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Club Genome

An evaluation of the object theater's impact on visitor knowledge and understanding of DNA

EXECUTIVE SUMMARY

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Club Genome is the newest object theater to production for the fourth floor at Science North and was opened in March 2009. It explores the idea of DNA as the basis for life and how DNA expresses itself in living organisms. The theater also explores the concept of "new genetics", which promises new unprecedented breakthroughs in health and medical research, procedures and treatments (Durant *et al*., 1999).

Objective

Before developing *Club Genome*, the development team outlined several learning goals for the theatre. These learning goals were used to develop the script for the show and are the basis for the results of this evaluation study. The learning goals for *Club Genome* are:

1. Convey complexity and logic of functions in our cells.

2. DNA is like a code, or language, or even musical notes in a song.

3. All living organisms have DNA.

4. New research of the genome will allow for great medical innovation.

As part of ongoing research and evaluation initiatives at Science North, it was important that *Club Genome* be evaluated with respect to the learning goals set out during the development of the theater. This is especially important when communicating science topics that may be more difficult for visitors to understand.

Visitors come to Science North with different backgrounds and experiences in DNA and genetics. Exposure to DNA and things related to DNA will vary among visitors. Some visitors would have been exposed to the topic in school or in the media in various ways and others not.

Methodology

For this study, we used a method known as Personal Meaning Mapping (PMM). This method is used to evaluate changes in an individual's knowledge of a specific topic and has been effective in previous studies (Falk & Storksdieck, 2005). Participants are asked to complete an interview either before or after exposure to an experience. The participant doing PMM writes thoughts and opinions on a sheet of paper containing a cue word in the centre. Responses can be in the form of paragraphs, words, phrases, or drawings. The interviews will then use the participant's written responses to ask open-ended questions and encourage dialogue on the topic.

Data Collection

Interviews were conducted at Science North in Sudbury, Ontario. All participants were selected randomly. Many visitors were asked to participate and those who chose to participate did an open-ended interview using the PMM technique. Participants of these interviews consisted of *non-viewers* and *viewers*. Non-viewers are visitors that participated in the interview without watching the show. Viewers are visitors that were randomly selected after watching the show.

In both cases, participants were asked to write words, ideas, images, phrases or thoughts that came to mind relating to 'DNA', which appeared as the cue word. The written words formed the basis for an open-ended interview. During the interview, participants were encouraged to expand on their thoughts and ideas.

Participants were also given a different colored pen by the researcher after having a discussion, and were asked to write or draw any additions they could think of that relate to DNA. This was valuable as visitors provided a greater extent of information after discussing their responses.

All written and oral responses recorded during the interview were analyzed.

Results

Non-viewers and viewers mentioned concepts that were grouped into four different conceptual categories: DNA structure and location, DNA function, DNA metaphors, and scientific and social issues. Table 1 shows the categories with example comments from both non-viewers and viewers.

Table 1. Concepts found within the cognitive categories for initial and exit interviews

Category	Non-Viewers	Viewer
DNA structure and location	1. Double Helix Structure 2. Found in blood 3. Found in cells 4. Acronym for Deoxyribonucleic acid 5. Base Pairs (ATGC)	1. Double Helix Structure 2. Found in cells 3. Base Pairs (ATGC)
DNA Function	1. Inheritance 2. Physical Traits (eye, hair colour, etc) 3. Genes 4. Individuality 5. Chromosomes	1. Inheritance **2. Humans not the only thing that have DNA** **3. Human similarity to other living things** 4. Genes 5. Chromosomes 6. Individuality 7. Physical Traits (eye, hair colour, etc)
Metaphors	1. Code 2. Blueprint 3. Map 4. Building block 5. Fingerprint	**1. Music Metaphor** 2. Building Block
Scientific and Social Application	1. Crime Solving 2. Cause Disease 3. Cloning 4. Genetically Modified Food 5. Human Genome Project	**1. Scientific research – finding cures for diseases** **2. Stem Cell Research**

Several comments mentioned within each category differed between non-viewers and viewers (Table 1). After watching *Club Genome*, viewers commented that all living things have DNA, not just humans. Many viewers were also surprised to learn how similar humans are to other living things, and how similar other living things are to each other.

After seeing *Club Genome*, viewers remarked that DNA research could help cure diseases. Visitors would mention certain aspects of the show such as the scientists talking about cancer research, the ability in the future to grow limbs, and other research topics that could help treat or cure diseases.

Visitors who appeared to have greater knowledge and understanding of DNA commented that the music metaphor was difficult to understand, however visitors who had limited knowledge and understanding of DNA often commented that the music metaphor made it easier to understand. One visitor commented: *"if they had used this way [music] of explaining this in school, it would have been a lot easier to learn."*

Conclusion

Two of the learning goals of *Club Genome* were communicated by non-viewers, but all four goals were clearly expressed by viewers after watching the object theater.

After watching the object theater, viewers were quick to mention that they had discovered that other living things have DNA. Viewers were very interested and surprised to learn about different ways in which DNA is being studied in order to help in the cure of diseases and disorders.

Based on the results of this study, we can suggest that visitors who experience *Club Genome* gain a better understanding, and increase their knowledge, of DNA as a component of all living things, as well as the scientific applications of DNA in medical science.

References:

Durant, J., Hansen, A., & Bauer, M. (1999). Public Understanding of the New Genetics. In T. Marteau & M. Richards (Eds.). The Troubled Helix: Social and Psychological Implications of the New Genetics. Cambridge, UK: Cambridge University Press.

Falk, J., & Storksdieck, M. (2005). Using the contextual model of learning to understand visitor learning from a science centre exhibition. *Science Education, 89*, 744-778.