# Evaluation Final Report

## Ontario Science Centre
## Vaccine Awareness Project

April 30, 2023

Barbara J. Soren, PhD
Aline Zara, MMSt/MI


Long-form animation panel

What happens after you get a vaccine?
youtu.be

Have you ever felt pain, fever or fatigue after getting a vaccine? You're not alone! Find out what's happening inside your body as your immune system learns how to protect you from a virus.

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# Vaccine Awareness Project

## Project Goals

The Ontario Science Centre applied for and received a grant from the Public Health Agency of Canada (PHAC) under the Immunization Partnership Fund (IPF). The intention of the IPF is to **improve vaccination coverage** by supporting provinces, territories (PTs) and stakeholders to develop new or adapt/ scale up existing interventions aimed at **increasing vaccine confidence**, uptake and access to COVID-19 vaccines, as well as to vaccines in general.

The target audience was Ontario Science Centre's core audience of families with children under 18 years. Secondary audiences were educators and community leaders. The project aimed to engage the core audience of families with children through clear science communication and interaction that increases understanding and awareness of how vaccines work and how they are a crucial tool in preventing the spread of communicable diseases. Educators and community leaders also were identified as important allies in the development, distribution and promotion of evidence-based science communication and fostering of family science capital.

The lead evaluation consultant was Barbara J. Soren, PhD who has been working in audience research and evaluation since she completed her dissertation in the 1980s. One of her case studies was at the Ontario Science Centre in the Hall of Technology. Since she completed her PhD in Education at the Ontario Institute for Studies in Education (OISE) in 1990, she taught in the Faculty of Information's Museum Studies program at U of T, and has been working on consulting projects related to visitor research across Canada, the US, and England. Dr. Soren and her U of T Museum Studies students worked on several evaluation projects at the Ontario Science Centre. Dr. Soren was assisted by one of her former students, Aline Zara, who is a PhD Student at the University of Toronto's Faculty of Information and has assisted Dr. Soren on several of her evaluation projects, most recently with Lord Cultural Resources for the Museum of Natural History at the University of Michigan.

## Evaluation Plan

The on-site evaluation was primarily to:

:

- Assess whether content developed for an exhibit and animations with videos in multiple locations throughout the Ontario Science Centre supports understanding of vaccines and vaccination;

- Examine the effectiveness of unique digital content both onsite and online.

## Methodology

### Preparation for the evaluation

- Plan evaluations, develop observations and interview questionnaires that include demographics summaries.
- Request instruments that other museums identified in an initial Environmental Scan used to evaluate their vaccine-related exhibits and animations.
- Work with Ontario Science Centre researchers/ programmers and 3-D designers to conduct formative and summative evaluations onsite as the exhibit and animations are being developed.

### Front-end evaluation and Formative evaluation (prototyping)

- Work with *Digital Public Square* to collect raw data using their game "Know it or Not" in the early Fall. Find out about attitudes to vaccines through a unique institutional link, which was shared with visitors at the Ontario Science Centre, and at community events.
- Gather data on visitors' perceptions, thoughts, and feelings as the exhibit was in development.
- Analyze data and provide summaries based on front-end and formative evaluation to support the development of the exhibit and animations.

### Summative and remedial evaluation

- Gather data on visitors' perceptions of three exhibits - the Macro, Micro, and Moments exhibits related to vaccines, knowledge/ information gaps, core audience perspectives, and confidence levels through onsite observations and interviews.
- Gather data on visitors' perceptions of the onsite animations and online animations through web metrics.
- Analyze data and provide summaries based on summative evaluation of the three exhibits, Short-form and Long-form animations, and provide recommendations for remedial evaluation.

### Onsite Sampling

Sample a range of diverse visitors onsite with a variety of ethnic, racial, gender identity, and physical abilities (i.e. representing equity, diversity and inclusion), including mixed genders, Ontario Science Centre members, families visiting with school-aged children, as well as teachers and students from schools visiting the Ontario Science Centre.

## Evaluation Outcomes

- A summary of the summative evaluation of the three exhibits and animations, and recommendations to improve the vaccine exhibits and animations onsite and online.

- A building of confidence among researchers/ programmers and 3-D designers related to observing and interviewing visitors about vaccine and vaccination awareness.

- A sense of the effectiveness of the vaccine exhibit and animations for diverse Ontario Science Centre visitors, families, members, educators, and school groups.

## Part 1: Front-end Evaluation - Digital Public Square's *Know It or Not*

According to data provided by *Digital Public Square* (DPS), Ontario Science Centre visitors completed a total of 41 sessions. Of these, 35 participants played *Know It or Not* and 32 completed the game. Primary data collectors were two Researchers/ Programmers, a Designer, and a Community & Visitor Engagement Coordinator.
(See Appendix 1a for Game Methodology and List of Questions)

**Demographics**

Of this group, 34% provided demographic information (n=14). Participants were predominantly aged 18-24 (29%, n=4); 35-44 (21%, n=3); or 75-84 (21%, n=3); and more likely to identify as female (n=8) rather than male (n=5) (see Figure 1).

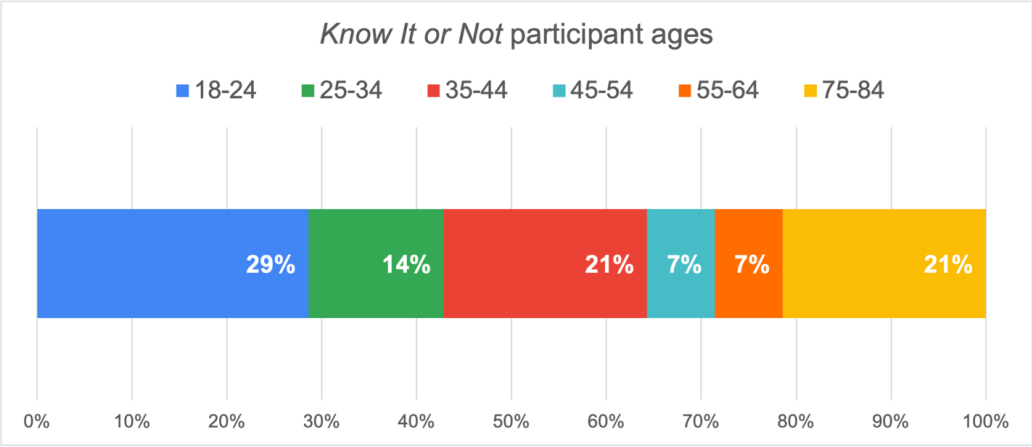


*Figure 1: Front-end evaluation - Participant Ages*

Most participants in this group identified their ethnicity as white: 36% as white European (n=5) and 21% as white North American (n=3). Participants also identified their ethnicity as East Asian (21%, n=3); Black (7%, n=1); South Asian (7%, n=1); Middle Eastern (7%, n=1); and Jewish (7%, n=1).

Half of these participants have lived in Canada for more than 5 years (n=7) and another 36% were born in Canada (n=5), while 14% have lived in Canada for less than 5 years (n=2).

All participants had received COVID-19 vaccines, with 64% having received a booster in addition to 2 COVID-19 vaccine doses (n=9); and 36% having received 2 COVID-19 vaccine doses (n=5).

**Gameplay and results**

At the beginning of each session (n=41 sessions), the initial question for each participant was, "How are you feeling about COVID-19 booster shots?" Just less than half felt confident (49%, n=20); 29% felt neutral (n=12); 15% felt skeptical (n=6); and 7% chose not to answer this question (n=3) (see Figure 2).

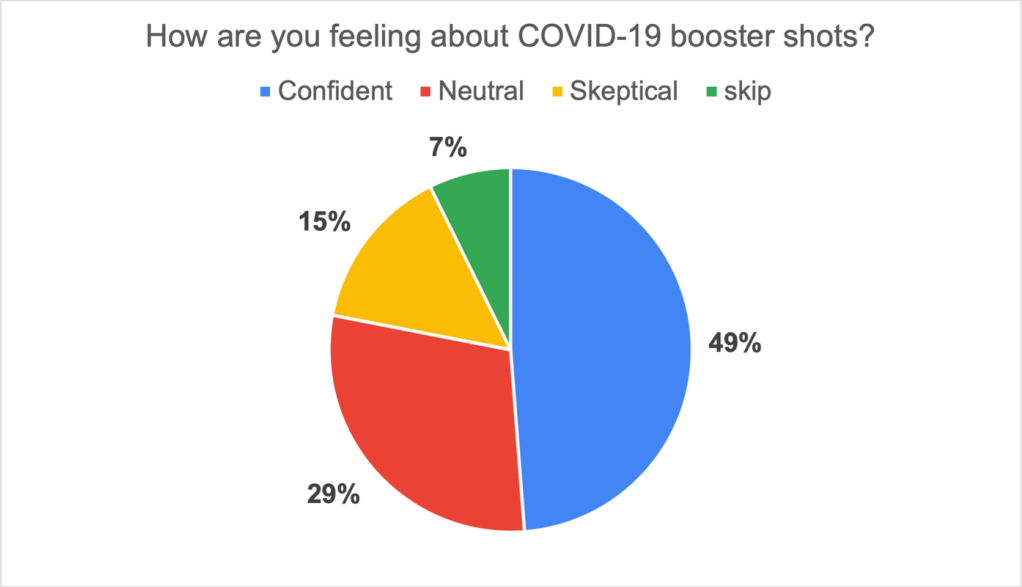


*Figure 2: Front-end evaluation - Feelings about Booster Shots*

The game continued by asking participants a combination of 12 true-false questions, from a list of 20 (n=35). As a result, the sample size varies for each question. (See Appendix 1a for the full question list.) Overall, participants answered questions correctly 82% of the time. This percentage is higher for participants who were confident about COVID-19 boosters at 87%. This percentage is slightly lower for both participants who were neutral and skeptical about COVID-19 boosters, at 78% and 81% respectively.

Participants always answered three questions correctly:

- Masks don't work. [False] (100% correct, n=28)
- It is now safe to get in person care from my doctor. [True] (100% correct, n=28)
- Even a mild COVID-19 case can cause serious issues that linger months after the infection is gone. [True] (100% correct, n=8)

Out of the list of 20 questions, people answered two questions mostly incorrectly:

- There are a total of 4 COVID-19 vaccines approved for use in Canada. [False] (11% correct, n=27)
- Serious side effects from COVID-19 vaccines are common. [False] (39% correct, n=18)

When an individual answers a question incorrectly in the game, the participant is offered the correct information, with the prompt “How does this information make you feel?” For these questions:

- 93% of participants felt happy (n=14) and 7% felt skeptical (n=1) that there are six COVID-19 vaccines approved for use in Canada.

- 50% of participants felt happy (n=2) and 50% felt skeptical (n=2) that serious side effects from COVID-19 vaccines were not common.

When asked these questions again, 93% of participants responded correctly to the question about the number of COVID-19 vaccines approved for use in Canada, while only 40% responded correctly to the question about COVID-19 vaccine side effects. On average, participants answered all recalled questions correctly 80% of the time.

Once participants completed the game, they could respond to one of three Likert Scale questions (on a scale from 1 – 5):

- How likely are you to share the information you learned here with your friends or family?
- How likely are you to get a booster shot in the next month?
- Having played this game, how do you feel about vaccines?

Most participants responded positively to these questions:

- Share information (n=18): 44% chose 5 (n=8); 39% chose 4 (n=7); 11% chose 3 (n=2); and 6% skipped the question (n=1) (see Figure 3).
- Get a booster (n=13): 62% chose 5 (n=8); 15% chose 4 (n=2); 15% chose 1 (n=2); and 8% chose 3 (n=1).
- Feel about vaccines (n=7): 43% chose 4 (n=3); 29% chose 3 (n=2); 14% chose 2 (n=1); and 14% chose 1 (n=1).

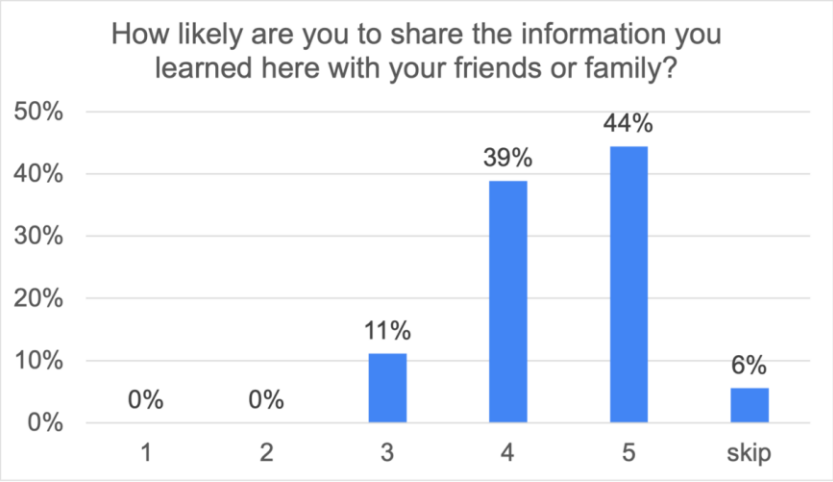


*Figure 3: Front-end evaluation - Sharing of Information*

## Part 2: Formative Evaluation: Prototype testing

### 2a. Prototype evaluation of Macro exhibit

**Exhibit Objectives**

In the Macro exhibit experience, visitors were to:

1. Learn that vaccines limit the spread of viruses;
2. Understand that vaccines protect communities, including people at greater risk (very young, very old, immunocompromised);
3. Discover that different viruses have different "spreadability."

**Goals of evaluation**

To observe visitors while they interacted with a prototype of the Macro exhibit and participated in short interviews. This Macro exhibit prototype presented visitors with two sliders: one which indicated level of vaccination (30%, 60%, 90%) and the other with infection (flu, COVID-19, measles). These selections impacted a display of coloured tiles on the floor in front of them, representative of a population: unvaccinated (yellow tiles), vaccinated (blue tiles), and infected (red tiles). As visitors made their selections, yellow tiles and blue tiles were adjusted in front of them. Once visitors set their infection, they were invited to interact with the tiles to indicate where the infect would begin and assist the facilitators in demonstrating its spread.

**What to observe**:

Do visitors …

- Understand how to set the spin dial? (Vaccination level – 60%, 30%, 90% vaccinated → amount of spread)
- Understand how to set the knob slider? (Disease – measles, influenza, COVID)
- Understand the difference between the blue, yellow, and red tiles? (Vaccinated, unvaccinated, infected)
- Interact with yellow, blue, or red tiles in various ways?
- Play on their own or with others?
- Try the exhibit more than once?

**Questions to ask the visitor (verbally):**

- On a scale from one to five, how easy was it for you to understand how to use this exhibit?
- How would you describe what this exhibit is about?
- If this exhibit makes you want to ask more questions, what would you want to know?

(See Appendix 2a for the Participant Profile we used to collect visitor demographics across instruments, and Appendix 2b for Macro Exhibit Observations and Interview Questions)

**Results**

Prototype evaluation:
Thursday, December 8, 1:00-2:00pm in Weston Family Innovation Centre exhibit hall.
A Researcher and a Designer
A total of 7 visitors/ visitor groups participated in the formative prototyping for the Macro exhibit.

**Demographics**

Participants for this evaluation were a mix of new and returning visitors to the Ontario Science Centre. Most visitors were returning to the Ontario Science Centre having last visited more than 5 years ago (29%, n=2), 2-3 years ago (14%, n=1), or last week (14%, n=1). For two of the participants, this evaluation occurred during their first visit to the Ontario Science Centre (29%, n=2). Another 14% of participants did not remember if they had visited the Ontario Science Centre before, or when (n=1) (see Figure 4).

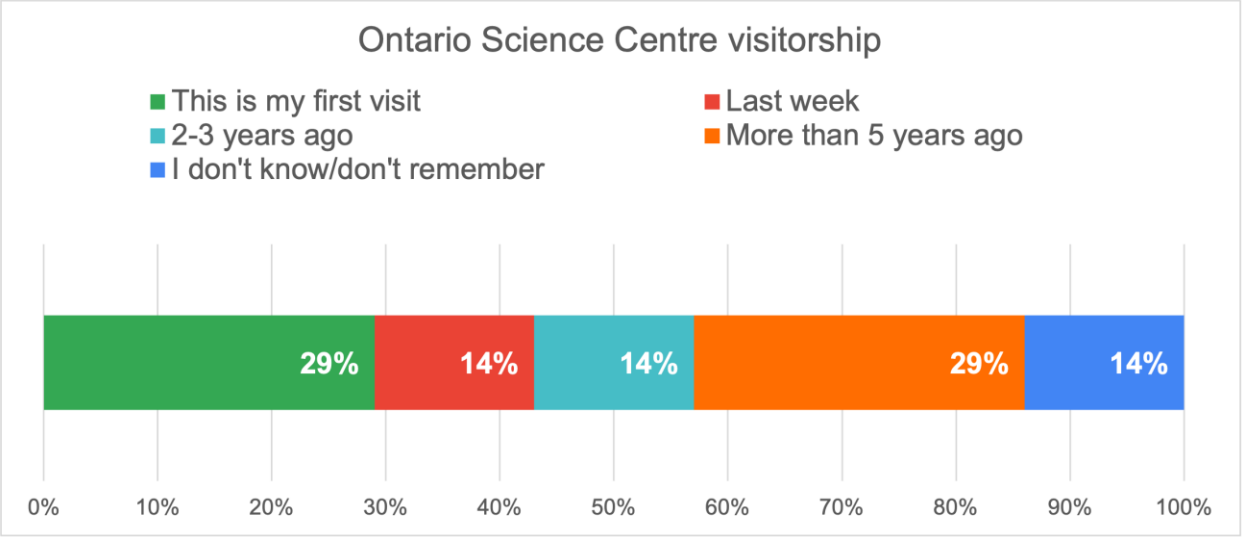


*Figure 4: Prototype evaluation of Macro exhibit - Ontario Science Centre Visitorship*

The participants were a mix of Ontario Science Centre members (29%, n=2) and non-members (71%, n=5).

Individuals were mostly visiting the Ontario Science Centre with family (29%, n=2), with one other person (29%, n=2), or with a large group (29%, n=2). One participant was visiting on their own (14%).

Participants who took part in this evaluation were predominately under 18 (29%, n=2) or in their 40s (29%, n=2). Other participants were ages 18-20 (14%, n=1), in their 20s (14%, n=1), or in their 30s (14%, n=1) (see Figure 5).

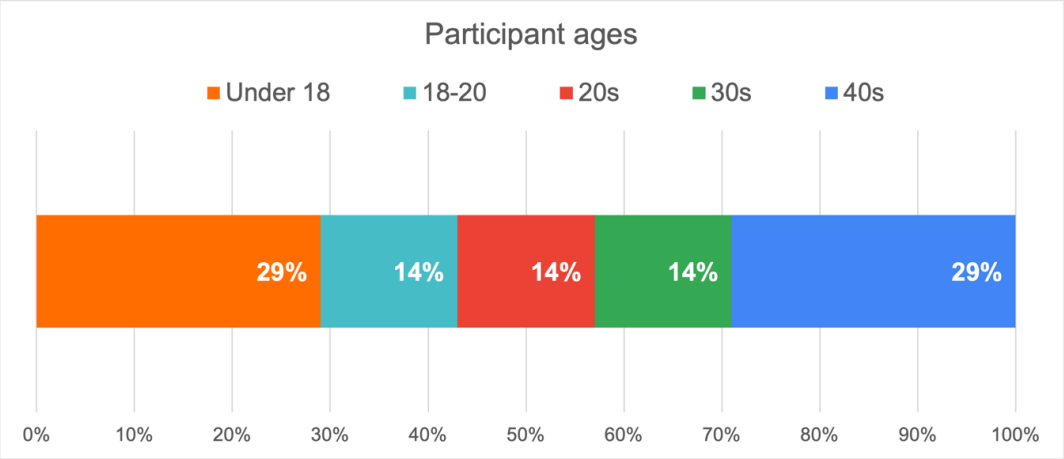


*Figure 5: Prototype evaluation of Macro exhibit - Participant Ages*

Most participants did not identify their cultural background (57%, n=4). Those who did identified their cultural background as Asian (14%, n=1) and Indigenous (14%, n=1).

Participants were all from Ontario. Most participants were from the Greater Toronto Area (GTA) (43%, n=3), while others were from the City of Toronto (29%, n=2) or in Ontario, outside the GTA (29%, n=2).

**Prototyping**

*Exhibit elements and gameplay*

For the most part, visitors understood how to interact with the exhibit. All participants were observed to have understood how to set the two sliders and the differences between the coloured tiles (100%, n=7).

During the interviews, participants ranked how easy it was for them to understand how to use the exhibit on a scale from one to five. As shown in Figure 6, 43% ranked their ease of understanding at 5 (n=3), 43% at 4 (n=3), and 14% at 3 (n=1).

While playing with the prototype, 57% of participants were confused or asked questions about how to interact with the tiles (n=4). Over half of participants were also hesitant to interact with the floor tiles (57%, n=4), with 29% not wanting to infect people (n=2).

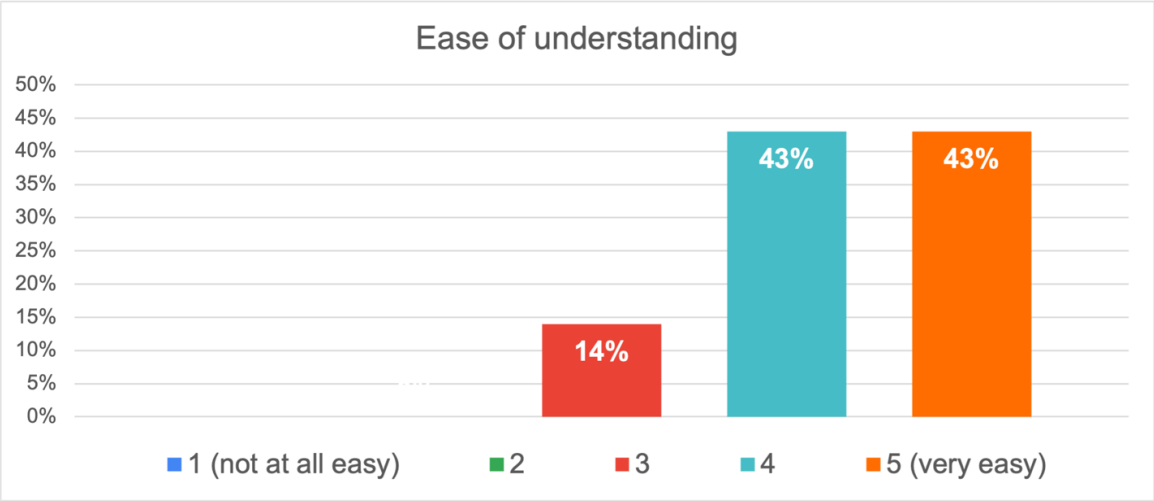


*Figure 6: Prototype evaluation of Macro exhibit - Ease of Understanding*

Participants mostly interacted with the floor tiles by stepping on them (71%, n=5), while others jumped (29%, n=2) or tapped (14%, n=1) on the tiles. Slightly more participants preferred selecting yellow tiles (43%, n=3) over blue ones (29%, n=2).

Most participants played with the exhibit on their own (57%, n=4). Less than half played together (29%, n=2) or with guidance (14%, n=1). All visitors only tried the prototype once. Overall, visitors seemed to have fun interacting with the exhibit (57%, n=4).


Prototype of Macro exhibit

Prototype evaluation of Macro exhibit

*Exhibit understanding*

Participants came away from the prototype testing with two main ideas that the exhibit was about: vaccinations (43%, n=3) and infections (43%, n=3).

The exhibit made most participants want to ask more questions (86%, n=6), on topics like the spread of infections (29%, n=2), the exhibit's context and function (29%, n=2), the risk of infection (14%, n=1), and more variables surrounding vaccination (14%, n=1)

*Table 1: Prototype evaluation of Macro exhibit – Exhibit understanding*

| ***What exhibit about*** | ***Comments*** |
|---|---|
| *Vaccinations*<br>*(43%, n=3)* | "Representation of populations vaccinated and not."<br>(Under 18, non-member, with a large group, GTA)<br><br>"How vaccinated people limit the spread of infection."<br>(20s, member, by themselves, Ontario)<br><br>"Vaccination and viruses positive opinion on vaccines."<br>(40s, member, with one other person, Ontario) |
| *Infections*<br>*(43%, n=3)* | "How can people get a virus."<br>(Under 18, non-member, with a large group, GTA)<br><br>"Vaccines infecting people."<br>(18-20, non-member, with family, Toronto)<br><br>"What's happening right now, infection diseases."<br>(40s, non-member, with family, Toronto) |
| *Unsure*<br>*(14%, n=1)* | Unsure how to describe what the exhibit was about<br>(30s, non-member, with one other person, GTA) |

*Table 2. Prototype evaluation of Macro exhibit – Exhibit question topics*

| ***Question Topics*** | ***Questions asked*** |
|---|---|
| *Spread of infections (29%, n=2)* | "What does a r0 mean, would like to see the impact of the spread on different scenarios."<br>(20s, member, by themselves, Ontario)<br><br>"Good explanation of disease spread."<br>(40s, non-member, with family, Toronto) |
| *Exhibit context/function (29%, n=2)* | "What's the purpose, how does it connect, what's the context?"<br>(30s, non-member, with one other person, GTA)<br><br>"How does it work, what will it look like?"<br>(40s, member, with one other person, Ontario) |
| *Risk of infection (14%, n=1)* | "My parents told me about risks of virus."<br>(Under 18, non-member, with a large group, GTA) |
| *Vaccination variability (14%, n=1)* | "Vaccines at different ages."<br>(18-20, non-member, with family, Toronto) |

## 2b. Prototype evaluation of Micro exhibit

**Exhibit Objectives**

In the Micro exhibit experience, visitors were to:

1. Explore the basic mechanisms of the immune system response to a viral infection;
2. Discover organs and cells of the human immune system and how vaccines work with it to protect us against pathogens (how the immune system responds; personal immunity);
3. See what is happening inside their body, at the cellular level.

**Goals of evaluation**

To observe visitors while they interact with a prototype of the Micro exhibit and record their responses to five interview questions.

**Visitor Experience**

Visitors approach what appears to be a mirror and see themselves. They are instructed to step in the area and choose between two scenarios: “unvaccinated” and “vaccinated”. In the unvaccinated scenario, they see a virus enter the airway, infect cells, and cause damage, before immune cells contain the infection. In the vaccinated scenario, they see a virus enter the airway, and antibodies able to respond quickly to block the virus before it can damage cells.

**What to observe**:

1. Did visitors choose one or both scenarios (unvaccinated/vaccinated)?
2. Which experience did visitors choose first? Unvaccinated or vaccinated?
3. Did they complete the scenario on their own or share it with others?
4. Did they ask questions or talk (about the experience) with others? Have fun?

**Questions to ask the visitor (verbally):**

1. On a scale from one to five, how easy was it for you to understand how to use this exhibit?
2. How would you describe what this exhibit is about?
3. Was there anything that surprised/ intrigued you about this exhibit?
4. Which of these concepts stood out the most to you? Why?
   - 4.1 The immune system's organs and cells
   - 4.2 How the immune system responds to a viral infection
   - 4.3 How vaccines work with the immune system to protect us
5. If this exhibit makes you want to ask more questions, what do you want to know?

(See Appendix 2c for Micro Exhibit Observations and Interview Questions)

**Results**

Prototype Evaluation: Thursday, January 26, 1:00-2:00pm in Human Edge exhibit hall.
Two Researchers/ Programmers, and a Designer.
Similar to prototype testing for the Macro exhibit, a total of 7 visitors/ visitor groups participated in the formative prototyping for the Micro exhibit.

**Demographics**

Many participants for this evaluation were returning visitors to the Ontario Science Centre, having last visited more than 5 years ago (14%, n=1), a year ago (14%, n=1), or 2-3 months ago (14%, n=1). For one participant, this evaluation took place during their first visit to the Ontario Science Centre (14%), and three others did not remember if or when they had visited the Ontario Science Centre before (43%, n=3), shown in Figure 7.

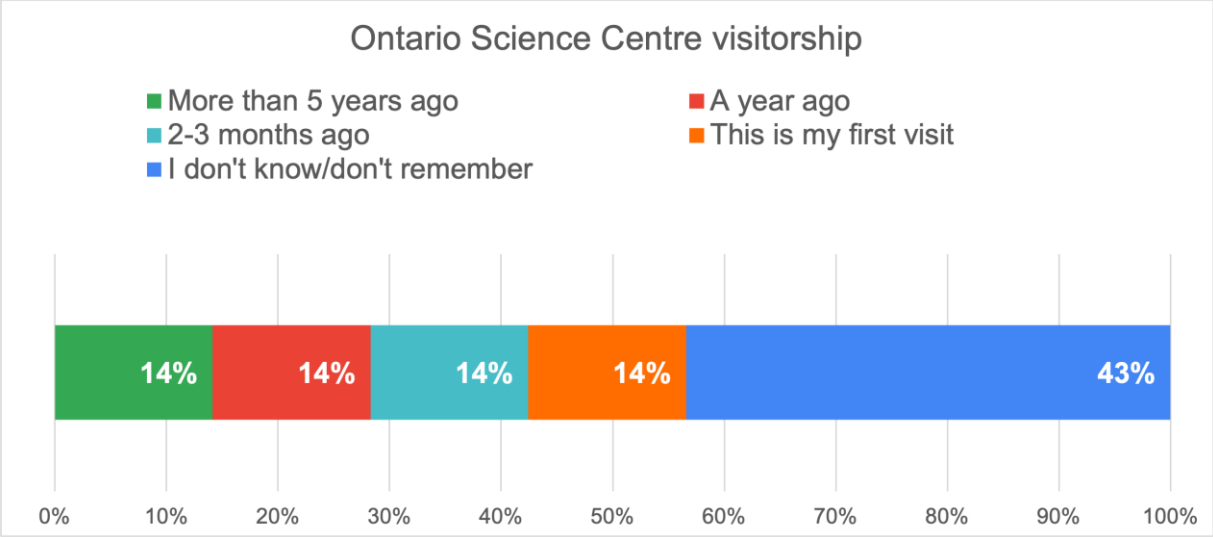


*Figure 7: Prototype evaluation of Micro exhibit - Ontario Science Centre Visitorship*

One of the participants (14%, n=1) was an Ontario Science Centre non-member; six were members (86%).

Participants for this evaluation were either visiting with a large group, such as a tour or a school group, (43%, n=3); with children under 14 years (29%, n=2); or with family (29%, n=2).

Three participants who took part in this evaluation were under 18 (43%, n=3). Other participants were in their 40s (29%, n=2), 30s (14%, n=1), or over 70 (14%, n=1), shown in Figure 8.

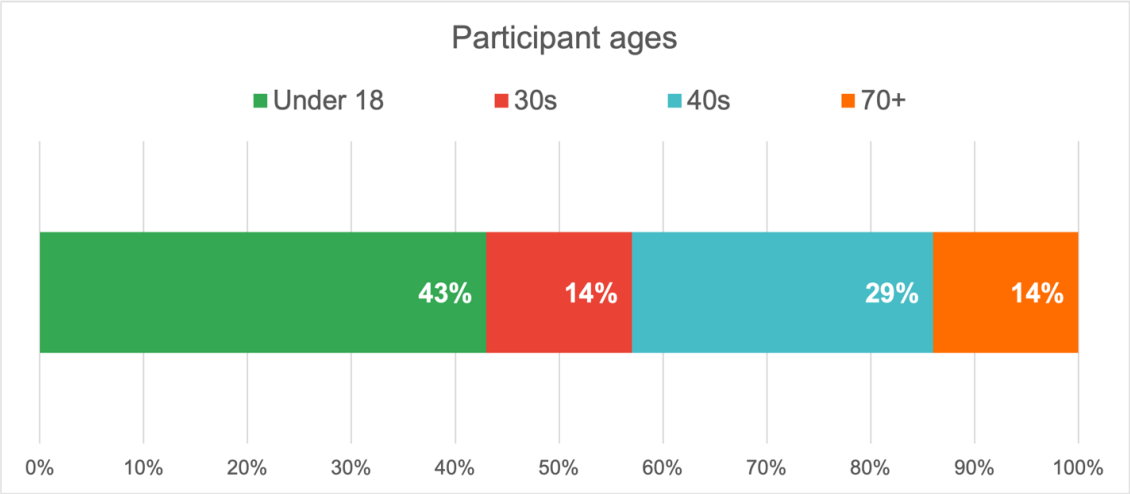


*Figure 8: Prototype evaluation of Micro exhibit - Participant Ages*

Two participants identified their cultural background as Canadian (29%, n=2). Other participants identified their cultural background as European (14%, n=1, Irish), Asian (14%, n=1, Chinese), Jewish (14%, n=1), or Black (14%, n=1). One participant did not identify their cultural background(14%).

All participants for this evaluation were from Canada. Most participants were from the GTA (43%, n=3) or the City of Toronto (29%, n=2). One participant was from elsewhere in Canada (14%) and another did not specify where they lived (14%).

**Prototyping**

*Exhibit elements and interaction*

Two participants (an educator in her 40s and a male senior who accompanied her and her class) engaged with the prototype without the benefit of the secondary screen (it had run out of battery and had to be recharged). The secondary screen shows the micro view of the different cell types. These participants only saw the overlay of lungs and lymph system in the mirror – valuable insight is the contribution of the secondary screen video to the experience.

This educator told us that she had a background in immunology and that she was a bit disappointed that she couldn't see the killer T cells and antibodies at work, as she thought those were important aspects for people to see and know about. She was enthusiastic about seeing the exhibition in its finished form, but was running off to a program with her students and couldn't stay to see the secondary screen video when it was available.

Most participants understood how to interact with the exhibit prototype. During the interviews, participants ranked how easy it was for them to understand how to use the exhibit on a scale from one to five. Many participants ranked their ease of understanding at 5 (71%, n=5), while two individuals ranked their understanding at 3 (14%, n=1) and 2 (14%, n=1), shown in Figure 9.

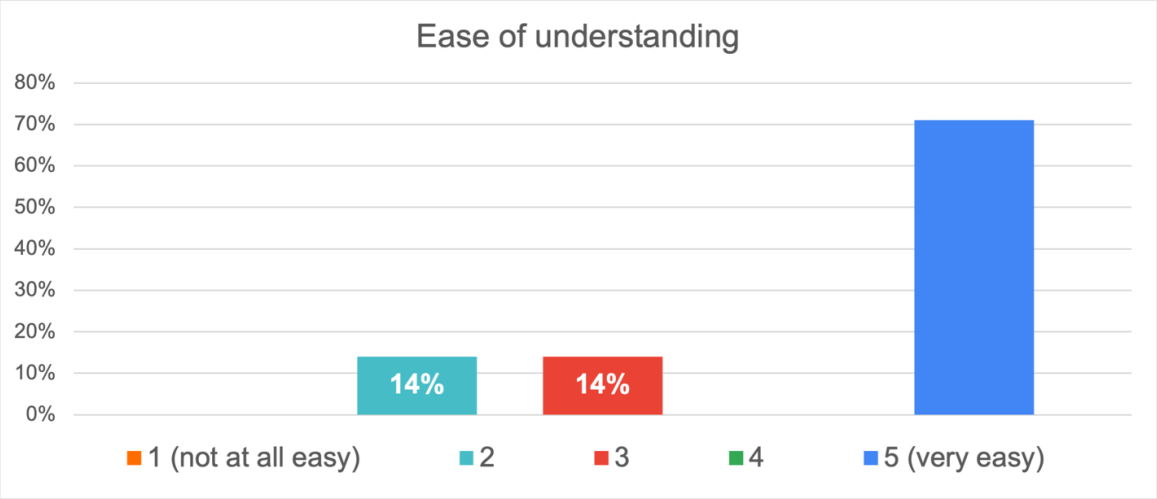


*Figure 9: Prototype evaluation of Micro exhibit - Ease of Understanding*

Participants were surprised and intrigued by the projection on their body (43%, n=3, e.g., "projection was cool" and "visual was well done"), and one person (14%, n=1) "Liked seeing where things are on your body"). Two visitors (29%, n=2) commented that they liked "the lungs and lymph system" and "How the immune cells move around". One participant did not respond to this question during their interview (14%).

"The projection on your body" drew more people's attention and focus (43%, n=3) than the screen with the cellular level view (14%, n=1). Two participants liked both experiences (29%, n=2). One person did not respond to this question.

Of all seven participants, 57% chose to experience both prototype's scenarios (n=4) and 43% only chose one scenario (n=3). For the most part, participants chose the vaccinated scenario first (71%, n=5). Only 29% chose to begin with the unvaccinated scenario (n=2).

During the scenarios, just over half of participants completed the scenarios on their own (57%, n=4), while the rest of the participants shared the experience with others (43%, n=3).

While interacting with the scenarios, most participants asked questions about the experience (71%, n=5). Other participants also talked with others (29%, n=2, e.g. parents talked with each other) and had fun (e.g. laughing, enthusiasm, curiosity) during the scenarios (14%, n=1). One participant did none of those behaviours (14%, n=1).

*Micro exhibit Prototype*

*Exhibit understanding*

Participants identified two main ideas related to what the exhibit was about: the impact of vaccines (71%, n=5) and the immune system (14%, n=1).

*Table 3. Prototype evaluation of Micro exhibit – Exhibit understanding*

| ***What exhibit about*** | ***Comments*** |
|---|---|
| *The impact of vaccines (71%, n=5)* | "How vaccines help your body."<br>(Under 18, non-member, with family, another part of Canada)<br><br>"What happens to your lungs when you get sick without a vaccine and with a vaccine."<br>(Under 18, non-member, with family, GTA)<br><br>"Showing how it's better to get a vaccine, what happens with and without the vaccine."<br>(Under 18, member, with children under 14 years, Chinese, GTA)<br><br>"Viruses and how your body fights them with vaccine."<br>(30s, non-member, with children under 14 years, Black, City of Toronto)<br><br>"Vaccines."<br>(40s, non-member, with a large group, GTA) |
| *Immune system (14%, n=1)* | "How the immune system fights infection."<br>(40s, non-member, with a large group, City of Toronto) |
| *Unsure (14%, n=1)* | (70+, non-member, with a large group) |

When asked which of the exhibit's concepts stood out the most to them:

- 71% of participants chose "How vaccines work with the immune system to protect us" (n=5);
- 29% of participants chose "The immune system's organs and cells" (n=2); and
- 14% of participants chose "How the immune system responds to a viral infection" (n=1).

For another 29% of participants, none of these concepts stood out to them. For instance, a 40-year-oild was "Not clear where the lymph nodes were supposed to be."

Participants were split as to what surprised them the most about this exhibit. While 43% (n=3) were intrigued by what was occurring inside the body (e.g. "How the immune cells move around"; "the lungs and lymph system"), another 43% (n=3) were surprised by the exhibit's visuals (e.g. videos, projections). One participant did not respond to this interview question (14%).

The exhibit also made a few participants want to ask more questions (43%, n=3) on the topics of antibodies (29%, n=2) and viruses (14%, n=1).

*Table 4. Prototype evaluation of Micro exhibit – Exhibit question topics*

| ***Question Topics*** | ***Questions asked*** |
|---|---|
| *Antibodies*<br>*(29%, n=2)* | "Was wondering how the body has the antibodies if not vaccinated."<br>(30s, non-member, with children under 14 years, Black, City of Toronto)<br><br>"Where do antibodies go?" (video wasn't playing)<br>(40s, non-member, with a large group, City of Toronto) |
| *Viruses*<br>*(14%, n=1)* | "What virus was it supposed to be?"<br>(Under 18, member, with children under 14 years, Chinese, GTA) |

## Part 3: Summative evaluation

## Long-form and Short-form Animations

### 3a. Short-form animation panels

The Ontario Science Centre prepared ten 30-second Short-form animations, in English and in French.

There were displays of the Short-form animations on monitors in three locations: Level 4, Level 6 Hot Zone, and Level 6 RPS (Rock Paper Science).

Researcher/ programmers collected Short-form animation observation data from March 30 to March 31, 2023, in three one-hour sessions across all three display locations.

<u>Engagement</u>
There were observations of a total of 22 visitors during the three one-hour observation periods: 15 at Level 6 RPS (68%), 4 at Level 4 (18%), and 3 at Level 6 Hot Zone (14%). Data collectors watched groups of visitors pass by the monitors, sometimes whole school groups of 30+ students. Of all the visitors that walked past the monitors (perhaps hundreds) only 22 noticed the monitors. Of those 22 that noticed the monitors, 18 just glanced, while four visitors watched at least a few seconds. The majority didn't notice the monitors at all. Observations indicated that visitors were looking at the monitors while passing by on their way to another location, looking at the monitors while waiting for other people they were visiting with, and briefly looking at the monitors before looking at something else nearby at the Ontario Science Centre.

Of the 22 people who noticed the monitors, many visitors were visiting with a large group (45%, n=10), while others were with family (23%, n=5), by themselves (9%, n=2), with friends (5%, n=1), or with one other person (5%, n=1)
[NR (no response) =3].


The visitors who stayed at the monitors all spent less than 30 seconds viewing the animations. Two visitors spent less than 10 seconds at the monitors, while one visitor spent 20 seconds.

*Short-form animation panel*

## 3b. Long-form animation panels

The Ontario Science Centre also prepared three 90-second Long-form animations, in English and in French:

- What happens when you get a vaccine? (Qu'arrive-t-il après un vaccin?)
- What happens when antibodies come into play? (Qu'arrive-t-il quand les anticorps entrent en jeu?)
- What happens when viruses mutate? (Qu'arrive-t-il quand des virus mutent?)

A large LED screen in the Level 6 Hot Zone displayed the Long-form animations, alongside other audiovisual material. They were also uploaded onto the Ontario Science Centre YouTube channel as part of the playlists "Vaccination, Explained!" and "Expliquons la vaccination", and shared on social media by the Ontario Science Centre and ScienceUpFirst on February 23, 2023 during National Kids & Vaccines Day.

Long-form animation observations and interviews took place on-site from March 30 to April 14, 2023, for a total of 18 observations and 13 interviews. Social media engagement data collected from March 17 to March 20 and April 9, 2023, indicated that as of April 9, 2023, the six Long-form animation videos uploaded to YouTube had 469 views and 22 likes, overall.

## On-site engagement

## Observations related to Long-form animation panels (n=18)

Out of the three Long-form animations on display at the Ontario Science Centre:

- 44% of visitors viewed "What happens after you get a vaccine?" (n=8)
- 39% of visitors viewed "What happens when viruses mutate?" (n=7)
- 28% of visitors viewed "What happens when antibodies come into play" (n=5)

(see Figure 10)

While most visitors only watched one video, 6% viewed all the videos in the series (n=1).

Visitors were more likely to view the Long-form animation individually (56%, n=10), although many did watch the video in a group (44%, n=8). Some visitors talked to others or asked questions about the video (11%, n=2) and had fun watching the animation (17%, n=3).

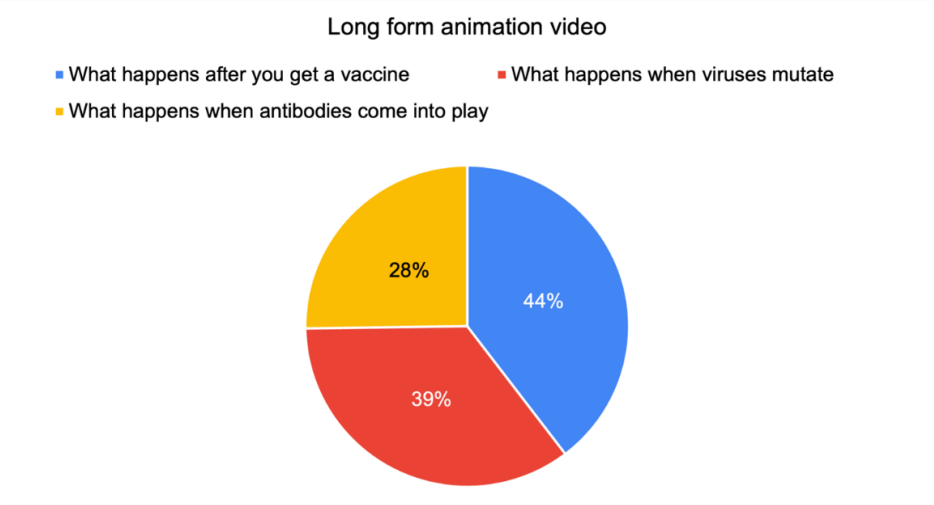


*Figure 10: Long-form animation video*

Many of the visitors were part of a larger school group, often in the Hot Zone for a snack or break (72%, n=13). Some visitors watched the videos while waiting for other people they were visiting with (17%, n=3) or while distracted (6%, n=1). Three visitors watched the video intently (17%, n=3).

As shown in Figure 11, most visitors viewed the entire Long-form animation (56%, n=10), while some only watched part of the video (28%, n=5). Other visitors spent a longer time at the Long-form animations, either viewing another animation or other material on the screen (17%, n=3).

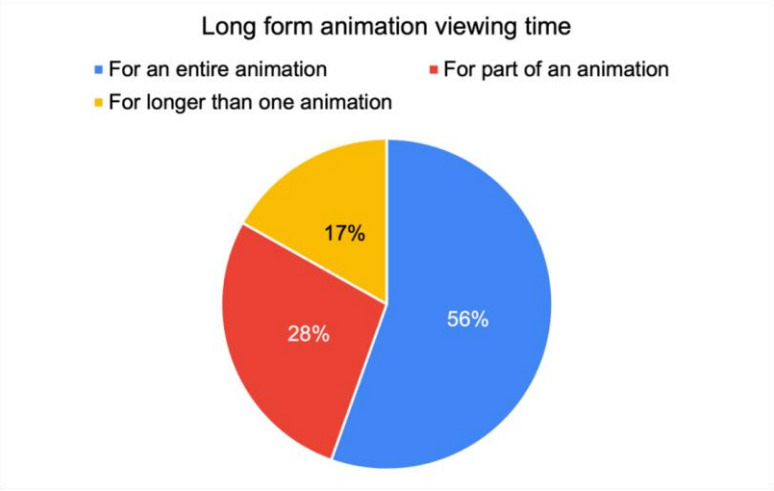


*Figure 11: Long-form animation viewing time*

## Interviews related to Long-form animation panels (n=13)

Some visitors interviewed at Long-form animation panels were at the Ontario Science Centre for the first time (31%, n=4), while other visitors were returning to the Ontario Science Centre after visiting more than 5 years ago (23%, n=3) or one month ago (8%, n=1). Others were not sure when they had last visited (15%, n=2) [NR=3].

Most visitors were non-members (46%, n=6), while one was a member (8%) [NR=6].

Most interviewees were visiting either with family (46%, n=6) or with a large group (e.g. a school group) (38%, n=5), while one visitor was visiting with children under 14 years (8%) [NR=1].

The ages of visitors interviewed ranged from under 18 (46%, n=6) to 30s (15%, n=2), 40s (15%, n=2), and 70+ (8%, n=1) [NR=2].

Visitors identified their cultural background as East Asian (31%, n=4), South Asian (23%, n=3), South American (15%, n=2), or North American (8%, n=1) [NR=5].

Most visitors lived in Canada, either in the City of Toronto (15%, n=2), the GTA (15%, n=2), elsewhere in Ontario (8%, n=1), or another part of Canada (8%, n=1). A few visitors were from the U.S. (23%, n=3) [NR=4].

In their interviews, most visitors were not surprised by what they saw in the Long-form animations (38%, n=5). Others were intrigued by how viruses and the immune system work (15%, n=2), the importance of vaccines (15%, n=2), the "fun" tone of the video (8%, n=1). One visitor self-described himself as "anti-vax". The data collector spoke with him at length for over 30 minutes during which he ended up watching all three animations. The interviewer described the conversation as respectful and civil. He mentioned that science is moving too fast in his opinion. He did not approve of vaccine mandates.

*Table 5. Summative evaluation – Long-form animation interest*

| ***Surprised/intrigued by*** | ***Comments*** |
|---|---|
| *How viruses/ immune system work (15%, n=2)* | "How virus moves, how you feel, how the immune system fights the virus." (Under 18, non-member, South Asian, with family, the U.S.) |
| *Importance of vaccines (15%, n=2)* | "Now I know why we need so many vaccinations." (Under 18, member, South Asian, with a large group, GTA) |
| *Fun tone (8%, n=1)* | "Liked it. Fun appealing music, fun happy cells at work." (30s, non-member, East Asian, with family, another part of Canada) |

Visitors described the Long-form animations as being about viruses (23%, n=3), antibodies (23%, n=3), what happens after a vaccine (23%, n=3), or something else (15%, n=2) [NR=2]:

*Table 6. Summative evaluation – Long-form animation understanding*

| ***Video is about*** | ***Comments*** |
|---|---|
| *Viruses (23%, n=3)* | "Covid or viruses in general" (30s, with children under 14 years) |
| *Antibodies (23%, n=3)* | "Learning how antibodies work, how they protect you." (Under 18, non-member, East Asian, South American, North American, with family, the U.S.) |
| *What happens after a vaccine (23%, n=3)* | "Why we have symptoms after a vaccine." (30s, non-member, East Asian, with family, another part of Canada) |
| *Other (15%, n=2)* | "Really good. (70+, East Asian, with family, City of Toronto)<br><br>"Learning about new things." (no demographics) |

**Here is a list of emotion words. Which TOP 3 emotions <u>are you feeling</u> after watching the animations?**

*Table 7. Summative evaluation – Long-form animation list of emotion words*

| | |
|---|---|
| Bored | Excited |
| Healthy | Confused |
| Challenged | Inspired |
| Curious | Disgusted |
| Joyful | Surprised |
| Uneasy | Hopeful |
| Satisfied | Sad |
| Confident | Serene |
| Discouraged | Angry |
| Safe | |

When asked to choose from a list of emotion words to describe how they felt after watching the videos (see Table 1), the most common emotion visitors felt was "curious" (62%, n=8) [NR=2]. Other emotions felt by visitors were also positive and included joyful, healthy, and surprised (each 23%, n=3).

Many visitors said that they felt these emotions because of the content (38%, n=5) and the music or visuals of the animations (15%, n=2).

Visitors responded to different questions depending on the video(s) they viewed. Questions asked about their opinions before and after viewing the Long-form animation.

For visitors who viewed “What happens after you get a vaccine” (N=6):

- *Feeling pain, fever, or tiredness from a vaccine is normal*
  - Before: 67% strongly agree (n=4), 33% agree (n=2)
  - **After: 67% strongly agree (n=4), 17% agree (n=1), 17% disagree (n=1)**
- *Feeling pain, fever, or tiredness from a vaccine is part of the body's natural response to a vaccine*
  - Before: 50% strongly agree (n=3), 50% agree (n=3)
  - **After: 67% strongly agree (n=4), 33% agree (n=2)**

For visitors who viewed “What happens when antibodies come into play” (N=4):

- *The immune system protects you by creating antibodies, which can be produced by vaccination or infection*
  - Before: 100% strongly agree (n=4)
  - After: 100% strongly agree (n=4)
- *Vaccination provides the safest path to protective antibodies*
  - Before: 75% strongly agree (n=3), 25% neither agree nor disagree (n=1)
  - After: 75% strongly agree (n=3), 25% neither agree nor disagree (n=1)

For visitors who viewed “What happens when viruses mutate?” (N=5):

- *Virus mutations are normal, some viruses mutate faster than others*
  - Before: 60% strongly agree (n=3), 40% agree (n=2)
  - **After: 80% strongly agree (n=4), 20% agree (n=1)**
- *Vaccines are the best defense against mutations*
  - Before: 60% strongly agree (n=3), 20% agree (n=1), 20% strongly disagree (n=1)
  - After: 60% strongly agree (n=3), 20% agree (n=1), 20% strongly disagree (n=1)

Overall, the Long-form animations that generated the most change were “What happens after you get a vaccine?” and “What happens when viruses mutate?”

## Social media engagement

Each Long-form animation video uploaded to YouTube has had a lasting viewership. Table 2 below compares the views of the videos on April 9, 2023 and May 28, 2024.

*Table 8: Long-form animation video views and likes on YouTube*

| Long-form animation video | April 9, 2023 | May 28, 2024 |
|---|---|---|
| What happens after you get a vaccine? | 247 views, 9 likes | 390 views, 10 likes |
| Qu'arrive-t-il après un vaccin? | 79 views, 4 likes | 115 views, 4 likes |
| What happens when antibodies come into play? | 48 view, 5 likes | 120 views, 5 likes |
| Qu'arrive-t-il quand les anticorps entrent en jeu? | 23 views, 2 likes | 41 views, 2 likes |
| What happens when viruses mutate? | 52 views, 1 like | 212 views, 1 like |
| Qu'arrive-t-il quand des virus mutent? | 20 views, 1 like | 50 views, 2 likes |

As of April 9, 2023, each Long-form animation video had an average of 78 views and 4 likes: the English videos had an average of 116 views and 5 likes, and the French videos had an average of 41 views and 2 likes. On May 28, 2024, each Long-form video had an average of 155 views and 4 likes: the English videos had an average of 69 views and 5 likes, and the French videos had an average of 241 views and 3 likes. Overall, the total number of views has increased 98% and likes has increased 9% over time.

The videos for "What happens after you get a vaccine?" came online earlier than the other Long-form animation videos and were promoted on social media by the Ontario Science Centre and ScienceUpFirst for National Kids & Vaccines Day on February 23, 2023. The data below were compiled from March 17 to 20, 2023.

Ontario Science Centre shared the English video on Facebook and Twitter. On Facebook, the post only received 8 reactions and 1 share. There was much more engagement with the audience on Twitter, where the post had 13.5K views, 14 retweets, 14 likes, and 2 shares.

ScienceUpFirst shared the English and French videos in two Instagram stories. The English story reached 972 accounts and had 2 profile activity actions. The French story reached 353 accounts and engaged 1 account.

## Exhibits

During the last two weeks of April, three researcher/ programmers and two designers collected exhibits-related data. Their goal was to observe and interview 30 visitors interacting with the three newly installed exhibits in Human Edge exhibition hall.

- The Macro exhibit is about community immunity and prompts visitors to choose the "pathogen" (flu, COVID-19, COVID-19 omicron, measles) and the "vaccination coverage" (0, 20, 50, 80, 95).
- The Micro exhibit is about personal immunity and enables visitors to "see" parts of their immune system as it responds to two scenarios:: "unvaccinated" and "vaccinated".
- In the Moments exhibit visitors encounter stories of success, struggle, and survival through text, images, and objects.

Primary data collectors were two Researchers/ Programmers, and a Designer. They observed which of the three exhibits 31 visitors interacted with first. Sixty-one percent of the visitors observed (n=19), interacted with the Macro exhibit, seven individuals or groups (22%) spent time at the Moments exhibit, and two people (6.5%) attempted to interact first with the Micro exhibit.

## 3.c.i Macro exhibit


**Macro exhibit**
Visitors approach a floor projection and a kiosk with two rows of buttons. They are prompted to choose the "pathogen", and the "vaccination coverage" by pressing the corresponding button. They are then prompted to step on the floor. On the floor, they see an assortment of blue (vaccinated) and yellow (unvaccinated/at-risk) circles corresponding to the vaccination input variables. Visitors step, jump, or walk across the floor, which triggers an infection, and watch the spread as according to input variables.

**Macro exhibit observations**
Twenty-three visitors observed (74%) interacted with the Macro exhibit. Nineteen (61%) tried more than one disease scenario. Seventeen (55%) stopped at the kiosk to set parameters first and sixteen (52%) interacted with the exhibit as group/ share experience. Fifteen (48%) read the instructional copy at the kiosk, fourteen (45%) tried more than one vaccination scenario, twelve (39%) appeared to be having fun, and eleven (35%) talked to others or asked questions about the exhibit. Five visitors (16%) spent 5 minutes at the Macro exhibit, three people (10%) spent 2 minutes and three spent 3 minutes.

## 3.c.ii Micro Exhibit

**Micro Exhibit**
Visitors approach what appears to be a mirror and see themselves. They choose between two scenarios: “without vaccine” and “with vaccine”. In the “without vaccine” scenario, they see a virus enter the airway, infect cells, and cause damage, before immune cells contain the infection. In the “with vaccine” scenario, they see a virus enter the airway, and antibodies are able to respond quickly to block the virus before it can damage cells

**Micro exhibit observations**
Unfortunately, during the observation period, the Micro exhibit had issues related to software + hardware, which were being resolved by the software developer the Ontario Science Centre contracted and they were waiting on the contractor to make the fixes. As a result, only two visitors (6.5%) interacted with the Micro exhibit and six (19%) did not. The two visitors easily started the exhibit experience, and listened to the narration. One read the instruction copy, talked to others or asked questions about the exhibit, tried the vaccinated scenario, and tried the unvaccinated scenario. They spent 30 seconds to 4 minutes at the Micro exhibit.

## 3.c.iii Moments Exhibit

**Moments Exhibit**
Visitors can learn about non-Western contributions to vaccine development, understand how advances in vaccine technology impact our world, and reflect on the evolution of ethics and history of harms in medical research. Visitors can rotate each ‘bubble’ or ‘disk’ to reveal more in-depth stories as well as artifacts, allowing the content to be shared sensitively and deliberately.

**Moments exhibit observations**
Eight visitors (26%) interacted with the Moments exhibit. Some (29%) spun sphere or discs, read the exhibit text (23%), viewed more than one panel (15%), talked to others or asked questions (13%), and interacted with the exhibit as a group/ share experience (13%). Four visitors spent two minutes at the exhibit, two spent 20-30 seconds, and two spent 5 minutes. One mother’s young daughter walked to the Macro exhibit and took her mother’s attention away from the Moments exhibit.

## Interviews related to exhibits (n=31)

One-quarter of the visitors interviewed were at the Ontario Science Centre for the first time (23%, n=7), while other visitors were returning to the Ontario Science Centre after visiting more than 5 years ago (16%, n=5) or a year ago (13%, n=4) [NR=10].

Once more, most visitors were non-members (58%, n=18), while two were members (6.5%) [NR=11].

Most interviewees were visiting either with a large group (e.g. a school group) (26%, n=8) or family (16%, n=5) while four visitors were visiting with one other person (13%) [NR=9].

The ages of visitors interviewed ranged from under 18 (35%, n=11), 18-20 (3%, n-1) to 20s (13%, n=4), 30s (10%, n=3), 40s (3%, n=1), and 60s (3%, n=1), 70+ (3%, n=1) [NR=9].

Visitors identified their cultural background as South Asian (13%, n=4), Chinese (10%, n=3), Asian (6.5%, n=2), or European (6.5%, n=2). Others were Scottish, Mexican, and Canadian [NR=5].

Most visitors lived in the City of Toronto (35.5%, n=11), the GTA (6.5%, n=2), elsewhere in Ontario outside the GTA (13%, n=4), or another part of Canada (3%, n=1). A few visitors were from the U.S., Mexico, and the UK (10%, n=3) [NR=11].

**If the visitor saw more than one exhibit:**

Nine visitors (29%) liked the Macro exhibit the most, or both Macro and Moments.
Some reasons given were:
- Cool, responsive to actions, lots to do
- More interactive
- Intrigued by the Macro lights and the spinning experience with Moments, also Micro was down

**What drew you to these exhibits during your visit?**
For twelve visitors (39%), look and feel was appealing, nine people (29%) felt that topic is important and interesting, and seven (23%) spoke about the exhibit as a new experience. Two visitors wanted their kids to learn about vaccines.

**Was there anything that surprised/intrigued you about these exhibits?**
Comments related to:
- the timeliness and relevance of Covid 19
- liking to watch the disease spread
- vaccines without needles
- how pressing buttons changes the floor layout in the Macro exhibit, as well as the bright colours, very interactive and inviting
- the exhibit expanding on current knowledge and interests
- the different R0 values and trying lots of different scenarios

- how diseases Infected one person and it showed others
- seeing the different diseases spread with lots of interactivity
- the spinning spheres in the Moments exhibit.

**What would you say this group of exhibits is about?**
Visitors seemed to have a clear sense of what the exhibits are about.

*Table 9. Summative evaluation – Exhibits understanding*

| ***Exhibit about*** | ***Comments*** |
|---|---|
| *Vaccines/Vaccination (16%, n=5)* | "Protecting your community." (under 18, 1st visit, with a large group, City of Toronto)<br><br>"Vaccination related to the new Covid vaccine." (20s, 1st visit, with one other person, US)<br><br>"It matters how many people are vaccinated." (30s, visited a month ago, with children under 14, City of Toronto)<br><br>"Vaccination + viruses + hesitation." (30s, 1st visit, South Asian, with one other person, City of Toronto)<br><br>"Vaccines and risks and impacts." (40s, 1st visit, UK, Mom with 2 year-old) |
| *Infection/disease (13%, n=4)* | "Simulation of a pandemic." (under 18, 1st visit, Mexican, limited English, spent lots of time with the exhibit and read the copy as a group, then carefully followed the instructions)<br><br>"Diseases, vaccination awareness." (18-20, more than 5 years ago, outside the GTA)<br><br>"Contagious infection disease." (20s, 1st visit, South Asian, with one other person, City of Toronto and Newfoundland, over 5 years ago, suggested adding masking options and different vaccines, and trying a different social network)<br><br>"The body and infection." (20s, more than 5 years ago, with children under 14, GTA |

| ***Exhibit about*** | ***Comments*** |
|---|---|
| Virus spread<br>*(13%, n=4)* | "How diseases spread."<br>(under 18, 2-3 years ago, with large group of children under 14, City of Toronto, took some coaching to explain the floor is interactive then played for 5 minutes)<br><br>"Disease spread, the importance of vaccination."<br>(under 18, 1st visit, with a large group, City of Toronto, students worked together, read instructions and tried multiple scenarios, lots of enthusiasm!)<br><br>"Virus spread, herd immunity."<br>(under 18, South Asian, with friends and family)<br><br>"The spread of disease, vaccination."<br>(20s, 1st visit, European, educator) |

**Here is a list of emotion words. Which TOP 3 emotions <u>are you feeling</u> after visiting these exhibits?**

*Table 10. Summative evaluation – Exhibits list of emotion words*

| | |
|---|---|
| Bored | Excited |
| Healthy | Confused |
| Challenged | Inspired |
| Curious | Disgusted |
| Joyful | Surprised |
| Uneasy | Hopeful |
| Satisfied | Sad |
| Confident | Serene |
| Discouraged | Angry |
| Safe | |

Similar to responses to the Long-form animated panels, the most common emotion visitors felt was "curious" (45%, n=14) [NR=9]. The next most common emotions were "satisfied" and "excited" (both 29%, n=9) and "joyful" (23%, n=7) – all very positive (see Table 10).

**What do you think led to feeling these emotions?**

Some responses were**:**

*Table 11. Summative evaluation – Exhibits emotions*

| ***Feeling emotions*** | ***Comments*** |
|---|---|
| *Fun*<br>*(10%, n=3)* | "The experience was fun."<br>(under 18, 1st visit, Mexican, with friends and family<br><br>"Having fun, lots to see in Human Edge."<br>(under 18, visited 2-3 years ago, with a large group of children under 14, City of Toronto)<br><br>"On a field trip, having fun with class."<br>(20s, visited more than 5 years ago, with children under 14, GTA, one adult with two children who mostly spun the Moments exhibit discs) |
| *Curiosity*<br>*(6.5%, n=2)* | "Wanted to see how it works, lots of noise from interaction."<br>(under 18, visited a year ago, Chinese, with a large group, City of Toronto)<br><br>"Wanted to know how it worked."<br>(30s, visited a month ago, City of Toronto) |

**Please rate your agreement with the following statements***:*

For the most part, visitors interviewed "Agreed" or "Strongly agreed" that the exhibits were relevant and interesting, and provided up-to-date information, and met the needs of everyone in their group. Three visitors were less certain that they wanted to share what they had learned with others, and four visitors disagreed that they felt inspired to want to learn more (see Table 12).

*Table 12. Summative evaluation – Exhibits ratings*
(generally18-20 of the 31 visitors interviewed responded to this question)

| | *Strongly disagree* | *Disagree* | *Neither agree nor disagree* | *Agree* | *Strongly agree* |
|---|---|---|---|---|---|
| The exhibits were relevant to me | 1(3%) | | 1(3%) | 11(35%) | 7(23%) |
| The exhibits were interesting | | | | 9 (29%) | 11(35%) |
| The exhibits provided up-to-date information | | 1(3%) | | 8(26%) | 10(32%) |
| The exhibits met the needs of everyone in my group | | | 6(19%) | 5(16%) | 8(26%) |
| I want to share what I learned from these exhibits with others | 1(3%) | 2(6.5%) | 4(13%) | 6(19%) | 7(23%) |
| The exhibits inspired me to want to learn more | 1(3%) | 3(10%) | 1(3%) | 10(32%) | 4(13%) |

**How much do you agree with the following statements?**

**Before seeing the exhibits, I understood…**
**After seeing the exhibits, I understand…**

These two final questions indicated that after interacting with the exhibits more visitors strongly agreed that they understood how vaccines work with the body's immune system to protect us from diseases, and how vaccines protect communities. Finally, more people strongly agreed and agreed that they better understood global contributions in the history of vaccine development (see Tables 13 and 14).

*Table 13. Summative evaluation - Understanding before seeing the Exhibits*
(generally 17-20 of the 31 visitors interviewed responded to the last two questions)

| | *Strongly disagree* | *Disagree* | *Neither agree nor disagree* | *Agree* | *Strongly agree* |
|---|---|---|---|---|---|
| How vaccines work with the body's immune system to protect us from diseases N/A=1 | 1(3%) | | 1(3%) | 10(32%) | 5(16%) |
| How vaccines protect communities N/A=1 | | 1(3%) | | 9(29%) | 7(23%) |
| Global contributions in the history of vaccine development N/A=1 | | 2(6.5% | 4(13%) | 5(16%) | 5(16%) |

*Table 14. Summative evaluation – Understanding after seeing the Exhibits*

| | *Strongly disagree* | *Disagree* | *Neither agree nor disagree* | *Agree* | *Strongly agree* |
|---|---|---|---|---|---|
| How vaccines work with the body's immune system to protect us from diseases N/A=1 | | | 2(6.5%) | 8(26%) | 9(29%) |
| How vaccines protect communities N/A=2 | | 1(3%) | | 7(23%) | 10(32%) |
| Global contributions in the history of vaccine development N/A=2 | | 1(3%) | 2(6.5%) | 7(23%) | 8(26%) |

## In Summary …

## Sample of visitors

The Evaluation Plan for the Ontario Science Centre PHAC Vaccine Awareness project was to collect a diverse sample of onsite visitors across evaluation instruments. The sample of Front-end evaluation visitors using *Digital Public Square*'s *Know It or Not*, included participants who were predominantly aged 18-24, 35-44, or 75-84, white and East Asian.

For the Formative evaluation of both the Macro and Micro prototypes, visitors were predominantly under 18 or in their 40s. People who were watching Long-form animation panels related to the Summative Evaluation were mostly under 18 years and again East Asian as well as South Asian. Across instruments, visitors were a mix of new and returning visitors and lived in Canada. Most often people were visiting with family, children under 14 years, one other person or a large school group and were not members of the Ontario Science Centre.

The sample of visitors interviewed for the Exhibits was quite diverse. Ages ranged from under 18 (35%, n=11), 18-20 (3%, n-1) to 20s (13%, n=4), 30s (10%, n=3), 40s (3%, n=1), and 60s (3%, n=1), 70+ (3%, n=1) [NR=9]. Visitors identified their cultural background as South Asian (13%, n=4), Chinese (10%, n=3), Asian (6.5%, n=2), or European (6.5%, n=2). Others were Scottish, Mexican, and Canadian [NR=5].

## Key Results

## Front-end evaluation

The initial question for each participant in the Front-end evaluation game was, "How are you feeling about COVID-19 booster shots?" Just less than half felt confident (49%) about the booster shots. Questions they answered *correctly* were that it is now safe to get in person care from their doctor and that even a mild case COVID-19 can cause serious issues that linger months. They also felt that masks work, and were happy that there are six COVID-19 vaccines approved for use in Canada.

Some visitors answered *incorrectly* that vaccine side effects are normal. The Ontario Science Centre used this information to make a long-form animation about "what happens after you get a vaccine" to correct this misconception.

## Formative evaluation – Prototype testing

During the Macro exhibit prototype testing, most ranked how to use the exhibit as easy to use (43% very easy and 43% easy). But more than half (57%) were confused about making a choice and stepping on tiles, or asked questions about how to interact with the tiles, the spread of infections,

the exhibit's content and function, the risk of infection, and variables surrounding infections. Just over half of the participants said the exhibit was about vaccinations and another half that it was about infections.

Most participants understood how to interact with the Micro exhibit prototype. Individuals were surprised and intrigued by the projection on their body, which drew more people's attention and focus than the screen with the cellular level view. Most chose the vaccinated scenario first (71%). While interacting with the scenarios, most participants asked questions about the experience, talked with others, and had fun during the scenarios. Most people (71%) identified the impact of vaccines rather than the immune system as the main idea of the Micro exhibit, but 71% chose "How vaccines work with the immune system to protect us" as the concept that stood out most for them.

## Summative Evaluation

## Long-form animations

Five visitors (38%) were not surprised by what they saw on the Long-form animations. Two people were intrigued by how viruses and the immune system work, two others talked about the importance of vaccines, and one person liked the "fun" tone of the video. When asked to choose from a long list of emotion words how they felt after watching the videos, 93% chose positive emotions in part because of the content and the music or visuals. The most common emotion 62% of the visitors felt was "curious." Responses to questions about opinions before and after viewing the Long-form animations indicated that that Long-form animations that generated the most change were, "What happens after you get a vaccine?" and "What happens when viruses mutate?"

In terms of online engagement, "What happens after you get the vaccine?" also had the most views on the Ontario Science Centre's YouTube (247 views, 9 likes April 9, 2023 and 390 views, 10 likes May 28, 2024). It came on earlier than the other Long-form animations and was promoted on social media by the Ontario Science Centre and ScienceUpFirst for National Kids & Vaccines Day on February 23, 2023. On a post on Twitter, the video had 13.5 views, 14 retweets, 14 likes, and 2 shares. Finally, ScienceUpFirst shared the English and French video on Instagram where the English story reached 972 accounts and had 2 profile activity actions.

## Exhibits

The most popular exhibit was the Macro exhibit. Twenty-three of 31 visitors observed (74%) interacted with the Macro exhibit. Nineteen (61%) tried more than one disease scenario. Seventeen (55%) stopped at the kiosk to set parameters first and sixteen (52%) interacted with the exhibit as group/ share experience. Fifteen (48%) read the instructional copy at the kiosk, fourteen (45%) tried more than one vaccination scenario, twelve (39%) appeared to be having fun, and eleven (35%) talked to others or asked questions about the exhibit. Five visitors (16%) spent 5 minutes at the Macro exhibit, three people (10%) spent 2 minutes and three spent 3 minutes.

Nine visitors (29%) liked the Macro exhibit the most, or both Macro and Moments.

Some reasons given were: responsive to actions, lots to do; more interactive; and Intrigued by the Macro lights and the spinning experience with Moments. For twelve visitors (39%), look and feel was appealing, nine people (29%) felt that topic is important and interesting, and seven (23%) spoke about the exhibit as a new experience. Two visitors wanted their kids to learn about vaccines. One visitor commented that the exhibit was very novel and used new techniques that were very inviting to people walking by!

Eight visitors (26%) interacted with the Moments exhibit. Some (29%) spun sphere or discs, read the exhibit text (23%), viewed more than one panel (15%), talked to others or asked questions (13%), and interacted with the exhibit as a group/ share experience (13%). Four visitors spent two minutes at the exhibit, two spent 20-30 seconds, and two spent 5 minutes.

Individuals talked about the timeliness and relevance of Covid 19, liking to watch the disease spread, how pressing buttons changes the floor layout in the Macro exhibit, as well as the bright colours helped to make the exhibit very interactive and inviting. The exhibits expanded on current knowledge and interests.

Unfortunately, during the observation period, the Micro exhibit had issues related to software + hardware, which were being resolved by the software developer the Ontario Science Centre contracted out and they were waiting on the contractor to make the fixes. As a result, only two visitors (6.5%) interacted with the exhibit. When the Micro exhibit is working well, it would be helpful to observe and interview five to ten individuals and groups at that exhibit in order to compare their responses to the Macro and Moments exhibits, as well as the Long-form animated panels.

Similar to responses to the Long-form animated panels, the most common emotion visitors felt after interacting with the exhibits was “curious” (45%, n=14) [NR=9]. The next most common emotions were “satisfied” and “excited” (both 29%, n=9) and “joyful” (23%, n=7). For the most part, visitors interviewed “Agreed” or “Strongly agreed” that the exhibits were relevant and interesting. The two final interview questions indicated that after interacting with the exhibits more visitors strongly agreed that they understood how vaccines work with the body's immune system to protect us from diseases, and how vaccines protect communities. More people strongly agreed and agreed that they better understood global contributions in the history of vaccine development.

# Appendices

# Appendices

## Appendix 1: Front-end Evaluation Instrument
## 1a Game Methodology and List of Questions

*Know It or Not* game questionnaire

At the beginning of the game, the initial question for all participants is:

- How are you feeling about COVID-19 booster shots?
  [Confident, Neutral, Skeptical, Angry]

As they play the game, individuals could respond to a combination of 12 true-false questions from the list below. If a participant answers a question incorrectly, they are provided with information and the prompt "How does this information make you feel" [Happy, Anxious, Skeptical, Angry]:

- Non-medicinal ingredients in COVID-19 vaccines are dangerous. [False]
- It is now safe to get in person care from my doctor. [True]
- There are a total of 4 COVID-19 vaccines approved for use in Canada. [False]
- COVID-19 vaccines approved for use in Canada completed 3 phases of clinical trials [True]
- A COVID-19 booster is unnecessary if you have received 2 vaccine doses. [False]
- Hospitals have had to postpone non-urgent medical operations at times during the pandemic. [True]
- The Omicron variant is not concerning for public health. [False]
- COVID-19 isn't more serious than the flu. [False]
- mRNA vaccines have been studied for decades. [True]
- The COVID-19 vaccine is safe for children under the age of 5. [True]
- Since the COVID-19 vaccine contains the live virus, it should not be given during pregnancy. [False]
- Masks don't work. [False]
- The COVID-19 vaccine can help protect against Long-COVID. [True]
- Boosters are suggested if you were infected with COVID-19 any time before June 2022. [True]
- Omicron will be the last COVID-19 variant. [False]
- If I already had COVID-19, then I don't need to get vaccinated or boosted. [False]
- Serious side effects from COVID-19 vaccines are common. [False]
- Less than 80% of Canadians over the age of 5 are vaccinated against COVID-19. [False]
- Even a mild COVID-19 case can cause serious issues that linger months after the infection is gone. [True]
- Mothers can help protect their babies against COVID-19 through breastfeeding. [True]

During the game, all participants respond to:

- On a scale of 1-5: How informative are you finding this game?
  [1 (not at all informative) – 5 (very informative)]

At the end of the game, participants could answer one of the following questions:

- On a scale of 1-5: How likely are you to share the information you learned here with your friends or family? [1 (not at all likely) – 5 (very likely)]
- On a scale of 1-5: How likely are you to get a booster shot in the next month?
  [1 (not at all likely) – 5 (very likely)]
- On a scale of 1-5: Having played this game, how do you feel about vaccines?
  [1 – 5]

# Appendix 2: Formative Evaluation Instruments

## Appendix 2a Participant Profile

**Demographics collected at the end of each instrument**

*When was the last time you visited the Ontario Science Centre?*

This is my first visit
Last week
A month ago
2-3 months ago
More than 6 months ago
A year ago
2-3 years ago
More than 5 years ago
I don't know/don't remember

*Ontario Science Centre membership: Are you...*

a member?
a non-member?

*What range does your age fall into?*

18-20 to 70+

*How do you identify your cultural background?*

*Who are you visiting the Ontario Science Centre with today? Are you...*

By yourself
With one other person
With friends
With family
With children under 14 years
With children over 14 years
With a large group (e.g. a tour, a school group)

*Do you live in:*

Toronto
Greater Toronto Area (GTA: York, Durham, Peel, Halton)
Ontario, outside the GTA
Another part of Canada
The U.S.
A different country

*If you live in a different country, which one?*

## Appendix 2b Macro Exhibit Prototype Observations and Interviews

### Introduction:

**Hello! The Ontario Science Centre is developing an exhibit about vaccines and how it impacts the way our immune system responds to infections. We're testing out one of our prototypes today. Do you have a few moments to help out?**

### Observations: *Does the participant …*

*Understand how to set the spin dial? (Vaccination level – 60%, 30%, 90% vaccinated → amount of spread)*

Yes, No, Other

*Understand how to set the knob slider? (Disease – measles, influenza, COVID)*

Yes, No, Other

*Understand the difference between the blue, yellow, and red tiles? (Vaccinated, unvaccinated, infected)*

Yes, No, Other

*Interact with the tiles?*

Jumping on tiles
Stepping on tiles Pointing to tiles
Other

*Play on their own or with others?*

Play on their own
Play with others
Other

*Try the exhibit more than once?*

Try once
Try more than once
Other

*If they try the exhibit more than once, how many times?*

Ask questions or talk (about the experience) with others? Have fun?
Ask questions
Talk with others
Have fun (laughing, enthusiasm, curiosity, wanting to play again...)
Other

## Interview

*On a scale from one to five, how easy was it for you to understand how to use this exhibit?*

*How would you describe what this exhibit is about?*

*If this exhibit makes you want to ask more questions, what would you want to know?*

## Appendix 2c Micro Exhibit Prototype Observations and Interviews

## Observations:

*Which experience did they choose first?*

- Unvaccinated
- Vaccinated
- Other

*Did they choose one or both options (unvaccinated/ vaccinated)?*

- Chose unvaccinated
- Chose vaccinated
- Chose both options
  - Which option first

*Did they complete the experience on their own or share it with others?*

- Complete it on their own
- Share it with others
- Other

*Did they ask questions or talk (about the experience) with others? Have fun?*

- Ask questions
- Talk with others
- Have fun (laughing, enthusiasm, curiosity, wanting to play again...)
- Other

## Interview

*On a scale from one to five, how easy was it for you to understand how to use this exhibit?*

*How would you describe what this exhibit is about? (e.g., unvaccinated or vaccinated scenarios)*

*Was there anything that surprised you about this exhibit?*

*Which of these concepts stood out the most to you? Why?*

- The immune system's organs and cells
- How the immune system responds to a viral infection
- How vaccines work with the immune system to protect us
- Other

*If this exhibit makes you want to ask more questions, what do you want to know?*

# Appendix 3: Summative/ Remedial Evaluation Instruments

## Appendix 3a  Short-Form Animation Panels

## Observations

Choose a set amount of time to observe each Short-form animation location and record your observations.  **You also can include more observations at the end of this section.**

*At which location are you located?*
*Mark only one*.
- Level 4
- Level 6 RPS
- Level 6 Hot Zone

*Did the visitor...?*
*Mark only one*.
- Glance at the monitor
- Stay at the monitor

*Is the visitor...*
*Mark only one*.
- By themself
- With one other person
- With friends
- With family
- With children under 14 years
- With teens over 14 years
- With a large group (e.g. a tour, a school group)

*If the visitor stayed at the monitor, did they...?*
*(Check all that apply.)*
- Talk to others/ask questions
- Call others over to the animations
- Watch the animations in a group
- Watch the animations individually
- Have fun (laughing, enthusiasm, curiosity)
- Watch more than one animation
- Other:

*If the visitor stayed at the monitor, how much time did they spend?*

*More observations*

# Appendix 3b Long-Form Animation Panels

## Observations

You can add observations in the Other answer for each question. **You also can include more observations at the end of this section AND on the last page of this Google form.**

*Which Long-form animation did they watch?*

What happens after you get a vaccine
What happens when antibodies come into play
What happens when viruses mutate

*Did the visitor...?*

Talk to others/ask questions about the video
View the video in a group/share experience
View individually
Have fun (laughing, enthusiasm, curiosity)
View more than one video in the series
Other:

*More observations*

*How long did they spend watching the Long-form animations?*

## Interview

**Hello! The Science Centre has created new animations about vaccines. Do you have time to answer a few questions about your experience with these videos?**

*Was there anything that surprised/intrigued you about the video?*

*What would you say this video is about?*

*Here is a list of emotion words. Which TOP 3 emotions are you feeling after watching these videos?*

Bored
Healthy
Challenged
Curious
Joyful
Uneasy
Satisfied
Confident

Discouraged
Safe
Excited
Confused
Inspired
Disgusted
Surprised
Hopeful
Sad
Serene
Angry

*What do you think led to feeling these emotions?*

***What happens after you get a vaccine***
*How much do you agree with the following statements?*
***Before seeing the videos, I understood…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree]*

Feeling pain, fever, or tiredness from a vaccine is normal
Feeling pain, fever, or tiredness from a vaccine is part of the body's natural response to a vaccine

***What happens after you get a vaccine***
*How much do you agree with the following statements?*
***After seeing the videos, I understand…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree]*

Feeling pain, fever, or tiredness from a vaccine is normal
Feeling pain, fever, or tiredness from a vaccine is part of the body's natural response to a vaccine

***What happens when antibodies come into play***
*How much do you agree with the following statements?*
***Before seeing the videos, I understood…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree]*

The immune system protects you by creating antibodies, which can be produced by vaccination or infection
Vaccination provides the safest path to protective antibodies

***What happens when antibodies come into play***
*How much do you agree with the following statements?*
***After seeing the videos, I understand…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree]*

The immune system protects you by creating antibodies, which can be produced by vaccination or infection
Vaccination provides the safest path to protective antibodies

***What happens when viruses mutate***
*How much do you agree with the following statements?*
***Before seeing the videos, I understood…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree]*

Virus mutations are normal, some viruses mutate faster than others
Vaccines are the best defense against mutations

***What happens when viruses mutate***
*How much do you agree with the following statements?*
***After seeing the videos, I understand…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree]*

Virus mutations are normal, some viruses mutate faster than others
Vaccines are the best defense against mutations

## Appendix 3c Exhibits – Macro, Micro, Moments

## Observations

There are separate observation sections for each exhibit and there are text boxes for you to include extra observations for each exhibit. Please fill out the relevant sections for each visitor. **You also can include more observations at the end of this section AND on the last page of this Google form.**

*Which exhibit did they interact with first?*

Macro
Micro
Moments

## MACRO OBSERVATIONS

*Did they interact with the Macro exhibit?*

Yes
No

*Did the visitor...?*

Stop at the kiosk to set parameters first
Interact with the floor first, before setting parameters
Read the instructional copy at the kiosk
Read the content copy on the panel
Talk to others/ask questions about the exhibit
Call others over to the exhibit
Interact with the exhibit as a group/share experience
Interact individually
Have fun (laughing, enthusiasm, curiosity)
Try more than one disease scenario
Try more than one vaccination scenario
Other:

*How long did they spend at the Macro exhibit?*

*More Macro observations*

## MICRO OBSERVATIONS

*Did they interact with the Micro exhibit?*

Yes
No

*Did the visitor...?*

- Easily start the exhibit experience
- Read the instructional copy
- Listen to the narration
- Talk to others/ask questions about the exhibit
- Call others over to the exhibit
- Interact with the exhibit as a group/share experience
- Interact individually
- Have fun (laughing, enthusiasm, curiosity)
- Try the vaccinated scenario
- Try the unvaccinated scenario
- Other:

*How long did they spend at the Micro exhibit?*

*More Micro observations*

## MOMENTS OBSERVATIONS

*Did they interact with the Moments exhibit?*

- Yes
- No

*Did the visitor...?*

- Spin the spheres/discs
- Read the exhibit text
- Talk to others/ask questions about the exhibit
- Call others over to the exhibit
- Interact with the exhibit as a group/share experience
- Interact individually
- View more than one panel
- View all the panels (spin all 6 spheres/discs)
- Other

*How long did they spend at the Moments exhibit?*

*More Moments observations*

## Interview

**Hello! The Science Centre just installed three new exhibits about vaccine awareness. Do you have time to answer a few questions about your experience with these exhibits?**
*[If they decline, reassure them that we value and appreciate their talking with us and/or visiting the Science Centre, and chat with them about their visit, the people they were with, etc..]*

**If the visitor saw more than one exhibit:**
*Which exhibit did you like the most?*

Macro
Micro
Moments

**If the visitor saw more than one exhibit:** *Why?*

*What drew you to these exhibits during your visit?*

Topic is important/interesting
Look and feel is appealing
New experience/exhibit
Related to career/schooling
Trying to visit whole OSC
Wanted kids to learn about it
Saw it on the OSC website or social media
Other

*Was there anything that surprised/intrigued you about these exhibits?*

*What would you say this group of exhibits is about?*

*Here is a list of emotion words. Which **TOP 3** emotions <u>are you feeling</u> after visiting these exhibits?*

Bored
Healthy
Challenged
Curious
Joyful
Uneasy
Satisfied
Confident
Discouraged
Safe

Excited
Confused
Inspired
Disgusted
Surprised
Hopeful
Sad
Serene
Angry

*What do you think led to feeling these emotions?*

*Please rate your agreement with the following statements:*
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree]*

The exhibits were relevant to me.
The exhibits were interesting.
The exhibits provided up-to-date information.
The exhibits met the needs of everyone in my group.
I want to share what I learned from these exhibits with others.
The exhibits inspired me to want to learn more.

*How much do you agree with the following statements?*
***Before seeing the exhibits, I understood…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree  N/A]*

How vaccines work with the body's immune system to protect us from diseases
How vaccines protect communities
Global contributions in the history of vaccine development

*How much do you agree with the following statements?*
***After seeing the exhibits, I understand…***
*[Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree  N/A]*

How vaccines work with the body's immune system to protect us from diseases
How vaccines protect communities
Global contributions in the history of vaccine development

## Extra notes and observations

Please include your extra notes and observations here.

For example, visitors LOVE to spin the discs in Moments. Is that the only interaction or the interaction that draws them to be curious enough to dwell a little bit longer.

## Do you have any suggestions for improving the exhibits or exhibit experiences?