# Traits of Life: Common Design- DNA Demonstration Study

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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

# Traits.Common Design.#1.DNA Demo.Interview.Report

**Veronica Garcia-Luis and Katherina Audley**
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## Exhibit under evaluation

- DNA Demonstration.
- Graphics showing where the DNA is extracted from a cow (thymus), what DNA is, and DNA model from the exhibit, "Panning for DNA" used in the 1995 exhibition, "Diving into the Gene Pool."
- Chemicals for extraction.
- Demonstrator: James Erard

## Goals of the evaluation

- To gage visitor interest in DNA demonstration.
- To find out visitor familiarity with DNA.
- To refine demo logistics by finding out if the demonstration is too long or short, and if too much information is conveyed, or too little.
- To gage visitor comprehension of language, concepts, and procedure in the demonstration.
- To get a reading on visitors' perception of DNA demonstration.
- To find out if visitors have any concerns about the demonstration.

## Methods of Evaluation

- Eleven groups were interviewed consisting of a total of 18 people following the conclusion of the demonstration.
- The demonstrations were conducted on Thursday, September 23, 1999 between the hours of 12:00 PM and 3:15 PM.
- The demonstrations wereconducted across from the biology lab at Bay 6.
- The demonstration lasted approximately twenty minutes.
- At the conclusion of the interview, the evaluator approached the visitors and conducted the interview.
- The interview lasted approximately fifteen minutes.

## Interview Demographics

- Female: 33% 20s (2), 30s (1) 40s (3)
- Male: 67% 5-6 (3), 10 (1), 20s (1), 30s (3), 40s (3), 50s (1)
- Group: Adult group (6), Single adult (2), Adult + kids (1), Kids (2)

- **Interview #:**

1- Female, 40s, Male, 40s
2- Female, 40s, Male, 40s
3- Female, 40s, Male, 40s
4- Male, 6
5- Male, 20s, Female, 20s
6- Male, 30s
7- Male, 30s, Female, 30s
8- Male, 30s
9- Male, 5, 6
10- Male, 10, 50s
11- Female, 20s

## Findings of Evaluation

***(* Note: Multiple answers were taken into consideration in analyzing the data. Therefore, the total sum of responses is not equal to 100% where noted with an asterisk*)***

**How would you rate the DNA demo?**
***(Note: Visitors were given the choice of answering interesting, somewhat interesting, or not interesting)***

- ***80% of the visitors found the DNA demonstration to be interesting.***
- ***20% found it to be somewhat interesting.***

**Can you tell me what you remember from the demonstration?***

- ***64% of the visitors remembered ingredients used in the demonstration or the process of extracting DNA.***
- ***21% of the visitors remembered seeing the extracted DNA (cow, human, and/or salmon).***
- ***14% remembered facts they had learned about DNA or cells.***
- ***7% remembered miscellaneous elements in the demonstration, such as certain language that was used during the demonstration.***

***64% - Ingredients used in the demonstration or the process of extracting DNA.***

3- I remember the process with the little boy (little boy gave cheek cells), then adding soap, alcohol, the process of separating the DNA.

5- Everything. We put stuff from the cow into one glass. Put stuff from the mouth into the second glass. Put water and salt together. Damaged the cow a little. Then soap. Shook it up. Added a little alcohol- it was isopropyl alcohol- extracted cells from the cheek.

4- You can extract DNA from humans and cows.
- I remember a molecule test. Remember the cow molecule. (Kid)

6- Cow thymus has more cytoplasm than human cheek. I remember the process; the water, soap, and salt mixture. You can buy DNA from salmon off the shelf. The cow thymus was more effective than the inside of my cheek. DNA is white and stringy.

7- You have to use soap for the cells. Like with washing the dishes. You have to use the alcohol. It [the alcohol and soap] go between the cells and the layer under it to see the DNA.

8- All the process

9- He said he bought the fish. He got the cow. He probably ripped a part off of it. (Kid)

10- I had to scrape my cheek. Alcohol and salt and water were used. To separate the DNA he had to put in soap. That's all I remember. (Kid)

***21% - Seeing extracted DNA (cow, human, and/or salmon).***

2- Just seeing the DNA of cow and her (her= other visitor who gave her cheek cells) DNA.

3- Seeing it separate and become strands from the cow.

11- Having my DNA in a tube. My boyfriend does stuff for kids with health issues.

***14% - Facts about DNA or cells.***

1- That fat cells are in every cell and help to hold the DNA in. I took biology in the last 4 years, so I know of the basic pairs. Fat and soap and salt is a simple explanation of the DNA breakdown.

6- Cow thymus has more cytoplasm than human cheek. I remember the process; the water, soap, and salt mixture. You can buy DNA from salmon off the shelf. The cow thymus was more effective than the inside of my cheek. DNA is white and stringy.

***7% - Miscellaneous elements in the demonstration, such as certain language that was used during the demonstration.***

2- He used the word, 'snot'. That's what's coming to mind.

**Were you familiar with DNA before this?**

- ***Yes- 85% of the respondents stated that they were familiar with DNA before seeing the demonstration.***
- ***No- 15% of the visitors were not familiar with DNA before the demonstration.***

***Of the 85% who were familiar with DNA,***

***55% learned about DNA in high school or college:***

1- Yes. In biology class we had an anal teacher so we had to know our stuff, but I really enjoyed his (James')explanations. That's what teachers should teach.

3- Yes. From high school and college but I don't understand it, really.

- Yes. Also from high school and reading about it. Solving crimes scenes and it's use.

5- Yes. Took biology in school.

6- Yes. Studied biochemistry in first year at university. I went to Cambridge.

7- Yes. We studied it at the university. But that was seven years ago and I never really understood it.

***45% were familiar with DNA from the media or from conversations they had heard outside of school:***

4- Yes. Bill Nye the Science Guy talked about it. (V: Do you remember what he said about DNA?) Um, it's important, but that's it.

8- Yes. I didn't study biology but I know more or less what it's about.

10- Yes, a little. Cells. I know about it because my mom's a doctor. (Kid)

-Yes. Somewhat. Just how it's used in legal identification.

11- Yes. In a really basic way. There's a lot of contemporary issues about genetics. I wish I understood more about it.

**I'd like to ask you some brief questions about DNA.**

**Where is DNA found?**

- ***62% of the visitors said that DNA is found inside cells. 38% of the total visitors who said that DNA is found inside cells went further to say that it is located inside the nuclei of cells.***
- ***38% of the visitors said that DNA is found in the bodies of living things.***

***62% - DNA is found inside cells.***

2- In all cells in the body. Before I thought it was just in the blood.

- Yeah. It's also in hair.

7- In every cell from a living being.

***38% - In nuclei of cells***

1- In every cell. Usually it's in the nucleus.

5- In cells. In the nucleus.

6- In the nuclei of all cells except bacteria, which don't have nuclei. In all living things.

8- In the nucleus of the cells.

11- In the nucleus.

***38% - DNA is found in the bodies of living things.***

3- In every living thing.

4- Under the fat of stuff. (Kid)

9- (Points to cheek). (Kid)

- All over the body. (Kid)

10- In your body. In your skin. Leaves have it. So do cows. All living things have it. (Kid)

**What do you think DNA does?**

- ***77% of the visitors said that DNA is what gives living things their physical identity, such as hair color, gender, and other genetic information.***
- ***23% of the visitors had a vague understanding about what DNA is but were not specific beyond saying that DNA is a part of life.***

***77% - DNA gives living things their physical identity.***

1- Gives us our hair color and everything. It's our make up of who we are.
2- It tells you who is who, like a thumbprint of the body.
- …But it's more specific.
3- It is what makes each person unique; the similarities and the differences.
5- It remembers all the genetic information about a person.
6- It contains the codes that are required for life.
7- It identifies the person or animal. You can tell by the chromosomes if it's a male or female or cow or sheep.
8- It encodes proteins that are in our body. It is responsible for how we look and for the processes that are in our bodies.
10- It makes you run. It chooses what color our body and hair will be. (Kid)
11- It's a coding system for your body functioning. It enables your body to function.

***23% - Vague understanding***

3- It forms the basis of life
4- When they want to know about stuff, it's that [DNA]. (Kid)
9- It moves around. It's some chemical. (Kid)

**Had you ever seen a DNA extraction demonstration before? If yes, where?**

- ***85% - No***
- ***15% - Yes***

6-Yes. We did it in class at university.
10-Yes. We did it in school once with cheek tissue the same way. (Kid)

**Would you say that the demo was too long, too short, or just right in length? If it was too long or too short, why?**

- ***100% of the visitors said that the demonstration was just right in length.***

**How long would you say the demonstration lasted?**

- ***Visitors perceived the length of the demonstration to be an average of 10 minutes.***

***(Note: The actual length of the demonstration averaged 20 minutes.)***

**What about the amount of information you heard—was it too much, too little, or enough? If too much or too little, why/what?**

- ***58% - Enough/Just Right***
- ***25% - Too little***
- ***17% - Maybe a little too much; ambiguous responses***

***58% - Enough/Just Right***

1- Just right. Not too detailed or too simple. It would work well for all.
3- About right for all the people in the group.
4- Just enough
7- For the explanation, it was enough.
9- Just enough.(Kid)
10-Just enough. There was space for questions.
11-Wish I had more information but museums always wear me out to tell you the truth. Better to get the information in small doses. If it were longer, I'd get tired.

***25% - Too little***

5- Okay. If people don't know about DNA, it probably isn't interesting. Maybe tell in the beginning a little about DNA. Not sure if you extract the DNA or the nucleus.

6- Needs more contextual information. Point out at first why DNA is interesting. Needs more context. Need to explain what DNA is. I think it's an interesting thing to do, but I didn't think the people around were interested. Need more pictures to show what is happening. It's difficult to explain abstract concepts in words. Maybe make a model of the cell or show where DNA is with a clear balloon filled with water.

8- For me, it was too little. I'd like to observe the structure of DNA.

***17% - Maybe too much; ambiguous responses***

2- Enough, but a little overwhelming sometimes with the more advanced information.

- Yeah. I agree.

**What part of the demonstration was most interesting to you? Why?**

- ***44% of the visitors said that the most interesting part was seeing the DNA separate and rise to the top of the tube after the addition of alcohol.***
- ***25% of the visitors found some part of the demonstration process (not including the addition of alcohol to the solution) most interesting.***
- ***19% of the visitors did not identify any specific part of the demonstration as the most interesting part.***
- ***12% of the visitors were most interested in seeing the DNA extracted from the tube and observing it outside of the solution or in the take-home vial.***

***44% - Seeing the DNA separate and rise to the top of the tube after the addition of alcohol.***

1- Two parts: How easily it's [DNA is] extracted and watching it [DNA] combine
2- When he put alcohol in and the strands came out.
3- The cow tissue to see the DNA appear. [Extraction of the cow's DNA]
5- To see how you can extract the DNA.
7- Effect of alcohol. That you can really see the DNA coming up.
8- When the strands of DNA got stuck in the top of the alcohol.
10- When they separated the alcohol from the DNA (Kid)

***25% - Some part of the demonstration process (not including the addition of alcohol to the solution).***

2- When he chopped up the cow.
3- Breaking up the tissue [cow thymus], salt making it adhere and soap and alcohol breakup.
9- The part where he put stuff [alcohol] in there and there was bubbles. The part when almost all of us got some DNA. That was the greatest. (Kid)
10- When the kid put the thing in his cheek. (Kid)

***19% - No specific part of the demonstration.***

4- Everything. (Kid)
5- Nothing special
6- Having my DNA extracted because it was from me.

***12% - Seeing the DNA extracted from the tube and observing it outside of the solution or in the take-home vial.***

10 - When they extracted the DNA out of the tube
11- Seeing DNA in all of its forms; The cow versus me versus the salmon. DNA always seemed like a concept. I liked seeing it as something tactile.

**Which part was least interesting to you? Why?**

- ***67% of the visitors said everything was interesting; they did not identify any uninteresting part of the DNA demonstration.***
- ***33% of visitors said a part of the demonstration was not interesting to them.***

***33% - Some part of the demonstration was not interesting.***

3- The more scientific part of it. The terminology and the chemistry
7- It's necessary to have all the steps. Adding the soap was not as interesting as the alcohol but without soap, you couldn't see the DNA.
8- The starting procedure. Grinding the meat.
10- When I scraped my cheek. It made me feel funny. (Kid)

**Was anything confusing to you? Like any language, concepts, procedures?**

- ***62% of the visitors did not find anything confusing.***
- ***38% of the visitors were confused by language, concepts, or procedures used in the demonstration.***

***38% - Confused by language, concepts, or procedure***

2- Yes. The double helix information. I got lost after the second step. I know he was speaking English, but I didn't understand the advanced stuff.
5- It was a little difficult to understand the language because English is my second language. And it was unclear whether it was DNA that was affected of the nucleus of the cells by all those chemicals.
9- The language was difficult for them [the kids]. The concept was okay. (Mother of kids).
11- It was more of a problem with myself than with the information. Abstract terms are hard for me to understand. It's hard to understand how the model of a helix has a function in your body.

**Could you see what was going on?**

- ***100% of the visitors could see what was going on.***

**Was anything surprising to you?**

- ***45% of the visitors were surprised by miscellaneous aspects of the demonstration.***
- ***27% of the visitors were surprised by seeing the DNA separate from the rest of the solution.***
- ***27% of the visitors did not find anything surprising.***

***45% - Miscellaneous aspects of the demonstration.***

3- Seeing the dried salmon. I never thought of it before.
6- It is always surprising when something like that works.
9- Yes. The part when we saw the bubbles (DNA)and he passed it around (Kid)
11- The fact that it was so interactive.

***27% - Seeing the DNA separate from the rest of the solution.***

2- Yes. When the DNA came together as a clump.
3- When you could actually see the cow's DNA in alcohol.
10- Right when you put alcohol in and saw it separate right away (Kid)

**Do you have concerns about this DNA demo?**

- ***There were no outright concerns about the DNA demonstration. There were a few speculations.***

***Listed below are the responses that were greater in length than a cursory, "No, I don't have any concerns about this DNA demo.":***

3- I don't, but I wonder if some people would feel skeptical.
- Some people might take it really far like that man [another observer of the demonstration who was not interviewed] who said "You're not going to give this to my doctor are you?" You know, jokes like that.
6- Grinding up bits of cow might upset people.

**Do you have any suggestions on how to make the demonstration better?**
**What would make this demonstration better or more interesting to you?**

***More content or explanation***

4- Show how the alcohol separates the DNA in a visual, colorful image. Show more visual explanations and colorful images. Explain why it is pulling out DNA and not other things. Have an introduction to DNA for people, especially for kids. Have the puzzle thing like that other exhibit [protein production]. I could explain to him [little kid] without the puzzle how his was similar and different from his little sister. (Parents of kids)

5- More explanation in the beginning.

6- The context I've been talking about. It needs a start, a middle, and an end. It was mostly a middle part. Why this demonstration and DNA is so important needs to be brought up more. More context in general. Need more pictures to show what is happening. Difficult abstract concepts.

***Change props or more props***

1- Maybe not only having cow DNA to look at. Add another thing like a marine thing like a starfish because you're so close to water.

2- Project the DNA image that he talked about on the back wall. I'm a visual person. (Note: James referred to a DNA image on the internet)

3- Use a photographic image of DNA of the cow or salmon DNA.

- Could you have a powerful microscope and see the cow and little kid DNA? That would be great. I kind of expected a microscope.

7- A bit more information on the boards. There was not much information about DNA. Need an explanation first.

8- To see chromosomes and genes and extracted DNA under a microscope.

9- The fish DNA- put it in water and make it look like the others. Explain more in depth what the DNA is. (Parents of kids)

10 - If you could look at DNA through a microscope.

- If you could get DNA from a dead body. (Kid)

11- More props. Like 3-D models. I respond to things that are visual. Hands on aspect makes things memorable.

***More inclusive; More audience participation***

1- Announce it (demo.) five minutes ahead of time and say that everyone of all ages is invited. I overheard a mom say to her kids that it was for big people only.

5- If the others could do more [of the demo] themselves.

- More participation.

9- If you put water and put a stick in your mouth. (Kid)

- He wants to swab everyone's cheek, not just your own. (Mother of kid)

***Additional comments***

2- Nothing. I thought it was fine.

4- I don't know. It was good. (Kid)

6- In the UK, genetic engineering is getting big. People are protesting against it everywhere. Storefront windows advertise: "We do not sell genetically engineered food here". If this demonstration were in England there would be a hundred people watching attentively.

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