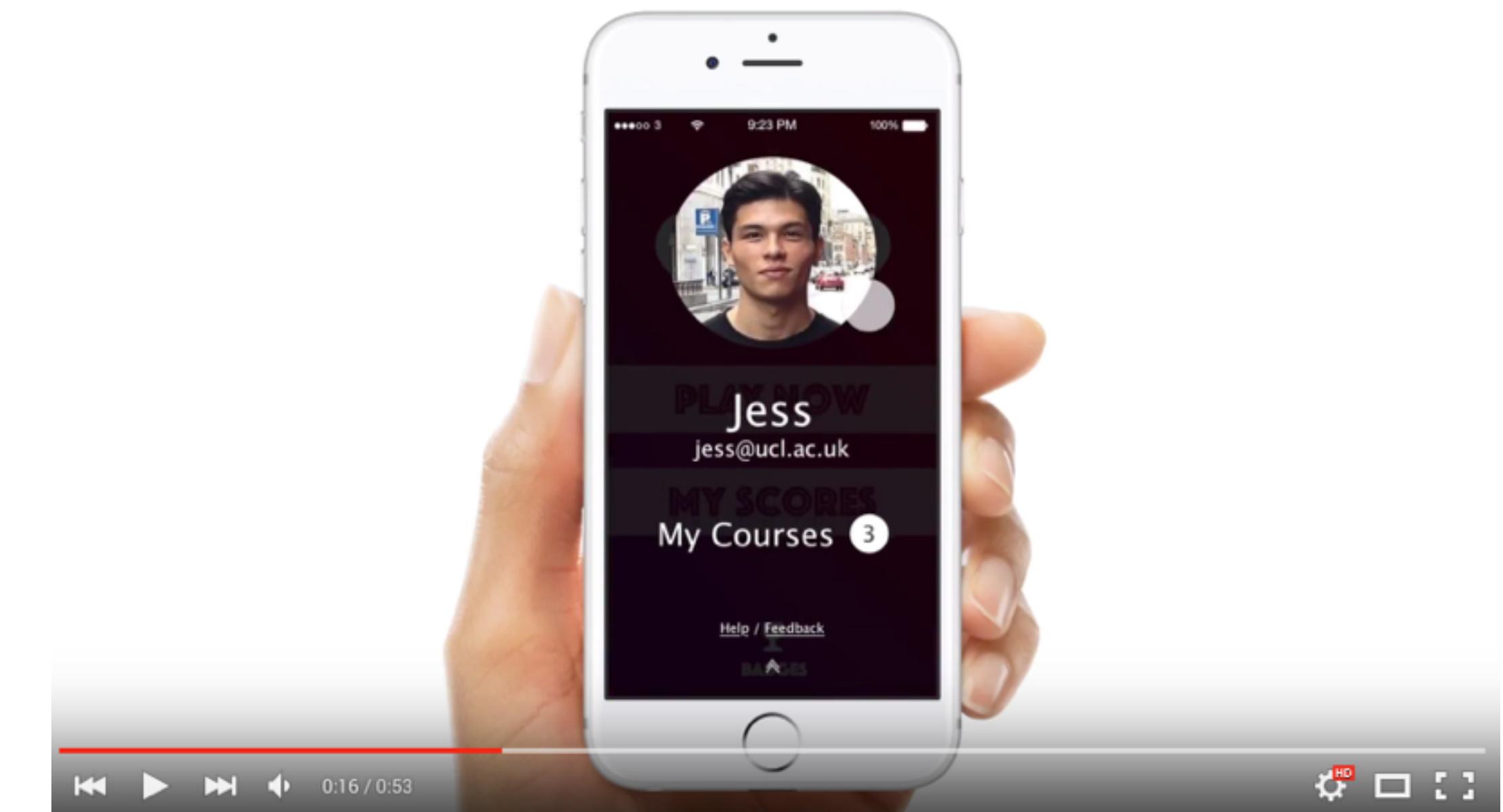
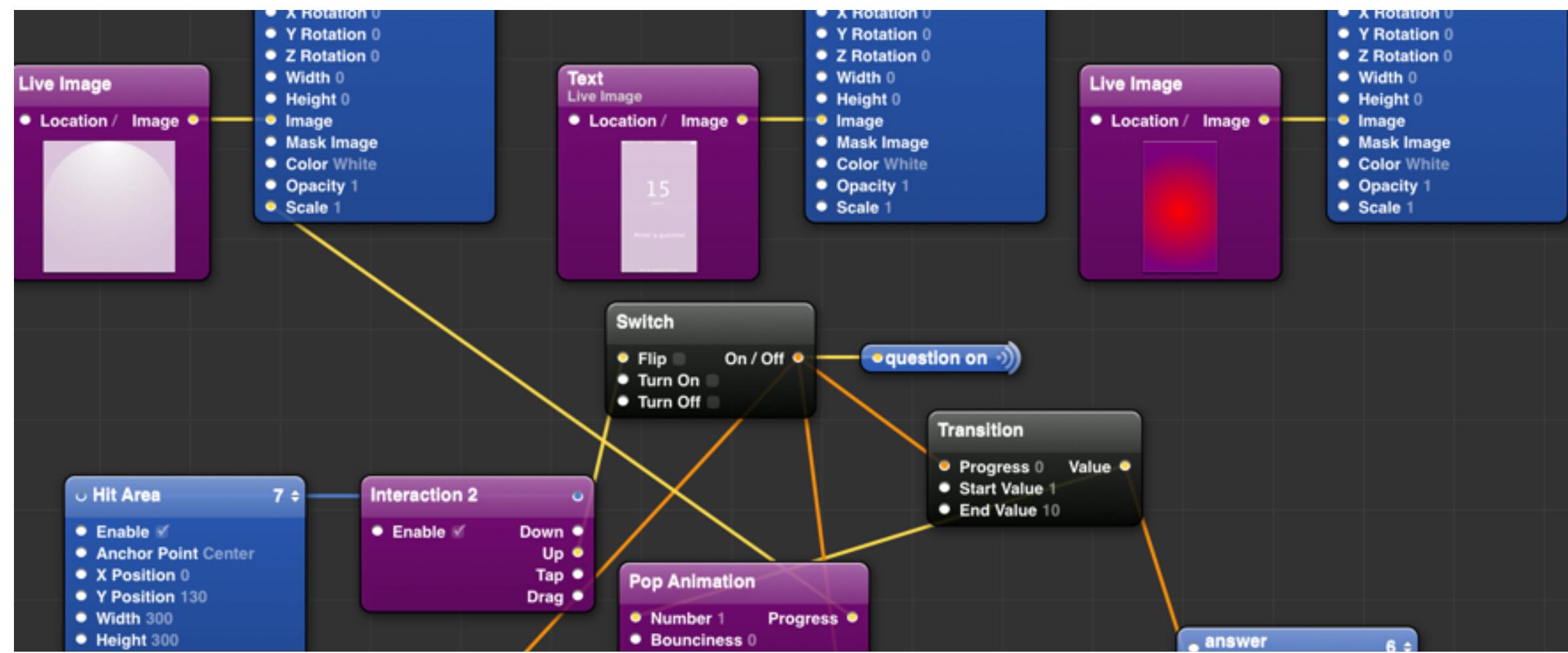
	Original	Redesigned	Improvement
Create a question	4	2	-50%
Answer a Question	5	2	-60%
React to a comment	6	2	-65%
Access Badges	4	1	-75%

Clicks or taps necessary to access selected interfaces

Final Product - High Fidelity Prototype

Sketching for mobile devices would not be completed without a live prototype that includes animations to interactions. User experience on mobile devices is in fact determined by the response to actions and behaviours.

I used **Origami**, a plugin for Apple Quartz Composer maintained by the Design team at Facebook, to import layers created with Sketch and add animations to them. Origami uses patches which can be seen as small functions taking inputs and outputs to control interactions.



Watch the video: <https://youtu.be/Y4mFjjbwJWE>

Prototype Evaluation

Two forms of evaluation have been used for the prototype:

Evaluation without users: Cognitive Walkthrough

For every **action sequence** (i.e. access to different functions in the system) I set up three questions (Kimmer):

1. Is the conceptual model based on user's expectation?
2. Is the current action visible?
3. Will the user understand the feedback?

Evaluation with users: Usability Test

I used direct observation in controlled environments with 5 users. In particular I used the **Think Aloud** technique and recorded notes.

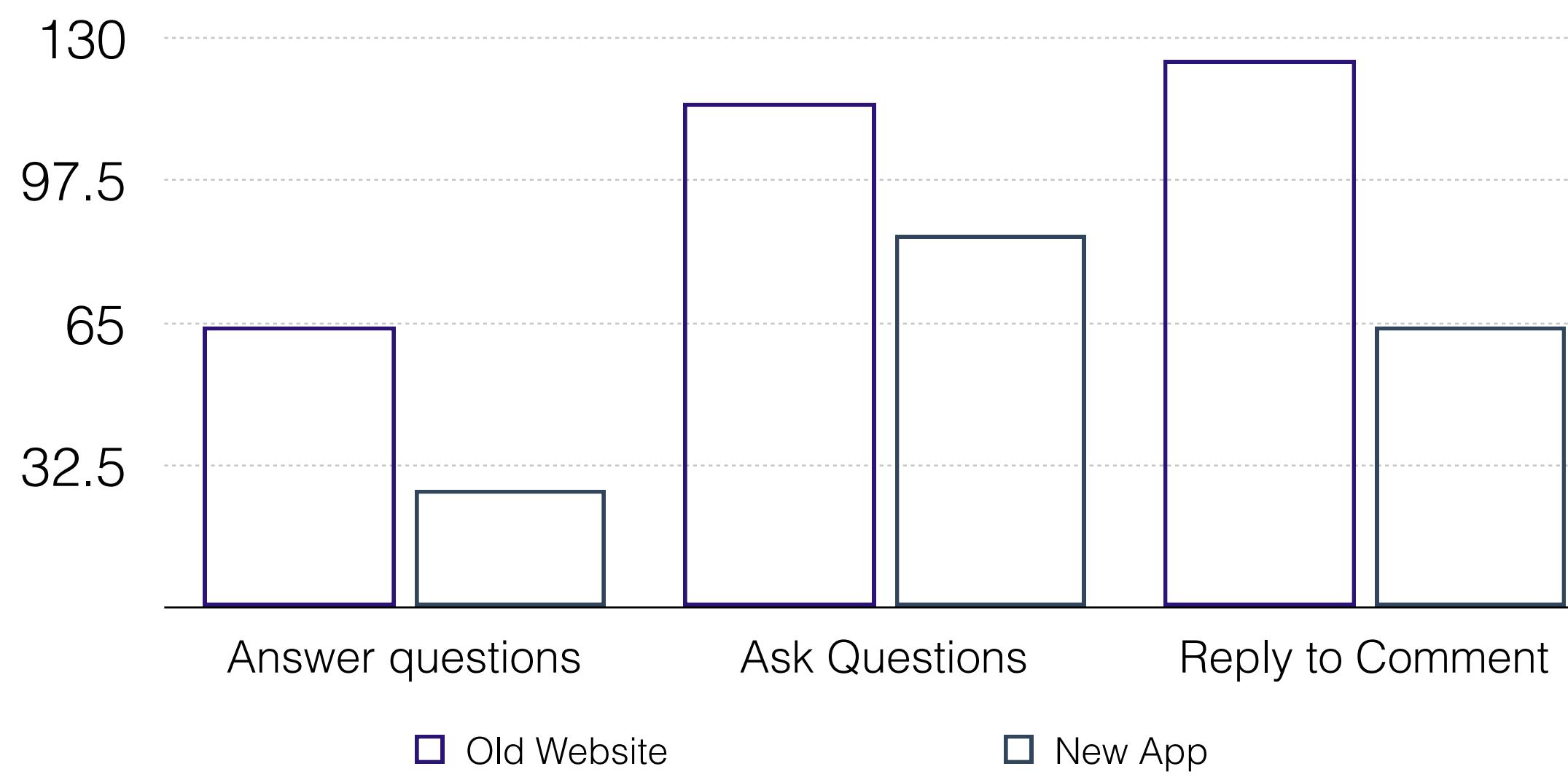
Prototype Evaluation: Positive Findings



From the cognitive walkthrough: The system responded to users' expectations for the whole Play Now section.



From the usability test (within subject): Time required to access each section dramatically reduced.



60% faster to answer
a question.

Based on usability test with 6 users. Measured in seconds from the home page to the function.

Prototype Evaluation: Issues



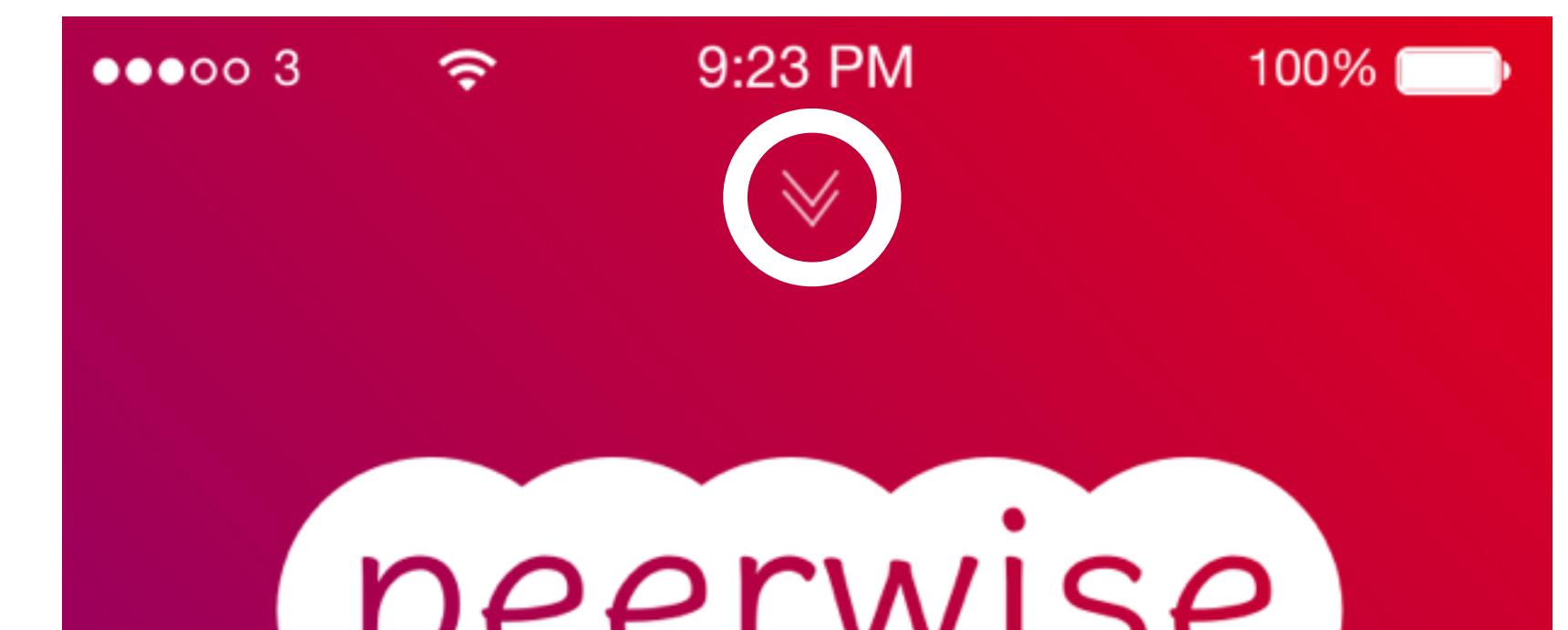
From the cognitive walkthrough: *conceptual model* for account and badges interfaces not evident: arrows to top or to bottom imply users learn the result of their actions via trial and error.



From the usability test: users are annoyed they had to go back to the Play Now interface to answer a new question.

Actions to take:

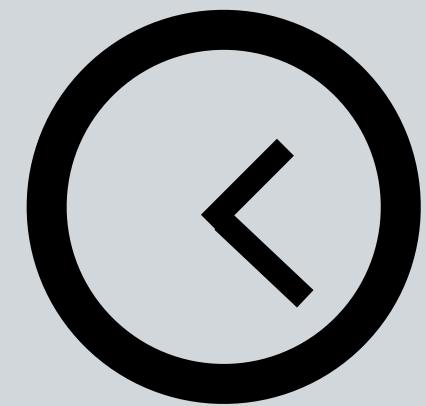
- Allow answering multiple questions in a row.
- Present a guided tour on first login to explain the arrows.



Arrows on the Home Page to access Account interface

Reflections on Interaction Design Process

The design process is now complete. I started gathering users data, establishing requirements, developing prototypes and evaluating those prototypes. Here are a few points I learnt from this process.

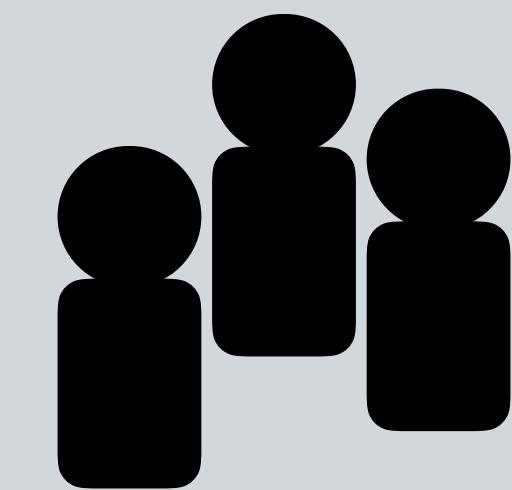


Usability Tests

During usability tests I was asking to start from the home page and reach certain interfaces to measure time. Users were becoming faster as the test progressed because they were familiarising with the UI. This partly polluted data.

Volere

The Volere template seems quite long if I had to follow it for every single requirement. In projects following Agile methodologies it would be too much of a overhead. This would end up being more of bureaucracy work.



Surveys

Surveys need to be concise in form and focused in questions. What helped me the most maximise the number of participants was also to say it was short within my request to them to take it.

Conclusions

1

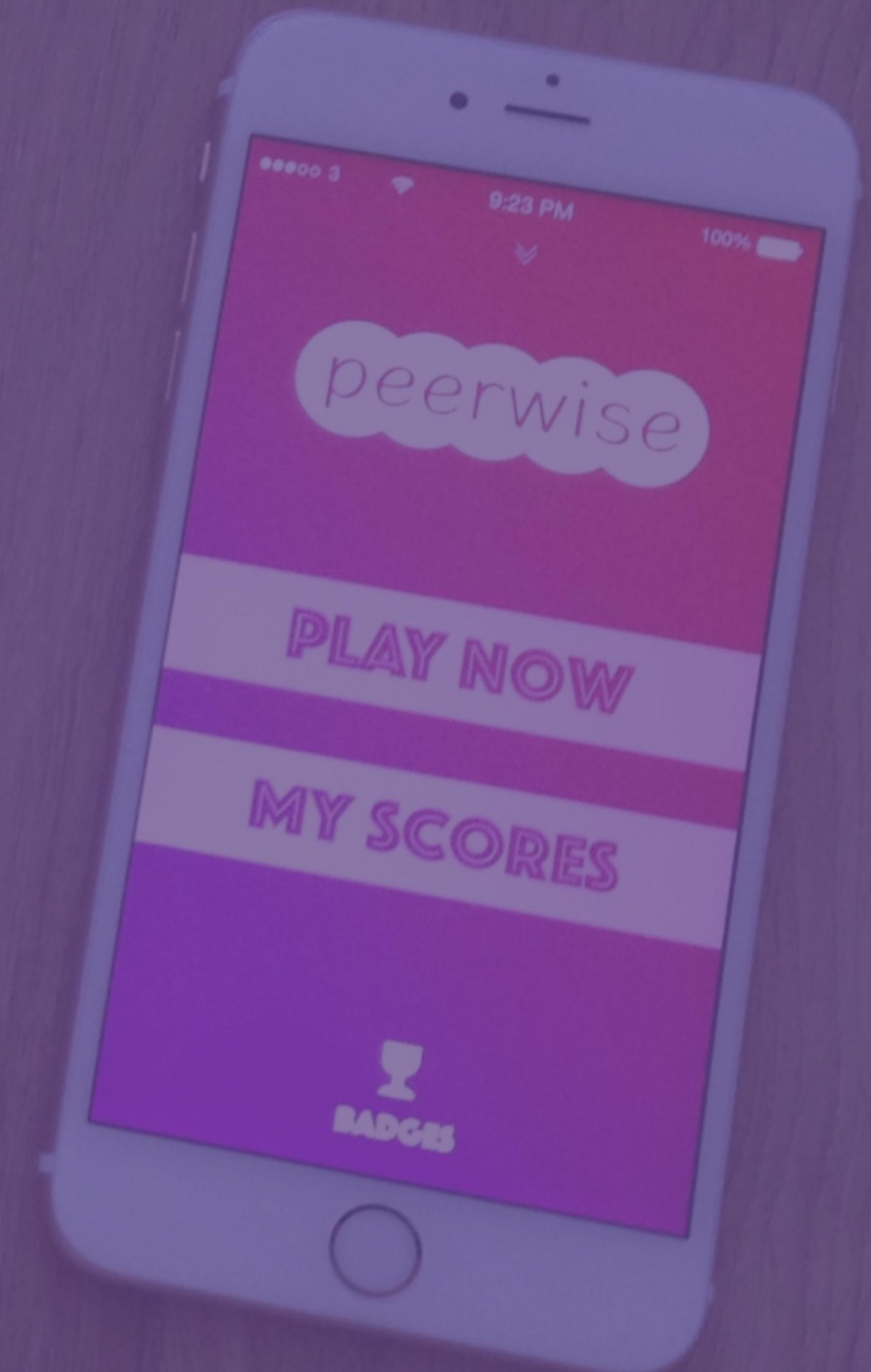
The new PeerWise followed a user-centred approach of design (Saffer, 2010). I translated users' needs into a redesigned application.

2

The process of interaction design is highly iterative. It should not end here. Feedback gathered from tests leads to new improvements.

3

Because user-centred design is iterative by nature, its phases should be as fast and agile as possible with little space for bureaucracy.



References

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Appendix: Interviews Questions

As I stated in my report, I used semi-structured interviews with five students as part of the gathering data phase. Here below the extract from one interview:

When did you use PeerWise for the first time?

I used it for the algorithms coursework only.

What did you find annoying when you set up your account?

The registration itself wasn't too much of a hassle. I was able to get my account ready in relatively short time. However, it was nonsense that I had to specify a module for each account.

Why?

Because if I had to use the system for other modules too I would have to set up a second account I think.

How would you improve this process?

I would have only one account for several courses for instance. Maybe still associated to my school.

What do you think about the user interface?

The UI felt outdated.

What do you mean?

It seems like it's done in the '90s. It doesn't look like modern websites yet it isn't too complicated to make god UIs.

Have you ever tried to access PeerWise from a mobile device?

Yes once but it didn't work so I stopped.

What exactly didn't work?

It didn't fit the screen properly. The whole page was fitting in the small screen so I had to zoom in for each individual section. It was annoying.

Do you think you would have used PeerWise more was it mobile first or a mobile application?

Yeah probably.

What do you think about the concept itself?

I liked the fact that I could ask clarifications on the questions I had to answer and that other people would join and answer. Also, the fact that the whole system is anonymous made it simpler for me to ask questions without fearing to be judged.

What did you most like about PeerWise?

This fact of being anonymous. Probably the fact that it was compulsory to participate made more people involved and hence it was more lively than if it was totally optional.

Appendix: Survey Question 5

While answers to questions 1-4 could be aggregated using graphs, question 5 was open. Here below a few answers I received.

Each question should be tagged using labels by the submitter. This would allow the person answering the questions to choose the topic/subject area from which he/she wants to answer questions.

Limited to only posting multiple choice questions. Maybe single box numerical answer slots? You could do that multiple choice too but that would involve 'giving' them an answer so they know better when they get the correct answer making the question easier.

I would make login first to the PeerWise and then select active channel, rather than finding university first, and then logging in.

There should be Facebook integration so we wouldn't need to login every time and we would receive all notification on Facebook or Twitter. Also we should be able to ask questions to the professor directly.

The screenshot shows a Google Doc window titled "PeerWise Questionnaire". The title is in bold black font at the top of the page. Below it, a sub-instruction says "It won't take more than 4-5 minutes." A note indicates "* Required". The main question asks "How much did you enjoy using PeerWise (1=not at all amazing)?" followed by a scale from 1 to 4 with radio buttons. The radio button for value 2 is selected. At the bottom, another question asks "What was the most annoying feature?" with a single radio button option: "Bad user interface.".

docs.google.com

PeerWise Questionnaire

It won't take more than 4-5 minutes.

* Required

How much did you enjoy using PeerWise (1=not at all amazing)? *

1 2 3 4

Bad user interface.

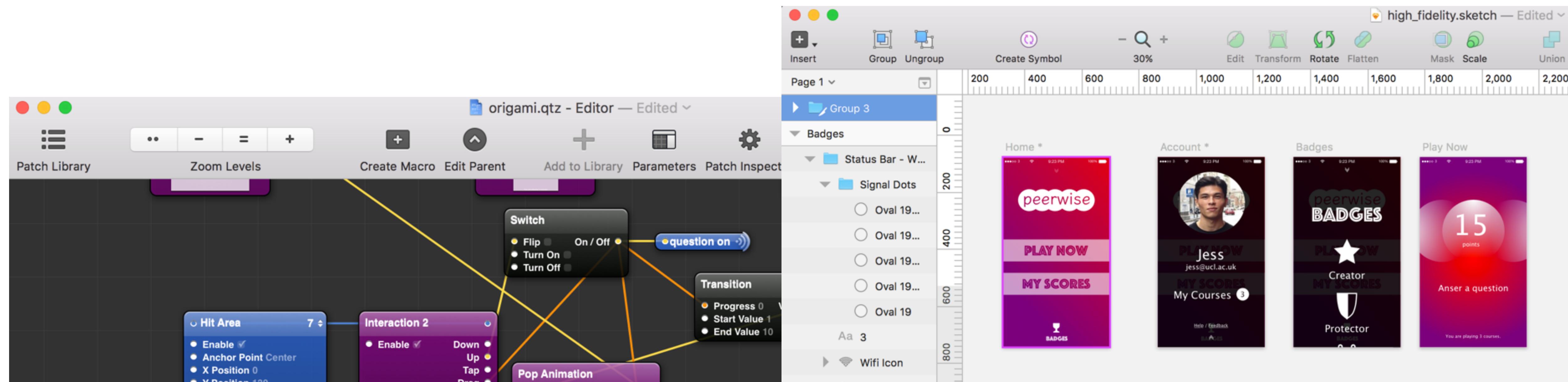
Appendix: Tools Used

Storyboard: StoryboardThat (<https://www.storyboardthat.com/>)

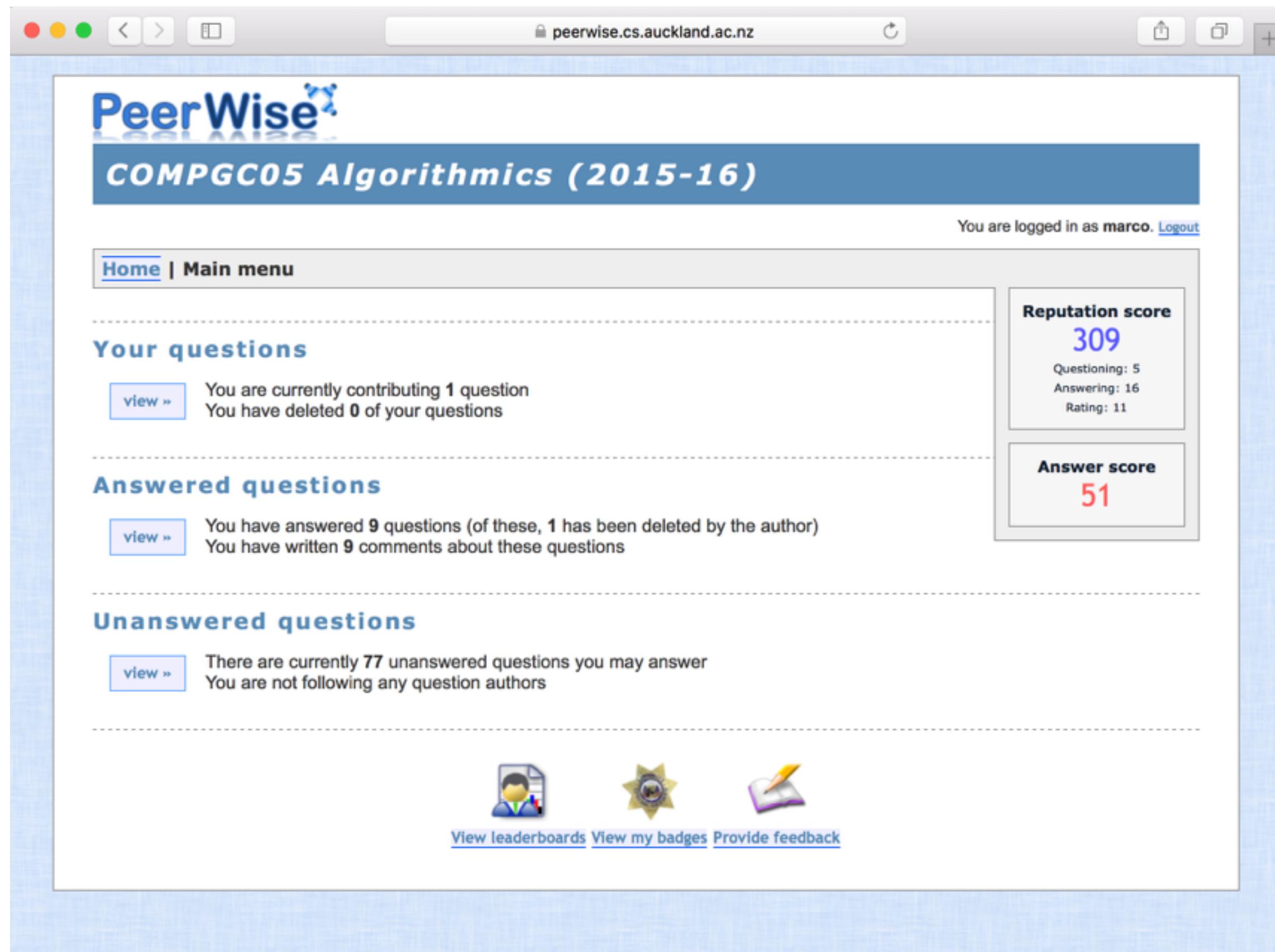
Initial Sketches: Balsamiq (<https://balsamiq.com/>)

High Fidelity Prototype: Sketch (<https://www.sketchapp.com/>)

Prototype Video: Origami (<https://facebook.github.io/origami/>)

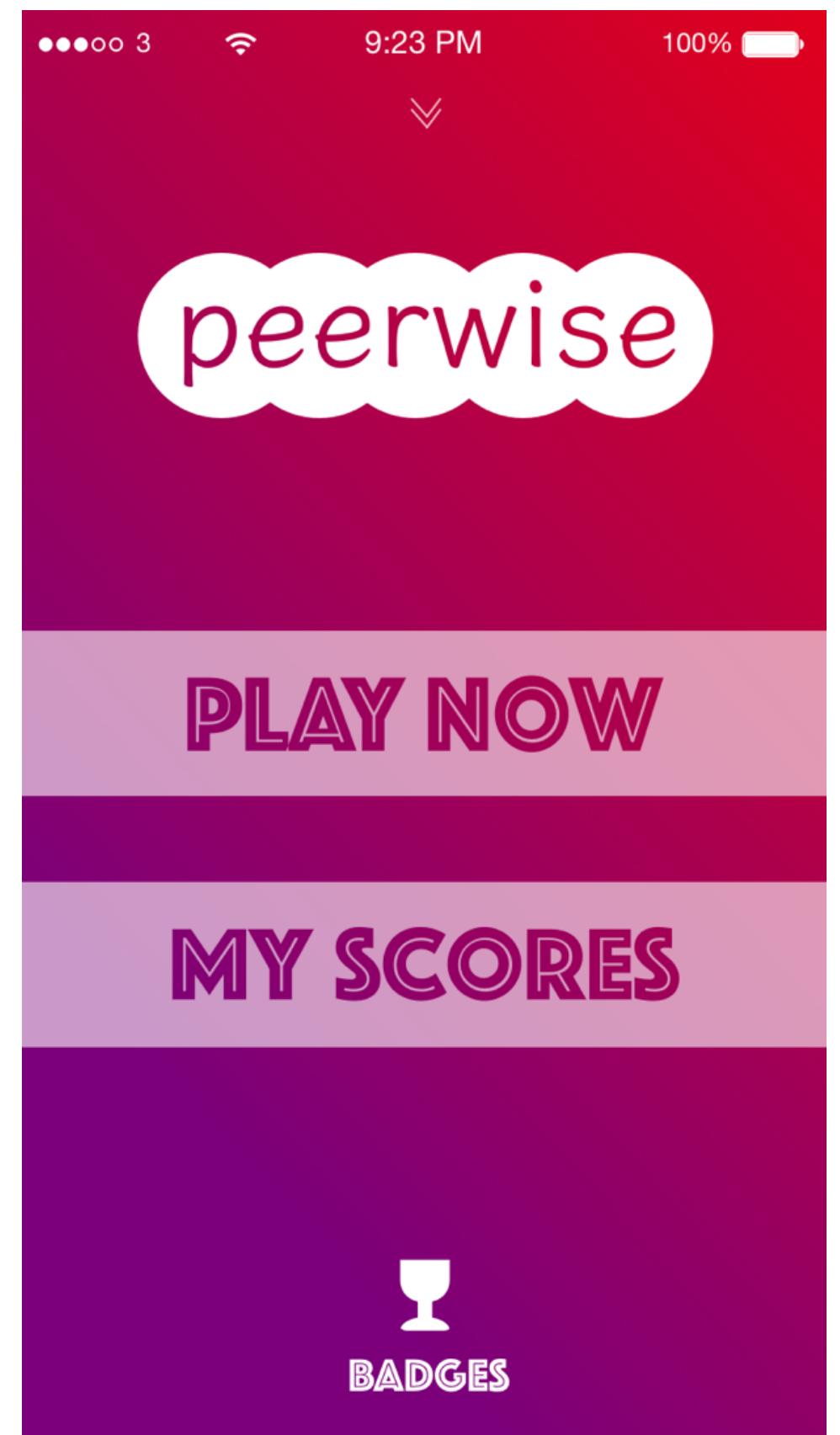


Appendix: Before and after – Home Page



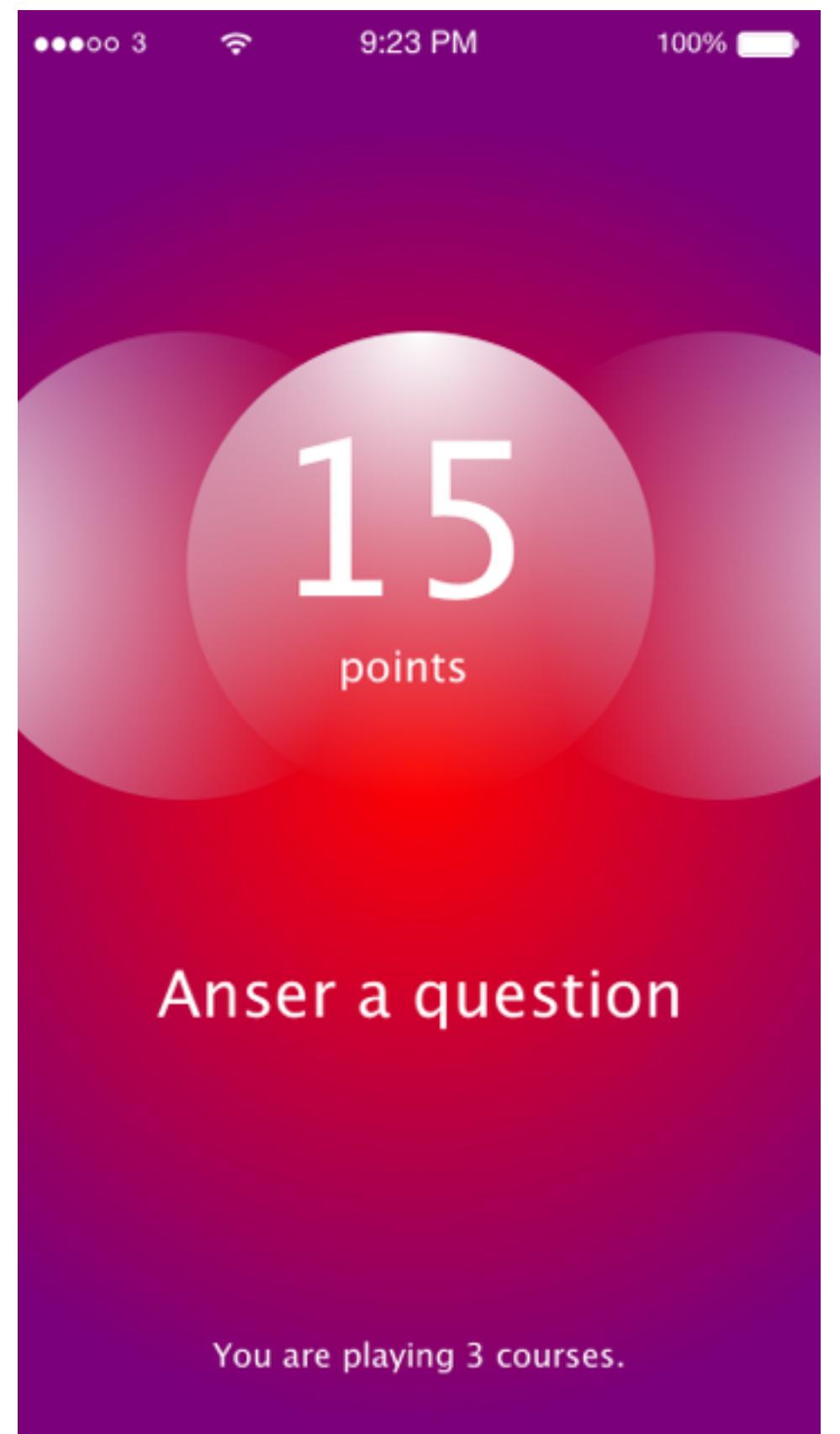
The screenshot shows the current PeerWise home page. At the top, it displays the course name "COMPGC05 Algorithms (2015-16)". Below this, a banner indicates the user is logged in as "marco". The main content area is divided into sections: "Your questions", "Answered questions", and "Unanswered questions". Each section includes a "view" link and a brief description. To the right, there is a summary box showing "Reputation score 309" (Questioning: 5, Answering: 16, Rating: 11) and "Answer score 51". At the bottom, there are links to "View leaderboards", "View my badges", and "Provide feedback", along with small icons for each.

Current Interface



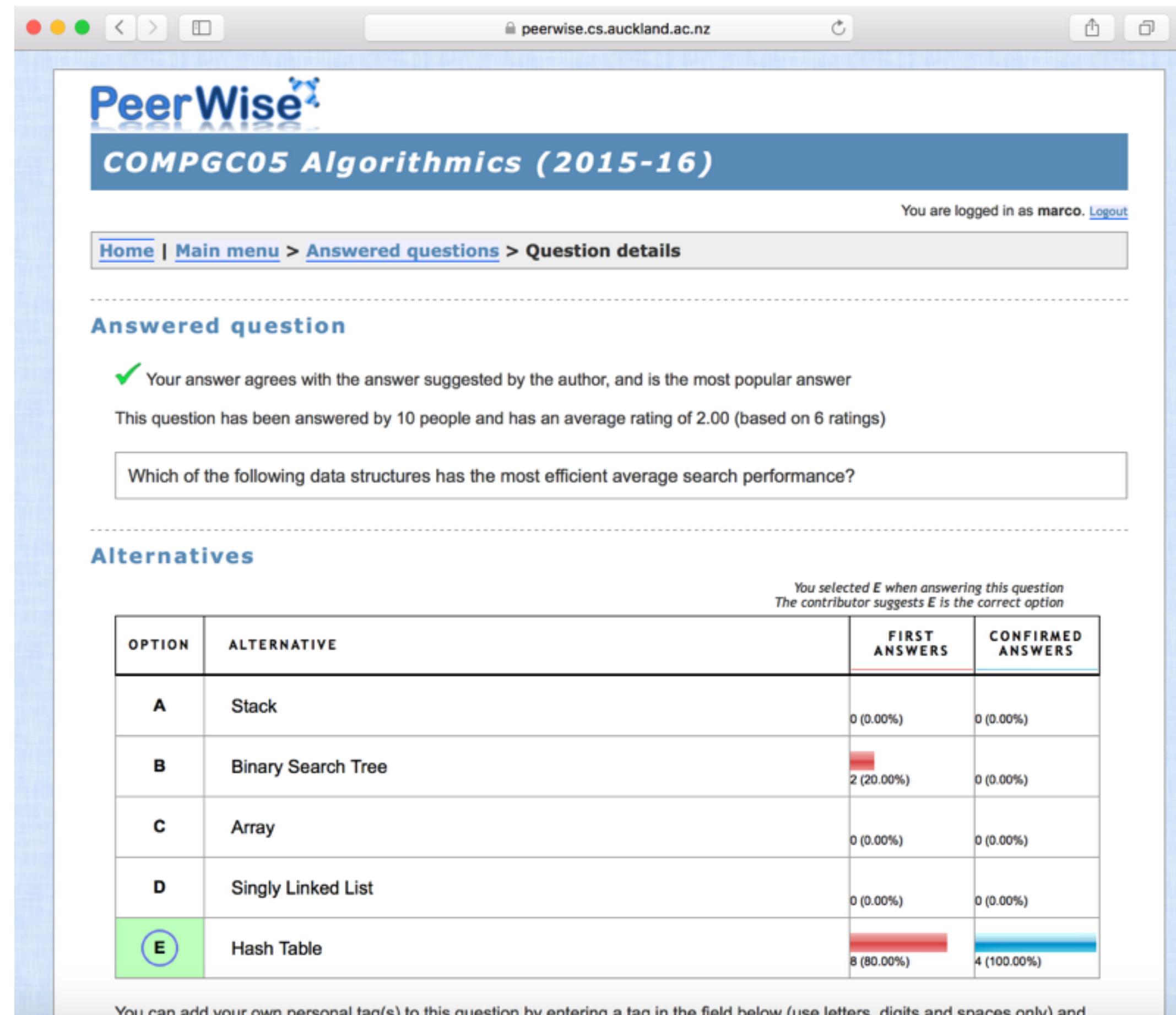
The screenshot shows the redesigned PeerWise home page on a mobile device. The interface is much more compact and modern. It features a large "peerwise" logo at the top, followed by a "PLAY NOW" button. Below that are sections for "MY SCORES" and "BADGES", each with a corresponding icon. At the bottom, it says "You are playing 3 courses." and shows a small trophy icon.

Redesigned Interface



This screenshot shows a second iteration of the redesigned PeerWise home page. The layout is similar to the previous one but includes a large circular badge in the center with the number "15" and the word "points". Below this, there is a "Answer a question" button. The bottom section remains the same, displaying "You are playing 3 courses." and a trophy icon.

Appendix: Before and after – Answer a Question

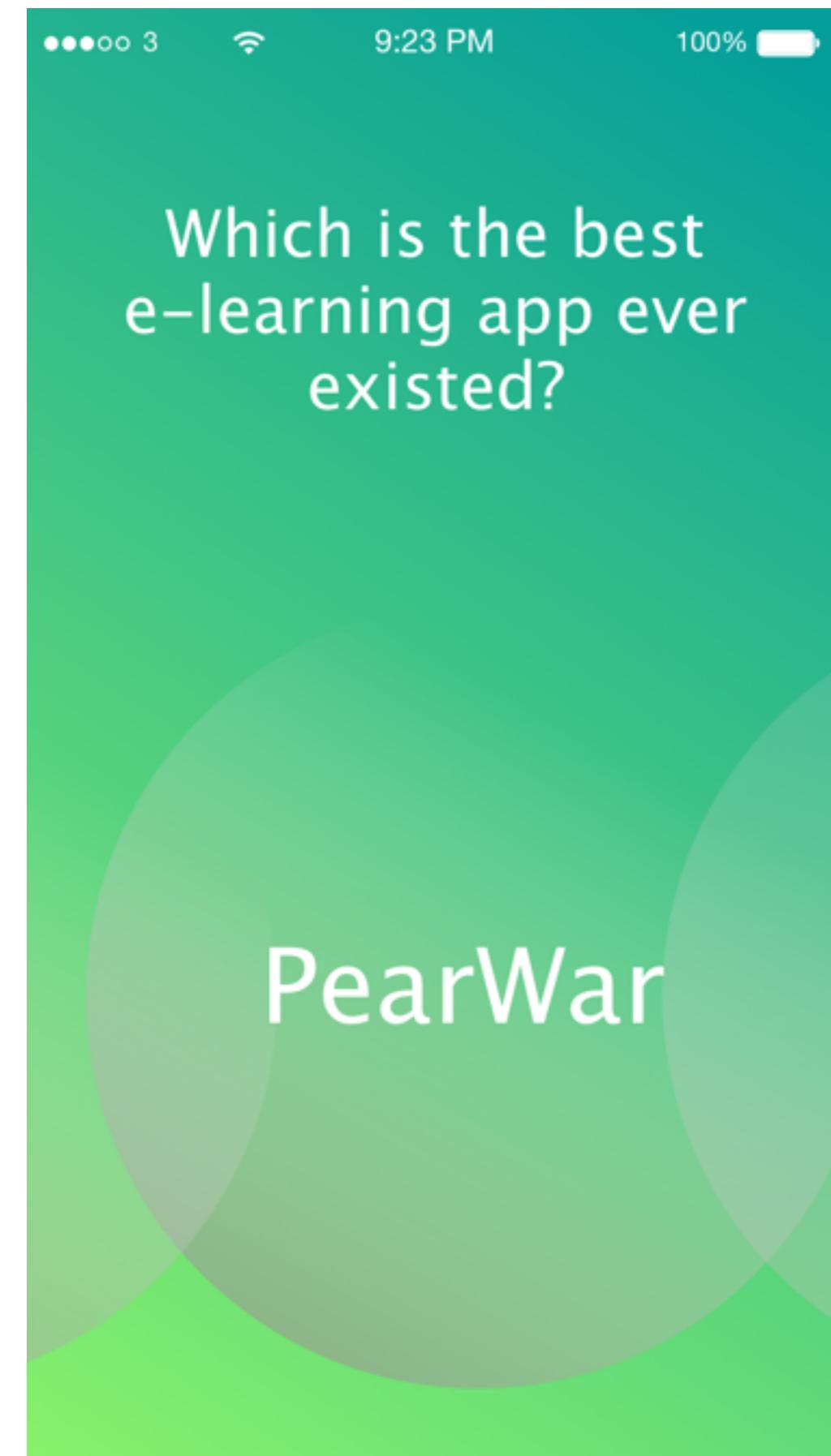


The screenshot shows a desktop browser window for the PeerWise platform. The URL is peerwise.cs.auckland.ac.nz. The page title is "PeerWise" and the subtitle is "COMP-GC05 Algorithms (2015-16)". The user is logged in as "marco". The main content area shows a question: "Which of the following data structures has the most efficient average search performance?". Below the question is a table titled "Alternatives" showing the distribution of answers:

OPTION	ALTERNATIVE	FIRST ANSWERS	CONFIRMED ANSWERS
A	Stack	0 (0.00%)	0 (0.00%)
B	Binary Search Tree	2 (20.00%)	0 (0.00%)
C	Array	0 (0.00%)	0 (0.00%)
D	Singly Linked List	0 (0.00%)	0 (0.00%)
E	Hash Table	8 (80.00%)	4 (100.00%)

At the bottom, there is a note: "You can add your own personal tag(s) to this question by entering a tag in the field below (use letters, digits and spaces only) and".

Current Interface



Redesigned Interface

Appendix: More circles

