

**Evaluation of the  
*BIOMEDICAL TECHNOLOGY PROJECT*  
for  
The Great Lakes Science Center**

**Mini-Report :  
Formative Evaluation of the Infectious Disease Multimedia Interactive**

**Eric D. Gyllenhaal, Ph.D.  
Selinda Research Associates, Inc.  
and  
Katherine Ziff  
Great Lakes Science Center**

**January, 2007**

**EXHIBIT NAME:**

**INFECTIOUS DISEASE MULTIMEDIA**

*Authors, version, date:*

Eric D. Gyllenhaal and Katherine Ziff, version 3, January 2007

**See Appendix A for a description of the prototype exhibit and its goals, messages, and intended engagements.**

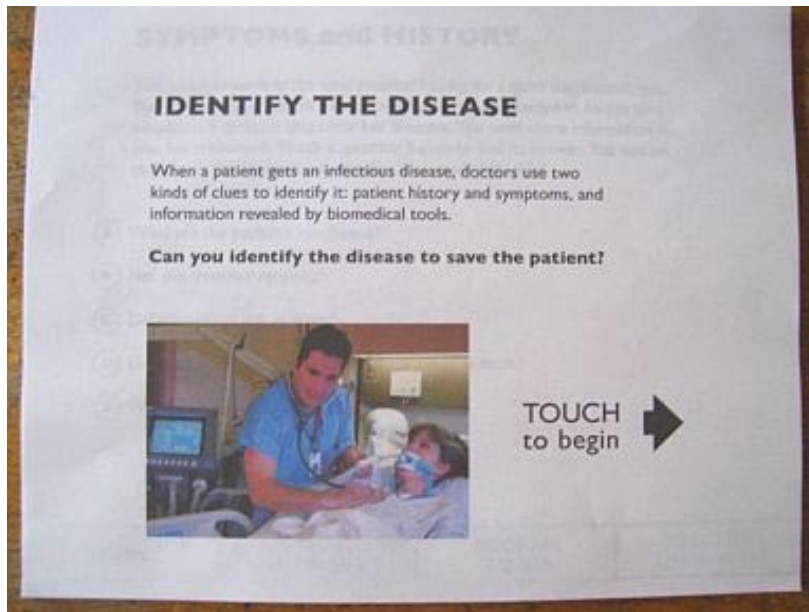


Fig. 1. Opening "screen" of Infectious Disease paper prototype.

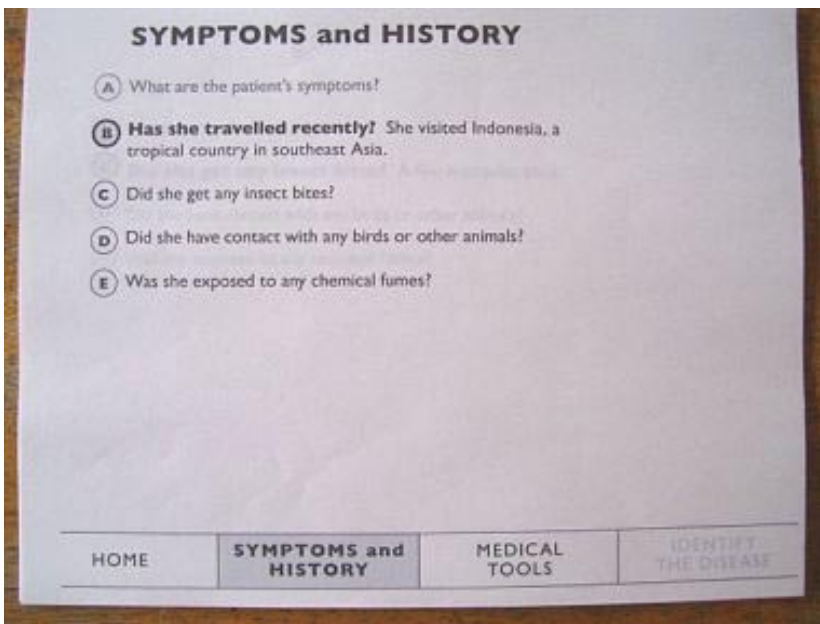


Fig. 2. Symptoms and History "screen" of Infectious Disease paper prototype. This screen is displayed when the user selects question "B. Has she traveled recently?"

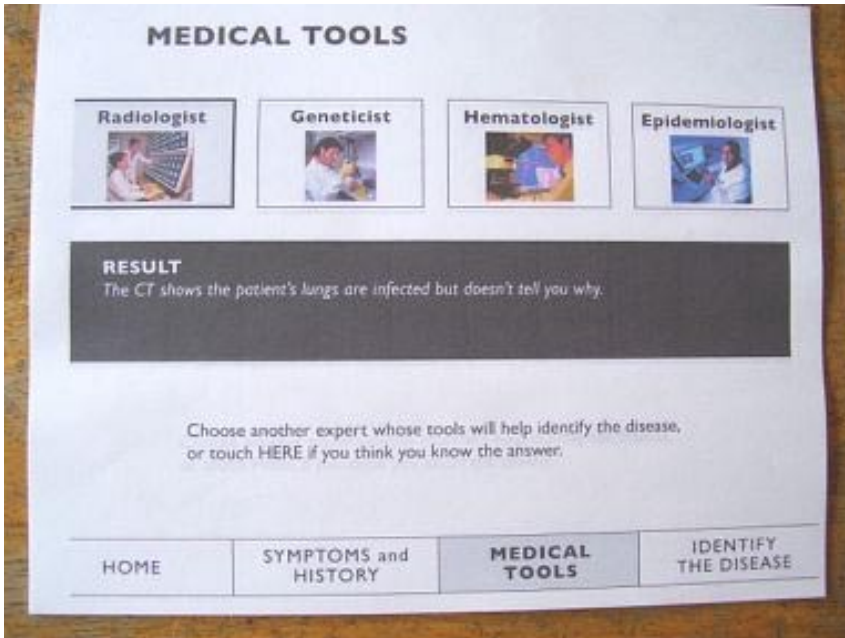


Fig. 3. Medical Tools “screen” of Infectious Disease paper prototype. This screen is displayed when the user selects Radiologist.

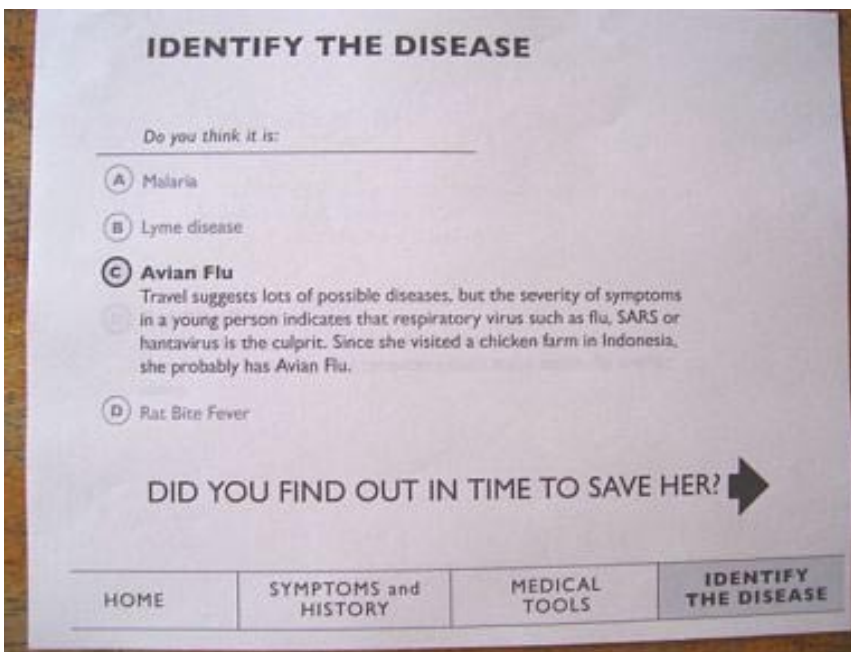


Fig. 4. Identify the Disease “screen” of Infectious Disease paper prototype. This screen is displayed when the user selects the correct disease.

## SUMMARY

The authors tested a paper prototype version of this interactive with three visitor groups (eight individuals) in the prototype area of the current *Medical Technology* exhibition. Most respondents found the game itself to be fun and informative, but perhaps not quite as challenging as they would have liked. However, navigation through the game proved a bit confusing to most respondents. Also, the prototype game was not effective at focusing respondents' attentions on the role of biomedical technology in detecting and identifying infectious diseases.

## VISITOR ENGAGEMENTS WITH THE PROTOTYPE EXHIBIT

---

**In what ways and to what extent did the observed engagements match (and differ from) the intended engagements?**

### Physical

- Respondents spent four to eight minutes working through the activity.
- Most respondents read most of the text and looked at the pictures. A few respondents said that, when a picture was present, they decided which option to choose based on the picture, rather than the text.
- Some respondents touched the photos and said they expected something to happen. They said that they wanted to touch, say, a picture of the patient or doctor and get more information.
- Many respondents had trouble moving between major sections of the program (e.g., from Symptoms and History to Medical Tests).
- Some respondents looked for back arrows when they wanted to review earlier pages.
- Some respondents were not sure what to do once they solved the puzzle. They said they expected to see a Start Over button or other way to exit the program.

### Emotional

- Respondents really did want to solve the puzzle, and most considered the activity to be fun and informative.
- Most respondents were confused or frustrated with the navigation at one or more points in the program.
- Most respondents were satisfied with their results, although some respondents said they wanted the activity to be more challenging.
- Several respondents said they enjoyed it enough that they wished there were more cases to solve, perhaps several that presented increasing levels of challenge.
- Most respondents did not focus on or appreciate the roles that advanced biomedical tools/technologies play in identifying infectious diseases—they focused on the specialists rather than their tools.

<p><b>Social</b></p>	<ul style="list-style-type: none"> <li>• The program inspired quite a bit of constructive social interaction as most groups worked together to identify the disease. Visitors discussed and negotiated their choices and shared personal experiences.</li> <li>• The multiple-choice like structure of Symptoms and History inspired some inappropriate competition, which resulted in respondents discounting relevant (albeit negative) evidence.</li> </ul>
<p><b>Intellectual</b></p>	<ul style="list-style-type: none"> <li>• Most respondents made choices and guessed which disease the patient had. They did not, however, develop and then test hypotheses during their investigation. [They probably did not have enough background or support from the program to engage on that level.]</li> <li>• Visitors focused more on the specialists than on the technologies they used.</li> <li>• Some respondents treated the Symptoms and History page as if it were a multiple-choice question, and they were trying to ask the “right” question. That meant they considered negative results to be “wrong” answers, rather than useful information that could help them rule out a disease. [Note: This was not unreasonable, given that the choices were labeled A, B, etc.]</li> <li>• Although the children in our sample did not understand the job titles for the specialists, they said they used either the descriptions or the photos of the specialists to decide which ones to chose.</li> <li>• Some respondents complained that they had trouble remembering all the symptoms and history once they reached the Identify the Disease page.</li> </ul>

**WHAT CHANGES WERE MADE DURING PROTOTYPING, AND WHY?**

How well did they work?

	<p>The version we took onto the floor had been extensively revised based on critical reviews. However, there were no changes made during this initial round of prototype testing.</p>
--	---

## COMMUNICATING EXHIBIT MESSAGES

In what ways, and to what extent, did the prototype exhibit communicate (or fail to communicate) its intended messages? What features of the prototype best communicated its messages? What features inhibited its success?

<b>Message 1:</b> Doctors use a patient's symptoms and history plus information revealed by biomedical tools to identify infectious diseases.	<ul style="list-style-type: none"><li>• Most of this message was communicated, because the users took the role of the doctor and selected which questions to ask and which specialists to consult. However, the emphasis was on the specialists rather than the tools they used, so the role of the tools in identifying diseases was not a focus for our respondents.</li></ul>
<b>Message 2:</b> Newly developed biomedical tools allow doctors to identify infectious diseases faster and with more certainty.	<ul style="list-style-type: none"><li>• This message was not communicated. This was partly because the prototype game focused users' attention on the specialists, rather than their tools. Also, the text did not specifically state that the tools were newly developed.</li></ul>
<b>Message 3:</b> Doctors get help from specialists who use biomedical tools/technologies to identify infectious diseases.	<ul style="list-style-type: none"><li>• This message seemed to be communicated pretty clearly, in large part because the users (in their role as doctors) selected which specialists to consult.</li></ul>

## ACHIEVING EXHIBIT GOAL

In what ways, and to what extent, did the prototype exhibit achieve (or fail to achieve) its goals? What features of the prototype provided support for the goals? What features inhibited its success?

<b>Goal:</b> Visitors will appreciate the important role that BMT plays in helping doctors tell which infectious disease a patient has, and where it came from	<ul style="list-style-type: none"><li>• This goal was not achieved. Respondents seemed to appreciate the importance of asking the right questions and consulting the right specialists, but they did not pay much attention to the biomedical technologies that the specialists used to do their work.</li></ul>
--	--

## RECOMMENDATIONS FOR THE FINAL EXHIBIT

---

- **Develop a new title for the introductory page.** It should mention the new technologies in some way, e.g. “Use new medical technologies to identify a deadly disease.”
- **Redevelop the navigation.** Potential solutions include:
  - Relocate the menu bar to the left side, which is standard for many familiar applications (e.g., Web pages);
  - Rename the menu choices (e.g., from Symptoms and History → Return to Patient’s Record, from Medical Tools → Run a Test, Home → Start Over);
  - Include hot-linked, navigation-related hints in the body of the page, e.g. “If you want to run another test, go here.”
- **Provide back and forward arrows.** These should function just like a Web browser’s arrows.
- **Develop the Symptoms and History screen so it looks less like a multiple-choice question.** Perhaps it should look more like a patient’s chart, on a clipboard.
- **Clicking on a question on the patient’s chart should take users to a detailed answer screen.** The answer should include photos, maps, etc., to illustrate and expand on the text. When the user goes back to the chart, just a short text answer should appear next to the question, and these should accumulate so the user can consult the results whenever necessary.
- **The patient’s chart should be available from every screen.** That way visitors won’t have to remember the symptoms, history, and test results.
- **Use larger and more informative photos of the specialists and shorter, clearer descriptions of the diagnostic technologies they can provide.** The title, photo, and description of each specialty should be available each time the user is asked to choose whether to consult another specialist.
- **Add screens where each specialist discusses the technology they rely on, emphasizing what is new and improved about that technology.** When a user selects a specialist on the Medical Tools page, the next screen should show an enlarged photo of the specialist with his or her tool(s). The specialist should say something like, “By using an advanced CT scanner, I can detect

small differences inside the patient’s lungs...” Then a separate results screen should show and interpret the resulting evidence (e.g., a CT scan of the patient’s chest shows mucus building up to dangerous levels, but no cysts or other abnormalities – and it doesn’t tell you why the mucus is there).

- **On the last screen, mention how the medical tools helped, and the potentially dire consequences had they not been available.** This will help emphasize the focus on the technology.
- **Put the user in the role of a medical student rather than a doctor.** One advantage to this approach is that it would give an excuse for offering a limited number of diseases that the student is trying to eliminate (i.e., your supervisor asked you to check whether it could be x, y or z).
- **To increase the level of challenge, consider adding a timer.**
- **To make the game more challenging and interesting, model it more after *Clue* or *Worse Case Scenario*, or maybe *Think Like a Doctor*.**

**References for this last recommendation:**

<http://worstcasescenarios.com/mainpage.htm>

Select fun and games, then Adventure Game

<http://www.thinklikeadoctor.com/>

---

## OTHER LESSONS LEARNED

- 
- **For most visitors, medicine is more about people and less about technology.** Visitors naturally focus on the patients—especially when they can personally identify with them—and the doctors who diagnose and cure them—especially when they can imagine themselves taking on a doctor’s role. We need to provide visitors with the human element to spark interest and motivation, yet still help them see the role that biomedical technology plays in doctors’ work and patients’ diagnoses and cures.
-

## APPENDIX A: STATEMENT OF EXHIBIT GOALS, MESSAGES, AND INTENDED ENGAGEMENTS

### Great Lakes Science Center Biomedical Technology Project Formative Evaluation

#### Exhibit Unit Intentions for Infectious Disease Multimedia

November 4, 2006  
Version 03

**Name of prototype exhibit:** Infectious Disease Multimedia

**Brief description of prototype exhibit:** This was a paper prototype of a planned multimedia station that will challenge visitors to follow the steps a doctor takes to diagnose an infectious disease. Users take the role of a doctor and try to solve a medical mystery using data collected on the patient's symptoms and history and tests done by specialists using biomedical technologies.

**Goals** are those things you want this exhibit unit to achieve. Goals always start with "Visitors will...." Goals tend to be pretty big statements about developing appreciation for or greater understanding of something.

- Visitors will appreciate the important role that BMT plays in helping doctors tell which infectious disease a patient has, and where it came from.

**Messages** are the content of the exhibit. They are comprised of Big Ideas and educational messages. **The Big Idea for this exhibition is,** "Rapidly advancing biomedical technologies give doctors new tools to improve personal and public health." The educational messages are a description of the main ideas you want visitors to walk away from the exhibit with.

- Doctors use a patient's symptoms and history plus information revealed by biomedical tools to identify infectious diseases.
- Newly developed biomedical tools allow doctors to identify infectious diseases faster and with more certainty.
- Doctors get help from specialists who use biomedical tools/technologies to identify infectious diseases.

**Physical engagements** are all the physical things visitors do at an exhibit, for example, sitting, standing, looking, reading, pointing, touching, and manipulating dials. It also includes how long visitors are expected to spend with the exhibit.

- Read the text and look at the photos.
- Use the interface to successfully navigate through the program.

**Intellectual engagements** are all the ways in which visitors engage cognitively with an exhibit, including thinking about, processing, and making meaning of their experiences.

- Visitors comprehend the information conveyed by text and photos.
- Visitors make choices about what steps to take.
- Visitors hypothesize about what disease the patient may have based on the evidence they have collected.
- Visitors understand that it takes more than one person to identify an infectious disease.

**Social engagements** are all the ways in which visitors engage with each other within the context of the exhibit, including verbal exchanges as well as body language. This could include directing attention, asking a question, coming up with an explanation together, reading a label out loud.

- Visitors read (or summarize) the text for companions who cannot read it independently.
- Visitors discuss their choices.
- Visitors negotiate what steps to take.
- Visitors discuss personal experience with (or pre-existing knowledge of) infectious disease.

**Emotional engagements** are all the ways that visitors engage emotionally with the exhibit; examples include surprise, delight, awe, satisfaction, feelings of competence, intimidation, and frustration.

- Visitors want to solve the puzzle.
- Visitors are not confused by or frustrated with unfamiliar terms or concepts.
- Visitors are satisfied with their efforts, even if they arrive at the wrong conclusion. [This implies that the program helps them understand where they went wrong.]
- Visitors appreciate the roles that advanced biomedical tools/technologies can play in identifying infectious diseases.

## RESPONDENT DATA SHEET

### BMT2 Formative Infectious Disease Multimedia Paper Prototype

Date	#	Exhibit unit	DC	Group Composition					Ethnicity				Racial Categories								Other notes	Time (min)			
				Total	AF	AM	CF ages	CM ages	H/L-F	H/L-M	N-F	N-M	A-F	A-M	B-F	B-M	W-F	W-M	AI-F	AI-M					
1105	3	Infectious	KZ	2	1	1					1	1			1	1									~7
1105	4	Infectious	KZ	2	1	1					1	1					1	1							~5
1105	5	Infectious	KZ	4	2	2	9	8			2	2					2	2							~8

#### KEY:

Date = MM/DD  
 # = Interview number  
 Exhibit unit = Prototype tested  
 DC = Date collector Initials

Group Composition:  
 Total = Total number in group  
 AF = Number of adult females in group  
 AM = Number of adult males in group  
 CF = AGES of female children in group  
 CM = AGES of male children in group

Ethnic Category:  
 H/L-F = Hispanic or Latino female  
 H/L-M = Hispanic or Latino male  
 N-F = Not Hispanic or Latino female  
 N-M = Not Hispanic or Latino male

Racial Categories:  
 A-F = Asian female  
 A-M = Asian male  
 B-F = Black or African American female  
 B-M = Black or African American male  
 W-F = White female  
 W-M = White male  
 AI-F = American Indian or Alaskan Native female  
 AI-M = American Indian or Alaskan Native male

Other notes = Note if respondents are in a wheelchair, show other evidence of having a disability; also note other relevant observations about the group.

Time = Approx. time at the prototype (prior to the interview), in minutes