

Indiana University, Bloomington. HCI/D

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[A DESIGN CHALLENGE EXPLORING MULTIPLE CHOICE QUESTIONS IN PALM- PRE]

Design challenge to understand the constraints associated with a design process. A practice of personas, computer imaginative thinking , user testing and incorporation of usability guidelines for disabled community.

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Assumption and Predisposition

Some assumptions we discussed

- People buy/give palm-pre for a reason, i.e. keyboard, multi tasking.
- Using touch screen is intuitive
- Social statement/status associated with palm-pre usage.
- task oriented tool, primary tool, avoids distraction.
- Could be effective way of learning interactively.

Personas

Emily

Medical Student



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Emily Hoffman is a 24 year old medical student living in Washington D.C. She recently moved there to attend John Hopkins medical school. This makes her schedule extremely busy, which in turn makes it difficult to spend time with her boyfriend of 2 years, Ron. Emily is constantly studying for her never-ending school work, and was given the Palm-Pre as a study tool by the university. She usually struggles with her computer and technology, and has never used a smartphone before. In her free time, Emily enjoys watching Reality TV. She often uses the DVR to record them, and then will spend one night trying to catch up on all of her shows. She likes to study intermittently while she watches though using her Palm-Pre.

Joe

Financial Advisor



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Joe Sheldon is a 34 year old man currently living in Cincinnati, Ohio. He works as a financial advisor for a large accounting firm. Joe constantly has to keep up with the industry, and is currently studying to complete a test to be eligible for a job promotion. Joe lives alone in a West Chester, Ohio, which is a suburb of Cincinnati. Joe commutes for about an 30 minutes each day for work, usually taking a bus. Joe lives alone and is currently not dating. He enjoys technology and is usually buying many 'Gadgets' for his personal use. His love of technology is what pushed him to buy the Palm Pre, and thinks that it is the best phone on the market.

Steve Cop



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Steve Barber is a 28 year old sheriff living in Hillsboro County, Florida. He has been a law enforcement officer since he graduated from High School. Unfortunately, Steve was in an accident where there was a small explosion very close to Steve. This has given him a hearing disability to the point of almost being deaf. Steve is married to his beautiful wife, Anna, and they currently have their first child on their way. Steve received the palm tree as a gift from his wife, and uses it to keep up on annual retraining at the sheriff's office.

Primary research

Various forms of primary research as listed below were carried out by the group.

- A 10 minute YouTube video to understand the various aspects of palm-pre.
- A visit to the sprint showroom to have a feel of the palm-pre before the start of the project.
- Exploring the various features associated with Multiple choice questions by using various smart phone applications using multiple choice questions *are you smarter than a 5th grader, Trivia Wars, Trivia Lite*.
- One of the major findings was that all the answers were easy to read and essentially required single tap.
- Visiting various websites to see the design on multiple choice question, For example BMW website(practice test questions).
- Studying various disabilities introduced as a part of the modifications by the U.S. government and designing for disabilities.

Preliminary sketches

A slew of sketches were drawn by the team before deciding the various aspects of the final design. See paper sketches and images provided with assignment.

Core of design and philosophy

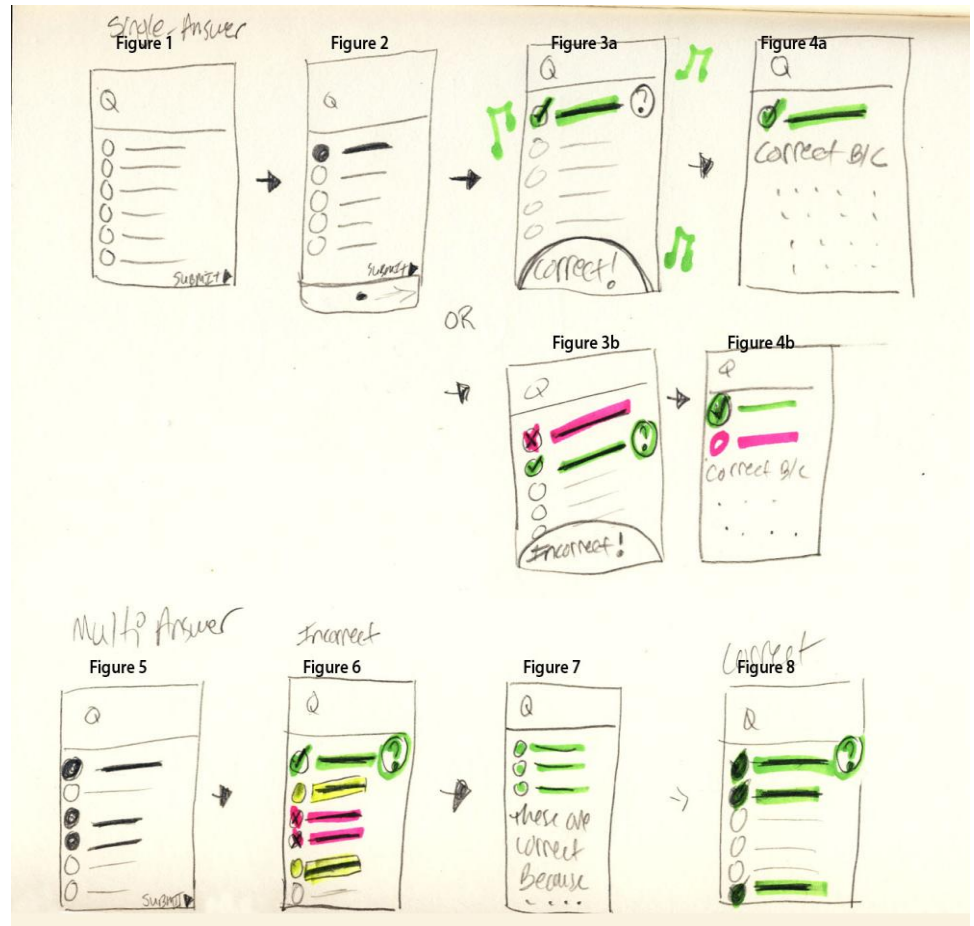
We decided on an "**effortless way to study**" as a design mantra. We decided that the capabilities of learning "on the go" has many implications for people who need to study for school, promotions, or just for exercising the mind. The mobile device allows users to practice anywhere and in a personal way. Emily could study in the library, Joe could study during his one hour commute, and Steve could study at home during his time off. The goal of the application was to provide instant feedback to aid in the learning process. The application needed to be clear about which answers were right and wrong, thus allowing the user to learn right away. We also provide an option to get more information about what was right and wrong and why. We decided to make this an option rather than forcing it upon the user because it that would hinder the flow of the test. If we want the user to be able to study, flowing through the questions effortlessly at a quick pace would be important.

Some of the main objectives behind our design are:

1. Design a simple way of learning between the end user and the system.
2. Empathizing with the disabilities act by keeping in mind that the disabled should not find it hard to use the design as well as not feel that the design had been made especially for them. Thus using the aspects of experience design with regard to disabled community.
3. A effective way of feedback which involves the end user being aware about the results as well seeing the possible explanation of correct or incorrect answer.
4. Having a minimum learning curve for the end user.

Design before user testing

For the main screen layout, we chose to put the question at the top for consistency's sake (Figure 1). Most people are used to the question being at the beginning, making this tool effortless to get started. We chose to have large bubbles next to each answer, again for familiarity. Most people have taken scan-tron like tests in their lifetime. This also aids the user to see what answer they have



selected, because the bubble is filled and the answer text is bolded (See Figure 2). We chose to have only a bubble and text, because having each answer inside of a button-like box would clutter the already small and densely packed screen. We added a submit button to the bottom portion of the screen in the "action spot", again this is familiar to users because the "action" button is commonly put in the bottom right corner. The Palm-Pre gesture area is useful for going forward and backwards and most Pre-users are probably familiar with it, however the actual device has no indication that this area is useable or what it does for a beginning

user. Because of this, we decided the gesture area could be used in conjunction with the submit button, but would not be the only method to move forward. We limited the application to 6 answers, because we wanted all answers to be able to fit on the screen, and having too many more answers than that would be difficult for both the user to understand and would hinder the study process. We assume that people making an application for a mobile device will not create questions with 10 or 20 answers because that is not very helpful on such a small screen.

To select their answer, we chose to allow both a tap and a double tap. We chose to allow for both because they are both familiar actions. We are preventing the user from making a "mistake" if they try to double tap and it doesn't work. For the single-answer tapping/double tapping a different answer would deselect that answer. For the multiple-answer, we decided to not limit how many choices the user could select, i.e. they could select only one or select all and the submit button would still allow them to submit. We made this decision because this is supposed to be a study tool, and if we set limitations on what they could and could not choose, that would be helping them weed out the right answer, rather than figuring it out for themselves. For the multi-answer questions, double tapping an answer would deselect it.

Once the user has submitted their answer, four things happen: (1) a message pops up for a few seconds on the bottom of the screen that says either "correct" or "incorrect"; (2) the correct answer is marked with a green check, the incorrect answer is marked with a red X, all others answers are faded to a light gray; (3) a small musical tune plays if the answer is correct; (4) a question mark button shows up next to the correct answer (see Figure 3a and 3b). For the multiple-answer questions, (1), (3), and (4) are the same, but in part (2) answers that the user selected are marked with either a check or an X (if they are right or wrong), but correct answers that they did not select are highlighted with a yellow box (see Figure 6 and 8) . We decided that we could not put a check mark next to answers that the user didn't select because this would be confusing. There needs to be two different methods for signaling the users selections versus what is correct. In both single and multiple answer questions, the users' selected answers stay bolded.

This gives the user a quick visual way to see what answer(s) they had chosen, and what of those are correct/incorrect.

Part (1) and (3) occur to provide a more fun experience. The pop up message in tandem with the small tune might make the user feel good that they got the answer correct. We decided the tune would be very short so that if the user were studying 50 different questions, it wouldn't be too annoying to hear it 50 times. Also, since the Palm-Pre does have volume keys, the user could easily mute the sound if they were in a public place studying. This is the reason we don't have only the pop up or only the sound - both are needed based on different situations. We also took into consideration deaf people using this application, so we could not have the only fun experience be sound related.

Part (2) is again based on familiarity. Green is associated with good, Red is associated with bad. Check mark equals good, X-mark equals bad. Fading out the other questions to light gray is another visual way for the users to see very quickly what is correct and not, without the clutter of all the other answers.

Part (4) gives the user the option to see more explanation about why the answer was correct or not, again they are not forced to see this information if they don't need to. We chose a question mark icon because that invites the user to ask "Why?" as in "Why is this answer correct?" (See Figure 4a, 4b, and 7)

After being given the guidelines for accessibility, we reevaluated our design to make sure we followed those rules. For example, we made sure to not use only colors to indicate right and wrong, there are also the checks and X's. We also considered the deaf issue with the sound.

User testing

Testing procedure

2 participants were recruited for the user testing. The following material was prepared for the usability testing. The participants were asked to use **think aloud protocol** during the user testing to gain insights into the design problems.

- Usability test consent form.(Appendix 1)
- Pre-usability test questionnaire.
- Task lists.
- Post usability test session.

Pre-usability study questionnaire

1. Have you ever used a Smartphone?
2. Have you ever used the Palm-Pre as a Smartphone?
3. Do you use applications on your Smartphone?
4. Have you answered multiple choice questions before?

Pre-usability study questionnaire Results

1. Both the participants said yes.
2. Both the participants said no.
3. One participant said yes and another said no.
4. Both the participants said yes.

Tasks

Same question list asked for both multiple/single answer questions.

1. How would you choose your answer?
2. Say you've thought about the question for awhile, and you want to change your answer. What would you do?
3. Now you're finished selecting your answer and you want to find out if you got it right. What would you do?
4. What does this screen mean to you? [Looking at the screen with questions marked with X and check mark.]
5. What if you wanted further explanation about this?

Results

Test 1

Single choice scenario

Positive points

1. User was successful in doing the task 1.
2. User tapped on the other option which was expected and thus we were successful in our design.
3. The user selected the submit button.
4. Correct and incorrect options were clearly explained by the user. Correct was appreciated by the user.
5. The user could relate the question mark to be related to the explanation.

Negative points

- 1.No negative points
- 2.No negative points
- 3.The user although identified the submit button however the user felt that the button was small as he revealed the reason for delay in identifying the submit button as the size of the submit button.
- 4.The user identified the question mark as the help button initially and then due to the presence of this question somehow felt that question mark was the only way he could get the feedback. Therefore some design problems have been observed.

5. The user had the same approach to click on question mark to find the feedback.

Multiple choice scenario

Positive points

1. User selected the first option
2. Clicked on some other option
3. Question mark was successfully used.
4. The user could explain the different aspects of the screen
5. The user identified the question mark as a means to help him.

Negative points

1. User was not aware that the MCQ had 2 choices.
2. The user felt that the selection of two choices was not obvious, thought that the question could have been framed in a better manner. Felt that the radio buttons could take the shape of the square buttons when clicked for questions having multiple answers.
3. Submit button was identified by the user, however it was felt that it was a result of identifying in the first scenario.
4. The user was confused where the question mark would go in case of multiple answer questions. One
5. One single question mark in front of one of the right option confused the user about placement and reasoning of having the feedback in front of that option and not in front of other right option. The user felt that the feedback system should be having one static position without any change like the ones suggested by application.

Test 2

Single choice scenario

Positive points

1. Subject selected 'Leg' and mentioned she would expect 'Arm' to be deselected.
2. Simply clicked 'Submit'
3. Subject selected 'Arm' by tapping it once.

Negative points

1. She understood that the X implied she got the answer wrong, and also understood the right answer was highlighted. She did mention, "I have no idea what the question mark means."
2. Clicked on question mark, but we feel that this was a leading question.

Multiple choice scenarios

Positive points and negative points

1. Just selected 'Royal Scotland' by tapping on it once.
2. To change her answer, she tapped on 'Parabis'. When she saw that 'Royal Scotland' stayed selected, she thought this implied there could be multiple answers.
3. Subject mentioned that she expected to not only see the correct answer on the feedback screen, but also to view what she selected, so she can know what she got wrong.

Rationale for redesign

Our prototyped design was simple in most cases to use; however, the users stated concerns regarding one or two of the designs we had implemented for our multiple choice question system. The users were able to comprehend the interactions with the touch screen device, and for the most part had little difficulty navigating around and submitting answers to proposed sample questions. From the beginning, most of the group had expressed that they were interested in designing a simple environment that would satisfy our defined core of the scope. This proved to be a vital concept in our design as we wanted to keep our environment as transparent to the user as possible. In the end, this allowed us to make simple and proficient changes following the insight we gained from our user tests. We conducted two usability tests on our prototype, as well as discussed methods that could be introduced into our design from a current PalmPre user.

We found mostly that our initial design worked well with the exception of a button or two, quite literally. We had questions from all of our tests to inquire as to what the circle button with the question mark did. We did not realize that this may not be obvious

to new users, but wanted that button to then give the user feedback on the extent of the task at hand. We then discussed these findings among ourselves and did a bit more research to see if PalmPre had an established icon or informational tool used to display miscellaneous information. After this research, we settled on the simple solution of adding a button with the text, 'Explain This'.

If we were allotted more time in the end, our group would have liked to have addressed more issues than what was prominently foreseen by the user tests; as we had more concerns ourselves later during the development process. We chose again to keep our design simple and chose to prioritize our attack of the problems on those concepts that the new users of our environment felt were unclear.

Final design after iteration

Single answer interfaces



Multiple answer interfaces



Appendix 1

Usability test consent form

Please read and sign this form.

In this usability test:

- You will be asked to perform certain tasks on a palm pre-application.
- We will also conduct interview with you.
- You will be asked to fill in a questionnaire.

Participation in this usability study is voluntary. All information will remain strictly confidential. The descriptions and findings may be used to help us design the application. However, at no time will your name or any other identification be used. You can withdraw your consent to the experiment and stop participation at any time. If you have any questions after today, please contact the usability consultants .

I have read and understood the information on this form and had all of my questions answered

_____	_____
Subject's Signature	Date
_____	_____
Usability Consultant	Date
_____	_____
Usability Consultant	Date