

## Cells to Self - Formative Evaluation

# Microbiome Photo Booth

Joyce Ma and Meghan Kroning

March 2019

THIS IS NOT A DEFINITIVE FINAL REPORT

FORMATIVE evaluation studies like this one often:

- **are conducted quickly**, which may mean
  - small sample sizes
  - expedited analyses
  - brief reports
  
- **look at an earlier version** of the exhibit/program, which may mean
  - a focus on problems and solutions, rather than successes
  - a change in form or title of the final exhibit/program

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### PURPOSE

This formative evaluation was conducted on an early prototype of the *Microbiome Photo Booth* to gauge:

- what visitors found interesting (and not interesting) about the exhibit,
- usability issues visitors experienced,
- what visitors thought the exhibit was trying to show, and
- any additional information visitors would have wanted at the exhibit.

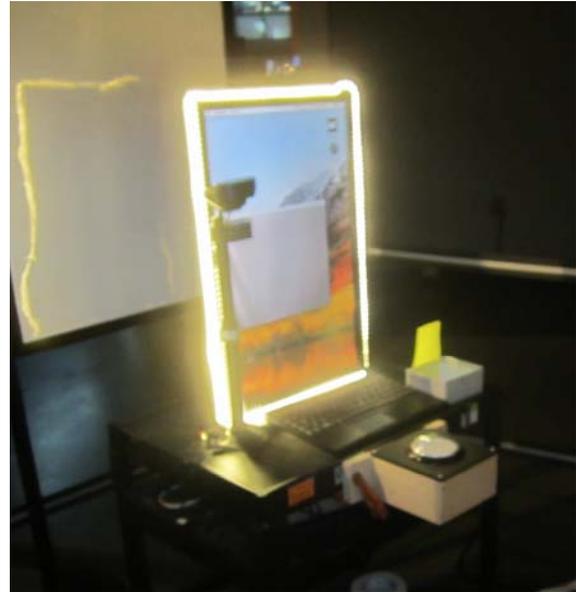
### METHOD

#### The Prototype

*Microbiome Photo Booth* allowed a visitor to take a snapshot of him/herself and superimposed color dots on four different areas of the visitor's face (i.e., the cheeks, chin, forehead, and nose regions) to indicate the different types of microbes that can typically be found in each area. It used face detection software to find *one* visitor's face. After the snapshot is taken, the visitor could use a button to look at each of the four facial areas in turn.

The prototype was set up in the Cells to Self corridor. We positioned the exhibit near the north wall and next to the former VIM wall, and used stanchions to create a 'nook' that comfortably allowed one person to sit in front of the camera while another visitor could stand and watch by his/her side (Figure 1). A white cloth was used to provide a clean backdrop to help face detection.

**Figure 1. Microbiome Photo Booth prototype as of 02/20/2019, from the back (left) and from the front (right).**



### Participants

The study collected data on two days, February 17 and 18. To recruit visitors, an assistant evaluator stood near the prototype and approached every other visitor who (1) appeared 8 years old or older, (2) crossed a predetermined imaginary line, and (3) was in a dyad or by him/herself. The evaluator asked that visitor if s/he would be interested in trying a new exhibit and giving feedback. If the visitor selected was a minor, the recruiter first found and then asked the accompanying adult for permission to talk with the youth.

The demographic information of the consenting participants is shown in Table 1. In total, the evaluator talked with 22 visitors.

**Table 1. Demographics of study participants**

Age Group	Count
Adult	15
Teen	4
Child	3
Total	22

Gender	Count
Female	11
Male	11
Total	22

Group Type	Count
Multigenerational	7
Adult Peer	11
Adult Singleton	4
Total	22

## RESULTS

### What visitors found interesting and not interesting

On average, visitors found the prototype *Somewhat Interesting* (4) on a Likert scale from *Not Interesting* (1) to *Interesting* (5). Table 2 provides the tally.

**Table 2. Visitors' interest ratings in response to the question, 'How interesting was that experience?'**

Interest Rating	Count (out of 22)
Interesting	9
<b>Somewhat Interesting</b>	<b>5</b>
Neutral	3
Somewhat Not Interesting	4
Not Interesting	1

When asked what was interesting about the exhibit, the majority (17/22) of the visitors mentioned that they liked finding out what was on their face. See Table 3 for example quotes.

Alternatively, visitors found the prototype *not* interesting for a variety of reasons including: it was not interactive enough, they didn't discover anything new at the exhibit, the experience made them feel dirty, and the prototype did not provide information about what was actually on their face.

Table 4 gives the quotes from visitors' interview responses for each category of reasons visitors gave. In addition, observations found that several visitors (6/22) spent a portion of their time at the exhibit on off-task behavior, specifically taking playful photographs with the web cam, which indicates a disinterest in the exhibit content.

**Table 3. What visitors found interesting with examples quotes.**

Visitors liked finding out what was on their face (17/22; 77%)

- V7: To find out the differences in how bacteria grows on your face and how there's different areas for different bacteria.
- V9: Getting to know what was on your face, I didn't know there was that much bacteria on me
- V11: The bacteria names and the parts of the face it exists on! I really like looking at microbial ecosystems. I don't think that's the right word for the face but ...
- V16: I think knowing what type of bacteria is on your face normally - since Staph is on your face normally, if you get a Staph infection... can't do much ...unless it disrupts the flora...
- V20: Just how many different types of bacteria there are and that it's different for different places on your face.

**Table 4. What visitors found *not* interesting with example quotes.**

Visitors wanted more interactivity (3/22; 14%)
V2: Kinda wish it was a little more interactive. Analyze bacteria on your face. Information on your personal features... I had to read so much and then *just* press the button.
V12: Lots of reading.
V13: It's not very interactive. [TMM?] It's just pressing a button
It didn't show them anything they didn't already know (3/22; 14%).
V1: I think it's stuff I already knew, from my cosmetic hygiene.
V8: Like ok, obviously we have bacteria that grows all over our body
V19: I don't know. I did microbiology... I don't know... Just not interested in it.
The exhibit made them feel unclean (3/22; 14%)
V1: I swear I washed my face this morning.
V9: P2: Makes me want to go wash
V11: I want to go wash my face
It did not actually detect what was on their face (1/22; 5%)
V10: Well I was more interested when I started because I thought it would show your actual face, but after the first couple buttons, I was the same for everyone, so it lost some interest. Once you do it and it's the same for all the faces... otherwise it's just saying it knows where your temples and chin are.

### Usability Issues

Visitors struggled with a number of issues with the camera and the face detection system. This included difficulties aligning their face with the camera, face detection errors when multiple users' faces entered the shot, glitches in the detection software despite proper alignment by a single user, and confusion with the repetitive cycling among the four facial regions without a clear conclusion to the experience. A few visitors were simply uncertain about how they were supposed to interact with the exhibit. Table 5 provides example quotes to illustrate each of the aforementioned usability issues.

**Table 5. Usability issues with example quotes.**

Visitors struggled with aligning with the camera (6/22; 27%)
V4: (P3 tried it out but was too short for the camera, so she had to kneel on the stool to try to get a picture. I don't know if she managed to take a picture, but she was having fun trying.)
V8: It was saying look center, but [I wasn't sure whether to look at the camera vs. center myself into the center of the page]
V11: It was a little hard to orient myself to look at the image vs the camera... like in a photo booth.
V22: (P1 has to stand for picture - she's too short for the camera.)

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**Multiple users were trying to use the exhibit simultaneously (5/22; 23%)**


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- V1: (P2 taking pics, P1 behind screen)
- V10: (P2 sitting on stool, holding baby. Holding baby up for picture)
- V21: (P1 in frame while P2 taking pictures - jacket/arm in pictures, but it didn't interfere with face recognition.)

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**There was a glitch in the face detection (6/22; 27%).**


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- V4: (Computer took a long time - probably 10 seconds or more - to recognize her face, even though she was centered and looking straight forward. It kept saying "face detected" for a half-second but then by the time she pushed the button it would be back to "Detecting face" - so it wouldn't take the picture. I let her try for a while, and she was patient with it, but I was about ready to step in and let her know it seemed to be having problems when it finally managed to detect her face for long enough for her to take a picture. She was very pale-skinned, with medium-light hair (red or dark blond, if I'm remembering correctly) and was wearing a white shirt. She didn't have glasses or anything else obscuring her face.)
- V5: (It didn't detect P2's chin - he had a full beard. First it detected his mouth and beard, and the second time it detected just his lips as his chin.) P1: It doesn't know where your chin is. P2: It thinks it's my mouth and beard.
- V22: (P1 in frame, has to move out because it wasn't picking up P3's face, and then it does once she moves out of the frame.)

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**Visitors didn't know that the facial regions were cycling from the first region again (4/22; 18%)**


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- V1: Didn't have a proper end, just wanted to cycle through
- V14: in the very beginning it'd be good to know there was different steps. I did figure it out, but it'd be good to know we're gonna take five different pictures.

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**Visitors were not sure how to interact with the prototype (4/22; 18%)**


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- V2: Wanted to press the screen for more information on areas it was talking about
- V14: In the very beginning I wasn't sure what this (button) did, but then I realized each time it did

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**Others (3/22; 14%)**


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- V1: They're watching you (regarding a prior comment "Is this taking (and storing) pictures?")
  - V13: (P2 Reading out loud, hesitating on the pronunciation of bacteria types).
  - V18: (P1 had distinctively unusual mannerisms, behavior, and speech. P1 seemed unsure at first how to use the exhibit- he didn't take a picture until P2 directed him repeatedly - he was looking at his friend's picture left on the screen, and then looking at himself on the screen but not taking a picture.) (P1 taking pictures, P2 just outside the rope, directing P1. P2 telling P1 how to use the exhibit - very directive.) (P1 was looking around - at screen, at camera, at me, a friend) P2: Click when you're ready. (P1 looking at self in screen, moving towards/away from screen, sort of smiling, looking like he was waiting for something to happen.)
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### Visitors' understanding of what the exhibit was about

Almost all (20/22) of the study participants thought the exhibit was about the bacteria on their face. Within this group, several (12/20) mentioned the different *types* of bacteria, and at least half (10/20) mentioned the different *regions* where bacteria live. A few visitors (4/22) also felt the exhibit was about hygiene. See Table 6 for examples of visitors' responses when asked to describe what the exhibit was about.

**Table 6. What visitors thought the exhibit was about, with example quotes.**

Visitors thought the exhibit was about the bacteria on their face (20/22; 91%).
V2: Based on regions of face, it gave description of what bacteria are there... I don't know. Probably just give us more information on our bacteria on our skin? I wasn't really clear
V4: It detected where your face was and told you what bacteria was where... I mean, it shows you the different types of bacteria and that sort of thing.
V6: There's a lot more there than you'd think. There's a bunch of bacteria living on you that you didn't know of.
V9: (pointed to screen) What kind of bacteria live on different parts of your face
V11: I think it's trying to give you a wider education on microbial world that's happening in front of our faces - haha, pun! ... personalizing it.
V20: The different types of bacteria that live on your face and how different ecosystems just from your nose to your chin.
V22: You see what kinds of things live on your face on different parts of your face... Just what lives on your face. Stuff that lives on your face.
The exhibit showed them that they should wash their face (5/22; 23%).
V7: That we need to wash our face more. Our faces are pretty gross and we touch our face all the time.
V10: (Jokingly) He was trying to show me that I had more bacteria! [He] waited in line [to prove that I had more]. (P1 and P2 joking about whose face was dirtier.)
V15: Just to know that if you keep your face clean there's stuff you might not want there.
Others (1/22; 5%)
V15: Microbes are everywhere. ...paranoid about them but they're everywhere.

When asked, almost all of the visitors (21/22) thought the dots represented bacteria. A few (4/22) also assumed the number of dots indicated the amount of bacteria. See Table 7 for example quotes. Furthermore, a majority of the study participants (15/22) thought that these dots were simulated results and did *not* show the actual bacteria on their face in real time. See Table 8.

**Table 7. What visitors thought the dots represented with example quotes.**

The dots showed bacteria on the face (21/22; 95%).	
V1:	I think that it corresponds to the color surrounding the (pointing to bacteria pictures on the screen)
V6:	Represent groups of bacteria, where the bacteria is located that they're describing
V9:	The microbes. These things (pointing), and it's color-coordinated so you can see
V15:	The different microbes, where they [are].
V20:	The different types of bacteria that are sort of highlighted below (points to boxes on screen)
V22:	So first you look at things at the bottom (pointing to boxes on screen) and you look at the color around it and you match the color of the dots with the color of the (point to the box on screen).
The dots show the amount of bacteria on the face (4/22; 18%)	
V7:	and how often it grows on your face
V8:	Well that (nose) was the area that had the most buildup of the bacteria, so it probably just holds more, whereas when it said the eyes, it was a very moist area and it wasn't as much as I was thinking it would be
V11:	Red is staphylococcus; green is unknown or maybe just lesser percentage.
V21:	multiple dots mean more and more bacteria

**Table 8. Tally of visitors who thought the dots represented simulated results versus real data .**

The dots were ...	Count (out of 22)
Simulated (not real)	15
Real data	5
Not sure	2

**Additional information visitors wished they had**

Roughly one third of the study participants (7/22) were curious about whether the bacteria shown were good or bad, with a focus on the staphylococcus bacteria in particular. Another third (7/22) wanted to see a visualization of what actual bacteria are on their faces in real-time, rather than a simulated output for the 'typical' human face. Otherwise, some visitors also asked for information about the population of different bacteria under various conditions, such as time of day or skin type, as well as help pronouncing the names of the different microbes. Table 9 provides the entire list of visitors' requests for additional information to help in the development of the next iteration of *Microbiome Photo Booth*.

**Table 9. What additional information visitors wanted with example quotes.**

Distinguishing between good and bad bacteria (7/22; 32%)
V1: what each of these bacteria are. P1: Staphylococcus - is that what causes a staph infection?
V2: this to skin car. More information on how it's beneficial. Some people might be scared. It's not something you need to clean away, just understand the microorganisms that live on us
V11: P2: There's good stuff but you need the good stuff. P1: Maybe not the staphylococcus. P2: Maybe if it (the exhibit) told you which was good.
V12: Is it good or bad? ... [Are there] medical [implications to what bacteria are there]? ... Why are they good or bad or whatever?
V15: Which of these might pose harm?
V16: I was wondering since he's on acne medication if it'd be different.
V20: I guess like details on what the actual bacteria are. You see Streptococcus and you're like 'is that strep throat?
Seeing a visualization of what is actually on their face (7/22; 32%)
V1: The actual bacteria on my face. That would be fascinating
V2: If it could show what the bacteria are on your face at the time
V10: if there was some sort of a swab, so [you could tell] of those four [bacteria types] what you have on your face. ... Actual bacteria on my face. P2: Or who the winner is [of who has the cleanest face].
V11: The one thing I'd be interested in to see, if there was a face wipe to see if it would change or a section to show, if you washed your face, what it would be [what bacteria would be there after]
V12: It'd be interesting to know if this actually existed on my or if it's just general.
V18: Where the microbes on our faces are located.
V21: Maybe like percentages of how much or how little of each one would be on your face, maybe
How the bacteria would change under different conditions (5/22; 23%)
V11: Or maybe morning, noon, and night. Or after any basic human interaction that involves your face.
V12: Like 'Oh hey you're Asian' or 'would you like to identify yourself as Asian, or African American or whatever' - maybe there are types of bacteria that are typically on Asian people. Or people in SF? ... Are pollutants contributing to the bacteria on your skin?
V15: You know what would be interesting, if there was some kind of anti-microbial thing you could put on and see how it affects it.
V16: I was wondering since he's on acne medication if it'd be different.
V19: Maybe different types of... I know some people are really into acne... So if there's a relationship to acne...
How this information is useful to them (4/22; 18%)
V7: I didn't even know that I wanted any of this information, to tell you the truth! I think I'd probably click on this exhibit if I saw what it was, but I think some people won't. [They'd] walk by or think it's gross.

V12: Didn't know what to do with the information. You can wash your face. Guess you don't want to scare people. Don't know what the point of just telling me [it's there].

V15: P1: They talk about how antimicrobial things are affecting resistance to ... [different types of antimicrobial things]. [I'd like to know] how that [information from the exhibit] plays into our lives. Should we be doing this, should we not?

V20: How does this all relate to things that I've experienced?

#### Help pronouncing the bacteria's names (2/22; 9%)

V5: wondering how you \*say\* the types of bacteria. I can read it, but how do you \*say\* them.

V14: (Pointing to the boxes on screen)... I can't even pronounce that.

#### Others (2/22; 9%)

V12: Are there animals that have these bacteria?

V16: Does it show more than 4 [types of bacteria]?...How does it detect it? I want to know how it works.

## SUMMARY AND NEXT STEPS

This formative evaluation found that visitors, on average, thought *Microbiome Photo Booth* was somewhat interesting mainly because it showed them the bacteria that may live in different regions of the face. However, technical difficulties with camera positioning and facial recognition and usability issues compromised some visitors' experiences. Visitors also pointed out areas for improvement and additional information that would have enriched their exhibit experience.

The exhibit development team is currently working on the technical issues identified. In addition, developers are looking into ways to better integrate the additional information visitors requested in this evaluation and consulting with researchers to see if there are parameters that may better personalize the microbiome information to improve visitors' exhibit experience for the next iteration of *Microbiome Photo Booth*.

## ACKNOWLEDGEMENTS

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## APPENDIX A: INTERVIEW QUESTIONS

1. How interesting did you find that exhibit? Would you say that was ...

Not Interesting	Somewhat Not Interesting	Neutral	Somewhat Interesting	Interesting
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- a. What made it \_\_\_\_\_ for you? Anything else that made it \_\_\_\_\_ for you?
2. What did you try to do?
3. Was there anything confusing or frustrating?
4. What do you think this exhibit is trying to show?
5. Did you take any photos? YES NO  
[If YES...]
- a. How many photos did you take?
- b. Do you remember what the photos were trying to show?
- c. [If answer is something about 'stuff on face'] So, on your own face right now? [Probe if necessary: I just want to make sure I understand, the exhibit is detected the stuff that is on your face.]
6. Is there any additional information you wanted but didn't find at the exhibit?