# Co-Discovery

A Masters Thesis

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## Summary

This report uses data gathered from co-discovery testing five pairs of 4th grade students at Castle Rock Elementary School on April 12, 1999. We tested the beta version of the Mystery of the Mission Museum CD. We were charged with answering five questions chosen by the client, which are listed below with a summary of our findings.

**Question 1**: What are the major usability problems in the product?

> 1.1 Most participants needed help the first time they played a video.
> 1.2 Navigation was often a source of frustration.
> 1.3 Only participants with advanced computer skills used the map.
> 1.4 Participants needed prompting to find and move objects.

**Question 2**: Which tasks are easy to complete?

> 2.1 Participants easily found videos and the names of videos.
> 2.2 Participants easily found the names of objects.
> 2.3 Participants easily found the names of rooms.

**Question 3**: What cognitive process is the user going through? Does the users cognitive model of the product reflect the process of visiting a real museum?

> 3.1 Unlike a real museum, navigation difficulties were dominant.
> 3.2 Similar to a real museum, participants were very interested in objects.
> 3.3 Girls commented on objects, but did not click on them.
> 3.4 Participants did not find the map useful.
> 3.5 Boundaries to travel were not clearly defined through GUI feedback.

**Question 4**: What are the design recommendations of the users?

> 4.1 Make navigation easier.
> 4.2 Add more people.
> 4.3 Improve map color and add objects.

**Question 5:** What does the user like doing? What is attractive and interesting about the product?

> 5.1 The product was attractive and interesting to both kids and teachers.
> 5.2 The look and feel of the product was very appealing.
> 5.3 Objects were attractive.
> 5.4 Videos were very interesting.

## Summary of Recommendations

The recommendations below come directly from participant's comments, (such as "Add more people" or "It was hard to move around") or from our data on the frequency of events such as prompting and navigation mistakes.

Naturally, in this report we focus on recommendations in response to problems. However, we also want to draw attention to the positive teacher and participant reception to the product overall.

**Improve navigation to facilitate exploration of the museum**

- Make cursor modal changes more obvious and intuitive.
- Provide GUI feedback when an action is not possible..
- Decrease the number of navigation choices.
- Make the map more colorful and attractive.
- Make the map more useful.
- Add distinctive landmark representations to the map.
- Differentiate between windows and doors more clearly.

**Improve video and object interaction**

- Videos should begin automatically.
- Replace the current video control buttons with simplified buttons.
- Create a docent tour or instructions explaining object interaction.
- Provide noticeable visual cues when the mouse rolls over objects.
- Do not cut off objects, like the top of the flagpole.

**Design recommendations of the participants**

- Add more people.
- Make it easier to navigate.
- Make the arrows easier to see.
- Fix the map.
- Keep the look and feel (inferred).

## Methodology

### Instruments and Protocols

We employed a standardized protocol to guide our co-discovery testing. We read from a script (see Appendix A) that included introductions, a statement of purpose, general instructions, equipment orientation, co-discovery modeling, and sample co-design debriefing. The script was closely followed for each co-discovery participant team to insure reliable data gathering.

We prompted participants as little as possible during the test. But in the event that prompting was needed our protocols set the following standards: 1. Keep the participants moving if they are severely stuck or confused. 2. As a measure of usability, after participants completely missed a function or feature.

Standard #2 was particularly successful and bares explanation. After our test piloting sessions, we realized that we could gather more usability data if we prompted users only *after* they had missed a function or feature. For example, if a participant found a video, but could not figure out how to play it, we would *not* prompt them until they had left the video and were back in the main program mode. This standard enabled us to establish that the designer's intention of users playing videos had, for whatever reason, failed.

After a participant missed playing a video, we would then prompt them to go back and we would show them how to play the video.

After each test, we conducted an introspective interview. We asked questions concerning the improvement of the product, such as what was easy or difficult. We also asked for any other general comments they might have.

### Data gathering

We gathered data for approximately five hours at Castle Park Elementary school. Our equipment consisted of two VHS cameras, a flat omni-directional microphone, a video mixer, and a monitor. The school computer lab was not in use that day and was the site of our testing. We used two cameras to achieve a picture-in-picture recording. We focused one camera on the screen and the other camera on the two participants.

Participants used a Macintosh G3, 233Mhz, 14.1 inch screen laptop with an external mouse attached.

### Data Reduction

Both Cindy and Caleb reduced the video data to an Excel table of event codes (see Appendix G). This system was used to employ inter-rater reliability. In order to reduce the video data a coding system was created after an initial viewing of tapes (see Appendix F).

As noted above, we used prompting data from the co-discovery sessions as a critical indicator of usability successes and problems. The table in Appendix C shows prompting data for participants' first-time interactions with some of the Mission Museum features. It shows how many feature interactions took place:

1. without any prompts or with partner prompts

2. with experimenter prompts

For this study, we have defined first-time interactions that occurred **without any prompts or with a partner prompt** as *successful* interactions, and first-time interactions that required **prompts by the experimenter** as *unsuccessful* interactions. Overall, if a feature interaction has a success rate of 75% or higher, interacting with this feature is classified as intuitive and easy to use. For instance, the first feature interaction in Appendix C is *Found a video*. Since its **no prompt/partner prompt rate** *(success rate)* is 75%, the feature interaction of finding a video is considered intuitive.

Note that $n$ is equal to the number of task occurrences we observed and recorded for all five groups. Because there is a possibility that we missed or did not record every occurrence, and because all ten participants did not interact with all the features in this study, $n$ is always less than ten.

Verbalizing of participants was coded as COM events and transcribed from the video directly into the notes section of the excel sheet.

## Methodology for individual questions:

### Question 1 and 2

We reduced data using the sort function in Excel, and then manually sorted the relevant event codes.

### Question 3

We coded all events that were indicative of a cognitive process and then entered them in to a new Excel spreadsheet. All comments about boundaries (BND) were added to these and the resulting events were exported into a FileMaker Pro database. This subset of data was further coded into subcategories of "Object" "Video", "Global", "Navigation", "Room", Boundary", and "Map". A second "find" was performed on each of the categories and the resulting codes counted and recorded in a table. This subset of data became the table in the findings section for this question.

### Question 4

We coded all the events from the posttest introspective (DES) data into categories by the question asked by the experimenter, such as "How to improve?" "What about the map?", "What was easy or hard?" and "global" comments. A second "find" was performed on each of the categories and the resulting codes counted and recorded in a table. This subset of data is the table in the findings section for this question.

### Question 5

A subset of events judged as positive was coded into categories of "object" "video" and "global". A second "find" was performed on each category and the resulting events imported into the report. This subset of data became the findings for the question.

## Participants

Appendix D describes student profiles. These profiles correspond to the target users of the Mystery of the Mission Museum. The teacher paired the ten participants (7 female, 3 male) into five co-discovery teams according to their ability to work well together. The participants' self-rated levels of computer experience are consistent with the demographics of the target users (2 "just learning", 5 "good", 3 "very good").

**Question #1:** What Are the Major Usability Problems in the Product?

### Findings and Interpretations

*Most Participants Needed Help the First Time They Played a Video*

[See video: "video_needing_help.mpg"]

The control symbols at the bottom of a *Mystery of the Mission Museum* video player and their functionality appear to be modeled after VCR and other multimedia player controls, perhaps because these symbols and their functionality are fairly universal. However, our research was aimed at determining whether or not these participants who are studying missions understand and can use these controls. Thus, for this product and audience, it is not universality that is important, but usability.

Findings suggest participants had problems playing and controlling videos. Some participants hesitated before they interacted with the videos--as though they were waiting for something. This suggests that participants expected videos to begin playing automatically. We conclude that participants did not think it was necessary to click the Play button since they had already clicked on the person.

[See video: "video_wannatalk.mpg"]

From our observation of facial and verbal expressions of participants interacting with the video, we also infer that participants did not really think of the videos as videos. They thought of the videos as people with whom they wanted to talk. As in real life, having made the first move in a one-on-one meeting, the participants expected the next move to come from the person in the video.

From observation, it was also evident that some participants did not know when they were in "video mode." Perhaps this was because they had had a previous experience in "object mode", and because there is not a notable difference when they clicked on an object versus a video, they often attempted to move an object in the video screen. In a couple of instances, a student tried moving an object in the video

Navigation Was Often a Source of Frustration for Participants

insert video 34.45 hallway]

Navigation options in this product included moving forward as well as panning left and right. During the orientation, we modeled how to move forward, by clicking on the large arrow, when we modeled co-discovery. Thus, participants had an opportunity to observe navigation before they began testing the product. This probably increased the success rate for first attempts to move forward.

The correlation between participants' self-rating of their computer skills and the time it took them to move forward for the first time is $r = 0.51, p = 0.13$. See Appendix C for detailed information. We assigned the lowest score value to the participant that showed no forward movement. This moderate correlation suggests that prior experience with computers is an important factor to early success with forward navigation.

Judging from fact that all of the participants, with the exception of two, moved forward successfully at least once during their time as driver, we might conclude that moving forward was an intuitive interaction for participants. The success rate is higher than 75%, but since we modeled moving forward for participants before beginning the actual testing, this is perhaps a misleading statistic. Even though most participants successfully moved forward within an average of two minutes and twenty-two seconds from starting the role of "driver". But there were many instances of navigation problems during testing that included:

2. **Needed a prompt**. Usually after one or more problems below.
3. **Clicked off arrow**: Clicking to move forward even though there was no forward arrow cursor on screen.
4. **Clicked and held**: Holding the mouse button down on the forward arrow cursor.
5. **Clicked with no forward arrow**. Clicking multiple times on the forward arrow without waiting for the computer to react.
6. **Hit a boundary**. Clicking on door that is unavailable in this alpha version, an outdoor boundary, or window.
7. **Panned slowly**. Moving to the left or right in an extremely slow fashion usually because the cursor was on the edge of the screen or near a boundary.

Quite a few of the participants panned slowly and showed frustration with the slow speed. There is a possibility that providing the participants with all the diagonal arrows may have overloaded the participants with too many choices, which has a tendency to cause confusion.

The following table shows the number of instances for these navigation problems.

| Navigation | Total |
| --- | --- |

| Problems | Instances |
|---|---|
| Needed a prompt (PMT) | 6 |
| Clicked and held on forward arrow (click and hold) | 3 |
| Clicked with no forward arrow (off arrow) | 4 |
| Clicked repetitively (IMP) | 6 |
| Hit a boundary (BND) | 21 |
| Panned slowly (PAN slow) | 16 |

*Table 1: Forward and panning navigation issues*

*Only Participants with More Advanced Computer Skills Used the Map*

[See video: "demo.mpg"]

We also modeled how to use the map when we modeled co-discovery; thus, participants also had previous experience with this feature before beginning actual testing. This may have increased some of the participants' awareness of the map and how they might make use of it.

| Interaction with the Map | Total Instances Observed | Related Qualitative Data |
|---|---|---|
| Used the map | 4 | 2 Devon points to North building on map and asks, "Have we been there?"<br>3 Shaun said, "Try going in that room where the soldier was." He pointed to where soldier was on map and said, "Down there."<br>4 Shaun said to Devon again, "Down there."<br>5 Erica said, "We're right there." |

| | | |
|---|---|---|
| Noticed the map, but did not use it correctly | 1 | 1. Erica is in *object mode* and does not realize she should click the Done button to exit. Erica points to map and the red dot, then the bridle. She asks "Can we go somewhere else?" Perhaps she thinks she can get out of object mode by using the map somehow. |
| Did not make any reference to the map | 7 | N/A |

*Table 2: Interaction with the Map*

[See video: "navigation_map.mpg"]

Shaun, Devon, and Erica, some of the more talkative, confident, and advanced computer users, were the only participants who noticed and/or used the map. These participants were not only computer savvy, they also immediately picked up the co-discovery technique and successfully explained out loud everything they were thinking and doing. This implies that the map is a more advanced feature.

*Participants Needed Prompting to Find and Move Objects*

As shown in *Appendix C: Success Rates of Feature Interactions*, some participants passed over clickable objects without showing a trace of recognition that an opportunity to interact existed. This phenomenon is known as the "Gulf of Perception".

*Appendix C* also shows that a large proportion of the participants who clicked on an object did not know that they could move the object by clicking and dragging with the mouse.

**Question #2:** Which Tasks Are Easy to Complete?

### Findings and Interpretations

Participants had high success rates when interacting with the features listed below. As the data shows in *Appendix C*, participants were either able to interact with these features without any prompts or they simply needed some ideas or encouragement from their partners.

*Finding videos was motivating and fairly easy for participants*

It was easy for participants to find and click on a person in order to see a video. From participant comments, we can conclude that the videos were one of the most popular attractions in the Mission of the Mystery Museum. Because participants wanted to hear the people talk, they easily noticed cursor changes when moving the mouse over people. The cursor change from the pointing finger to the concentric circle was an effective cue for this interaction. Thus, the visual cues for finding the video should stay the same.

*Finding the names of videos, objects, and rooms was easy for participants*

The consistent placement and appearance of video names, object names, and room names was helpful to participants. Once they located a name of an element, they recognized that they could refer to the same location for other element names.

**Question #3**: "What cognitive process is the user going through? Does the users cognitive model of the product reflect the process of visiting a real museum?"

### Findings and Interpretations

*The product simulates a museum in terms of participants' interest in unfamiliar objects, but the cognitive load of navigating is unusually high.*

We coded one hundred thirteen events that we judged relevant to questions regarding the cognitive processes of participants. The following table shows the number of cognitive process comments by museum features or program functions.

(For complete table of data, including comments, see *Appendix F*: *Events Pertaining to a Participant's Mental Model*.)

| Feature or Function | | Instances |
|---|---|---|
| Navigation | General | 27 |
| | Boundaries | 21 |
| | Map | 5 |
| | Navigation total | 53 |
| Objects | | 30 |
| Global | | 10 |
| Room | | 7 |
| Video | | 3 |
| TOTAL | | 113 |

*Table 3: Participants' Mental Model*

To infer what participants were thinking, we categorized comments we felt revealed cognitive processes. For example: the comment "Looks like a pot"

would fall into the object subcategory above. After dividing up events into subcategories we grouped three of them, (general, boundaries, and map) to be part of one meta-category dealing with navigation. The total events for the navigation meta-category is fifty-three. This reveals a mental model dominated by navigation issues such as this exchange between participants: Question: "How do you go down the hallway?" Answer: "I have no idea".

[See video: "navigation_hallway.mpg"]

In the navigation subcategories twenty-one events related to boundaries to navigation, such as when a participant attempts to go into a field, or through a window.

[See video: "navigation_window_for_door.mpg"]

We believe these events reveal desires and motives of the participants. A quick count reveals that the fields around the Mission were the most desired out of bounds destination, (we wanted to go into the fields as well), followed by windows mistaken for doors, and then attempts to go through doors in rooms not yet built.

The boundary data reveals an interesting pattern. Participants continued to attempt to go off boundary even *after* they had mastered moving forward. Participants specifically clicked on the fields as if they were making absolutely sure that they could not go there. Perhaps participants were checking for "secret" areas. We infer from this data that some kind of feedback is needed to let users know when they are clicking on a boundary.

[See video "boundary_playground.mpg"]

We have five recorded events related to the map. As we reported for question #1, only the most experienced participants used the map at all, and even then only once or twice during the testing period. This finding is interesting in light of the fact that participants were all shown the map, the red dot, and how the two related, immediately before they used the product. This suggests that participants did not find the map *useful*.

[See video: "navigation_map.mpg"]

We predict with confidence that the difficulty with navigation is not similar to the cognitive processes of kids exploring a real life museum. But there is some encouraging data within the navigation meta-category. Comments about where to go also surfaced, such as "Let's go there", or "Have we been there?" This is similar to what one would expect to hear among kids walking around a real museum unsupervised.

We found thirty events concerning objects. Comments included questions about what objects were, for example regarding the shield object, "Looks like

a hat" followed by a partner saying, "It's a shield". Or regarding the bridle, "It's a bow or something, I can't figure it out."

Most of the events were questions about the shield, beds, bridle and gun in the Cuartel. We also found that boys commented more on the guns and soldier, and girls commented more on beds, and purses with comments like "Comfy or hard?" concerning the beds in the Cuartel.

[See video: "object_bed_comfy.mpg"]

In addition, girls talked more about objects then they clicked on them.

[See video: "object_girl_recognize.mpg"]

This adds interesting findings to Mike McKean's SDA data that found boys clicked on objects significantly more then girls. We found that girls talked about objects more than boys, often asking their partner questions and making guesses out loud about them.

Ten global comments betrayed varied questions about the museum in general, with specific attention to the fields, the top of the flagpole being cut off, and three occurrences by three different participants about objects they recognized from their study of California Missions. This last finding is encouraging for the curriculum aspects of the project. We infer that kids will be able to recognize objects from their study in books about Missions. The most interesting of the global comments included this one about the bread oven on the back patio. "Oh, I saw that in a book about missions". The participant went on to guess that they cooked tortillas in it, and was corrected by her partner who said, "bread".

[See video: "object_recognize_from_book.mpg"]

The comments about the flag pole that popped up in this data, as well as throughout the data in general, were surprising. We feel this is due to the fact that the top of the flagpole is cut off. This caused most participants to try and pan up and then be frustrated when they could not see the top of the pole.

[See video: "global_flag_pole.mpg"]

Seven events about rooms interested us because of their focus on the cell in near the workbench. In particular two boys thought that it was messy and a fight had obviously occurred, which they felt was substantiated when they found the cell in the room. After seeing the workbench and guessing there had been a fight, upon seeing the cell, one participant said excitedly "I told you they had a fight!" This is a fascinating window into the mind of the participants and speaks of their desire to invent stories to explain their surroundings. We guess that the information about the gun in the Cuartel may have set up this thought process.

We found only three comments about the videos. This is perhaps the most deceiving of the data as it only reveals verbal comments. While observing the participants watch the videos there was no doubt that they were the single most captivating part of the experience, even if they did not verbalize their feelings.

[See video: "video_excited.mpg"]

Stepping back from this data we can see that fifty-three navigation events is a considerable amount when weighted against the thirty object events. A visit to a real museum would not result in such difficulties walking around. One can imagine a bunch of strange kids in a museum. Some spin around and around in the middle of rooms, others are trying to jump out the windows, while others seem to be repetitively attempting to walk through invisible walls.

But because object comments came in second to navigation in terms of frequency, we predict that the improvement of navigation would leave object curiosity the leading cognitive process. We infer that the resulting cognitive process would then closely match the cognitive process of kids visiting a real museum.

**Findings and Interpretations**

*Improve navigation and add more people*.

[See video: "improve_arrow.mpg" and "improve_fix_it.mpg"]

There were 26 verbal responses to our post-test interview questions.

(See *Appendix G* for complete table of data.)

| Post Test Question | | Instances |
|---|---|---|
| How would you improve it? | | 14 |
| What did you find easy or hard? | Easy | 2 |
| | Hard | 5 |
| What about the map? | | 5 |
| TOTAL | | 26 |

*Table 4: Users Recommendations*

Participants reported fourteen ideas for improvements. Adding more people being the most common suggestion. Comments varied from responses to promtings such as "What kind of stuff would you add?" being "I would put some more people," to direct responses for improvements of "Add more people".

[See video: "improve_add_more_people.mpg"]

Requests for navigation improvements were the next most common recommendation. Improvement suggestions included comments such as "Make the arrows more easier", to statements of difficulty such as, "Hard to control the mouse", and "Wanted to go straight, but we couldn't."

This data parallels the general trend of our findings thus far. Participants have difficulty, as well as a sense of lack of control, in moving around the Mission. One participant who had particular difficulty with panning said, "it was going fast and we couldn't stop it."

A young girl suggested an interesting solution to this problem, "If you just clicked it once, it would just go like this," and she demonstrated that you shouldn't have to click to more forward, it should happen automatically when you hold the mouse down and roll it forward. Perhaps this is based on the participants' experience with certain computer games that use such a system of navigation for very quick movement through environments.

Another interesting comment was about being able to "see what we did and saw, and try and make up a story". This supports earlier comments by the two boys who invented a story about a fight taking place in near the workbench.

Questions about the map resulted in five answers from two participants who were both self-reported experienced computer users. This supports earlier data that shows only experienced computer users used the map. Participants suggested improving the map by saying things like "Maybe you should put houses on the map so we know where we want to go," and "More color in it".

**Question #5:** "What does the user like doing? What is attractive and interesting about the product?"

### Findings and Interpretations

*Participants like the overall look of the museum, the gun, shield and "spinner" video.*

[See video: "like_cool.mpg"]

There were fewer events then we expected in this area. We see now that the participants' general reluctance to verbalize their thoughts is the likely cause of the low events. Because of these low numbers, we feel a more accurate gauge of what participants like doing is the SDA report by Mike Mckean.

However, there is valuable data here because these events are *unprompted verbalizations*, which we infer to have significant weight because of participants having to overcome the testing environment to verbalize them.

There were 12 unprompted positive comments. The majority of these comments were about the product in general.

(See *Appendix H* for complete table of data)

| Event category | Total Instances |
|---|---|
| General Comments | 6 |
| Object Comments | 3 |
| Video Comments | 3 |
| TOTAL | 12 |

We found that most positive comments were what you would expect from the participants, considering their age. The boys' tended to comment on the Mission and objects using words like "cool" while the girls used "beautiful" to comment on the general look of the building.

[See video: "likes_so_beautiful.mpg"]

Objects received three positive comments. Once male participant loved the fake gun butts while another female gave a "cool! I think that's a hat for them to wear" concerning the shield.

There were three comments concerning the videos but we consider them to have less weight because two out of the three were from the same participants about the same "Spinner" video.

Overall, this data supports other findings in this report about the look and content of the product being attractive and fun, and the attraction of objects and videos.

## Recommendations

We structured these recommendations in response to the original questions. For this section, we omitted questions 2 and 5 because they did not include recommendations.

### Question 1: What are the major usability problems in the product?

*Most Participants Needed Help the First Time They Played a Video*

The testing uncovered evidence of several types of errors including errors in modal perception. This happened when the participants thought they were in object mode, when they were really in video mode. To remedy this situation, it is recommended that the video mode and the object mode each be given a distinct appearance so that it is obvious that they are "different worlds". These different looks could be something as simple as different frames around the focal points.

It also seems that the video controls and the video feature in general did not act as participants expected. To comply with student expectations, it may be more effective to play the video immediately, as soon as the video is found and summoned. In other words, start the video as soon as the student clicks on the person. It was also clear that many of the participants were unfamiliar with the symbols used on the video control buttons. Program designers might want to consider possible solutions such as the following:

- Add a fixed button label, such as "Play", "Stop", "Sound Level", beneath each of the respective buttons.
- If fixed button labels are not possible, add similar rollover labels.
- Add simple on-screen instructions for the video player such as "Click the *Play button* to play the video".

*Navigation Was Often a Source of Frustration for Participants*

Program designers might want to consider possible solutions such as the following:

- Make clearer depictions of the navigational icons. Try making arrows that have different affordances more distinct from one another. For instance, if

a type of arrow that represents a boundary is a necessary part of the program, make the symbol of a boundary more noticeable.

- Provide GUI feedback when an action is not possible. This is taken from the well-known interface design theory, that every action by the user should have a reaction by the program.

- There is a possibility that providing the participants with all the diagonal arrows may overload the participants with too many choices. Decrease the number of affordances so that it is not as confusing.

The version of Mystery of the Mission Museum that was tested was an early Beta version. Many of the boundaries exist because the depictions of the rooms and areas are not yet ready. Thus, most of navigation problems related to boundaries will not be present in future versions. Testing navigation problems out in a later version is suggested to see if this is the case.

*Only Participants With More Advanced Computer Skills Used The Map*

If possible make the map more colorful and attractive so users of all levels will notice it. Add distinctive landmark representations to the map that correspond to the real landmarks within the mission for visual cues. Because using the map seems to require a bit more experience, it may be a good idea to reserve any tasks that require map usage for later lessons.

*Participants Needed Prompting To Find And Move Objects*

Program designers might consider the following:

- Provide a docent tour or write on-screen instructions with a line or two of instructions about finding and moving objects.
- Provide more noticeable visual cues when the mouse rolls over objects.

**Question 3:** What cognitive process is the user going through? Does the users cognitive model of the product reflect the process of visiting a real museum?

- Improve navigation to facilitate exploration of the museum. This should result in the existing curiosity about objects in the museum to dominate the participant's thought processes. This new cognitive process will more closely parallel a visit to a real museum.

- Make changes in the cursor mode more obvious.

- Provide users with feedback to all actions. Currently, the product lacks corrective feedback to users when actions are not possible. Possibly use a "flash" on the screen.

- Increase the map's usefulness. The map needs to provide users with information they need, such as the names of rooms they are in, the direction they are going, or perhaps a record of where they have been.

- Differentiate between windows and doors more clearly. If this is impossible, providing negative feedback might accomplish the same thing.

- Consider providing something to satisfy the intense desire to go into the fields.

- Do not cut objects off, like the top of the flagpole.

**Question 4:** Design recommendations from users.

- Add more people.
- Make it easier to move around.
- Make the arrows bigger.
- "Fix" the map by adding houses and more color.
- Consider this interesting idea: One participant wanted to see the trail of her travels around the museum and then be able to make up a story about her adventure.

### Appendix A: Pretest Script

"Hi, my name is Cindy, and this is Caleb, Shari, and Mike. I'm going to read this to you just to make sure I tell you the same information that I tell all the other kids that do this with us. It will also keep me from forgetting anything important.

We're here to see what is easy and what is difficult about using the CD-ROM called the Mystery of the Mission Museum (hold up the CD-ROM). The Mystery of the Mission Museum, which we can call M3 for short (1 M for Mystery, 1 M for Mission, and 1 M for Museum), is for fourth grade students like you. This CD-ROM is not finished yet, and to make it the best it can be, before it is used in schools, we need your help.

You will be exploring M3 today. You are NOT being tested on how well you do at anything, but instead, you get to do the testing. You will be telling each other how easy it is or how hard is it for you to move, to find your way around, and to use M3 to help you fill out an Exploration Journal. While you explore, _____ and I will be sitting nearby taking some notes and Caleb and _____ will be videotaping. The reason we are videotaping is so that we can share what we all learn today with other people who are not here. Right now, Caleb is going to point out a few things about some of the equipment.

(Equipment Orientation)

We would like you to tell each other everything that comes to your mind about what you are doing. Every time you do something, tell each other why you are doing it and what you think is happening on the computer. If you have a question, try asking your partner first. If you still need help, then ask us.

You will each have a chance to be the Driver for 10 minutes and the Recorder for 10 minutes. The Driver controls the mouse and key board, and sits in that chair (point). The Recorder writes down what the two of you find in M3 in

your Exploration Journal (go over the Exploration Journal). The Recorder sits in that chair (point). We'll tell you when it's time to switch seats.

We want to thank you for volunteering to be our "kid experts".

Do you have any questions? Do you remember what the main thing is that we want you to do? (Tell each other what you are thinking)

Okay, now watch Caleb and I for two minutes. We will show you how we'd like you to test M3, as well as some ways to get around M3. (Go over panning, moving, and tracking location. Other navigation will only be given when they need it.)

After Co-discovery:

What would you do to improve M3?

What would make it easier for you?

Follow-up questions to clarify any expressions, behaviors, events

Thanks so much for testing M3 for us today. You've given us some great ideas to make M3 be the best it can be.

# Appendix B: Participant's Blank Exploration Log

| Name of the Room or Area | Name or Description of Objects in the Room or Area | Questions You Have About the Room or Area |
|---|---|---|
|  |  |  |

## Appendix C: Success Rates of Feature Interactions

| Feature Interaction (and number of participants) | Percentages | | "Intuitive"? (75% or higher) |
|---|---|---|---|
| | Without prompts or with a partner prompt | Needed prompt by evaluators | |
| Found a video (*n*=8) | 75 | 25 | Yes |
| Played a video (*n*=8) | 50 | 50 | No |
| Found the name of a video (*n*=5) | 100 | 0 | Yes |
| Found an object (*n*=8) | 50 | 50 | No |
| Moved an object (*n*=4) | 25 | 75 | No |
| Found the name of an object (*n*=4) | 75 | 25 | Yes |
| Found the name of a room (*n*=9) | 89 | 11 | Yes |

**Appendix D: Participants**

| Student Name Group Number | Gender | Age | Computer at Home? | Self-rating of Computer Skills | Activities done on the computer |
|---|---|---|---|---|---|
| Shaun, group 1 | M | 10 | PC | very good | researches, surf, music, games |
| Devon, group 1 | M | 9 | Mac | good | draw, surf, games |
| Danielle, group 2 | F | 9 | no | good | writes, researches, games |
| Dalia, group 2 | F | 9 | no | very good | writes, draws, music, games |
| Ariella, group 3 | F | 9 | no | good | writes, draws, games |
| Suzanna, group 3 | F | 9 | no | good | draws, games |
| Erica, group 4 | F | 10 | PC | good | writes, draws, games |
| Timmy, group 4 | M | 9 | Mac | just learning | surfs, games |
| Sasha, group 5 | F | 10 | PC | very good | draws, surfs and plays games |
| Brenda, group 5 | F | 9 | no | just learning | writes, games |

## Appendix E: First Forward Movement Times

| Driver Name and Group Number | Self-rating of Computer Skills | Time of first forward movement (minutes:seconds) |
|---|---|---|
| Shaun, group 1 | very good | 0:10 |
| Devon, group 1 | good | 1:02 |
| Danielle, group 2 | good | *4:27 |
| Dalia, group 2 | very good | 2:59 |
| Ariella, group 3 | good | 1:00 |
| Suzanna, group 3 | good | 2:25 |
| Erica, group 4 | good | 0:38 |
| Timmy, group 4 | just learning | 3:20 |
| Sasha, group 5 | very good | 0:20 |
| Brenda, group 5 | just learning | No record of a forward movement |
| **Average time it took for first forward movement** | | 2:22 |

*with experimenter prompt*

# Appendix F: Events Pertaining to a Participant's Mental Model

| Feature | Events | Time | Comments |
|---------|--------|------|----------|
| | | | |
| **Objects** | **30** | 0:35.42 | Horse hitch, Danielle, "wonder what they use that for" |
| | | 0:37.03 | Cots in Cuartel, Dalia, "wonder what that is" |
| | | 0:39.16 | Dalia, "that's cool" shield, Danielle, "I think that's a hat for them to wear" |
| | | 0:40.25 | Dalia, of shield, "looks like a map", Danielle, "it's a shield" |
| | | 1:05.05 | Suzanna, "is that a gun? To gun in scabbard |
| | | 1:05.31 | Ariella, "can't read that" south wall hanging |
| | | 1:06.04 | Both, "what's that?" about stocks |
| | | 1:06.31 | Ariella, "comfy or hard?" Suzanna, "hard" about beds wondered if made of wood in log |
| | | 1:09.09 | Ariella, "they're guns" about the fake gun butts |
| | | 1:12.42 | Ariella, "we know that's a gun" Suzanna, "that one" and points. |
| | | 1:12.50 | Suzanna, "that looks like a purse" Ariella, "is that a purse" |
| | | 1:13.03 | Ariella about little drawers by soldier, "looks like little drawers" Suzanna. "yeah" |
| | | 1:13.14 | Suzanna, "are those beds hard", Ariella, "lets get out of here and see what we can find" |
| | | 1:16.40 | Ariella about shield's inside graphic, "tells you about what state it is maybe" |
| | | 1:17.22 | Ariella, gets the front and back of the shield patters being related. |
| | | 1:30.55 | Erica "and we have a bed and a purse and leashes….and there's man" |
| | | 1:31.37 | Erica, 'there's a candle, lets see what else" |
| | | 1:31.51 | Timmy "looks like a pot" shield |
| | | 1:32.28 | Erica, bridle 'what do you think it is" |
| | | 1:32.55 | Erica, 'bridle 'it's a bow or something, I can't figure it out." |
| | | 1:33.30 | bridle Erica, "does it go down or up?" Timmy "nope" |
| | | 1:35.19 | Erica "Rawhide whip" |
| | | 1:35.49 | Erica "horse hair ropes" |
| | | 1:36.02 | Erica "leg chaps" |
| | | 1:36.12 | Erica "horse hair bridle" |
| | | 1:37.00 | Erica, "we'll try that again" goes into bridle object again. |
| | | 1:37.37 | Shield Timmy, found and moved |
| | | 1:37.56 | Erica, "it's a shell" |
| | | 1:38.45 | Erica, "it's black, can't see", Timmy, 'looks there's the name" re: purse object |
| | | 1:43.35 | both, "it's a bed" corporals bedroom, "see if there's a person in here" |
| | | | |
| **Navigation** | **27** | 0:13.17 | Devin, "have we been there?" North building |
| | | 0:15.15 | SHAWN POINTS TO WHERE SOLDIER WAS, "DOWN THERE" |
| | | 0:16.00 | ditto quote |
| | | 0:33.20 | |
| | | 0:33.45 | Danielle, "How do you go down the hallway", Dalia, "I have no idea" |
| | | 0:34.42 | Dalia, "Let's get inside" |
| | | 0:38.25 | Dalia, "what's that?" not pointing. Danielle, "A window", |
| | | 0:42.58 | corridor door off |
| | | 0:46.28 | |
| | | 0:46.45 | Corridor door off |
| | | 1:02.20 | Suzanna, "go out there" East field |

| | | | |
|---|---|---|---|
| | | 1:02.20 | big time on forward |
| | | 1:02.24 | Ariella, "it doesn't go there" |
| | | 1:03.40 | on forward, no see arrow. |
| | | 1:04.16 | Cindy "does anything happen when you go over the door with the man in it.?", |
| | | 1:10.00 | both "lets go somewhere else," "Lets go" and Suzanna "how about the bed?" |
| | | 1:13.51 | Suzanna, "can't go up" of flagpole |
| | | 1:14.43 | Ariella thinks middle door of south building is door out of the soldier's room |
| | | 1:33.33 | points to map and the red dot, then bridle, as if she had clue |
| | | 1:40.48 | Erica, "lets see if you can go straight" West soldier door boundary, |
| | | 1:41.39 | Timmy on field by corridor |
| | | 1:41.57 | Erica, "we're right there" |
| | | 1:42.53 | of north door boundary Erica, "can't go in there" Timmy, "lets see if there's a guy in there" |
| | | 1:55.36 | |
| | | 1:59.02 | Brenda whispers "It's a door, It's a door!" archway into the Shops corridor |
| | | 2:00.01 | Brenda "There's a door" Sasha "But we can't use it" upper shops corridor |
| | | 2:05.47 | Sasha "Do you want to go outside so we can see other places?" |
| | | | |
| Boundaries | 21 | 0:05.49 | Soldier Shawn: "looked like he wouldn't let us in" |
| | | 0:05.58 | South building |
| | | 0:09.23 | End of shops corridor |
| | | 0:21.17 | Cuartel West door |
| | | 0:21.24 | Cuartel North door |
| | | 0:32.29 | South field |
| | | 0:34.33 | West field |
| | | 0:34.40 | first corridor window |
| | | 0:35.29 | South field |
| | | 0:38.43 | Window |
| | | 0:43.10 | East field tree |
| | | 1:02.24 | East field |
| | | 1:14.19 | major south boundary clicking |
| | | 1:42.06 | East field and tree |
| | | 1:55.04 | Window front of Cuartel-west window |
| | | 1:56.52 | South Barn door |
| | | 1:58.08 | Cuartel NW door |
| | | 2:04.44 | weaving room window |
| | | 2:06.01 | Weaving room boundary. Heavy clicking |
| | | 2:06.30 | weaving window |
| | | 2:07.06 | different window, same room |
| | | | |
| Global | 10 | 0:34.34 | Dalia, "lot of acreage huh" West field |
| | | 0:36.32 | Dalia, "weird clothes" in Cuartel. |
| | | 0:36.37 | Danielle, didn't we see that in our mission book?" Cuartel guy |
| | | 1:03.05 | Ariella, "look how many windows it has" south barn |
| | | 1:03.14 | Suzanna, "looks like a flag" about flag pole. |
| | | 1:41.14 | Erica about flagpole, "lets see if it has a hand" |
| | | 1:42.19 | of east field 'maybe that's like a playground or something" smiling "I like that" |
| | | 1:44.57 | Erica, on back patio about oven "Oh, I saw that in a book about missions" |
| | | 1:45.22 | both, "there's wood, fire wood" back patio corridor |
| | | 1:56.26 | Sasha "Remember this?…" about the horse hitch |
| | | | |
| Room | 7 | 0:48.29 | Dalia, "Where people prayed" seeing door to majordomo's kitchen |

| | | | |
|---|---|---|---|
| | | 1:04.34 | "We're in" soldier's room |
| | | 1:05.57 | Suzanna, "is that a cage or something" about door bars |
| | | 1:43.25 | Erica "I think it's a kitchen" |
| | | 0:13.00 | Devon, about workbench "it's all messy and stuff" |
| | | 0:13.25 | Both, about jail "It's a cell" |
| | | 0:13.25 | Devin "I told you they had a fight!" |
| | | | |
| **Map** | **5** | 0:13.17 | Devin, "have we been there?" North building |
| | | 0:15.15 | SHAWN POINTS TO WHERE SOLDIER WAS, "DOWN THERE" |
| | | 0:16.00 | ditto quote |
| | | 1:33.33 | points to map and the red dot, then bridle, as if she had clue |
| | | 1:41.57 | Erica, "we're right there" |
| | | | |
| **Video** | **3** | 1:01.56 | Suzanna, "look at his clothes" for soldier and "boots" |
| | | 1:31.36 | Timmy, "wonder what he is, he's a soldier" |
| | | 1:34.40 | Erica, "does this thing want to talk?" of soldier |

# Appendix G: Participants design recommendations

| Question | Incidents | Time | Comments |
|---|---|---|---|
| How to improve? | 14 | 0:22.10 | Improve? Recommendations? Devon "Fix it up." |
| | | | How? Shawn "Add more stuff." |
| | | | What kind of stuff? Devon "More people." |
| | | | Favorite part people? Devon "Yes" |
| | | 0:52.04 | improve, Dalia, more doors to get into…, more doors in soldiers room |
| | | 0:52.54 | What else? Dalia, "more people" |
| | | 0:53.11 | Both, "make the arrows more easier"*** |
| | | 0:53.30 | What do to arrows?, Dalia, "You don't have to press the arrows to make is push more… |
| | | 0:54.37 | Danielle, "if you just clicked it once it would just go like this…" |
| | | 1:18.18 | what you change to make easier Ariella, something about arrow, |
| | | 1:19.17 | Suzanna, "more rooms" |
| | | 1:46.30 | Improve? Erica "first see what we did and saw and try and make up story" |
| | | 1:47.06 | Improve again, Erica, "I would put some more people", |
| | | 2:10.54 | Improve, make it better? Sasha "Painting it?" Cindy, |
| | | | |
| What was easy or hard? | 7 | | Moving around? Devon "It was hard to stay in the screen." |
| | | | Easier? Shawn "bigger screen" |
| | | 0:53.21 | Danielle, "hard to control mouse" |
| | | 1:18.18 | easier, hard? Think back Suzanna. "hard to get in doors" Ariella agrees |
| | | 1:20.05 | Ariella "we wanted to go straight but we couldn't" |
| | | 1:20.36 | video hard? Ariella, "it was going fast and we couldn't stop it" |
| | | 1:47.28 | video, both "easy" to use |
| | | | |
| What about the map? | 5 | | Map help? Shawn "yes" |
| | | 2:12.05 | Caleb, "Map? Sasha, " It was perfect right there |
| | | 2:12.22 | Caleb, "Map better? Sasha, " Maybe more color in it?" |
| | | 2:12.39 | Sasha "Maybe you should put houses on the map so we know where we want to go." |
| | | 2:13.10 | Sasha, "If they showed the whole picture in the computer, |

# Appendix H: Participant's positive comments

| Category | Incidents | Time | Comments |
|----------|-----------|------|----------|
| General | 6 | 0:48.05 | Dalia "So beautiful" on patio |
| | | 0:34.11 | Dalia, "so beautiful" |
| | | 0:21.48 | Did you like it? Devon "it was cool, till it started getting blinking" speaking of the buggy videos |
| | | 0:54.02 | Learn, "yes…cool that' it's still standing cause it was a long time ago" |
| | | | What else helped you figure out where you were? Devon "The names" |
| | | 1:18.15 | good teaching tool? "Yes" |
| | | | |
| Objects | 3 | 0:20:19 | Devon "Cool!" about... not real guns |
| | | 0:39.16 | Dalia, "that's cool" shield, Danielle, "I think that's a hat for them to wear" |
| | | 0:41.44 | Nice pouch |
| | | | |
| Videos | 3 | 0:07.40 | Spinner on bench Devin: "Cool" |
| | | 0:11.20 | Spinner in weaving room, Devin, "it's spinning, cool, I like it, what's that" about cord |
| | | Group 1 post | Favorite part people? Devon "Yes" |

*Table 5: Participants positive comments*

# Appendix I: Event Code Key

| Code Key | | | | |
|---|---|---|---|---|
| Codes | | | | Definitions |
| | | | | |
| OBJ | | | | |
| | FND | | | Found object |
| | FND | PMT | | Found object after prompt from experiementer |
| | FND | PAR | PMT | Found object after prompt from partner |
| | MOV | | | Moved object |
| | MOV | PMT | | Moved object after prompt by experimenter |
| VID | | | | |
| | FND | | | Found video |
| | FND | PMT | | Found video after prompt by experimenter |
| | FND | PAR | PMT | Found video after prompt by partner |
| | FND | PLY | | Found video and played it unprompted |
| | PLY | | | Played video |
| | PLY | PMT | | Played video after prompt by experimenter |
| | PLY | PAR | PMT | Played video after prompt by partner |
| | No PLY | No PMT | | Found video, didn't play, weren't promted |
| NAM | | | | |
| | ROM | FND | | Found the name of a room |
| | ROM | FND | PMT | Found the name of a room after prompt by experimenter |
| | ROM | PMT | | Were prompted but didn't find the name of the room |
| NAM | | | | |
| | OBJ | FND | | Found the name of an object |
| | OBJ | FND | PMT | Found the name of an object with prompt by experimenter |
| NAM | | | | |
| | VID | FND | | Found the name of a video |
| | VID | FND | PMT | Found the name of a video with prompt by experimenter |
| NAV | | | | |
| | FWD | | | Moved forward |
| | FWD | PMT | | Moved forward with prompt by experimenter |
| | FWD | Click off arrow | | Clicked forward when there was no arrow |
| | FWD | Click and hold | | Clicked on forward arrow, but didn't let go and didn't go forward |
| | FWD | IMP | | Clicked on forward arrow, and let go, but didn't wait long enough |
| | FWD | BND | | Clicked on a door, window or other boundry |
| | PMT | | | Gereral prompt about navigation |
| NAV | | | | |
| | PAN | | | Panned without a prompt |
| | PAN | PMT | | Promted to pan |
| | | Slow | | Pannned slow because off center |
| | | Angle down | | Panned slow because angled down |
| NAV | | | | |
| | MAP | | | Noticed the map but did not use |
| | MAP | Used | | Noticed the map and used it |
| COM | | | | General comment |

| | | | | |
|---|---|---|---|---|
| | PMT | | | Comment that's a prompt by experimenter |
| | PAR | PMT | | Comment that's a prompt by partner |
| DES | | | | Design comment in post test retrospective interview |

### Appendix J: Data

| Participants | Code | Time | Notes |
|---|---|---|---|
| Group #1 | Start Group 1 | 0:05.27 | Shawn drives, Devon records |
| Devon-AA | NAV FWD | 0:05.37 | |
| Writer, talker | NAV PAN | 0:05.40 | |
| | COM | 0:05.49 | Soldier Shawn: "looked like he wouldn't let us in." |
| Shawn-Hispanic | NAV FWD BND | 0:05.58 | South building. |
| great navigator | NAM ROM FND | 0:06.21 | |
| | OBJ FND | 0:07.06 | |
| | COM | 0:07.17 | Re: Spinner on bench Devon: "What do you think she is doing." |
| | VID FND | 0:07.17 | simultaneously, while Devon talks. |
| | NAM VID FND | 0:07.18 | Spinning Thread. |
| | VID PLY | 0:07.19 | |
| | | | |
| | COM | 0:07.40 | Spinner on bench Devon: "Cool." |
| | COM | 0:08.02 | Spinner on bench Devon: "Is it supposed to strech like that." |
| | NAV FWD BND | 0:09.23 | End of shops corridor. |
| | COM | 0:11.20 | Spinner in weaving room, Devon, "it's spinning, cool, I like it, what's that?" to cord. |
| | COM | 0:11.39 | Shawn: "Piece of cotton..I.see." |
| | COM | 0:11.42 | Devon: "Could be a sock or something." |
| | COM | 0:12.32 | Devon: "Did you already go into the room", Shawn, "No", Devon: "Weird." |
| | COM | 0:13.00 | Devon, about workbench "it's all messy and stuff" |
| | COM | 0:13.05 | Devon, about workbench "Looks like they had a fight", Shawn "they must sell tools." |
| | NAV MAP Used | 0:13.17 | Devon: "have we been there?" North building. |
| | COM | 0:13.25 | Both: about jail "It's a cell." |
| | COM | 0:13.25 | Devon: "I told you they had a fight!" |
| | Switched roles | 0:14.38 | Devon: drives, Shawn records |
| | NAV PAN | 0:14:40 | |
| | NAM ROM FND | 0:14.15 | |
| | NAV FWD | 0:15:40 | |
| | COM | 0:15.11 | Shawn " Try going in that room where the soldier was." |
| | NAV MAP Used | 0:15.15 | Shawn points to where the soldier was, "down there." |
| | NAV MAP Used | 0:16.00 | Ditto quote |
| | COM | 0:16.06 | Devon: "I thought that was a door." Shawn "Me too." Pointing to a window in shops corredor. |
| | NAV PAN Slow | 0:16.21 | |
| | COM | 0:16.32 | Shawn: "Just turn around a lil bit more, there you go, down the hall." |
| | COM | 0:16:39 | North Shops Corredor, trying to find the soldier, Shawn "Now you can talk to the soldier." Devon: " I know, huh?!" |
| | COM | 0:17.07 | Devon "Is it up here?" Mid shops corredor, Shawn: "Just keep going down the hall…" |

| Participants | Code | Time | Notes |
|---|---|---|---|
| | NAV PAN Slow | 0:17.28 | |
| | COM | 0:17.32 | Devon: "Do you think its around here?" S. corner; Shawn "Yeah, it was where that door was." |
| | NAV PAN Slow | 0:17.56 | |
| | COM | 0:18.18 | Devon "Oh that's the time on the Father Time Clock and Stuff. Number 1, #2, #3 ..." pointing at numbers on wall in Cuartel. |
| | OBJ FND PMT | 0:18.37 | stocks |
| | COM | 0:18.44 | Devon "Isn't that where they put the slaves in? You know what I'm talking about?" |
| | COM | 0:19.23 | Shawn "Talk to the guy." speaking of the soldier |
| | VID PLY PAR PMT | 0:19.39 | Soldier Story |
| | COM | 0:20:19 | Devon "Cool!" about... not real guns |
| | NAM VID FND | 0:20.26 | Soldier's story |
| | NAV FWD BND | 0:21.17 | Cuartel West door |
| | NAV FWD BND | 0:21.24 | Cuartel North door |
| | COM | 0:21.36 | Shawn "That's probably the rifle he was talking about." |
| | End Co-discovery | 0:21.39 | |
| | DES | 0:21.48 | Did you like it? Devon "it was cool, til it started getting blinking" speaking of the |
| | DES | 0:22.10 | Improve? Recommendations? Devon "Fix it up." |
| | DES | | How? Shawn "Add more stuff." |
| | DES | | What kind of stuff? Devon "More people." |
| | DES | | Favorite part people? Devon "Yes" |
| | DES | | Moving around? Devon "It was hard to stay in the screen." |
| | DES | | Map help? Shawn "yes" |
| | DES | | What else helped you figure out where you were? Devon "The names" |
| | DES | | Easier? Shawn "bigger screen" |
| | End Group 1 test | 0:23.44 | |
| Group 1 Student Exploration Log | | | |
| | Name of the Room or Area | | Name or Description of Objects in the Room or Area |
| | Shops Corredor | | Spinning Thread |
| | Weaving Room | | Hammer |
| | Carpenters Shop | | |
| | Caurtel | | Stock Soldiers stuff |
| Group #2 | Start Group 2 | 0:31.39 | Danielle drives, Dalia records |
| Danielle | NAM OBJ FND | 0:31.48 | Danielle, "shops corridor" |
| littler | COM | 0:31.51 | Dalia, "lets move" |
| | NAV PAN | 0:31.51 | |
| Dalia | NAV PAN Slow | 0:31.58 | Left south field |
| bigger | COM | 0:32.00 | Both, "Pole or a flag?" South flag pole, "I think it's a flag." |
| | NAV FWD BND | 0:32.29 | South field |
| | COM | 0:32.34 | Dalia, "Lets go back where we were at" |
| | NAV FWD IMP | 0:33.05 | Beginning corridor |
| | COM | 0:33.11 | Dalia, "what if we go this way, we may see something"; after Danielle turns to corridor, "there's a hallway" |
| | NAV FWD IMP, click and hold | 0:33.20 | |
| | COM | 0:33.45 | Danielle, "How do you go down the hallway", Dalia, "I have no idea" |
| | NAV FWD PMT | 0:34.06 | corridor |

| Participants | Code | Time | Notes |
|---|---|---|---|
| | COM | 0:34.11 | Dalia, "so beautiful" |
| | COM | 0:34.17 | Recognizes title of Mission at top of screen |
| | NAV FWD BND | 0:34.33 | West field |
| | COM | 0:34.34 | Dalia, "lot of acreage huh" West field |
| | NAV FWD BND | 0:34.40 | first corridor window |
| | COM | 0:34.42 | Dalia, "Let's get inside" |
| | NAV FWD IMP | 0:35.00 | |
| | NAV FWD PMT | 0:35.05 | Arrow works yet?, both, yes |
| | COM | 0:35.13 | Dalia, "Lets try and get in the building" |
| | NAV FWD BND | 0:35.29 | South field |
| | COM | 0:35.42 | Horst hitch, Danielle, "wonder what they use that for" |
| | NAV FWD BND | 0:35.52 | |
| | NAV PAN Slow | 0:35.55 | |
| | COM | 0:36.32 | Dalie, "weird clothes" in Caurtel. |
| | COM | 0:36.37 | Danielle, didn't we see that in our mission book?" Cuartel guy |
| | NAV PAN Slow | 0:36.43 | |
| | COM | 0:37.03 | Cots in caurtel, Dalia, "wonder what that is" |
| | COM | 0:37.05 | "try to get through there", Cuartel, north east door. |
| | COM | 0:37.42 | Danielle, "lets go back in there" |
| | COM | 0:37.46 | Dalia, "or we try to go into another room" |
| | NAV PAN Slow | 0:38.18 | |
| | COM | 0:38.25 | Dalia, "what's that?" not pointing. Danielle, "A window"; Dalia, No that?" the wall hanging in South Caurtel. |
| | NAV FWD BND | 0:38.43 | Window |
| | OBJ FND PMT | 0:39.10 | Shield |
| | NAM OBJ FND | 0:39.13 | Shield |
| | COM | 0:39.16 | Dalia, "that's cool" shield, Danielle, "I think that's a hat for them to wear" |
| | OBJ MOV PMT | 0:39.21 | |
| | COM | 0:39.32 | Dalia, "the person's moving it" |
| | Switched roles | 0:39.54 | Dalia, drives Danielle records |
| | COM | 0:40.25 | Dalia, of shield, "looks like a map", Danielle, "it's a shield" |
| | COM | 0:40.32 | Dalia, "do we hit 'done' to get out" of shield object; Danielle, "I think press done and see what happens" |
| | OBJ FND | 0:40.48 | Leggings |
| | OBJ FND PAR PMT | 0:41.25 | pouch, danielle |
| | NAM OBJ FND | 0:41.29 | pouch, danielle |
| | OBJ MOV | 0:41.39 | |
| | COM | 0:41.44 | Nice pouch |
| | VID FND NO ply, no pmt | 0:42.00 | Soldier |
| | NAV FWD | 0:42.53 | corridor |
| | NAV FWD click off arrow | 0:42.58 | coriddor door off |
| | NAV FWD BND | 0:43.10 | East field tree |
| | NAM ROM FND | 0:43.22 | Shops corridor |
| | COM | 0:43.53 | both "hard to move" prompted with how easy? |
| | COM | 0:44.55 | Dalia, "Trying to get past this" corridor start south |
| | COM | 0:44.58 | Danielle "go back to solider to get in room" |
| | OBJ FND | 0:45.23 | Bridle |
| | COM | 0:45.42 | Can we get out this room |
| | COM | 0:45.57 | promted to go to hall. |

| Participants | Code | Time | Notes |
|---|---|---|---|
| | NAV FWD IMP | 0:46.28 | |
| | NAV FWD click off arrow | 0:46.45 | coriddor door off |
| | NAV FWD PMT | 0:47.00 | Shari, prompt walk hall up the hall at first corridor, they pass first door, don't grasp the concept |
| | COM | 0:47.55 | "Oh yes" found Majordomos |
| | COM | 0:48.05 | Dalia "So beautiful" on patio |
| | COM | 0:48.29 | Dalia, "Where people prayed" seeing door to mayordomo's kitchen |
| | NAM ROM FND | 0:48.49 | M, Kitchen |
| | VID FND No PLY, No PMT | 0:48.53 | kitchen, leaves kitchen, prompted, goes back and finds it! |
| | VID PLY PMT | 0:50.23 | MAJOR PROMPT |
| | NAM VID FND | 0:50.48 | m, story |
| | End Co-discovery | 0:51.27 | |
| | DES | 0:52.04 | improve, Dalia, more doors to get into…, more doors in soldiers room |
| | DES | 0:52.54 | What else? Dalia, "more people" |
| | DES | 0:53.11 | Both, "make the arrows more easyier"*** |
| | DES | 0:53.21 | Danielle, "hard to control mouse" |
| | DES | 0:53.30 | What do to arrows?, Dalia, "You don't have to press the arrows to make is push more…just move the mouse…just click once and then go up. |
| | DES | 0:54.02 | Learn, "yes…cool that' it's still standing cause it was a long time ago" |
| | DES | 0:54.37 | Danielle, "if you just clicked it once it would just go like this…" |
| | End Group 2 test | 0:55.56 | |
| Group 2 Student Exploration Log | | | |
| | Name of the Room or Area | | Name or Description of Objects in the Room or Area |
| | Cuartel | | Shield, Legging, Pouch |
| | Mayordom's Kitchen | | The Mayordoms story |
| Group #3 | Start Group 3 | 1:00.27 | Ariella drove , and Suzanna records |
| Ariella | COM | 1:00.34 | both, read title, "mystery of the mission museam" |
| smaller dark hair | COM | 1:00.57 | both read title "mission la purisma" |
| | NAM ROM FND | 1:01.02 | Shops corridor opening scene |
| Suzanna | COM PAR PMT | 1:01.05 | Suzanna, "click on it" for shops corridor text |
| shorter short hair. | NAV FWD | 1:01.27 | |
| | COM | 1:01.35 | Suzanna, "see if you can move forward" at front of cuartel |
| | COM | 1:01.56 | Suzanna, "look at his clothes" for soldier and "boots" |
| | COM PAR PMT | 1:02.20 | Suzanna, "go out there" East field |
| | NAV FWD Click and hold | 1:02.20 | big time on forward |
| | NAV FWD BND | 1:02.24 | East field |
| | COM | 1:02.24 | Ariella, "it doesn't go there" |
| | COM | 1:03.05 | Ariella, "look how many windows it has" south barn |
| | COM | 1:03.14 | Suzanna, "looks like a flag" about flag pole. |
| | NAV FWD Click and hold | 1:03.40 | on forward, no see arrow. |
| | COM | 1:04.12 | Ariella, You see we're just going around" in frong of Cuartel |

| Participants | Code | Time | Notes |
|---|---|---|---|
| | NAV FWD PMT | 1:04.16 | Cindy "does anything happen when you go over the door with the man in it.?", Ariella did it and said, "No" |
| | NAV FWD PMT | 1:04.27 | Shari Blatend mouse prompt, they get in |
| | COM | 1:04.34 | "We're in" soldier's room |
| | NAV PMT | 1:05.03 | shari, about mouse again |
| | COM | 1:05.05 | Suzanna, "is that a gun? To gun in scabord |
| | COM PAR PMT | 1:05.20 | Suzanna, "go through that door" about East door in soldier room |
| | COM | 1:05.31 | Ariella, "can't read that" south wall hanging |
| | NAV PAN PMT | 1:05.43 | anti slow pan promt |
| | COM | 1:05.57 | Suz, "is that a cage or something" about door bars |
| | COM | 1:06.04 | Both, "what's that?" about stocks |
| | COM | 1:06.16 | Ariella, "strange" about doors |
| | COM | 1:06.31 | Ariella, "comphy or hard?" Suz, "hard" about beds wondered if made of wood in log |
| | NAM ROM FND | 1:06.40 | Caurtel |
| | VID FND | 1:06.43 | soldier video |
| | NAM VID FND | 1:06.47 | video name |
| | VID PLY PMT | 1:06.58 | use wrong slider buttons at first but then got it with another prompt |
| | COM | 1:09.09 | Ariella, "they're guns" about the fake gun butts |
| | COM PAR PMT | 1:09.38 | Suz, "click done" |
| | Switched roles | 1:09.55 | Suzanna drives, Ariella, records |
| | COM | 1:10.00 | both "lets go somewhere else," "Lets go" and Suzanna "how about the bed?" |
| | COM PAR PMT | 1:10.11 | Ariella, "how about that door" north east door again |
| | COM PAR PMT | 1:10.33 | Ariella, "bo back, go back, I saw a hand somewhere" |
| | COM PAR PMT | 1:10.50 | Ariella, "how about that door" north west door |
| | COM PAR PMT | 1:11.07 | Ariella, "how about that door" north door |
| | NAV PAN Slow | 1:11.29 | big one |
| | COM PAR PMT | 1:11.46 | Grabs mouse, gets out of room |
| | COM PAR PMT | 1:12.10 | Let go back to the man, repeated. "click the arrow" "right there" she gets the arrow |
| | NAV FWD IMP | 1:12.20 | on man |
| | COM | 1:12.42 | Ariella, "we know that's a gun" Suz, "that one" and points |
| | COM | 1:12.50 | Suz, "that looks like a purse" Arella, "is that a purse", yadda |
| | COM | 1:13.03 | Ariella about little drawrs by soldier, "looks like little drawrs" suz. "yeah" |
| | COM | 1:13.14 | Suz, "are those beds hard", Ariella, "lets get out of here and see what we can find" |
| | COM | 1:13.51 | Suz, "can't go up" of flagpole |
| | NAV FWD BND | 1:14.19 | major south boundry clicking |
| | COM | 1:14.43 | Ariella thinks middle door of south building is door out of the soldier's room |
| | COM | 1:15.02 | Ariella "I'd like to go out there in front"; Suz, No you can't go out there; Ariella "I know" F. Cuartel |
| | COM | 1:15.45 | Suz, "lets go in the door" again, the north east door of soldiers room. |
| | OBJ FND PMT | 1:16.22 | Shield |
| | OBJ MOV PMT | 1:16.30 | Shield |
| | COM | 1:16.40 | Ariella about shield's inside graphic, "tells you about what state it is maybe" |
| | COM | 1:17.22 | Ariella, gets the front and back of the shield patters being |

| Participants | Code | Time | Notes |
|---|---|---|---|
| | | | related. |
| | End Co-discovery | 1:17.26 | |
| | DES | 1:18.15 | good teaching tool? "Yes" |
| | DES | 1:18.18 | easyier, hard? Think back Suz. "hard to get in doors" Ariella agrees |
| | DES | 1:18.18 | what you change to make easier Ariella, something about arrow, "see what it is and click on it" |
| | DES | 1:19.17 | Suz, "more rooms" |
| | DES | 1:20.05 | Ariella "we wanted to go straight but we couldn't" |
| | DES | 1:20.36 | video hard? Ariella, "it was going fast and we couldn't stop it" |
| | End Group 3 test | 1:20.50 | |
| Group 3 Student Exploration Log | | | |
| | Name of the Room or Area | | Objects Name, Des |
| | Cuartel | | Guns, leg chaps |
| Group #4 | Start Group 4 | 1:29.45 | Erica's driving, Timmy recorder |
| Erica | NAV FWD | 1:30.23 | |
| Dregs | NAV PAN | 1:30.36 | |
| | COM | 1:30.39 | Erica "There's the first room, we can go forward |
| Timmy | COM | 1:30.55 | erica "and we have a bed and a purse and leashes….and there's man" |
| Mexiasian | COM | 1:31.36 | timmy, "wonder what he is, he's a soldier" |
| | COM | 1:31.37 | erica, 'there's a candle, lets see what else' |
| | COM | 1:31.51 | timmy "looks like a pot" shield |
| | OBJ FND PMT | 1:32.12 | Bridle |
| | COM | 1:32.28 | erica, 'what do you think it is" |
| | OBJ MOV PMT | 1:32.34 | bridle |
| | COM | 1:32.55 | erica, ''it's a bow or something, I can't figure it out." |
| | COM | 1:33.30 | erica, "does it go down or up?" timmy "nope" |
| | NAV MAP | 1:33.33 | points to map and the red dot, then bridle, as if she had clue |
| | COM | 1:33.50 | erica, "can we go somewhere else" thinks she's in the program, not the object |
| | COM PMT | 1:33.59 | Cindy, "click done" |
| | VID FND PMT | 1:34.24 | soldier |
| | COM | 1:34.40 | erica, "does this think want to talk?" of soldier |
| | NAM VID FND | 1:34.40 | erica, "soldier's story" |
| | VID PLY PMT | 1:35.01 | soldier video |
| | COM | 1:35.19 | erica "Rawhide whip" |
| | COM | 1:35.49 | erica "horse hair ropes" |
| | COM | 1:36.02 | erica "leg chaps" |
| | COM | 1:36.12 | erica "horse hair bridle" |
| | COM | 1:37.00 | erica, "we'll try that again" goes into bridle object again. |
| | | | |
| | Switched roles | 1:37.35 | Timmy drives, Erica recorder |
| | OBJ FND MOV | 1:37.37 | Shield timmy, found and moved |
| | COM | 1:37.56 | Erica, "it's a shell" |
| | NAM OBJ FND PMT | 1:38.15 | Shield |
| | NAM ROM PMT | | no write, but prompted |
| | COM | 1:38.45 | Erica, "it's black, can't see", timmy, 'looks there's the name' re: purse object |
| | VID PLY PAR PMT | 1:39.15 | erica, prompts timmy to play soldier video |
| | COM | 1:40.48 | erica, "lets see if you can go straight" West soldier door |

| Participants | Code | Time | Notes |
|---|---|---|---|
| | | | boundry, and "Oh, lets see if they have like a hand in here" about the stocks |
| | NAV FWD | 1:40.55 | Exit soldier room |
| | COM | 1:41.14 | erica about flagpole, "lets see if it has a hand" |
| | COM | 1:41.24 | erica "that's the one we saw" about corridor door, thinking it's the soldier door |
| | NAV FWD Click off arrow | 1:41.39 | timmy on field by corridor |
| | NAM ROM FND | 1:41.51 | timmy "shops corridor" on second click forward |
| | NAV MAP Used | 1:41.57 | erica, "we're right there" |
| | NAV FWD BND | 1:42.06 | East field and tree |
| | COM | 1:42.19 | of east field 'maybe that's like a playground or something" smiling "I like that" |
| | COM PAR PMT | 1:42.41 | cindy and erica prompt timmy to turn and find Corporal's kitchen |
| | COM | 1:42.53 | of north door bndry erica, "can't go in there" timmy, "lets see if there's a guy in there" |
| | COM | 1:43.25 | erica "I think it's a kitchen" |
| | NAV PAN Slow, angle | 1:43.25 | global thing |
| | COM | 1:43.35 | both, "it's a bed" corporals bedroom, "see if there's a person in here" |
| | COM | 1:44.33 | "can't go there" on same door |
| | COM | 1:44.57 | erica, on back patio about oven "Oh, I saw that in a book about missions" |
| | COM | 1:45.22 | both, "there's wood, fire wood" back patio corridor |
| | NAM ROM FND | 1:45.45 | erica "master's weavers kitchen" |
| | COM PMT | 1:45.46 | Cindy, "wait for it to turn black. Remember to look for fat arrow." |
| | End Co-discovery | 1:46.10 | |
| | DES | 1:46.30 | Improve? Erica "first see what we did and saw and try and make up story" |
| | DES | 1:47.06 | Improve again, erica, "I would put some more people". Favorite part people? Both, "yeah" erica, "because they could talk and explain" |
| | DES | 1:47.28 | video, both "easy" to use; Map "cool", better "bigger" |
| | DES | 1:48.01 | Erica We tried to get into the rooms, but couldn't because sometimes there was no arrow." |
| | End Group 4 test | 1:48.44 | |
| Group 4 Student Exploration Log | | | |
| | Name of the Room or Area | | Name or Description of Objects in the Room or Area |
| | bedroom kitchen outside | | bed, leashes browle hide wip hourse hair firewood shield to protect |
| | | | pouch rohide cooking pot |
| Group #5 | Start Group 5 | 1:54.30 | Sasha is driving, Brenda is recorder |
| | NAV FWD | 1:54.50 | |
| | NAV FWD BND | 1:55.04 | Window front of Cuartel-west window |
| | NAV FWD click off arrow | 1:55.36 | |
| | COM | 1:56.26 | Sasha "Remember this?…" about the horse hitch |
| | NAV PAN Slow | 1:56.34 | Global |
| | NAV FWD BND | 1:56.52 | South Barn door |

| Participants | Code | Time | Notes |
|---|---|---|---|
| | NAV PAN Slow | 1:57.13 | |
| | NAV PAN Slow | 1:57.37 | |
| | NAV FWD BND | 1:58.08 | Caurtel NW door |
| | COM | 1:59.02 | Brenda whispers "It's a door, It's a door!" archway into the Shops corridor |
| | COM | 1:59.23 | Sasha turns to ask Cindy, "Can you go forward?" |
| | NAV FWD PMT | 1:59.33 | Cindy answers "Sometimes you have to be patient with it and |
| | COM | 2:00.01 | Brenda "There's a door" Sasha "But we can't use it" upper shops corridor |
| | VID FND PMT | 2:01.07 | weaving video |
| | VID PLY PMT | 2:01.37 | |
| | | | |
| | Switched roles | 2:04.01 | Brenda's driving, Sasha is recorder |
| | NAV PAN Slow | 2:04.15 | |
| | NAV FWD BND | 2:04.44 | weaving rm window |
| | VID FND | 2:04.49 | weaving vid again, didn't play it though |
| | COM | 2:05.47 | Sasha "Do you want to go outside so we can see other places?" |
| | NAV FWD BND | 2:06.01 | Weaving rm bound. Heavy clickage |
| | NAV PAN Slow | 2:06.30 | |
| | NAV FWD BND | 2:06.30 | weaving window |
| | NAV PAN Slow | 2:07.06 | |
| | NAV FWD BND | 2:07.06 | different window, same room |
| | VID FND PAR PMT | 2:08.34 | Spinning thread vid, Sasha prompts |
| | VID PLY PAR PMT | 2:08.34 | |
| | End Co-discovery | 2:10.25 | |
| | DES | 2:10.54 | Improve, make it better? Sasha "Painting it?" Cindy, you mean putting more color in it? Sasha "yeah, because the inside it looks more grayish" |
| | DES | 2:11:11 | Cindy, "How bout the arrows? How would you make them better? Easier for you? |
| | DES | 2:12.05 | Caleb, "Map? Sasha, " It was perfect right there because it probably told us where we wanted to go." |
| | DES | 2:12.22 | Caleb, "Map better? Sasha, " Maybe more color in it?" |
| | DES | 2:12.39 | Sasha "Maybe you should put houses on the map so we know where we want to go." |
| | DES | 2:13.10 | Sasha, "If they showed the whole pic in the computer, maybe it wouldn't be so hard with the names." |
| | End Group 5 test | 2:13:28 | |
| Group 5 Student Exploration Log | | | |
| | Name of the Room or Area | | Name or Description of Objects in the Room or Area |
| | | | There was a loom where one landy was weaving. And there was a man he was using spinning thread |

END OF FILE