Watch Mushrooms Grow
Lisa Sindorf
East Gallery - Formative Evaluation
February 2011

THIS IS NOT A DEFINITIVE FINAL 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
Watch Mushrooms Grow
Lisa Sindorf
February 2011

Summary:
This formative evaluation found:

- A majority (19/22) of the visitors we interviewed were interested in watching the mushrooms grow. Almost all (20/22) looked at both the time-lapse video and the live mushrooms. Some visitors noticed and commented on the rapid growth (13/22) and changing appearance (7/22) of the mushrooms.
- However, visitors’ comments seem to indicate that some visitors (7/22) were confused about the mushrooms’ growth medium (the block of sawdust and mycelium): they wondered what it is, even after attempting to infer its composition from the label.
- Although almost everyone (21/22) was able to use the spin browser to navigate the full length of the time-lapse, a few (2/22) visitors, the younger ones, were unsure of the connection between the live mushrooms in the orb and the time-lapse video.
- A few others (4/22) wonder about the parts of the mushrooms’ lifespan—past and future—that cannot be seen in the accompanying time-lapse video.
- Some (7/22) visitors expressed interest in growing or eating mushrooms at home.
- A third of the interviewed visitors noticed the QR code without prompting. No visitors reported finding it confusing, but only about half had any idea of what it might be.

Based on these findings, we will make some changes to the label to support visitors’ interests and clarify confusing elements.
Background

This report looks at a prototype for the exhibit *Watch Mushrooms Grow*. The exhibit features live mushrooms growing from a sawdust and mycelium block, inside a protective globe, along with a time-lapse video of the mushrooms’ growth that visitors can navigate via a spin browser.

![Watch Mushrooms Grow exhibit](image)

*Figure 1. Watch Mushrooms Grow exhibit*

Goals

The goals for this evaluation are:

- Regarding the **exhibit experience**, to determine whether this exhibit supports observation, and what kind of observation. For example, what features of the mushrooms do visitors notice? Where do they look to see the mushrooms?
- For the **labels**, to learn whether the content of the labels is clear and interesting. Specifically, to learn whether any information is confusing or missing; if there is interest in growing mushrooms at home; and if visitors know that the water vapor is not hot.
• To look at one label in particular, which used a **QR code**—a black and white square of pixels similar to a barcode—to determine whether visitors find the QR code interesting or confusing.

• Last, for the interface, to check the overall usability of the **spin browser**.

![Figure 2. Close up of QR Code label and placement](image)

**Methods**

An evaluator selected and approached every third visitor who crossed an invisible line near the exhibit, and who appeared to be over 8 years old\(^1\). The evaluator asked the visitor to use the exhibit for as long as he or she wanted to. When the visitor finished, the evaluator asked him or her some questions about the experience. The interview questions can be found in Appendix A.

**Participants**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Count (N =22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>11 (50%)</td>
</tr>
<tr>
<td>F</td>
<td>11 (50%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Count (N =22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child (8-18)</td>
<td>9 (41%)</td>
</tr>
<tr>
<td>Adult</td>
<td>13 (59%)</td>
</tr>
</tbody>
</table>

\(^1\) If the visitor was a minor, we asked the accompanying guardian for permission to talk with the child.
Findings

What did visitors notice about the mushrooms?
Almost all visitors (20/22) were observed looking at the live mushrooms in the orb as well as the time-lapse video. The other two visitors looked at the video but were not observed to look at the live mushrooms.

During the interview, visitors were asked to describe what they noticed while using the exhibit, as well as what was new or unexpected about the exhibit. Two features of the mushrooms were often mentioned by visitors:

• The surprising speed of the growth:
A majority of the visitors (13/22, 59%) used the clock and calendar information to evaluate the speed of the mushrooms’ growth, which they found surprising. For example:
  Visitor 4: I finally figured out that there's a clock there. You can see how long it takes to grow that much. Just 3 days! I could track the time. It's more than just spinning it.
  Visitor 19: I'm surprised it took only that many days. It's only a short time. Most plants take months to grow
  Visitor 5: It doesn't take as long as you think. They get big faster at the end. The speed of growth went up. Or maybe that's just how we turned it.

• How the mushrooms changed as they grew:
A few visitors (8/22 visitors, 36%) noticed the mushrooms not only got bigger, but changed in other ways as well:
  - Color (2 visitors), e.g.
    Visitor 19: The mushroom got bigger and whiter. Now (at the beginning of the video) it’s more yellow.
  - Shape (3 visitors), e.g.
    Visitor 18: It curled when it got big enough.
  - Clumps (3 visitors), e.g.
    Visitor 22: There's a mass of mycelium here (on the right) that shrinks and goes away, and this mass (on the left) really blooms. It makes me wonder, are there more nutrients over there?

Appendix B gives visitors’ verbatim responses to these two questions: what visitors noticed while using the exhibit, and what was new or unexpected about the exhibit.

What was interesting about the exhibit?
When asked what made the exhibit interesting, most visitors (19/22, 86%) mentioned enjoying watching the mushrooms grow. For example:
  Visitor 2: To see how mushrooms grow. The mushroom is beautiful. I like how it looks.
  Visitor 22: I'm a biology teacher. I like the theme of change over time. It's cool to see how the structure changes.
In addition to this general interest, we also looked at visitors’ interest in growing mushrooms at home. Three visitors mentioned this topic during some part of the interview. Their comments include:

Visitor 18: It says you can grow it at home using mycelium. Where can you get that? I’m a teacher. I could do it with my students. (This person went on to find this information through the QR code, and then said) Just the information we wanted.

Visitor 15: The information makes it interesting [Which part? Anything specific?] You can grow edible mushrooms at home from coffee and a paper cup.

Visitor 3: I read you can grow it yourself.

On a related note, five visitors expressed interest or curiosity about eating the mushrooms. They commented:

Visitor 19: Are they safe to eat? If you have pets, you might not want them to get poisoned.

Visitor 10: We just ate oyster mushrooms.

Visitor 7: How do you tell a poison mushroom from a non-poison mushroom?

Visitor 13: Can you eat them? (Then sees label) oh, it’s oyster mushrooms!

Visitor 21: Can you eat them?

See Appendix C for all visitor comments about what made the experience interesting.

**What was missing or confusing?**

**On the label**

Visitors were asked whether anything was confusing about the exhibit, or about the label in particular. They were also asked whether they had any questions about the exhibit. While no visitors directly cited the label as confusing, some confusion around the label content can be inferred from other visitor comments and questions.

- Some visitors (7/22, 32%) raised questions about the mushrooms’ growing medium. For example:
  
  Visitor 5: It looks like it's growing on the side of a rock. What are the nutrients that make it grow?

  Visitor 4: She (daughter) wasn’t sure if the white part (block) is the mushroom, or if the mushroom is just stuck to it.

  Some comments suggested that visitors may have read the label but still did not know what the block was:

  Visitor 1: There (on the round label) it says "oyster mushrooms" and there it says it's water vapor (the other small round label) but it doesn't tell you what it's growing out of.

  Visitor 19: I wondered what the white thing is. Maybe it's like wood, because it (the label) says the mushrooms decompose wood. And some of it (the block) is brown like wood. And it has craters in it like it decomposed.

  Visitor 22: One question was to know more about the medium. It (the label) mentions sawdust, but it doesn't look like sawdust. What is the white goo binding it together?
• A few visitors (4/22, 18%) wanted to know more about parts of the mushrooms’ lifespan that weren’t visible in the time-lapse video:
  Visitor 22: The video doesn’t go to the beginning of the growth. What did it look like before that (start of video)?
  Visitor 18: How long does it (mushroom) last? When do you change it? It was 5 days so far.

• A few visitors talked about the water vapor in terms of the moisture it provided; only one adult and one child (2/22, 9%) talked about the temperature of the vapor. Both may have mistaken the clock for a thermometer:
  Visitor 15: It caught my eye, the globe with air circulating and the temperature control.
  Visitor 6: They grow more with more heat and light. [Tell me more about that?] The scale in the corner (pointing to the clock) went higher and that means the temperature went up.

With the spin browser?
Almost all visitors (21/22, 95%) were observed to spin the browser all the way, enough to see a significant change in the mushrooms’ growth. The one remaining visitor spun the wheel only a few times, only enough to see the water vapor move around. However, this visitor was not fluent in English and mentioned during the interview that she hadn’t read the label.

Two younger children found it difficult to connect the time-lapse video and the actual mushrooms in the orb. One didn’t understand what the video showed; the other expected that spinning the browser would affect the live mushrooms. Their comments include:
  Visitor 7: How did you get it to grow and ungrow when you spin the dial? And the part about "you are watching a time line video... in the orb." I don’t know what it means.
  Visitor 21: They (mushrooms) wouldn’t move. I thought those (in the orb) would grow (when the wheel turned).

With the QR code label?
No visitors mentioned the QR code as confusing; and no visitors raised any questions about it on their own. When prompted to notice it, some visitors (5/21, 24%) expressed curiosity--asking what it was--but not confusion.

See Appendix D for the complete list of visitor comments indicating confusion.

What reaction did visitors have to the QR Code label?
Visitors were asked whether they noticed the small QR code label, and then to take a guess as to what it was. If they knew what it was, they were asked whether they’d ever use it. Their reactions are shown in Table 1 below:
Table 1.

Visitor Reactions to the QR code label

<table>
<thead>
<tr>
<th>Visitors who...</th>
<th>Count (N = 21*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noticed the QR code label on their own</td>
<td>7 (33%)</td>
</tr>
<tr>
<td>Had some idea about what the QR code was</td>
<td>6 (27%)</td>
</tr>
<tr>
<td>Knew exactly what the QR code was</td>
<td>5 (24%)</td>
</tr>
<tr>
<td>Wanted to use the QR code but didn’t have the right phone or app</td>
<td>3 (14%)</td>
</tr>
<tr>
<td>Used the QR code (after it was brought to their attention)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Could have used the QR code but were not interested in doing so</td>
<td>1 (5%)</td>
</tr>
</tbody>
</table>

*Note: One visitor did not complete this part of the interview, so the total number of visitors is smaller than in previous sections.

Comments from the two visitors who successfully used the QR code include:

Visitor 18: Oh, we have that scanner but we never use it! (Uses it then) Oh, it's how to grow your own. Just the information we wanted. Maybe if it (the label) said what it is on the sign I would have done it. I didn't think to try because I never use it (that feature of phone).

Visitor 3: I've used them before but I didn't on this. (Uses it then) Oh, it's about growing your own mushrooms. Well, we already have some growing in our front yard.

Next Steps

The data suggest that most visitors observed the mushrooms’ growth using the spin browser and that they found their observations interesting. However, some changes to the label can address some of the issues this evaluation found:

- Since some visitors were confused about the composition of the sawdust and mycelium block, we plan to place that information within the bold text on the main label, and add a small circular label on the block itself.
- In response to visitors’ comments and curiosity about the edibility of the mushrooms, we plan to clarify that the mushrooms in the orb are edible by changing the right-hand label text to read, “You can grow these edible mushrooms at home.”
- Because some visitors showed interest in the changing mushrooms, including their growth before and after the time-lapse video, we may add information explaining that the block is changed once a week, on Sundays.

The unlabeled QR code did not appear to confuse visitors or detract from their experience, but additional investigation would be needed to better assess how its content is used and enjoyed by visitors, and how using QR codes on this exhibit can align with institution-wide directions.
Acknowledgements

The author would like to thank Joyce Ma for facilitating meetings with the developers, and for providing feedback on the study’s methods, instrument, and report drafts.
Appendix A: Interview Instrument

Interview instrument:

Purpose:
To determine:

- For the experience:
  - Whether the exhibit supports observation. What features of the mushrooms do visitors notice? Where do they look to see the mushrooms?
- For the labels
  - Whether the content of the labels is clear and interesting
    - Is any information confusing or missing?
    - Is there some interest in growing mushrooms at home?
    - Do visitors know the water vapor is not hot?
  - What reaction visitors have to the QR label: is it confusing? Does it add interest?
- For the interface:
  - The usability of the spin browser

Recruitment:
Select and approach every 3rd person (>8, group size <4) crossing an invisible line.

Script:
Excuse me, my name is XX and I work here. I’m talking with visitors today about a new exhibit we’re trying to improve. It’s right over here. Would you be willing to use it and then give us some feedback?

Person interviewed:

Gender: Male Female

Age estimate: 8-12 13-17 18-20s 30s 40s 50s 60+

ESL: N Y Yes, but fluent

Group Size: 1 2 3 4 5 +

Others in group:

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (&lt;8)</td>
<td>8-12</td>
<td>13-17</td>
</tr>
<tr>
<td>Age (8-12)</td>
<td>13-17</td>
<td>18-20s</td>
</tr>
<tr>
<td>Age (13-17)</td>
<td>18-20s</td>
<td>30s</td>
</tr>
<tr>
<td>Age (18-20s)</td>
<td>30s</td>
<td>40s</td>
</tr>
<tr>
<td>Age (30s)</td>
<td>40s</td>
<td>50s</td>
</tr>
<tr>
<td>Age (50s)</td>
<td>50s</td>
<td>60+</td>
</tr>
</tbody>
</table>

Observation:
Did the visitor:
- Look at the actual mushroom block? (or just the screen)?
• Point out features of the mushrooms (on media or on block)?
• Spin the browser? All the way? just a small back and forth?
• Look at or use the QR code (by taking a picture of it with a phone)?

Other observations:

**Questions:**

1. How interesting did you find that experience? Would you say that was ...

<table>
<thead>
<tr>
<th>Not interesting</th>
<th>Somewhat Not interesting</th>
<th>Neutral</th>
<th>Somewhat Interesting</th>
<th>Interesting</th>
</tr>
</thead>
</table>

2. What made it _________ for you?

3. Can you tell me a little about what you did at this exhibit?

4. Can you describe what you noticed while using this exhibit? *(Anything else?)*

5. Did you see anything new or unexpected?

6. Do you have any questions about the exhibit, or anything more you’d like to know?

7. Was there anything confusing about this exhibit?
   a. what about this part? [*content parts of label*]
   b. what about this? [*grow your own mushrooms part*]

8. Did you happen to notice this label over here? *(Point to QR label)*
   YES  NO
   a. Any ideas what that black and white square might be?
   b. *If they know what it is* Would you ever use it? *Or if they already used it* Does reading this make you curious? Would you want to find out more? Would you ever use that information, after your visit?

**At the end:**

Those are all my questions. Thank you very much for your help!
May I give you a little black dot? If you put this on your admission sticker, it just lets other people know that you’ve already helped us out today and we won’t stop you again to ask you questions. Thanks again. Have a great visit.
Appendix B: Visitors’ comments about what they noticed while using the exhibit

Note that in this and following appendices, the notation [AE?] refers to the interviewer’s question, “Anything else?” The notation [TMM?] refers to the interviewer’s question, “Tell me more?”

Visitor 1: It's useful that the faster you turn the wheel, it accelerates. I thought it would take forever. And I like the clock in the background. [AE?] Seeing the fungus grow and shrink.
Visitor 2: The thing that it's growing on (sawdust block) bubbles popped on it. At first we didn't realize that was the same mushroom (in video and in orb). It was better after that.
Visitor 3: It's only from two days ago! [AE?] I read you can grow it yourself.
Visitor 4: That it took 3 days. [AE] It has fog in it. I think it's water. [AE?] I didn't know it could grow so big.
Visitor 5: it doesn't take as long as you think. They get big faster at the end. The speed of growth went up. Or maybe that's just how we turned it.
Visitor 6: They grow more with more heat and light. [AE?] The scale in the corner (the clock) went higher and that means the temperature went up.
Visitor 7: The clock spins. It has the date. [AE?] I see a rock (on the block)
Visitor 8: The growth of the mushroom. [AE?] No.
Visitor 9: As the mushrooms got bigger they got lighter color.
Visitor 10: Nothing beside the obvious. [TMM?] See the mushroom grow and develop.
   [AE?] The clock.
Visitor 11: It got bigger, and that's it. [AE?] No.
Visitor 12: It grew a lot on Tuesday. You see a lot of growth on Tuesday. [AE?] I was wondering why the water vapor is there. I know mushrooms need a lot of moisture.
Visitor 13: Over three days, the 21st to 24th, the mushrooms grew really fast. [AE?] No.
Visitor 14: It grew in spurts. I infer the video is growing, so you can go to the present and back to the past, then to the present, and each time, the present is adding more.
Visitor 15: It caught my eye, the globe with air circulating and the temperature control.
Visitor 16: Here, it says it grows. I didn’t see that. Where do I look (the orb or the video)?
Visitor 17: The clock spinning is cool. [AE?] No.
Visitor 18: It got bigger and bigger. [AE?] It curled when it got big enough. And it's only growing on one side.
Visitor 19: At the beginning there was nothing there. At the end, a mushroom! And I saw the date at the bottom.
Visitor 20: The wheel only goes back so far, to Sunday. It takes a week of time for the mushrooms to grow.
Visitor 21: The mushrooms "tingle." [TMM?] When you turn the wheel, they shake (in the orb). (Adult also observes:) look, a huge growth spurt.
Visitor 22: There's a mass of mycelium here (on R) that shrinks and goes away, and this mass (on L) really blooms. It makes me wonder, are there more nutrients over there?

Visitors’ comments about what they found to be new or unexpected:
Visitor 1: I'm surprised it's only 3 days of growth. I saw the calendar on the bottom. That's amazingly fast.
Visitor 2: That that's a mushroom! I have only seen them in the grocery store before. [AE?] The leafy things used to be sloped down and then they went up.
Visitor 4: I didn’t know what the box part (sawdust block) is.
Visitor 5: The speed of growth is fast at the end.
Visitor 6: It started small and it grew really big. [AE?] No.
Visitor 7: When the mushrooms get bigger they open up more.
Visitor 12: I don't know if I've seen this type of mushroom before. It's not the usual kind.
Visitor 13: I didn’t know they grew that fast.
Visitor 16: Sometimes you see the smoke (in the video) and sometimes not. The clock showed different smoke (at different times). I'm curious about that.
Visitor 17: This one (small formation on R of mushroom block) is shrinking while the others are growing. Is it dying? One's at the beginning of its life, one's at the end.
Visitor 18: I expected it would grow everywhere (all over the block). It's cool to grow your own. And it's neat to see the real thing next to the video. It adds a connection and makes it more real.
Visitor 19: I didn't know it was a mushroom at first. I thought it was a flower. But then I read, it said oyster mushroom. I'm surprised it took only that many days. It's only a short time. Most plants take months to grow
Visitor 20: That it grew so big. [AE?] No.
Visitor 21: They wouldn't move. I thought those (in the orb) would grow. (Kid didn't really get the exhibit at first)
Visitor 22: One question was to know more about the medium. It (label) mentions sawdust, but it doesn't look like sawdust. What is the white goo binding it together?
Appendix C: Visitors’ comments about what made the experience interesting

Visitor 1: The progress, going back and forth.
Visitor 2: To see how mushrooms grow. The mushroom is beautiful. I like how it looks.
Visitor 3: It's good for those of us who don't have time to watch them grow. It's neat how fast it grew. You can spin to see it really fast.
Visitor 4: I finally figured out that there's a clock there. You can see how long it takes to grow that much. Just 3 days! I could track the time. It's more than just spinning it.
Visitor 5: You see a time lapse of the mushroom growth. You don't get to see and appreciate that usually.
Visitor 6: I didn't know there was a type of moisture that makes mushrooms grow bigger.
Visitor 7: Because when you spin the dial you see it grow smaller and bigger.
Visitor 8: Seeing how it goes from nothing to full-grown. If we had been here four days ago, it would have been just little. Seeing the video of what it's been made it interesting.
Visitor 9: You can see it grow and usually you don't get to see that.
Visitor 10: Watching how they grew. The information was about the right amount. It explained that it's not a plant. And the mycelium, is that right? That's new. I never thought about what they are (As in, that they're not plants). And we just ate oyster mushrooms. And, a time-lapse is always interesting.
Visitor 11: Watching it grow. [AE?] No.
Visitor 12: It's cool, but I've seen time lapse before. [TMM, of what?] Plants and things.
Visitor 13: I like watching things grow.
Visitor 14: You're able to control the evolution of the mushroom, backward and forward.
Visitor 15: Because I know people who gather mushrooms, learn about where to find them. The information makes it interesting [Which part? Anything specific?] You can grow edible mushrooms at home from coffee and a paper cup.
Visitor 16: It's interesting but I don't really know what it is. I didn't read it.
Visitor 17: You're able to see it was just 5 days ago. You see how the clock is going.
Visitor 18: The timeline, seeing it go from so little to so large. We've never seen that kind of mushroom before.
Visitor 19: How it looks at the beginning and at the end. And I like the clock that shows how much time passed.
Visitor 20: The way it changed. It started small, then grew larger over time.
Visitor 21: We have mushrooms where we live. We pick them.
Visitor 22: I'm a biology teacher. I like the theme of change over time. It's cool to see how the structure changes.
Appendix D: Visitor comments indicating confusion

Visitor 1: There (on the round label) it says "Oyster mushrooms" and there it says it's water vapor (the other small round label) but it doesn't tell you what it's growing out of.

Visitor 4: She (daughter) wasn't sure if the white part (block) is the mushroom, or if the mushroom is just stuck to it.

Visitor 5: The soil. It looks like it's growing on the side of a rock. What are the nutrients that make it grow?

Visitor 7: How did you get it to grow and ungrow when you spin the dial? And the part about "you are watching a time line video... in the orb." I don't know what it means.

Visitor 16: Why does the smoke go in and out (of view, in the video)? Why does it change over here (video) but not over here (orb)? (This group didn't speak English well and seemed to really not get the exhibit...)

Visitor 17: what is the white thing behind it (the block)?

Visitor 19: I wondered what the white thing is. Maybe it's like wood, because it (label) says the mushrooms decompose wood. And some of it is brown like wood. And it has craters in it like it decomposed.

Visitor 21: Are they alive and growing right now (in the orb)? ...[AE?] What that big white blob is? Why the mushrooms don't move when you turn it. (He sees that the mushrooms in the orb shake slightly when you turn the wheel, and expected that he'd see them actually growing)

Visitor 22: One questions was to know more about the medium. It (label) mentions sawdust, but it doesn't look like sawdust. What is the white goo binding it together?