Improving the Learning Experience of Museum Visitors: Examining Different Types of Experiences in the *Genome: Unlocking Life's Code* Exhibit

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Introduction

Learning at the museum is a free-choice experience. A museum offers visitors choices that reflect their own experiences and interests. Three of the most common experiences at the Smithsonian's National Museum of Natural History (NMNH) include:

- exhibit panels with images, text, and/or objects
- interactive activities
- other physical materials

We proposed that each kind of experience also stimulated different learning for people with different interests.[1] The Smithsonian's Office of Policy and Analysis (OP&A) has developed a typology of visitors' experiences known as IPOP. IPOP refers to people's preferences for: **I**deas (an attraction to concepts, abstractions, linear thought, rational reasoning, and facts), **P**eople (an attraction to emotion, stories and social interactions), **O**bjects (an attraction to things, aesthetics, craftsmanship, ownership, and visual language), and **P**hysical (an attraction to physical sensations, including movement, touch, sounds, lights and smells). The IPOP typology has been used to learn more about how visitors engage with the subject matter presented.[2]

The effectiveness of three approaches to meeting the same set of learning goals were explored (Table 1). We also studied how the IPOP typology influences people's learning with three different experiences. Exploring the outcomes of different experiences helps museum educators and exhibit developers discover ways to improve the visitor's learning experience overall.

Research Questions

Are exhibit rail displays, videos, and activities equally effective in producing the same learning outcomes:

1. for museum visitors?
2. with different IPOP types?

Methods

The research was conducted in the *Genome: Unlocking Life's Code* exhibit at NMNH during two weeks in July 2013. A quasi-experimental research design was used to compare learning using three different approaches: An exhibit rail (n = 118), a video (n = 71), and an interactive activity (n = 59). (See photos above for images of each approach.)

- Visitors above age 13 were systematically selected to participate.
- Participants either read the rail, watched the video, or did the activity.
- All participants completed a survey (Figure 1) to indicate what they learned, their IPOP type, and their overall satisfaction.
- Codes were assigned to learning reports based on agreement of the researchers until a pattern of 10 codes was recognized (Table 1). The 10 codes were applied to all cases by the researchers. Learning data for each code were analyzed using *chi-square* tests because data were binary (presence or absence of a code) or ordinal (IPOP type). Learning data for main ideas were scale data analyzed using ANOVA.

"That it might be possible to sequence an entire ecosystem" – 46 years old from USA

"You can go to the ocean and do it yourself" –14 years old from Guam

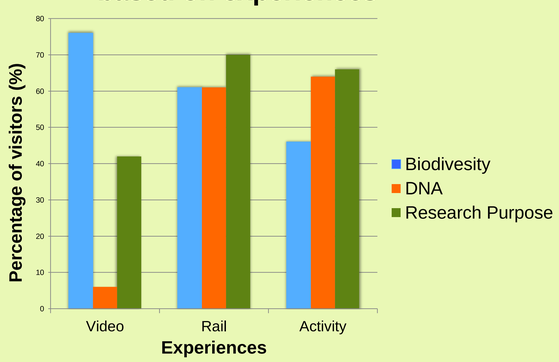
"Species may look the same but may be different" – 22 years old from Brazil

Figure 1: Data Collection Instrument

MOOREA BIOCODE PROJECT SURVEY

Date:
Time:
Condition:
Subject #

Figure 2: Percentage of visitors in each condition that report learning related each of the three main learning goals for each of the approaches



Results

Key findings are presented below and in Figure 2 and Table 2.

- There was significantly greater learning about DNA with the rail and activity than the video, $F(2, 245) = 43.820$, $p < .001$
- There was significantly greater learning about research with the rail and activity than the video, $F(2, 245) = 8.163$, $p < .001$
- There was significantly greater learning about biodiversity and new species with the video than with the rail or the activity, $F(2, 245) = 6.533$, $p < .01$
- The most commonly assigned codes were Biodiversity, DNA Utility, Research Purpose/Impact, and ARMS.
- There were no significant differences in outcomes within each approach for visitors with different IPOP types.

Table 1: Common learning goals and related codes for the three approaches

Common Learning Goals	Codes Assigned
Visitors will understand how NMNH scientists search for and catalog biodiversity in a coral reef system.	Awareness of Research Awareness of SI Research Biodiversity Research Process
Visitors will understand that ARMS are a method for collecting organisms in a way that is nondestructive and getting organisms not previously accessible via past methods.	ARMS Reef Monitoring
Visitors will understand that genomics is a method to discover what can't be seen and can increase species count exponentially.	DNA Process DNA Utility New Species Research Purpose

Table 2: Learning codes assigned to visitor responses and percentage of visitors in each condition that showed evidence of each code *p< 0.01 **p<.001

Codes	Video	Rail	Activity	Chi-Square X^2 (3, N = 248)
Biodiversity	56%	46%	**22%**	16.087**
New Species	**48%**	**25%**	**9%**	25.570**
Reef Monitoring	13%	**31%**	12%	13.369**
Research Process	39%	**13%**	27%	17.935**
DNA Process	**1%**	**35%**	**17%**	30.484**
DNA Utility	**4%**	45%	54%	43.953**
Research Purpose/Impact	30%	42%	**14%**	15.281**
ARMS	37%	**59%**	36%	13.337**
Awareness of Research	23%	31%	17%	4.179
Awareness of SI Research	1%	**14%**	7%	9.683*

Discussion

The data shows that visitors achieved the learning goals using all three methods. People reported learning with the rail in more areas because it presented the greatest diversity of messages. Also, the rail was designed through a thorough writing process garnered specifically for an exhibit. The activity was in prototype stage and not designed specifically for the exhibit. The video was designed for an online audience.

The video appeared to be more effective for biodiversity because it is a concept that could be best understood visually by actually seeing new species. Both the rail and the activity seem to be effective in conveying information about DNA and understanding research, one by reading and the other by doing. The video was not as effective for DNA because it was only briefly mentioned. For an online audience, research purpose scores might be higher.

It was surprising that there were no significant differences in learning for people with different IPOP preferences. This could be because the rail, the activity, and the video all included ideas, people, objects (at least to see), and physical activity (even if a person wasn't doing the research, they could see people doing it). To improve the visitor experience and enhance learning for visitors, it could be effective for the museum team to combine experiences by putting them closer together. Users could learn the ideas in many different ways and get the best of the activity, the rail, and the video by using them together.

Future Work

- Include visitors under age 13 to see if these approaches help younger people learn important concepts and whether different approaches, such as interactive activity, are more effective.
- Include conditions in which visitors participate in more than one experience to see if multiple experiences work together to produce more learning.
- Increase the number of visitors participating to broaden the data and results.
- Include more international visitors as cultural differences and educational processes may have effects on museum learning experiences.
- Data collection could be more efficient and could appeal to more visitors by offering the option of taking the survey on an interactive tablet.

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