Station Monitor Evaluation Summary

For
Michael Hubenthal
IRIS

By
Bradford Davey
TLC Inc.
October 2018

Table of Contents

Executive Summary

- A total of 15 participants completed the app review (9 male and 6 female, 5 in the youngest age group, 4 in the middle group, and 6 in the oldest age group).
- Participants rated their "science interest" with a mean of 7.1/10 and a range from 2 to 9 and a mode of 8.
- It took participants an average of 16 minutes to work through the app with a range of 10 to 25 minutes and a mode of 18 minutes.
- When rating their pre and post knowledge of basic earthquake concepts, participants showed increases in all three areas: When an earthquake occurs the ground moves (2.2/5 Pre and 3.3/5 Post), For really large earthquakes, this motion includes all of Earth's surface, even if only a tiny amount (2.2 Pre and 3.3 Post) and The amplitude of the ground motion gets smaller as you move farther away from the epicenter of the earthquake (2.7 Pre and 3.5 Post).
- Users were able to navigate through the app and improve their skills as the testing progressed.
- The app offered new information for all levels of users, was engaging, and worked well.
- Recommendations from observing users included encouraging more time be spent reviewing the introductory screens and informative videos, offering additional help throughout the app (pop-ups), include some additional navigation reminders, and improve some minor functionality issues.

Evaluation Design

Goals

1) Demonstrate that, following a large earthquake, a new user to the IRIS Station Monitoring app can successfully:
    a. find a station near their location and determine whether an earthquake was recorded at a nearby station and if so, how much did the ground move.
    b. describe what a seismogram is and the information it conveys
    c. determine if the ground moved at other stations as a result of an earthquake and how the ground motion at a second station compares to the first station (e.g. if the second station is closer to the quake the amplitude should be larger).
    d. investigate an event or station further in greater detail
2) Returning visitors will be able to successfully:
    a. investigate a station location for daily changes and patterns
    b. monitor background noise from same location in winter and summer
    c. determine differences in quake data based on proximity of station to the epicenter
    d. describe difference in station recordings during non-events.

Core Learning Ideas (for new users)

Core learning ideas were determined by the IRIS team and user were asked post experience to rate their understanding of each core idea using a scale from 1 to 5 where 1 was no understanding and 5 was a complete understanding.

1. When an earthquake occurs the ground moves.
2. The amplitude of this ground motion decays as you move away from the epicenter of a quake.
3. For really large quakes this motion includes all of Earth's surface, even if only a tiny amount.

Primary Screens for Station Monitor

- Introduction
- Map View
- Station View
- Seismogram View

Interview

A total of 15 "new users" (e.g. those that have never used the app previously) who are "science interested but not seismologists" (e.g. a range of 3 to 10 on a scale from 1 to 10) will be asked to use the Station Monitor app to complete tasks using the following protocol:

Introduction

A. Open the app. Describe what you are seeing as you explore (this will be the initial help screens). View and record if the user reads the into screens, Ask users if their exploration of the help pages was "normal" for how they would interact with an app or would they be more likely to just skip over those screens to get to the functional app?

Map View

B. When they get to the map page - What features are immediately apparent?
C. Navigate to the closest station to your current location on the map?

D. What information is available about this location? (Probe for the value of the info provided. Is it too little? (what else would they want) Just right? Too much? (What is extraneous))
E. If they haven't already, ask them to predict what they think will occur if they select the magnifying glass icon? As them what they predict will occur if they select the three dot icon? All them to explore both features and note if they matched expectations.
F. Assume that a large earthquake (Magnitude 7+) has occurred in Japan. Did you know that such a quake can make the ground move where we are now? Navigate so you can look at the seismic recordings for this station. (Can they find the wiggle icon in top right and do they click it?)

Station View

G. Explore the page and describe what you see on the screen. Do they scroll to the bottom of the page?
H. What does the seismic recording at this location tell you?
I. Navigate so you can view the recording from a different date. How does this data compare to the previous days data?
J. Navigate to 9/28/18. Describe what you see on the screen. How does this data compare to the previous days data?
K. What information might you want to know about the event? Navigate to see if you can get that information. This should lead them to the Seismogram View page.

Seismogram View

L. Explore the page. Did they scroll below the map? Was the information they found useful? Was there information that was confusing to them? If so, ask them to seek "Help" for what they see on the screen.
M. If uses don't click the three dot icon in the upper right, point it out to them.
N. Ask them what they the function would be for each item in the three dot menu? Allow them to explore and see if the actions match their expectations. Note use of help menu.
O. Navigate back to the Station View. (could they find the back button)

Station View

A. If they didn't already, ask them to seek help for this page. If uses don't click the three dot icon in the upper right, point it out to them.
B. Ask them what they the function would be for each item in the three dot menu? Allow them to explore and see if they actions match their expectations. Note use of help menu.
C. Ask users what they expect to find under the Event button in to right (next to three dot).
D. Allow users to explore and see if the actions match their expectations.
E. Next, navigate to a station that is closer to where the large event occurred (in this case, near Indonesia).

Map View

F. Before we select a station, "How would you expect the ground motion to compare to the first station we looked at?"

Station View

G. Navigate so we can examine the ground motion at this station.
H. How does this ground motion compare to that of the first station we looked at? Allow open exploration here. Interested in participants reactions to the presentation of the data, number of events on the screen and how this matched their expectations.

IRIS provided a list of current or former users who can be interviewed: A total of 5 "repeat users" (those that have used the app on at least one other occasion) who are "science interested but not seismologists" (e.g. a range of 3 to 10 on a scale from 1 to 10) will be asked to use the again using the following protocol:

A. Open the app navigate to a station near their current location.
B. Predict how you expect the ground motion near you to vary on a daily basis. Explore how the ground motion at that station varies daily. What do they notice? How do they react if there is seismic noise by no earthquake (e.g. Jacksonville Station N4-456A has lots of noise on the traces but few are flagged as quakes)? Describe the differences in station recordings during non-events.
C. Next, explore how the ground motion for this location varies for summer and winter periods. How did they go about exploring this? What did they observe? Reactions?
D. There was a large event on 9/28/18 in Indonesia. This event was recorded by stations all over the world. How do you think the recordings of the quake would differ based on proximity to the epicenter? Explore this. As them to think aloud as they explore this and examine the data.

Evaluation Recording

During the users' time using the app, the evaluation was conducted as follows:

A. Ask if the intended user is willing to participate prior to beginning the process.
B. Ask the new user and repeat users to activate the app.
C. Once activated, the evaluator will give the above corresponding protocol to the user one step at a time and ask them to describe their experience.
D. The evaluator will record audio of as the users responses as well as any questions they ask.
E. The evaluator will also record the screen and user interactions with the app via video recording (for virtual users) and with his phone for in-person users.
F. The evaluator will note any issues with the app including freezing, data not loading, and crashing.
G. At the end of the above steps, both new and repeat users will be asked to rate their level of understanding of the three core ideas. Please rate your understanding of these ideas Before using the app and After using the app today on a scale from 1-5 where 5 is a complete understanding and 1 is no understanding at all.
    a. When an earthquake occurs the ground moves.
    b. For really large earthquakes, this motion includes all of Earth's surface, even if only a tiny amount.
    c. The amplitude of the ground motion gets smaller as you move farther away from the epicenter of the earthquake.
H. The evaluator will:
    a. Work with the IRIS team to insure 15 users are able to test the app
    b. Schedule users either virtually or in-person

c. Guide the users through the app testing procedure using the guiding questions developed by the IRIS team
d. Observe the users as they test the app and record both with notes and through a screen capture recording the users experience and interactions
e. Summarize the findings from the app users and share all data including
    i. Screen capture and in-person videos
    ii. Notes from observations

Evaluation Findings

Overview

All of the users were able to open and navigate the app. All but one saw the initial help screens and explored them. Most users took only a short amount of time to explore the pages with about half making some comment later in the exploration that they should have taken more time on the help pages. Most reported not usually spending much time on the help pages and expected that they could "learn as they went." The following is a summary of observations made during the described protocol.

Map View

- When arriving on the map view page, the users recognized the map as a map of Earth, noted the different features, had a guess as to what the numbered tringles meant, and could navigate around including zooming in and out. Few of the users were able to correctly identify that the numbers represented the number of stations in that area of the map and incorrectly thought that was the number of recorded earthquakes.

- All users were able to navigate to the closest station to their current location. Most simply zoomed in using the two finger expansion method with two using the "+" on the right of the page.

- All users were able to correctly identify the information about the location they chose and felt that there was nothing missing.

- About half of the users identified the "magnifying glass icon" and those that did we able to correctly guess what might happen if they clicked on it. Most had a correct explanation for what might happen if they clicked on the "three dot icon" with two not being very sure. Once users clicked on either icon they felt that what they were given made sense and was what they expected even if they were unsure what to expect.

- About half of the users (mainly those with high interest in science) understood that a large earthquake could move the ground halfway around the world in their location. As users engaged more with the app, they were more comfortably and efficiently able to navigate and interact. All but two were able to navigate to the seismic recordings for the station without help.

Station View

- On the station view page, the users all correctly identified that they were looking at a recording from the station of seismic activity in that area. Only three users scrolled down to the bottom of the page without prompting.

- All of the users were able to navigate to a different date recording and were able to determine that each recording was different based on what had occurred during that time. All of the users were able to navigate to the 9/28/18 data page and described seeing the activity recorded on that date with all users noticing the dramatic difference when a large event occurred.

- Users described wanting to know when the event occurred, how strong the earthquake was, and was there any damage in the area. The last question was not information available from the app.

Seismogram View

- All users successfully navigated to the seismogram view page. About half, after learning to scroll from previous pages, scrolled down below the map. The information they found was useful and valuable to their understanding. For some, the information was challenging in terms of understanding everything. The seismogram in particular was challenging for about two thirds of the users and many commented that they should have looked more closely at the intro pages to understand them better. When prompted, all were able to seek additional help and then understood better what they were looking at. Most were not familiar with seismograms and P and S waves.

- A majority of the users needed some prompting to locate the "three dot icon" in the upper right corner and most were not sure what it might do when clicked. Once they did click on it, it did make sense to them and they understood the additional information. All of the users were able to navigate back to the Station View page.

Station View

- All of the users were able to correctly identify and click on the "three dot icon" and get additional help with this page. Many of the users spent additional time on the help page recognizing that they had missed the opportunity earlier in the exploration.

- Users were much more familiar with the app at this point and all were able to correctly identify what they would see by clicking on the Event button and what they found matched their expectations. All of the users were able to navigate to a station that was closer to the event.

Map View

- Before navigating to a station closer to the event, all of the users were able to correctly guess that they station would have recorded a stronger/larger signal.

Station View

- All of the users were able to navigate to the next station – closer to the event. As they expected, the recording showed more "movement" in the seismogram and most suggested correctly that this meant a stronger earthquake felt at this location.

- Being more familiar with the events and the app, users further explored areas that they expected might have even stronger events (Japan, AK, CA)

User Level of Understanding of Core Concepts Before and After Testing (N=14)

Concept 1-5 rating, 5=high	Before	After
When an earthquake occurs the ground moves	2.2	3.3
For really large earthquakes, this motion includes all of Earth's surface, even if only a tiny amount	2.2	3.3
The amplitude of the ground motion gets smaller as you move farther away from the epicenter of the earthquake	2.7	3.5

Notes From Direct User Observations by Evaluator

Subject 1

Demographic – Male, 72
Science interest level – 8
User worked with the app for a total of 25 minutes

Needed some prompting to get through the intro screens. Once started was able to go through the intro and understand it. Did not understand what the P and S waves were and thought they were locations. Did not look to learn about them from the app.

Subject 2

Demographic – Female, 66
Science interest level – 8

Thoughts – list some of the terms at the beginning to help the viewer knows that they all mean. Ask the viewer questions and give them the option to self-discover or explore the information before just jumping into the app.

Was able to navigate through the app fairly easily.

Subject 3

Demographic – Male, 33
Science interest level – 9 (subject is a programmer and web developer)
Suggested some features changes including a P and S wave info pop-up and more interactivity.

Was able to navigate through the app fairly easily.

Subject 4

Demographic – Female, 65
Science level interest – 3

Was able to navigate easily. Was comfortable with findings different things on the app.

Subject 5

Demographics – Male – 65
Science level interest – 7

Was able to navigate around the map and choose locations based on interest. Had questions about what annotate means and what advanced means and why they would use them.

Subject 6

Demographics – Male – 51
Science level of interest – 6

Was able to get through intro
Two questions – would have liked to know about the scale and some more information about the time sequence.
Would go back to the introduction.

Subject 7

Demographic – Female – 42
Science level of interest – 8

Felt there was a lot of info on the second info screen
Wanted some info visually for the into
Was confused about the numbers on the map and thought they were events
Wanted to be able to "set my station" so that she could get a text to go and see a recent event.

Subject 8

Demographic – Female – 17
Science interest level – 9

Navigated very easily

Subject 9

Demographic – 17
Science interest level – 7

Some issues with the zoom function
Where does the data come from?
Liked the structure and felt it was clear.

Subject 10

Demographic – 16
Science interest level – 8

Easily navigated and opened app
Question about location and push notifications
Perhaps some additional focus to get the map interactivity correct.

Subject 11

Demographic – 16
Science interest level – 7

Went right to search function and skipped over the intro.

Subject 12

Demographic – 14
Science interest level – 8

Just like Google Maps

Subject 13

Demographic – 70
Science interest level – 8

Looked through the intro and then on to map page
Would need help from someone to teach them how to use it and to better understand what she was looking at. Would like to learn more about terminology.

Subject 14

Demographic – 44
Science interest level – 8

Able to navigate fairly easily
Wanted to see a scale for the seismogram
General tends, hot spots, current events

Subject 15 - Evaluator

Demographic – 47
Science interest level – 8

Introduction could have been more pronounced/noticeable helping people engage with it
Users did not seem to spend enough time on the intro and station data screens to be able to understand what they were seeing on the app once they used the app

Highlighting the numbers on the main screen with a pop-up explaining the numbers were not the number of earthquakes in that area but the number of stations Users missed the information below the seismic station recording page – could use an arrow or indicator to help them look below for more info Users really liked the videos explaining things on the app but not too many used them Users wanted to get notices about earthquakes in their area Some glitches when users were manipulating the screen Users were all able to navigate the app and find things interesting to them and understand what they were seeing and learning

Conclusions and Recommendations

Conclusions

- Overall, the app performed well with no major issues associated with navigation or usage.
- Users learned core information through the use of the app.
- Users quickly improved their ability to navigate and efficiently work the app.
- There was new information for users or all science interest levels and there were no differences in users' ability to effectively use the app based on age or gender.

Recommendations

- It is worthwhile for first time users to spend time reviewing the introductory screens – encourage this more.
- Because most users did not spend enough time on the intro screens, they needed reminders. For more ongoing guidance, have pop-ups when users hover over different important features and information on the screen (P and S waves, Stations on main screen, Station Info, etc.).
- The information below what is on most screens is not noticeable at first. Some indication that there is additional information would help users find it and explore all available information.
- The videos were well liked by users. However, most users did not watch them so a way to encourage this would be beneficial.
- Not every action on the website functioned correctly. Most notably, the screen did not always zoom or scroll correctly.