Axiovert with Specimen Selection

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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

Imaging Station – Formative Evaluation
Axiovert with Specimen Selection

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This report documents the evaluation results for two iterations of the Zeiss Axiovert microscope exhibit with specimen selection.

Iteration 1

PURPOSE

This evaluation was conducted to see:

- if visitors looked at different specimens, using the media piece to select either the amoeba or the zebrafish,
- if visitors had any difficulties using the exhibit, and
- what, if any, connections visitors made between what they saw and humans and themselves.

SETUP

- A slide with two 'wells' was prepared by the microscopist, one well for amoeba and the other for GFP zebrafish.
- An evaluator set the xy limits for both wells as well as the focus range for each of the objectives enabled for each specimen. The 10x and the 20x objectives were available for amoeba, and the 5x and the 10x objects were available for zebrafish.

METHOD

- Observations:
  - An evaluator sat 10 feet away from the stand-alone station and observed visitors as they used the exhibit. If visitors came in a group, the first visitor to stop was observed. The evaluator noted when a visitor stopped at the exhibit, when s/he looked at the main monitor, the media monitor, and the microscope, and when that visitor left the exhibit. Demographic information was also noted.
  - A tracking program logged what media screens visitors were looking at on the media piece.

  - The clocks used by the evaluator and the tracking software were synchronized to each other before each day's observation. This allowed us to coordinate our floor observations with the computer log to determine what each observed visitor did and saw with the media piece.
- Uncued Interviews
  - When possible, a visitor whom we just watched was then approached and asked a series of questions about the media piece. These questions are in Appendix A. We selected visitors to interview based on age (must be 8 or above) and holding time (must be longer than 15 seconds).
- We collected data on Saturday, June 12 and Sunday, June 13. However, we aborted the data collection early, at 2pm, because of technical difficulties.

PARTICIPANTS

- Observations
  - N = 20

Gender	Count
Male	9
Female	10
Total	20[1]

Age Group	Count
Under 8	2
Child	3
Teen	2
Adult	12
Total	20[1]

- Uncued Interviews
  - N= 9

Gender	Count
Male	6
Female	2
Total	8

Age Group	Count
Child	2
Teen	1
Adult	5
Total	8

[1] Demographic information is missing from one of the observations

RESULTS

Specimen Selection

Did visitors select another specimen to look at?

Note that the current implementation 'features' the zebrafish. That is, it resets to the zebrafish specimen and the start screen for zebrafish whenever it times out.

- Only 2 out of the 20 (10%) visitors whom we observed looked at both specimens.
- These same 2 visitors were the only visitors who looked at the amoeba specimen.
- All but one visitor who started with zebrafish did not look at amoeba.

Why didn't visitors look at the other specimen?

- We asked visitors who only looked at one specimen, why they did not look at the other. These were all visitors who only looked at the zebrafish. In all but one case (5 out of 6), visitors explained that they did not know that there was another specimen to look at:

  Visitor2: didn't know there's something else. But we didn't look very carefully. Maybe if we stayed longer

  Visitor6: I didn't know there were microbes there as well

  Visitor7: we must have missed it. Were they in there with the fish embryo? [Told him media button to switch sample] I didn't see that. Maybe we'll go back to look at that

  Visitor12: I was concentrated on the fish. Didn't see that there was something else

  Visitor18: um, I don't think I saw it on the screen.

  Furthermore, all but one of these visitors did spend time looking at the media piece.

- If we are interested in having visitors know there are other specimens to explore, we may want to redesign the media to make this more evident.

Difficulties with the Exhibit

The following are the difficulties visitors reported having at the exhibit:

- XY movement

  Visitor7: the movement is a little jumpy when you try to move around, if you know what I mean. I don't know if it's possible, but it'll be great if you can move around more smoothly.

  Visitor12: no, I would like to move around faster, so I can search the area. But I didn't really have trouble using it, just required a little more patience:

- Focus control

  Visitor7: we also couldn't focus very well when we were zoomed in… the focus isn't very sharp when you zoomed in.

- Interpreting what they were seeing

  Visitor10: it took us a while to see the amoeba. We weren't sure what we're suppose to look for at first

Making Connections

The Human Connection

- Five out of 8 visitors we interviewed did not think there was a connection between what they saw and human beings.
- The other 3 visitors saw:
  - Similarities between zebrafish and humans

    Visitor5: not directly. Except the pictures of the fish development reminded me of the pictures of fetus development when my wife was pregnant with our daughter

    Visitor7: this is biology, about life, so in that way it is related to human beings. I were at that exhibit where you have to guess which embryo is human. I think the zebrafish was actually one of them. I suppose there are similarities between their embryos and ours
  - Content that featured human biology

    Visitor18: Um yes- beating heart, it showed on there an ultrasound for a beating heart on humans.

The Personal Connection

- Half the visitors interviewed (4 out of 8) did not see any connection between what they saw and their own lives.
- The other visitors connected the exhibit to
  - Biology class

    Visitor6: life science classes in school. We had to learn about the animal kingdom and different species. We talked about different kinds of fish

    Visitor10: maybe bio classes I took from way back
  - Development and birth

    Visitor5: the pictures of the fish development reminded me of the pictures of fetus development when my wife was pregnant with our daughter

    Visitor18: um, yes- being born.

SUMMARY

- A small minority of visitors (10%) looked at the other specimen available. When interviewed, most visitors, who did not select another specimen, indicated that they simply did not know there was another specimen to look at. We may, therefore, wish to make this feature more prominent on the interface so that visitors are at least aware that there are other samples they can explore at the exhibit.
- About half of the visitors interviewed made a connection between what they saw at the exhibit and human beings or between what they saw and their own lives.
- Because of technical difficulties encountered during this evaluation, we decided to abort the evaluation early, to give time for the team to identify and address problems with the back-end and the front-end, and to re-evaluate the following week.

Iteration 2

BACKGROUND

The team made changes to the prototype to address use and usability issues that arose in the first evaluation study. In particular, these changes tried to

- make the specimen selection feature more evident on the media piece,
- address issues with UV and zoom control. Specifically, we extended the virtual control panel so that visitors sitting on the left can more easily see the panel. The UV light was set to timeout after 30 seconds. And, we changed the text on the zoom buttons and the look of the buttons to more clearly indicated whether the microscope was already zoomed in or zoomed out.

In addition, technical issues we encountered with the first iteration were resolved by the second evaluation study allowing us to go out with a more robust exhibit prototype.

PURPOSE

This evaluation focused on the use and usability of the following features:

- specimen selection,
- UV light control (for the zebrafish specimen), and
- zoom control.

METHOD

- The exhibit setup remained largely unchanged from the first study.
- We used the same methods as the first study. However, because of the usability focus of this study, we tailored the floor observations to look, in particular, to see
  - if visitors changed specimens,
  - if visitors used zoom control,
  - if they used the UV light to look at the zebrafish and
  - if visitors managed to see anything under different zoom and UV conditions.
- The interview questions were changed to focus on usability issues. See Appendix B.
- We collected data on Friday, June 18 and Saturday, June 19.

PARTICIPANTS

- Observations
  - N = 31

Gender	Count
Male	15
Female	16
Total	31

Age Group	Count
Under 8	3
Child	3
Teen	3
Adult	22
Total	31

- Uncued Interviews
  - N= 16

Gender	Count
Male	10
Female	6
Total	16

Age Group	Count
Child	2
Teen	2
Adult	12
Total	16

RESULTS

Did visitors see anything under the microscope?

- 90% (28 out of 31) visitors saw something under the microscope.
- 81% (25 out of 31) visitors saw something in focus. Note that whether a specimen was in focus or out of focus was a judgment call made by the evaluator during floor observations.

What did visitors try to look at?

Zebrafish

- 74% (23 out of 31) visitors looked at the zebrafish specimen.
- 65% (20 out of 31) visitors saw a zebrafish under the microscope. Of the 3 visitors who did not find a zebrafish, 1 was a child who stayed at the exhibit for 5 seconds, but the other 2 were adults who stayed for more than 30 seconds.
- Of the visitors who looked at the zebrafish specimen, 43% (10 out of 23) used the zoom button to zoom either with the normal or with the UV light.
  - 6 out of these 10 visitors saw something when they zoomed in.

- 4 out of the 10 visitors who used the zoom did not see anything. Two of these visitors used the zoom only under UV light.
- 4 visitors zoomed in under UV light. None of them saw a zebrafish. This suggests that it can be difficult for visitors to see anything at 10x under UV light.
- Visitors we interviewed explained that zooming in on a zebrafish
  - helped them to see more details. For example,

    Visitor7: more details. You can see everything better

    Visitor23: it was already zoomed in when I got there. I saw something moving inside the body, I'm guessing it's blood or some sort of fluid

    Visitor30: we saw the heart close-up

    Visitor31: the zoom was great. It's like you can zoomed all the way into the fish. You can definitely see the heart and other things moving in the body. He thinks we saw blood flowing in the body but we weren't sure.
  - did not help them see anything closer or better

    Visitor22: I like the zoomed out view better, so I didn't really look it in very much

    Visitor21: we lost the view when we zoomed in. Didn't see anything

- 39% (9 out of 23) of the visitors who looked at the zebrafish specimen used the UV light either at the 5x or the 10x magnification.
  - 5 out of these 9 visitors saw something under UV light. All of these visitors saw something while at 5x magnification.
  - 4 out of the 9 visitors who used the UV light did not see anything
  - 4 visitors tried, but no visitor was able to see a zebrafish under UV light at 10x magnification.
  - Visitors we interviewed described what they saw with the UV light

    Visitor7: a faint green glow. I didn't see very much

    Visitor17: saw part of its head glowed. Can't remember. Didn't leave it on for very long

    Visitor22: you can see the beating heart glowing

    Visitor31: that was interesting. You can see the heart glowing very bright. But you don't see as much of the other details. I think I like it better without the light, but it's good to have the option

    The above comments suggest that the UV light did not have a powerful effect on the experience.

<u>Amoeba</u>

- 55% (17 out of 31) visitors looked at the amoeba specimen.
- 100% (17 out of 17) visitors saw an amoeba under the microscope. Only one of these visitors did not manage to look it an amoeba in focus.

- Of the visitors who looked at the amoeba specimen, 18% (3 out of 17) used the zoom button to zoomed in.
  - All three visitors saw something when they zoomed in. One of these visitors brought the specimen into focus.
  - One of the visitors explained that when he zoomed in on an amoeba, he "saw them crawling around. They were really big."

Specimen Selection

Did visitors select another specimen to look at?

- 9 out of the 31 (29%) visitors whom we observed looked at both specimens. Compared to the first iteration, there were now more visitors who were using specimen selection (29% vs. 10%). This difference, however, if not significant; Fisher's Exact Test, p= .17 > .05.
- Visitors who started with the zebrafish were just as likely to switch specimens as those visitors who started with the amoeba; Fisher's Exact Test, p = 1.0. See Table 1.

Table 1. Visitors who changed specimens according to initial specimen in view

	Did NOT change	Changed
Started with amoeba	8	4
Started with zebrafish	13	5
Total	21	9

Why didn't visitors look at the other specimen?

- We asked visitors who only looked at one specimen, why they did not look at the other. These visitors explained that:
  - They didn't 'notice' (5 out of 8). Some of these visitors seemed confused thinking that the two specimens were together; that is, in the same well. They did not think that they could switch to another area on a slide to look at a completely different specimen.

    Visitor8: I think I saw something swimming around, but I don't think those were the fish, [the small ones that were swimming around the amoeba really fast?] Yeah, I guess I wasn't looking hard enough.

    Visitor11: I didn't notice

    Visitor21: as I said, it is probably too hard for my son's age. We didn't really get to see everything

    Visitor22: [she said she saw one, although I don't think she ever switched to amoeba]

    Visitor28: I didn't know there were any fish or embryos in there.
  - The current specimen was interesting enough (2 out of 8)

Visitor7: I wasn't sure what it was. The fish was interesting so I just stuck to it. If I stayed longer I'll probably check that out as well

Visitor23: I know you can move around, but since there was something to see on the screen when I got there, I was content to look at that one. I didn't try to find other things.

– Someone else was controlling the microscope (1 out of 8)

Visitor5: my brother was controlling it. I didn't know there were fishes in there as well

Difficulties with the Exhibit

The following are the difficulties visitors reported having at the exhibit:

- It was hard to see with the UV light

Visitor7: I had a hard time seeing the glowing fish. It was really faint… no, just that I wasn't sure if I was looking at the right thing when it was glowing

- Zebrafish were hard to find

Visitor10: fish was moving around though

Visitor13: I guess. Didn't really see anything. There's suppose to be some sort of fish in there, I think

Visitor21: I think my son is probably too young for it. He didn't really have the patience to find the fish embryos. He was just playing it like video games, moving back and forth.

Visitor30: except that we kept trying to find the different embryos for a while

- There's only one set of controls

Visitor22: the only thing was my son kept moving the controls, so it didn't stay in focus.

- Visitors were not sure about what they were seeing

Visitor5: I'm not sure what is an amoeba

Visitor8: it said those were amoebas, right?

- Visitors wanted more information about:

Visitor16: one of the fish eggs was very murky and grey. Is it having some sort of problems? Is it deformed?

Visitor22: I was wondering why the fish glows in a green color when the light is blue.

Visitor25: were the amoeba and zebrafish in 2 separate areas?

Visitor28: it would be useful if you had more information about the amoeba. Like what type of organism they are, where you can find them.

Visitor31: looks like all the amoeba crawled into 1 big clump. We were wondering what they were doing and if they always do that. Only some of them were moving. Were the other ones dead or just inactive?

SUMMARY

- A large majority (90%) of the visitors who stopped at the exhibit saw something with the microscope. Most visitors who looked at a zebrafish specimen saw a zebrafish, and all the visitors who looked at the amoeba specimen saw an amoeba.
- There was an improvement in the percentage of visitors who looked at both specimens in this iteration compared to the previous design, although this change was not statistically significant (29% vs. 10%). Some visitors still did not know that there's another specimen to look at.
- About 40% of the visitors who looked at the zebrafish tried the zoom controls. Of these visitors, 40% did NOT see anything when they zoomed in.
- Alternatively, fewer than 20% of the visitors used the zoom control when looking at the amoeba. All of these visitors did see something when they zoomed in on amoeba.
- About 40% of the visitors used the UV light to look at the zebrafish. About half of these visitors saw something, but the other half did not. We note that no visitor saw anything when using UV light at 10x magnification. This indicates that activities that depend on seeing zebrafish under high magnification under UV light will need a lot of support.

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APPENDIX A

Questions for Iteration 1

1. How interesting would you say that was? Would you say that exhibit was …

Uninteresting	Somewhat Uninteresting	Neutral	Somewhat Interesting	Interesting
1	2	3	4	5

2. What made it _____ for you?

3. What did you try to do at the exhibit?

4. Did you have any trouble using the exhibit? What? [Probe: You mentioned that you tried to xxx, did you have any trouble doing that?]

5. Was there anything confusing about what you saw? Do you have any questions about what you saw on the main monitor?

6. Did you feel there's any connection between what you saw and human beings? [Probe: what?]

7. Did anything at the exhibit remind you of something from your own life? [Probe: what?]

8. Did you see a fish or embryo, something that looks like an egg? What about a microbe, a reddish blob? *Zebrafish* *Amoeba*

9. Did you try any of the activities suggested at the exhibit? (If they saw zebrafish ask only about zebrafish. Ask about amoeba only if they did NOT look at zebrafish.)

   [if zebrafish] Like zoom in on blood, or compare a zebrafish heart?

   [if amoeba] Like compare how the microbes move?

10. Did you have any difficulties with xxx [zooming in on blood…] or yyy or zzz?

11. So, were you able to xxx ? [try to ask in a non-accusatory way]

12. [if they only saw one of the 2 specimens] Is there any particular reason why you didn't look at the other specimen, the fish/microbe?

13. Do you have any suggestions for improving the exhibit?

APPENDIX B

Questions for Iteration 2

1. What did you try to do at the exhibit?

2. Did you have any trouble using the exhibit? What? [Probe: You mentioned that you tried to xxx, did you have any trouble doing that?]

3. Was there anything confusing about what you saw on the main monitor (the monitor on the left)?

4. Did you see a fish or embryo, something that looks like an egg? What about a microbe, a reddish blob? *Zebrafish* *Amoeba*

5. [if they only saw one of the 2 specimens] Is there any particular reason why you didn't look at the other specimen, the fish/microbe?

6. Did you try to zoom in on the fish/ microbe (pick fish if visitor saw both specimens)?

7. [if YES to 6] Can you tell me what you saw when you zoomed in?

8. [if they looked at zebrafish] Did you try using the blue light to look at the zebrafish?

9. [if YES to 8] Can you tell me what you saw with the blue light?

10. Do you have any suggestions for improving the exhibit?