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NANOSCALE INFORMAL SCIENCE EDUCATION



# Nanomedicine Explorer Interactive Multimedia Kiosk

## Formative Evaluation

By Kerry Bronnenkant

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## Acknowledgements

Without the help of many people this evaluation would not have been possible.

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- Jeanne Antill and Carol Lynn Alpert, members of the Strategic Projects Department and developers of this kiosk, for their help and support during the evaluation;
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**THIS IS A FORMATIVE EVALUATION REPORT**

Formative evaluation studies like this one often:

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

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## Executive Summary

The purpose of this study was to provide visitor feedback to the Strategic Projects team about visitor use of the prototype "Nanomedicine Explorer" kiosk so that they could make improvements to it based on the needs of visitors. The Nanomedicine Explorer provides opportunities to learn about nanomedicine, nanotechnology, cancer biology, new research in cancer diagnosis and therapy, and the process of medical research from bench to bedside. The Explorer also provides the opportunity to meet a diverse group of researchers and to understand how they approach these medical challenges. Games and polls increase the level of interactivity, and visitors are also invited to send themselves a link to the online exhibit. The overarching questions that the study sought to address included the following:

- How visitors interacted with the kiosk,
- How they felt about the overall experience,
- What specific features they found the most appealing and which caused problems, and
- What connections visitors were able to make between data presented in the kiosk and their lives.

To collect visitor feedback that could be used to improve this kiosk, 65 visitors were observed as they interacted with the Nanomedicine Explorer. This allowed researchers to see which parts of the program visitors spent the most time at as well as which parts they passed over all together. A small subsection of these visitors (21) were asked to participate in an exit survey and interview after interacting with the kiosk. These visitors were asked their gender and age, a series of rating questions about how they felt about the exhibit, how appealing and easy to use they found different aspects of the kiosk, how the activity connected to their lives, what they learned from the activity, and how the activity could be improved.

Results from the study indicate the following:

1. Visitors were most attracted to the intro animation and the games, and they spent the most time interacting with the sections about cancer biology, the new nanomedicine diagnostic and therapeutic technologies, and playing the games.
2. Visitors found the Nanomedicine Explorer very appealing and highly usable.
3. Visitors felt they learned a lot from the Nanomedicine Explorer especially about the nanomedicine technologies discussed in the exhibit.

# I. Introduction

## About the Nanomedicine Explorer Kiosk

The Nanomedicine Explorer computer kiosk is an interactive multimedia exhibit designed primarily for museums and libraries. It was created to be disseminated in a variety of formats: as a DVD ready for install in existing computer displays, as a ready-to-install exhibit kiosk, as a website, or as part of a set of interactive museum exhibits on nanomedicine. The purpose of the Nanomedicine Explorer kiosk is to introduce some of the basic concepts of nanotechnology and nanomedicine and of the process of medical research and to bring visitors face-to-face with a diverse group of role models practicing research in this area. This prototype included video segments and animation following the work of two teams of researchers:

- Jennifer West and Naomi Halas of Rice University are developing a non-invasive technique to burn away cancerous tissue using a combination of near-infrared laser light and specially tuned gold nanoshells.
- At Massachusetts General Hospital, Ralph Weissleder is developing a non-invasive technique for diagnosing the spread of cancer to lymph nodes using MRI imaging enhanced with iron nanoparticles and Mukesh Harisinghani is conducting clinical trials testing safety and efficacy.

The Nanomedicine Explorer Kiosk has several sections that visitors can explore. These sections include:

- Introductory Animation: Nanotechnology joins the war on cancer.
- Research Stories: Researchers tell the story of their research in brief chaptered video and animation segments.
- Animated Tutorial: What is Cancer?
- Tutorial: What is Nanotechnology?
- Games: "Zap a Tumor" and "Diagnose a Mouse," each tied to one of the research stories.
- Take a Poll: Share your opinions and see how others vote.
- Get a Link: Email yourself a link to the virtual exhibit online.

The Nanomedicine Explorer kiosk was produced by the Strategic Projects team under the direction of Carol Lynn Alpert, Director of Strategic Projects at the Museum of Science. Funding for the development of Nanomedicine Explorer Kiosk came from the following three sources:

- The Science Education Partnership Award (SEPA) program of the National Institutes of Health, National Center for Research Resources,
- The Nanoscale Informal Science Education Network (NSF ESI 0532536), and
- The Center for High-rate Nanomanufacturing (NSF 0425826), at Northeastern University, the University of Massachusetts-Lowell, and the University of New Hampshire.

## About the Evaluation

The purpose of this formative evaluation was to provide visitor feedback to the Strategic Projects team about visitor use of the prototype Nanomedicine Explorer, so that they could make changes to it based on the needs of visitors. The overarching questions that the evaluation sought to address included the following:

1. How do visitors interact with the kiosk?

2. How did visitors feel about the overall kiosk experience?

3. What about the kiosk's specific features (video stories, games and polls) were most appealing and easy to use, and which caused problems and need to be changed?

4. What connections did visitors make between information presented by the kiosk and their lives?

Evaluators collected data between August and November 2008. The final evaluation report was released in March 2009.

# II. Methods

Data were collected between August 20 and November 29, 2008 in the Human Body Connection exhibition gallery (Table 1). The kiosk was placed in the back of the Human Body Connection near the space's window. Evaluators observed visitors using the kiosk and recorded data on specific behaviors (see Appendix B for the observation protocol). Visitors were also asked to complete a written survey (Appendix C) and to answer a few brief exit interview questions (Appendix C). The methods that evaluators used to select study participants and protocols for the visitor observations and surveys/interviews are described below.

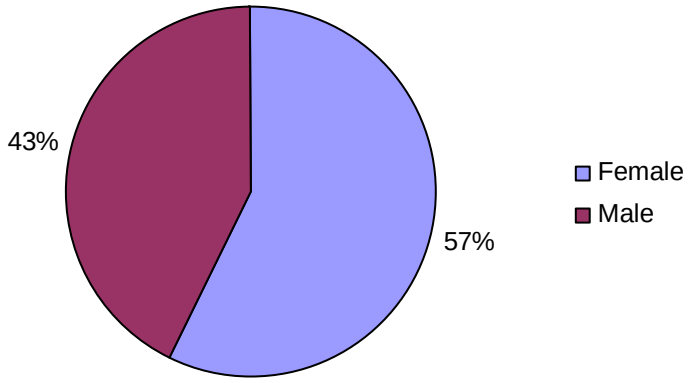
## Recruitment of Study Participants

Evaluators stood near the kiosk at either its right or left side to record observations. Evaluators had to stand fairly close to the kiosk to ensure that they were able to see everything that they needed to observe. When an eligible group "engaged" with the kiosk, evaluators began recording their observations. Groups were only considered to be eligible if the primary user of the kiosk was 13 years of age or older, and the group was not a school or camp group. This population was chosen because it was felt that the content was most appropriate for children and adults who were at least 13 years of age, and because evaluators could not interview children without parent or guardian permission (leading to the exclusion of camp and school groups). After the observations were completed, as many groups as possible were asked to complete a survey and answer a few interview questions. Using these methods, 65 group observations were conducted. Additionally 21 surveys and exit interviews were conducted. Graphs 1-3 provide a breakdown of the demographics of the surveyed visitors. Appendix E contains graphs of the demographics for the observed visitors.

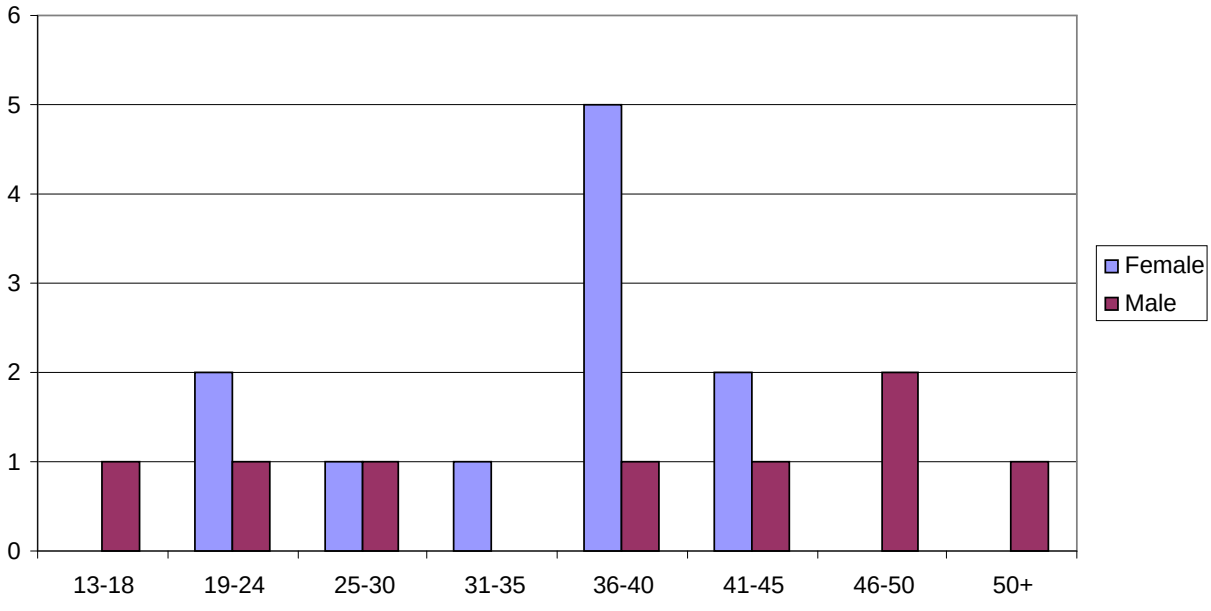
**TABLE 1. Number of Observations and Surveys Collected at the Nanomedicine Kiosk.**

| Date | Number of Groups Observed | Number of Surveys Collected |
|---|---|---|
| 8/20/2008 | 4 | 1 |
| 8/21/2008 | 3 | 2 |
| 8/24/2008 | 9 | 2 |
| 9/14/2008 | 2 | 2 |
| 10/25/2008 | 8 | 4 |
| 11/1/2008 | 9 | 3 |
| 11/8/2008 | 11 | 2 |
| 11/21/2008 | 3 | 1 |
| 11/22/2008 | 2 | 2 |
| 11/28/2008 | 8 | 1 |
| 11/29/2008 | 6 | 1 |
| **Total** | **65** | **21** |

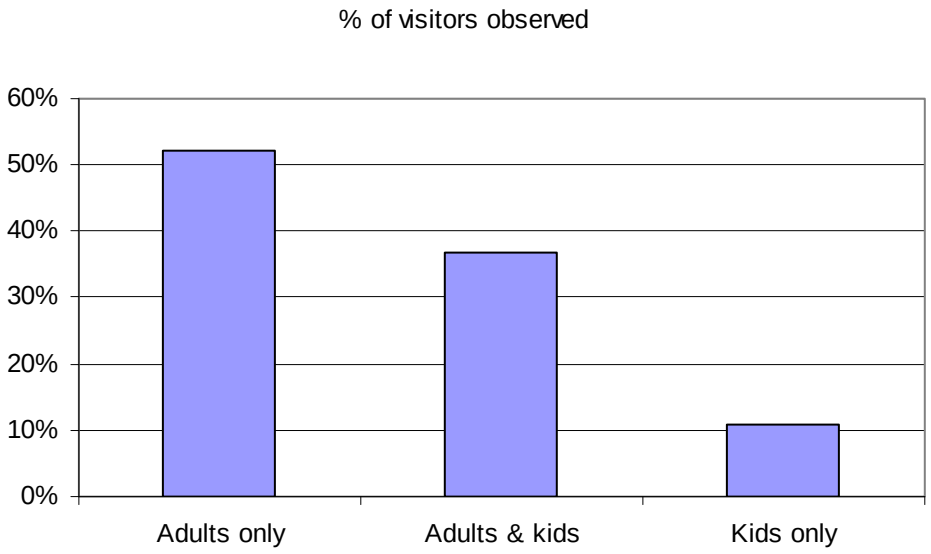
**GRAPH 1. Gender of Survey Respondents. (N=21)**




**GRAPH 2. Histogram of Survey Respondents Split by Gender and Age. (N=21)**



**GRAPH 3. Group Type of Surveyed Visitors. (N=21)**




## Group Observation Protocol

When an eligible group approached the Nanomedicine Explorer kiosk, they were observed to see when they began to "engage" with the kiosk. Eligible groups were recorded to have "engaged" with the exhibit if they moved the cursor on the screen with the mouse or looked at the screen. This is the point at which the evaluators started their stopwatches in order to record the total amount of time that the participants spent at the exhibit. Throughout the observation, evaluators focused on the behaviors of the primary user because it would be difficult to record the behaviors of everyone in the group. The primary user was the defined as the first person within the group to engage with the nanomedicine kiosk. The behaviors that evaluators recorded included the following:

- The order in which the primary user interacted with different sections of the kiosk,
- The amount of time the primary user spent using these different sections of the kiosk,
- Whether the primary user completed a section of the activity, and
- If they used specific features (audio, Spanish, video control) of sections of the kiosk.

Some data were excluded due to incomplete data collection forms, the N=65 are completed forms only.
A copy of the observation sheet can be found in Appendix B.

## Survey and Interview Protocol

If the group remained at the kiosk for a least one minute, then the primary user of the kiosk was asked to fill out a written survey (Appendix D) as well as to participate in a brief interview which consisted of a few open-ended questions when they were finished interacting with the kiosk. In order to better understand the make-up of the audience, on the written survey, the primary user was first asked to provide demographic information including his/her age and gender. The primary users were then asked to complete a written survey which consisted of a series of Likert-like scale questions about the topic, content, and features of the kiosk including the following:

- How they felt about the exhibit overall,
- How interesting they felt the topic was,
- Whether the kiosk decreased or increased their curiosity,
- How much they learned,
- How difficult the kiosk was to use,
- How appealing the video stories, games, and polls were, and
- How difficult to use the video stories, games, and polls were.

Upon completing the self administered survey, the primary users were then asked three open-ended questions by the evaluators including the following:

- If the activity connects to anything they might know or think about;
- What were the most interesting things they learned from the activity; and
- What suggestions they have to improve the activity including the games and introductory animation.

A copy of the exit survey can be found in Appendix C.

## Data Analysis

Data collected through the exit survey were both qualitative and quantitative in nature. Quantitative data were analyzed through descriptive statistics such as percentages, counts, and means. In addition, comparative tests of significance were sometimes conducted. The level of significance was set at 0.05, and only statistically significant results are described in this report. Qualitative data were analyzed using inductive coding. Inductive coding analysis involves "immersion in the details and specifics of data to discover important patterns, themes, and interrelationships" (Patton, 2002, p.41).

# III. Results and Discussion

Based on the observations and the responses from the surveys, the three main findings about the Nanomedicine Explorer kiosk were the following:

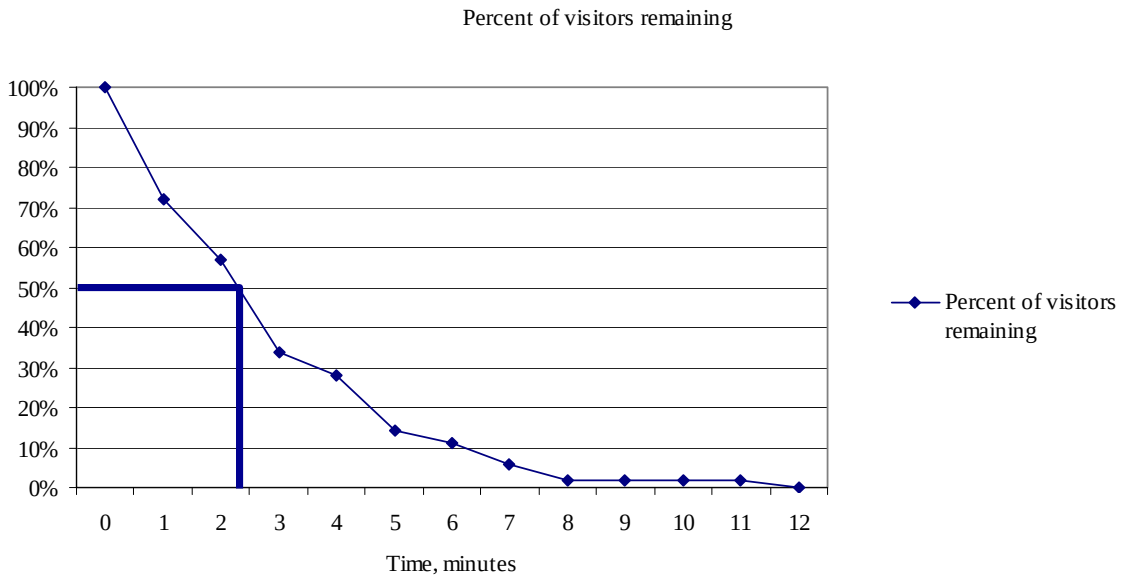
1. The visitors were most attracted to the intro animation and games on the Nanomedicine Explorer, and they spent the most time learning about cancer and the new technologies and playing the games.
2. Visitors found the Nanomedicine Explorer appealing and highly usable.
3. Visitors felt they learned a lot from the Nanomedicine Explorer kiosk especially about the technologies discussed in the exhibit.

## 1. The visitors were most attracted to the Intro animation and games on the Nanomedicine Explorer, AND they spent the most time learning about cancer and the NEW technologies and playing the games.

### *1.1 Visitors found the Nanomedicine Explorer kiosk interesting and relevant.*

Observed groups spent on average 2.7 minutes (SD= 0.9) interacting with the kiosk with the range of time spent being from 11 seconds to nearly 12 minutes. The "half life" that a visitor spent at the exhibit is represented in Figure 1 below. This figure illustrates that by two and a half minutes half of the visitors remain at the kiosk.

**FIGURE 1: Visitor decay curve for the Nanomedicine Explorer kiosk**



There were several different sections that visitors could attend to while at the Nanomedicine Explorer kiosk. Table 2 illustrates the various sections that were included in this study.

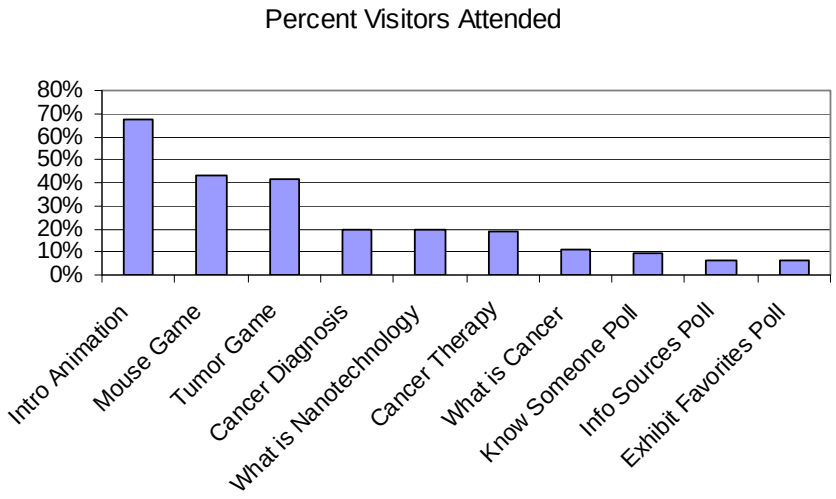
**TABLE 2. Nanomedicine Explorer Kiosk Sections.**

| | |
|---|---|
| Intro Animation | Watch a brief video introducing cancer nanomedicine |
| Cancer Diagnosis | Watch a set of brief videos about enhanced diagnosis with iron nanoparticles. |
| Cancer Therapy | Watch a set of brief videos about zapping tumors with gold nanoshells and laser light. |
| What is Cancer? | Go step-by-step through a graphic tutorial. |
| What is Nanotechnology? | Read an explanation of nanotechnology. |
| Zap a Tumor Game | Play a game in which you practice going through the steps of destroying a tumor using the experimental therapy. |
| Diagnose a Mouse Game | Play a game in which you practice diagnosing a mouse using the experimental diagnostic technique. |
| Poll: Know Someone with Cancer? | Participate in a poll about the prevalence of cancer. |
| Poll: Sources of Info | Participate in a poll about sources of information about medical research. |
| Poll: Exhibit Favorites | Participate in a poll about which kiosk segments visitors like best. |

As Graph 4 illustrates below, 68% (n=44) of all the observed visitors watched the intro animation. The two interactive games, the "diagnose a mouse" game (43%, N=28) and the "zap a tumor" game (42%, N=27) were also highly utilized by visitors. In addition, 20% (N=13) of observed visitors spent time in the Cancer Diagnosis section and What is Nanotechnology, and 18% (N=12) of observed visitors used the Cancer Therapy section. The lowest attended components of the kiosk were the three polls (Know Someone (9%, N=6), Info Sources (6%, N= 4) and Exhibit Favorites (6%, N=4).

It is possible that the intro animation was the most attractive section for visitors because it automatically played as people started using the Nanomedicine Explorer kiosk. Therefore, it was likely that if visitors spent some time looking at the intro screen, that evaluators would think that visitors were watching the intro animation even if they were not. It is also possible that so many visitors watched the intro animation because they were using it as a way to orient themselves to the kiosk. It is possible that the games were popular with visitors because they were interested in interaction more than passive watching or because children (who were in many of the groups) drove the use of the games.

**GRAPH 4. Percent of Visitors Attending to the Different Kiosk Components. (N=65)[1]**

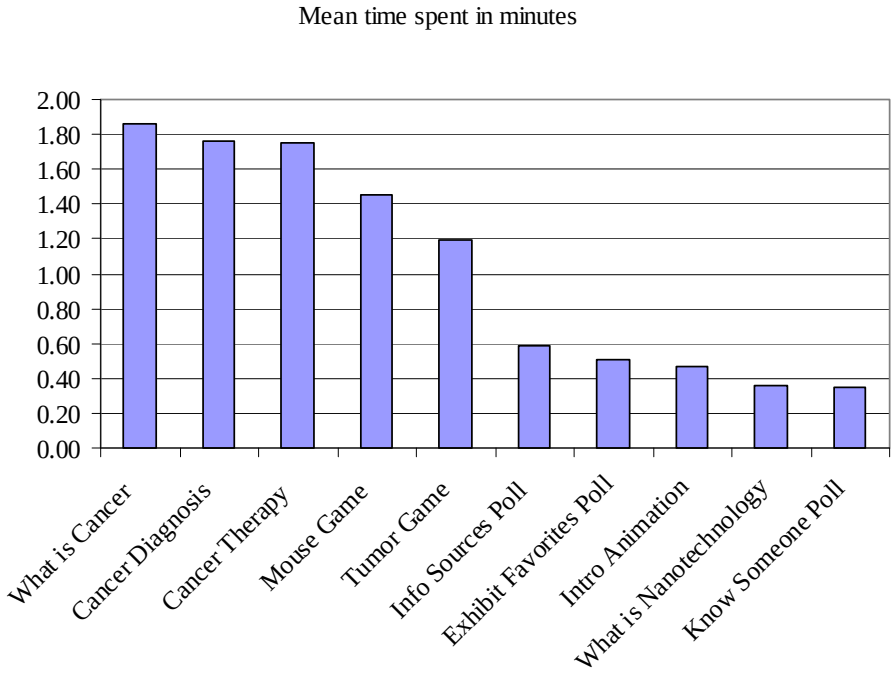



When looking at time spent at each of the components, "What is Cancer?" had the longest mean time spent at 1.86 minutes (SD[2]= 79.8), followed closely by "Cancer Diagnosis (1.76 minutes, SD=91.3) and "Cancer Therapy" (1.76 minutes, SD=134.4 ). The two games also had mean stay times above one minute with the Mouse Game having a mean interaction time of 1.45 minutes (SD=48.2) and the Tumor Game having a mean interaction time of 1.20 minutes (SD= 46.7). The three polls (Info Sources Poll, Exhibit Favorites Poll and Know Someone Poll) all had mean stay times under one minute (M[3]=0.59 minutes, SD=36.9 ; M=0.50 minutes, SD= 8.1; and M=0.35 minutes, SD=15.1 , respectively) (Graph 5). The Intro Animation also had a stay time less than one minute, which is not surprising since the animation itself only lasts 30 seconds.

It is possible that visitors are spending the most amount of time using What is Cancer?, Cancer Diagnosis, and Cancer Therapy because these sections were broken into video and graphic subchapters that told stories and contained a lot of information. It is also possible that visitors are spending a lot of time at these sections because they are interested in the content. Visitors are probably spending less time at the games because they contain less content. It is also possible that visitors became frustrated with the games and left them before they completed them. However, we do not know from the data if this occurred. People probably did not spend very much time using the polls because it only takes a short time to complete them. Since the Intro Animation has a mean visit time of over 30 seconds (greater than the length of the animation), this may mean that visitors are pausing and replaying certain aspects of the intro animation or that the visit times include times when the visitors were reading the list of contents on the page and not paying attention to the animation.

[1] Numbers add up to over 100% due to the fact that visitors could choose to interact with more than one component of the kiosk.
[2] "SD" stands for standard deviation.
[3] "M" stands for mean.

**GRAPH 5. Mean Time Spent at the Kiosk Components in Minutes. (N=65)[4]**




## 2. Visitors found the Nanomedicine Explorer appealing and highly usable.

On the exit survey, primary users were given pairs of phrases that allowed them to rank the appeal and usability of the kiosk on a Likert-like scale of one to five. They were also asked to rank the appeal and usability of different parts of the kiosk including the videos, games, and polls. Overall, visitors found the kiosk highly appealing and quite easy to use.

When surveyed visitors were asked to rate on a scale of "Disliked the Exhibit" to "Liked the Exhibit," their mean score was 4.3 (SD=0.9), with visitors choosing between 2 and 5 for their ranking, as Table 3 illustrates. Surveyed visitors rated the topic on a scale from uninteresting to interesting with a mean of 4.6 (SD=0.5). All of the visitors rated this topic with either a 4 or 5 indicating that visitors found this to be an interesting topic.

Visitors were asked to rank whether the presentation decreased or increased their curiosity. The mean rank visitors gave to these phrases was 4.2 out of 5 (SD=0.9) with all respondents choosing a rating between three and five. This finding shows that visitors felt that the presentation somewhat increased their curiosity in the topic.

[4] Visitors may spend time at a variety of components so the whole is greater than 100%

**TABLE 3. Visitors' Mean Scores and Minimum and Maximum Ranks on the Likert-like Scale Questions about Interest in Overall Exhibit and Topic.**

| | N | Minimum Rank | Maximum Rank | Mean | SD |
|---|---|---|---|---|---|
| Disliked the exhibit – Liked the exhibit | 20 | 2 | 5 | 4.3 | .9 |
| Uninteresting topic - Interesting topic | 21 | 4 | 5 | 4.6 | .5 |
| Decreased my curiosity - Increased my curiosity | 19 | 3 | 5 | 4.2 | .9 |

Finally, visitors were also asked to rate the appeal of the video component, game component, and poll component of the kiosk on a Likert-like scale of 1 to 5. There was some variance among the visitors. As shown below in Table 4, the appeal of the video component received a mean score of 3.9 (SD=1.1) with visitors' responses ranging from a low score of 1 to a high score of 5. The game appeal received the highest score of the three components with a mean score of 4.3 (SD=0.8) with all the visitors choosing between a 3 and a 5. The fewest visitors responded to the question about the appeal of the poll indicating that few visitors used the poll component. As shown in Table 5 below, 79% of visitors (n=15) gave the video appeal a score above 3, 81% of visitors (n=13) gave the game appeal a score above 3 and 64%of visitors (n=7) gave the poll appeal a score above 3. These data were supported by the fact that data collectors found that only 9% of the overall sample (N=14 out of 65 observed visitors) utilized the poll feature. Those people who did rank this component gave it a mean score of 3.9 (SD=1.0) with all visitors choosing between a 2 and 5 as their ranking.

**TABLE 4. Visitors' Mean Scores and Minimum and Maximum Ranks on the Ranking Questions about the Appeal of Different Kiosk Components.**

| | N | Minimum Rank | Maximum Rank | Mean | SD |
|---|---|---|---|---|---|
| Video Appeal | 19 | 1 | 5 | 3.9 | 1.1 |
| Game Appeal | 16 | 3 | 5 | 4.3 | .8 |
| Poll Appeal | 11 | 2 | 5 | 3.9 | 1.0 |

**TABLE 5: Breakdown of Percentage of Visitors' ratings of appeal of components**

| | Video Appeal | | Game Appeal | | Poll Appeal | |
|---|---|---|---|---|---|---|
| % Visitors ratings | N | % | N | % | N | % |
| $\leq 3$ | 4 | 21% | 3 | 19% | 4 | 36% |
| $> 3$ | 15 | 79% | 13 | 81% | 7 | 64% |

When the surveyed visitors were asked if this activity connected to anything they knew about or might think about, the majority of visitors surveyed were able to think of at least one way that the activity connected to something they knew as illustrated below in Table 6.

**TABLE 6. Visitor Responses to the Open-Ended Question: "Does this activity connect to anything you know about or might think about??" (N=21)[5]**

| | Number of Respondents | % | Quotes |
|---|---|---|---|
| About cancer in general | 7 | 33% | "Explain cancer in simple way-liked it!" |
| About cancer treatments | 4 | 19% | "Yeah, learned about new cancer treatments. It was easy to understand. Really educational." |
| Knew about this topic before | 4 | 19% | "I knew a lot of what it talked about. Easy to understand. It was adult but not adult" |
| It was a new topic to me | 2 | 10% | "I've never heard of nanomed & it's really interesting. It's completely new to me." |
| Relates to job | 2 | 10% | "Yes, I am a doctor, familiar with many facets of oncology." |

### *2.1 Visitors found all aspects of the kiosk very easy to use; however, they suggested that the Nanomedicine Explorer might be improved by updating the graphics.*

Visitors rated the Visitors rated the ease of use of the exhibit with a mean rating of 4.9 (SD=0.4), and all of the visitors either rated this a 4 or 5 for ease of use (Table 7). This mean rating and rating range suggest that overall the exhibit was easy to use for all of those surveyed. In terms of ease of use for three of the individual sections of the exhibit (video, game and poll), visitors rated all of them highly as illustrated below in Table 9. The mean score for ease of use with the video component was 4.9 (SD=0.2) with all visitors rating it either a 4 or 5. The game ease of use mean score was also a 4.9 (SD=0.3) with all visitors rating it a 4 or 5. For the poll, the mean score for ease of use was 4.7 (SD=0.7) with visitors ranking it between 3 and 5.

The high ratings for the individual components are supported by visitors' overall rating for the exhibit's ease of use. These findings suggest that no improvements need to be made to the usability of the kiosk. However, it should be noted that because the sample size was quite small (N=21) and only included visitors that spent over one minute at the kiosk, it is difficult to tell if the kiosk is really usable for all visitors. It is possible that some of the visitors who spent less than one minute at the kiosk left it because they encountered usability problems. In order to make true recommendations about usability, it would have been important to interview visitors who did not spent a lot of time at the kiosk to find out why and what prevented them from staying longer.

**TABLE 7. Visitors' Mean Scores and Minimum and Maximum Ranks on the Likert-like Scale Questions about the Overall Exhibit.**

| | N | Minimum Rank | Maximum Rank | Mean | SD |
|---|---|---|---|---|---|
| Difficult to use - Easy to use | 21 | 4 | 5 | 4.9 | .4 |

[5] The number of respondents is greater than 21 because some visitors' responses fit into more than one category.

**TABLE 8. Visitors' Mean Scores and Minimum and Maximum Ranks on the Ranking Questions about the Ease of Use of Different Exhibit Components.**

| | N | Minimum Rank | Maximum Rank | Mean | SD |
|---|---|---|---|---|---|
| Video Ease of Use | 17 | 4 | 5 | 4.9 | .2 |
| Game Ease of Use | 13 | 4 | 5 | 4.9 | .3 |
| Poll Ease of Use | 10 | 3 | 5 | 4.7 | .7 |

When asked in an open-ended question what improvements could be made to make the activity to make it more appealing or clearer for the visitor, as Table 9 illustrates, six (29%) visitors suggested that the graphics could be improved. Another four (19%) visitors felt that they wanted more content or information. Three (14%) visitors felt that it was aimed at children or was more appropriate for children, especially when referring to the games aspect. Two (10%) visitors reported that the kiosk was too slow paced which made it "boring", while another two (10%) visitors felt that they were not interested in using computer interactives while at the museum.

**TABLE 9. Visitor responses to the Open-Ended Question: "How could we improve this activity to make it more appealing or clearer for you?" N=16[6]**

| | Number of Respondents | % | Quotes |
|---|---|---|---|
| Improve Graphics | 6 | 29% | "Better Images. Better graphics." |
| More Content/Info | 4 | 19% | "Wanted more info; was too short; would go to website for more info." |
| Good For Kids | 3 | 14% | "Game was too easy-for a younger audience." |
| Slow Pace | 2 | 10% | "Slow pace makes it boring." |
| Exhibit Style | 2 | 10% | "It's not what I come to museums to do-sit and look at a computer screen-it's not what I want my kids to do either." |

## 3. Visitors felt they learned a lot from the Nanomedicine Explorer kiosk, especially about the NEW technologies discussed in the KIOSK.

Visitors rated the question of "learned nothing" to "learned a lot" with a mean of 4.5 (SD=0.7), and all the visitors ranked it between a 3 and 5 indicating that visitors felt they learned a lot from the kiosk.

| | N | Minimum Rank | Maximum Rank | Mean | SD |
|---|---|---|---|---|---|
| Learned Nothing – Learned a lot | 20 | 3 | 5 | 4.5 | .7 |

[6] The number of respondents is greater than 16 because some visitors' responses fit into more than one category.

When visitors were asked an open-ended question about what they learned, the majority (57%) of those surveyed said that the most interesting thing they learned was about the new technology that is being used, as illustrated below in Table 11. Two (10%) respondents reported learning more facts about cancer, while another two (10%) respondents reported liking the interactivity of the kiosk. Only one respondent reported that they didn't learn anything, and 19% did not answer this question.

**TABLE 11. Visitor responses to the Open-ended Question "What are the most interesting things you learned from this activity?" (N=17)**

| | Number of Respondents | % | Quotes |
|---|---|---|---|
| **New technology** | 12 | 57% | I think that the in evasive technology to treat cancer was very interesting. |
| **Facts about cancer** | 2 | 10% | "What cancer is: a collection of cells." |
| **Interactivity of kiosk** | 2 | 10% | I liked the interactive aspect and before/after effects; being able to see. |
| **Didn't learn anything** | 1 | 5% | "I didn't really learn anything." |

# IV. Conclusion

The data illustrate that overall visitors enjoyed the Nanomedicine Explorer kiosk. Visitors found the kiosk components (videos, animation, games and polls) easy to use, and they could relate what they experienced to some aspect of their lives.

The tracking data collected as a part of this study indicated that the majority of visitors viewed the Intro Animation as part of their kiosk experience and spent on average 1.86 minutes viewing the Intro Animation. Additionally, the two games embedded within the kiosk were attended by over 40% of visitors. Visitors spent on average 1.45 minutes at the Mouse Game and 1.20 minutes at the Tumor Game. Given that "half life" of visitors is slightly over 2.5 minutes, this indicates that visitors are spending a lot of kiosk time playing the games. The more in-depth components of the kiosk (Cancer Diagnosis, What is Nanotechnology, and Cancer Therapy) were attended by 18-20% of visitors. Visitors spent on average 1.76 minutes on both Cancer Diagnosis and Cancer Therapy and .36 minutes on What is Nanotechnology?

The three polls that are within the kiosk were the lowest attended components. In addition, these components had the lowest mean time spent at them. Visitors spent on average .59 minutes at the Info Sources Poll, .50 minutes on the Exhibit Favorites Poll and .35 minutes on the Know Someone Poll. However, since the polls do not require a lot of time to complete, this is not a surprising finding.

Findings from the survey and interview indicate that many visitors learned about the new experimental technique of using gold particles and near-infrared light to destroy tumor cells from the kiosk. Some visitors referred to learning this new information from the games they played within the kiosk. Additionally, most visitors were able to relate something from the kiosk to what things they knew from the either work, or had read in a newspaper or already knew about cancer research.

There were some suggestions that visitors made regarding improvements to the kiosk. The improvement of graphics was mentioned by six out of 21 visitors. Four visitors felt that they wanted more information and that what was presented was too short and they wanted more in depth information. It may be helpful to add a button "for more info" so that visitors who would like more information can get it if they would like, but so that not all visitors are compelled to read the additional information. Although the games were a popular part of the kiosk, there were at least three visitors who felt that the games were really aimed at a younger audience and were not intended for or appealing to adults.

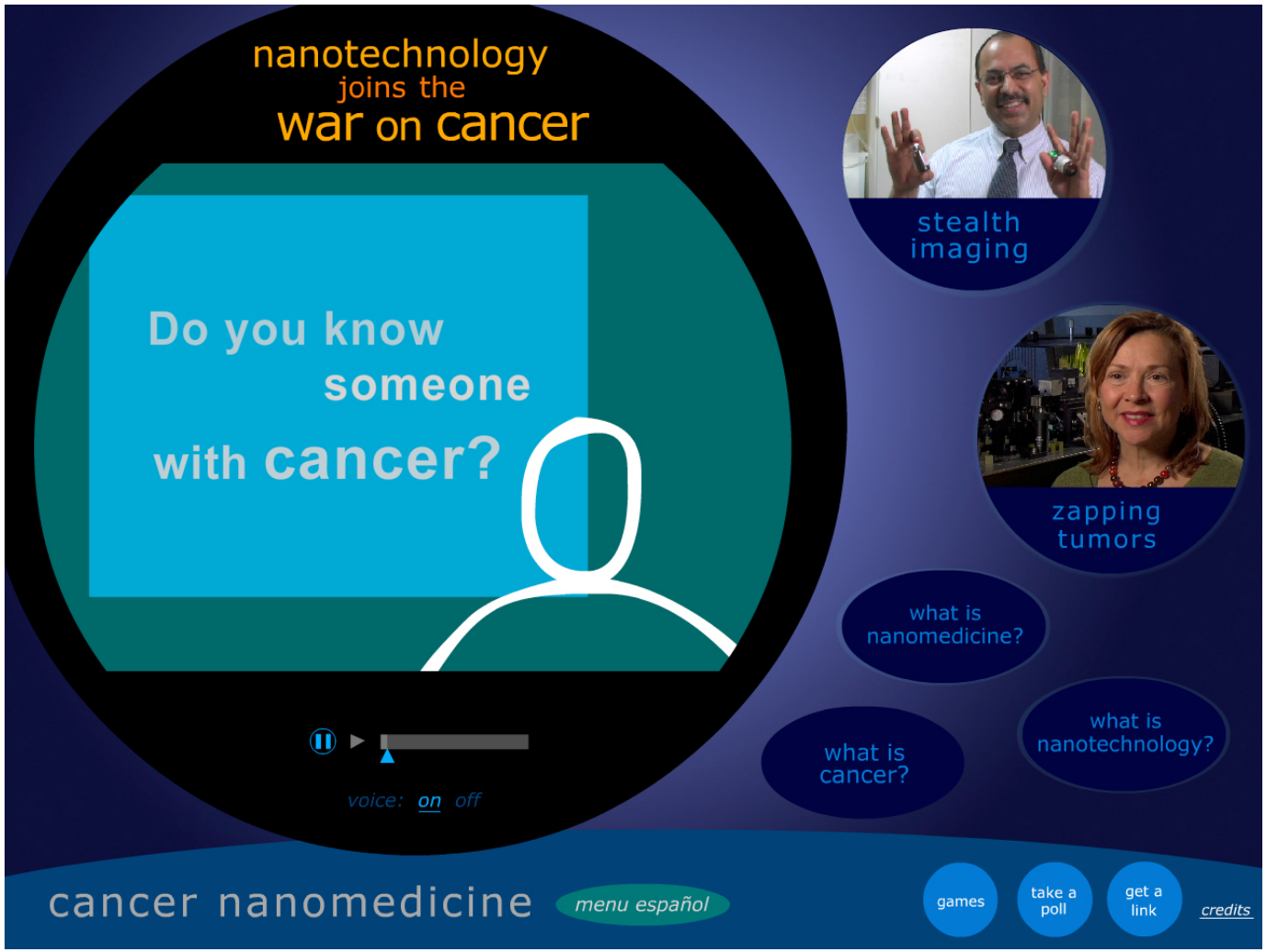
*NOTE: The Nanomedicine Explorer production team began making improvements to the program based on this study's early results and observations, and Version 1.0, to be published in May 2009, incorporates improvements to address these formative findings. The May 2009 version will also be fully bilingual (English-Spanish) and fully subtitled for situations where audio is a challenge. A new component, a video tutorial "What is Nanomedicine?" has been added and the games have been developed further to make them more challenging and more closely linked to content, with enhanced graphics. The new kiosk includes a "Text yourself a link" to the virtual exhibit online as well as the "Email yourself a link" functionality.*

## References

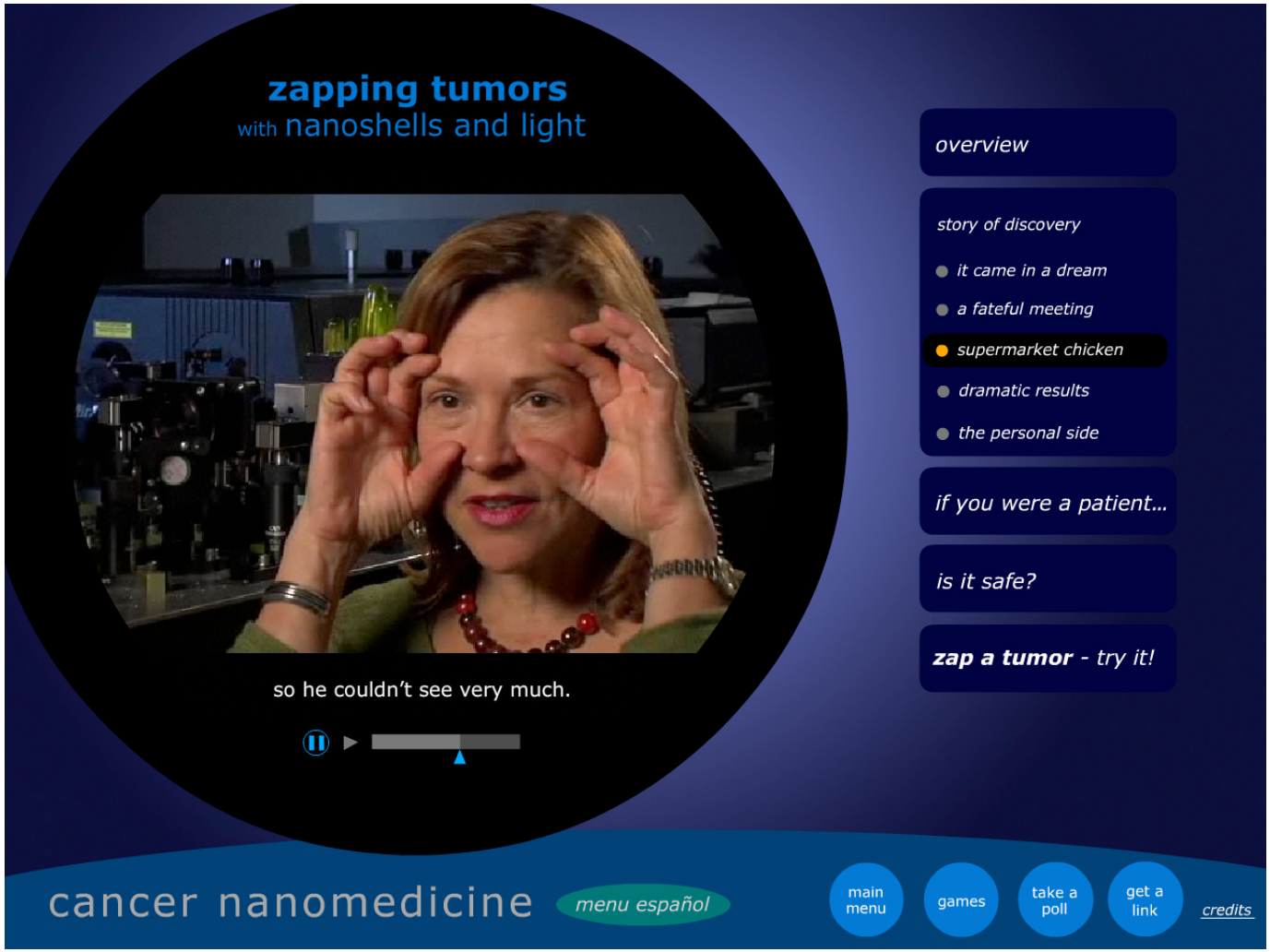
Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage Publications, Inc.

# Appendix A: Screen Shots of Nanomedicine Explorer Kiosk V.1.0

Home Page with Intro Animation

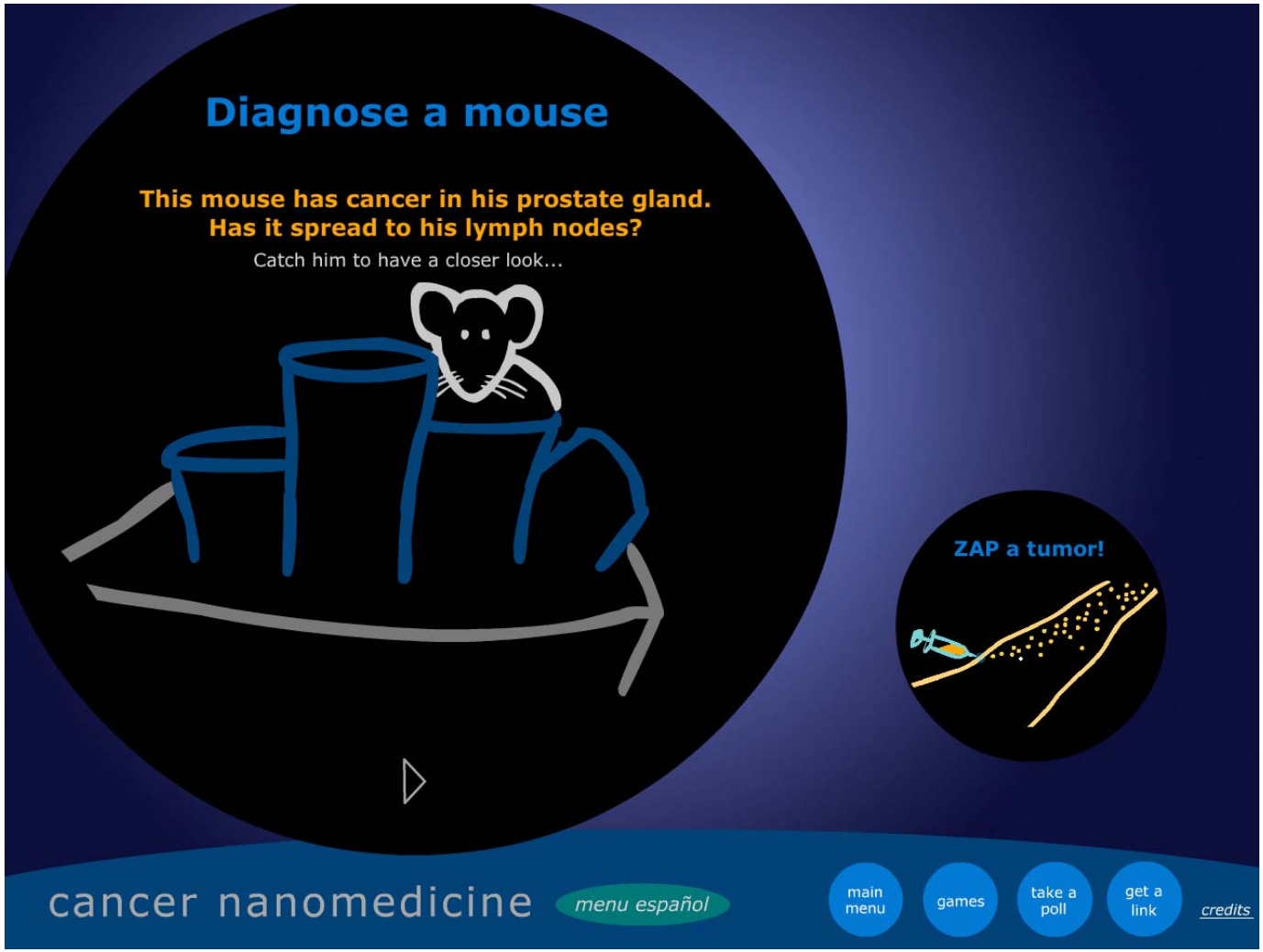


Cancer Therapy Research Story: Zapping Tumors with nanoshells and light research

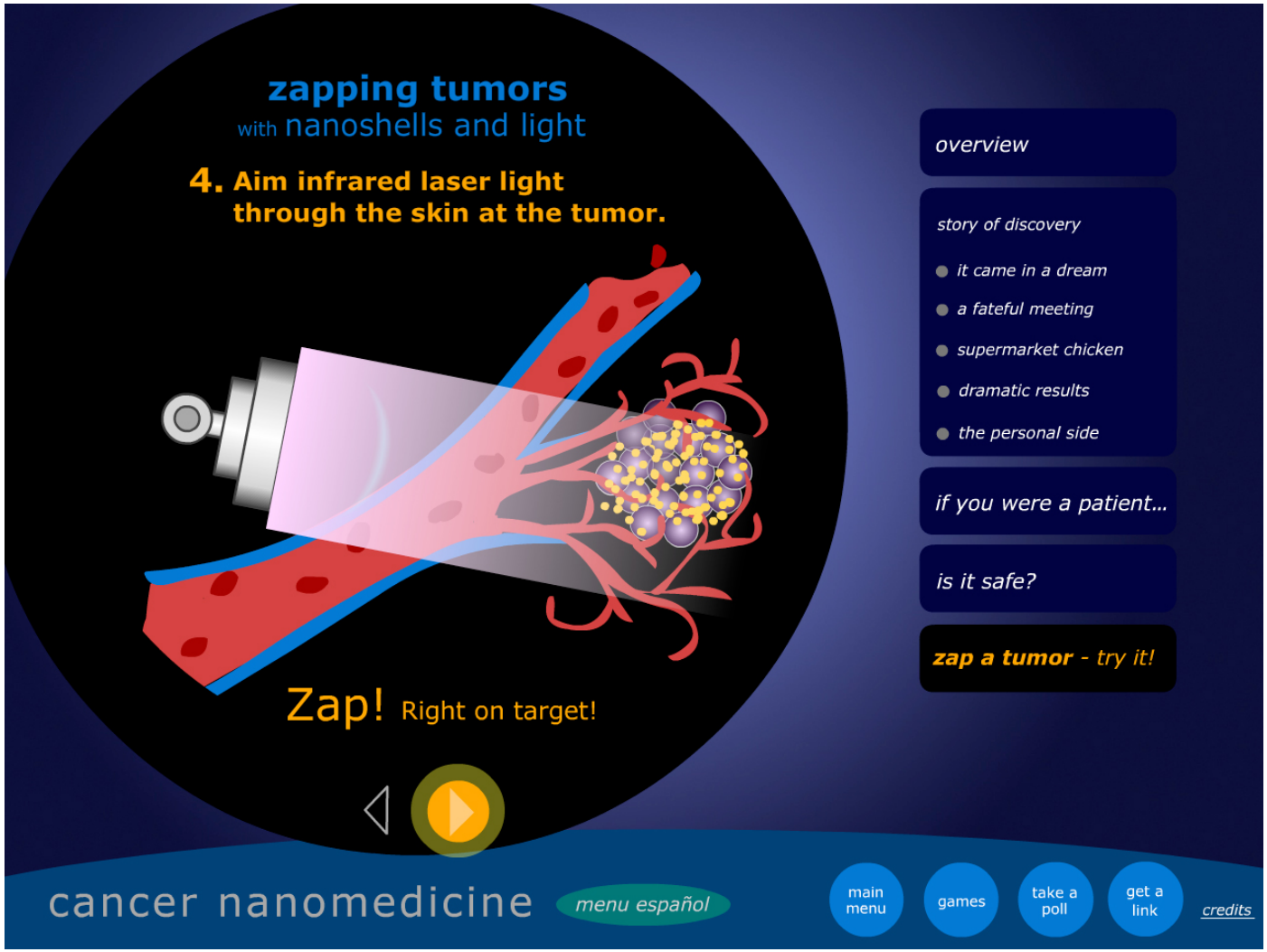


Cancer Diagnosis Research Story: Stealth Imaging with iron nanoparticles

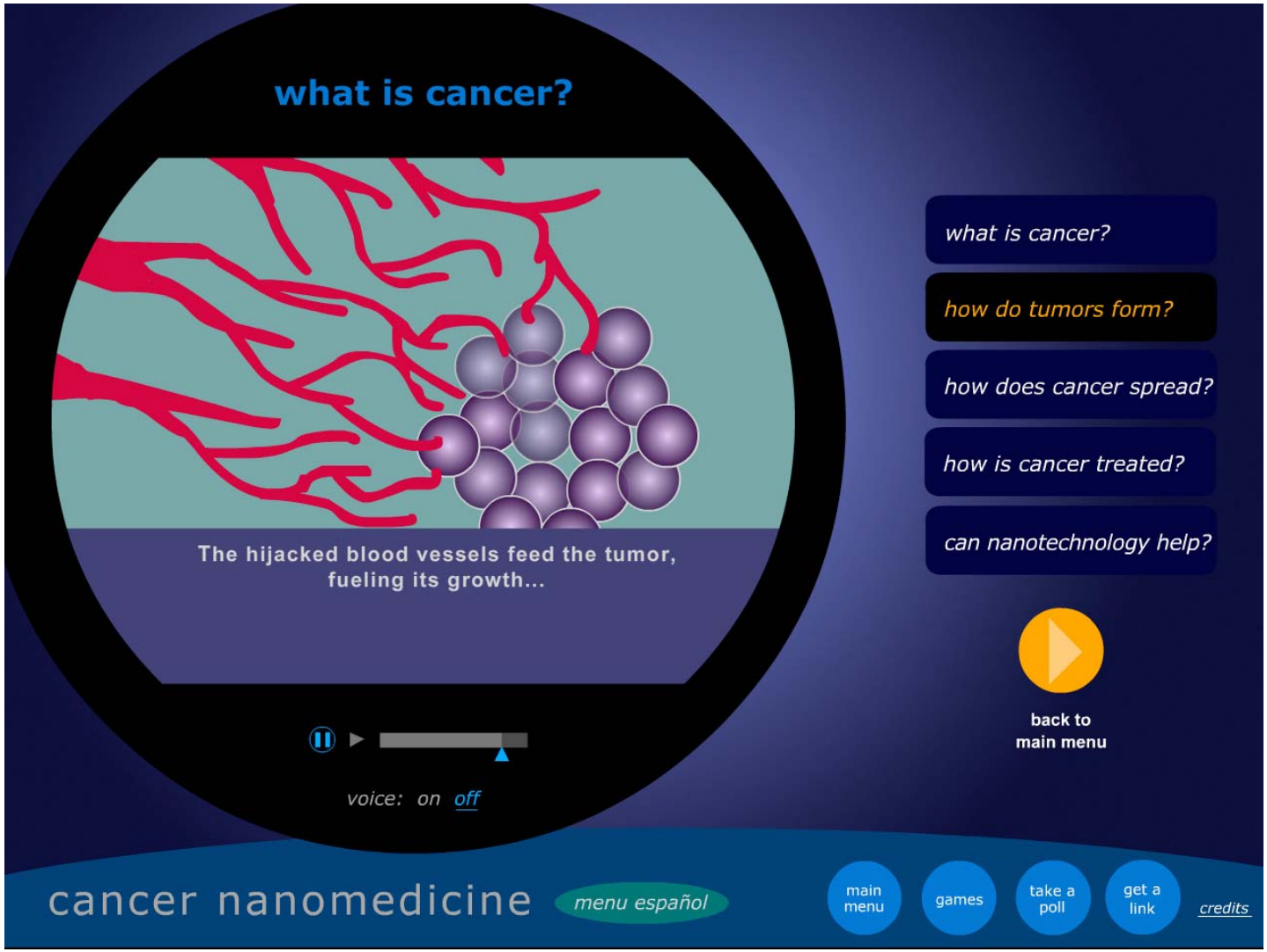
Game: Diagnose a Mouse



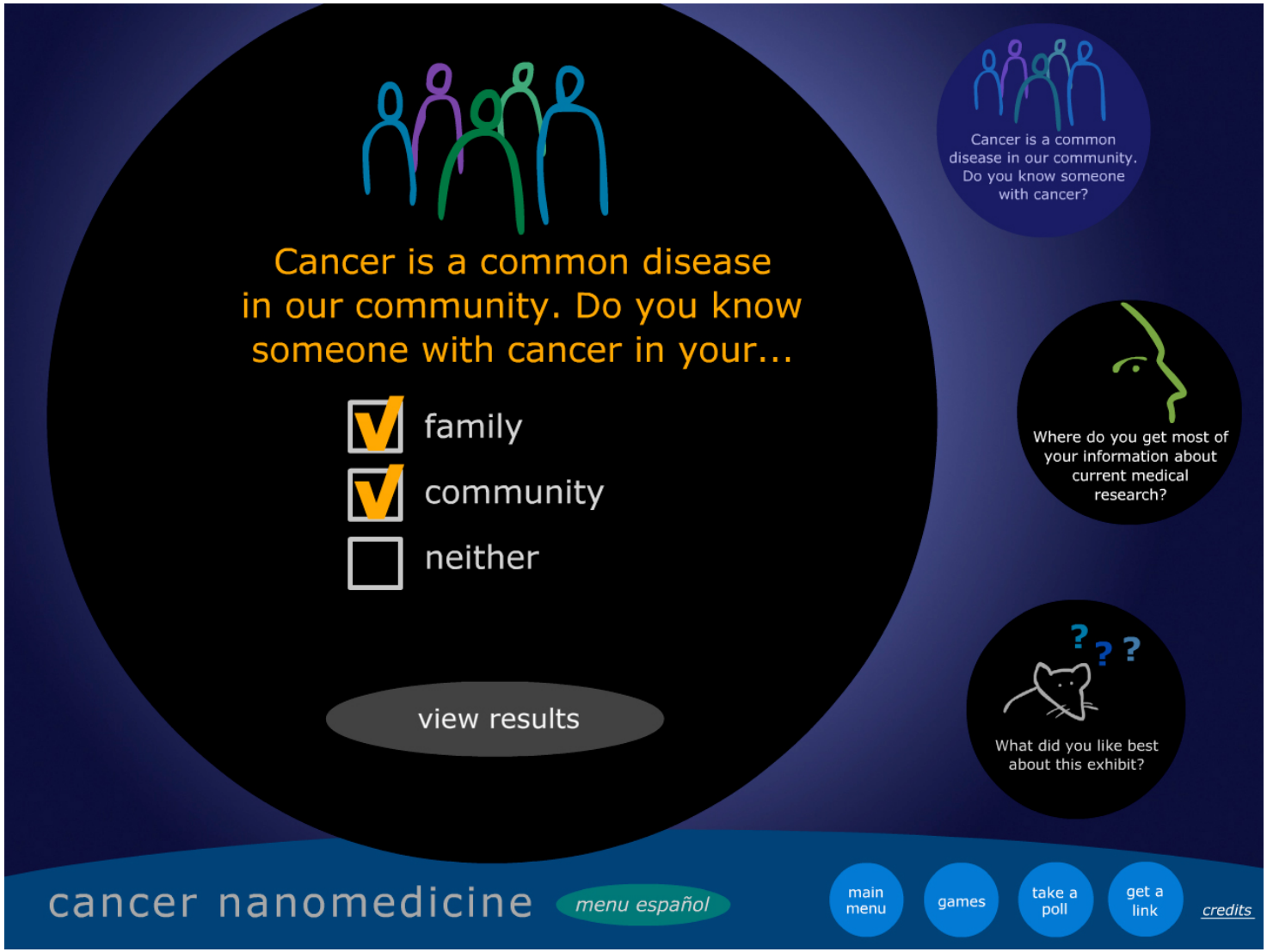
Game: Zap a Tumor



Tutorial: What is Cancer?



Poll: Do You Know?



# Appendix B: Observation recording sheet

**Visitor Information:** # Females _____ Ages _____ / # Males _____ Ages _____

Group type ❑ Kids only ❑ Adults only ❑ Adults and kids ❑ Other: _____ Total time:_____

**Observations**

| | Order | Time: | Top to bottom? (Y/N) | Complete activity? (Y/N) | Use these features? | Comments |
|---|---|---|---|---|---|---|
| **Intro Animation** | | | | | ❑ Audio ❑ Spanish ❑ Video ctrl | |
| **Cancer diagnosis** | | | | | ❑ Audio ❑ Diagnose a mouse ❑ Video ctrl | |
| **Cancer therapy** | | | | | ❑ Audio ❑ Zap a tumor ❑ Video ctrl | |
| **What is cancer?** | | | | | ❑ Audio ❑ Video ctrl | |
| **What is nanotechnology?** | | | | | | |
| **Games** | | | | | | |
| Tumor | | | | | ❑Click and drag | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mouse | | | | | ❑Click and drag | |
| **Take a poll** | | | | | | |
| Know Someone? | | | | | ❑Respond ❑Results ❑Did you Know | |
| Info Sources? | | | | | ❑Respond ❑Results ❑Did you Know | |
| Exhibit Favorites | | | | | ❑Respond ❑Results ❑Did you Know | |
| **Get a link** | | | | | | |

# Appendix C: Exit Interview Questions

Interview

Does this activity connect to anything you know about or might think about?

What are the most interesting things you learned from this activity?

How could we improve this activity to make it more appealing or clearer to you?

[Probes: (If they played the games) Was there anything difficult or confusing about using the games? (If they used the main menu intro animation, then point to it in the activity) How, if at all, did this help you to understand the material]

# Appendix D: Self Administered Survey

**Help the Museum improve future exhibits by providing us with feedback.**

**About you…**

**What is your gender?** ❑ Male ❑ Female **What is your age?** _____years

**Circle one number on the scale of 1 to 5 for each pair of descriptions below. Read the opposite descriptions carefully.**

**How do you feel about the exhibit overall?**

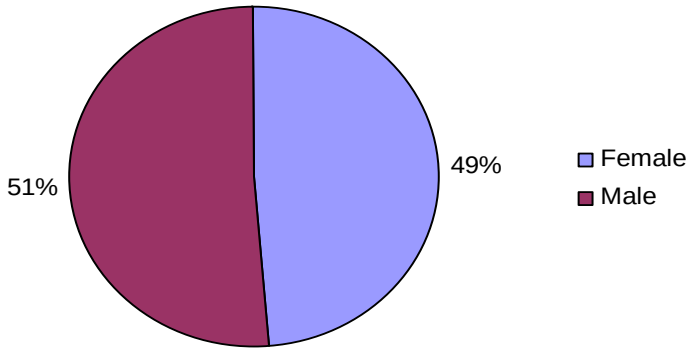
| | | | | | | |
|---|---|---|---|---|---|---|
| Disliked the exhibit | 1 | 2 | 3 | 4 | 5 | Liked the exhibit |
| Uninteresting topic | 1 | 2 | 3 | 4 | 5 | Interesting topic |
| Decreased my curiosity | 1 | 2 | 3 | 4 | 5 | Increased my curiosity |
| Learned nothing | 1 | 2 | 3 | 4 | 5 | Learned a lot |
| Difficult to use | 1 | 2 | 3 | 4 | 5 | Easy to use |

**How do you feel about each exhibit feature that you used? Circle one number from 1 to 5 for appeal and ease of use for only those components you used.**

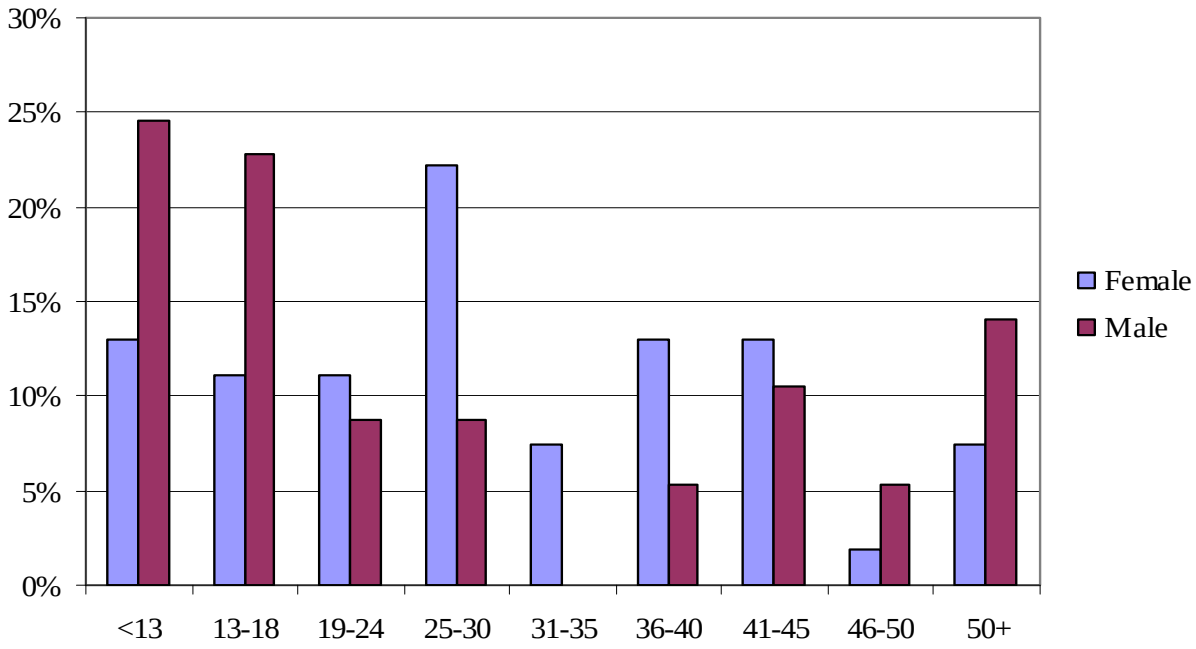
| **Exhibit Features** | **1= not appealing; 5 = very appealing** | | | | | **1= difficult to use 5 = easy to use** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Video stories | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **Games** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **Polls** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |

# Appendix E: Demographic Data of Visitors Observed

**GRAPH D1. Gender of Visitors Who were Observed but Not Interviewed. (N=90)[7]**




**GRAPH D2. Histogram of Visitors Who were Observed but Not Interviewed Split by Gender and Age. (N=90)[8]**




[7] N=Total sample which includes visitors observed as well as visitors surveyed.
[8] N=Total sample which includes visitors observed as well as visitors surveyed.

**GRAPH D3. Group Type by Visitors Observed. (N=21)**