Visitors’ interest, questions, and observations about GFP Zebrafish under the Axiovert200M

Joyce Ma and Jackie Wong

February 2004

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

Visitors’ interest, questions, and observations about GFP Zebrafish under the Axiovert200M

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PURPOSE

This study was conducted to:
• Gauge visitors’ interest in looking at GFP Zebrafish under UV light
• Collect visitors’ questions about what they see
• Identify what visitors notice about the GFP Zebrafish

These results feed into an iterative process to develop the accompanying content for GFP Zebrafish specimen for the standalone Axiovert microscope exhibit.

SETUP

Figure 1. Exhibit setup
Details of the setup can be found in Appendix A.

**METHOD**

- **Cued Interviews**
- Visitors were recruited from the Life Sciences Area on the Mezzanine of the Exploratorium.
- Before each interview, the evaluator made sure that there was nothing in view on the monitor.
- Visitors were asked to look at a special kind of Zebrafish that glows under UV light. The evaluator also told visitors that they could control the microscope: move the stage, focus, turn on and off the UV light, and zoom in and out. Then, visitors were asked to use the microscope controls to look at the Zebrafish.
- Each visitor group was then asked a series of questions about what they saw under normal and UV light and under lower and higher magnification. These questions are in Appendix A.
PARTICIPANTS

- Groups

<table>
<thead>
<tr>
<th>Group Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td>6</td>
</tr>
<tr>
<td>Teen</td>
<td>1</td>
</tr>
<tr>
<td>Groups</td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td>5</td>
</tr>
<tr>
<td>Adult-children</td>
<td>7</td>
</tr>
<tr>
<td>Teen</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
</tr>
</tbody>
</table>

FINDINGS

The group is the unit of analysis in this study.

Interest

Did visitors find the GFP Zebrafish more interesting to look under UV or under normal light at 5x magnification?

- There was no clear preference for one kind of light over the other.

<table>
<thead>
<tr>
<th>GFP Zebrafish is MORE interesting under (at 5x)</th>
<th>Count (out of 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal light</td>
<td>7</td>
</tr>
<tr>
<td>UV light</td>
<td>5</td>
</tr>
<tr>
<td>UV and Normal are about the SAME</td>
<td>8</td>
</tr>
</tbody>
</table>

Visitors explained that the Zebrafish is more interesting to look at **under normal light** because
- You can see more (4 visitors)
Visitor10: you can see everything
Visitor12: you could see more information, in UV: you can't see the whole shape of
what you're looking at. It only focuses on the movement. This is more 3-d. UV is
2d
Visitor16: you can see more
Visitor18: you don't see as much with the UV light
- It’s clearer (1 visitor)
  Visitor17: the UV is neat, but you can see the fish better with normal light
- The UV is scary (1 visitor)
  Visitor3: the UV light is very neat, but it almost scary.
- It’s real (1 visitor)
  Visitor19: it’s real.

- Visitors explained that the Zebrafish is more interesting to look at under UV light because
  - It’s clearer (3 visitors)
    Visitor4: you see more more definition.
    Visitor7: you can see a lot more. Even when it moves, you can still see it.
    Visitor8: it’s easier to see, before I don’t know what I’m looking at. This is more clear
  - It glows (2 visitors)
    Visitor5: it glows
    Visitor20: it’s just interesting to see it glow like that.
  - It looks alien (1 visitor)
    Visitor4: a little alien like
Did visitors find the GFP Zebrafish more interesting to look under UV or under normal light at 10x magnification?
• More visitors preferred the UV light at 10x magnification.

<table>
<thead>
<tr>
<th>GFP Zebrafish is MORE interesting under (at 10x)</th>
<th>Count (out of 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal light</td>
<td>4</td>
</tr>
<tr>
<td>UV light</td>
<td>10</td>
</tr>
<tr>
<td>UV and Normal are about the SAME</td>
<td>6</td>
</tr>
</tbody>
</table>

Did visitors find the GFP Zebrafish more interesting to look under UV light at 5x or at 10x magnification?
• More visitors preferred using the UV light at 10x as opposed to 5x magnification.

<table>
<thead>
<tr>
<th>GFP Zebrafish is MORE interesting at (under UV light)</th>
<th>Count (out of 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x magnification</td>
<td>6</td>
</tr>
<tr>
<td>10x magnification</td>
<td>12</td>
</tr>
<tr>
<td>5x and 10x are about the SAME</td>
<td>2</td>
</tr>
</tbody>
</table>

• Visitors explained that the Zebrafish is more interesting to look at with 5x under UV light because
  - You see more at once (4 visitors)
    Visitor1: [at 10x] you have to keep moving around to look at it. But you can see lots of tissues, and things moving around. It’s easier to see under with the other one [5x]
    Visitor9: you can see the whole thing.
    Visitor14: I like being able to see the whole thing [embryo].
    Visitor15: the 5 would be the best. so you can see the whole thing.
  - It’s hard to tell what you’re looking at (2 visitors)
    Visitor9: when you’re zoomed in, it’s hard to tell what you’re looking at.
    Visitor19: when you’re so close up, you can’t necessarily tell what you’re looking at.
  - It’s clearer (2 visitors)
Visitor15: under the 10, everything blends together more. 5 is a little more sharp.
Visitor18: like I said, it’s harder to see things clearly when it’s zoomed in. the fish moves around too much.

- Visitors explained that the Zebrafish is more interesting to look at with 10x under UV light because
  - You see more details (8 visitors)
    Visitor2: just seeing more details
    Visitor4: [normal and UV] they just show different things. Both good to have.
    More contrast in UV, but you don’t see the egg. [10x] You see a lot more with the higher mag. a lot of details.
    Visitor7: you can see a lot more things. I like seeing details.
    Visitor10: much more detailed.
    Visitor12: [5x] this, you see details, but zoomed in you see more, you can really see it.
    Visitor13: the heart is really cool; you see it beating very well.
    Visitor16: you can see all the heart thing, the tail.
    Visitor20: it gives you the most details.
  - It’s shows things better (2 visitors)
    Visitor11: I think you can see better. The depths and everything.
    Visitor17: [UV 5 vs. 10] you just see it a lot clearer with 10. With 5, it’s still really nice, but it’s more just a blurry green glow.
  - [No explanation]
    Visitor6: once you get the image clear, it looks amazing. Like I said though, it’s harder to use when you’re zoomed in.
    Visitor8: I like it better zoomed in, but they are both neat.

Questions
- Visitors were asked if they had any questions about what they saw under UV light. They asked about
  - The light and the glowing
    Visitor3: why does it glow? ... How do you get them to glow?
    Visitor4: how come the egg [sac] disappears under UV light?
    Does the UV light cause them to move around more?
Visitor6: do they naturally glow like that? Does that affect the fish? Like do they live as long?

Visitor9: why is it green? What makes it glow?
So it’s the gene huh? Interesting.

Visitor12: what’s the purpose of the UV light? Why would you use it? ... Why would it be green, when UV is normally violet, purple or pink? Does the UV light harm them? Do these fish live? Will they hatch?

Visitor15: Just if it will glow after it hatch, if you can see them swimming around and glowing.

Visitor17: do all Zebrafish glow in the dark like this? Or did you do something to make them glow?

Visitor19: what makes them glow like that, is it just the light you’re using? ... Do they automatically glow like some tropical fish?

Visitor20: are these the same as those worms over there, I mean, do they glow for the same reason, with the special gene or something [yes]

- Parts they see

Visitor5: [at 5x] no. I assume... what is that? [heart] the blood flowing.
Visitor7: [at 5x] what was that big thing [yolk]
Visitor10: [at 5x] is that the spine?
Visitor16: [at 5x] what’s that? [heart] that’s neat

- The fish

Visitor7: do they hatch in here? Where do you get these fishes?
Visitor14: are Zebrafish the ones where there was a controversy. Whether you should be able to buy these fishes for pets?

Observations

What did visitors find interesting to look at under UV light?

- Visitors were asked what (if anything) they found interesting to look at under UV light at 5x magnification.
  - You can see the heart, in particular (12 visitors)
    Visitor1: watch organs move, heart, it’s cool.
    Visitor2: the heart glows
    Visitor3: You can see the heart really well.
    Visitor7: you can see its head, heartbeat. You can see the outline. It’s really cool.
Visitor8: the heart beating is pretty cool.
Visitor10: is that the heart beating?
Visitor14: the heart, you can see things pumping through it. Just the movement, you can see it a lot more clear.
Visitor15: light watching the heart, easier to see, it looks really neat. You can see the double pump, the action
Visitor16: ...the heart
Visitor18: the fact that it glows
Visitor19: how clear the heartbeat is.
Visitor20: it makes the heart and everything inside show up more clearly

- You can see the organs inside, other than the heart (6 visitors)
  Visitor1: watch organs move, heart, it's cool.
  Visitor7: you can see its head, heartbeat. You can see the outline. It's really cool.
  Visitor9: it's green, brings out the internal more. You can see it better, the inside.
  Visitor12: that you can see more details of what's going on, he's breathing or something. Brains? The heart beat. More info
  Visitor13: it outlines the internal organs, the structure
  Visitor17: see it glows. That's neat. It highlights parts of the fish

- It glows (6 visitors)
  Visitor3: It's neat how it glows.
  Visitor4: that it glows
  Visitor5: yeah, it glows.
  Visitor6: how it glows, especially when it's moving. You can see it very well.
  Visitor16: all of it lights up green.
  Visitor17: see it glows. That's neat. It highlights parts of the fish

- You can see movement (2 visitors)
  Visitor11: the details come out more, you can see the movement a lot more, but lose view of whole item.
  Visitor12: that you can see more details of what's going on, he's breathing or something. Brains? The heart beat. More info

- Visitors were asked what (if anything) they found interesting to look at under UV light at 10x magnification.
  - You can see the heart, in particular (10 visitors)
Visitor2: the same. But the heart is more pronounced
Visitor4: you can see it better. A little harder to focus. You can see the valve (heart).
Visitor5: the heart again. You can see the stuff moving inside.
Visitor6: the heart is very cool when it’s glowing. You can see the heart beat.
Visitor12: you really see the organs, the brain, organ functions, heart.
Visitor13: the details, you can see the heart beating very well
Visitor15: it’s harder to see the circulation, but the heart is easier to see. The bones.
Visitor16: this [heart beating and blood]
Visitor17: you can see the heart beat really well.
Visitor20: the heart is really clear here. You can see it pumps the blood.

- You can see the bones inside (4 visitors)
  Visitor7: kinda the same, but you can see the bone a lot better this time. If you’re interested in the skeleton, this would be more interesting.
  Visitor15: it’s harder to see the circulation, but the heart is easier to see. The bones.
  Visitor18: the same thing [as last question], but you see more structures, the skeleton
  Visitor19: the bones.

- You can see organs (2 visitors)
  Visitor9: the organs.
  Visitor12: you really see the organs, the brain, organ functions, heart.

- You can see movement inside (2 visitors)
  Visitor3: movement inside, you can really see it well here.
  Visitor5: the heart again. You can see the stuff moving inside.

- You can see things bigger and more detailed (nothing more specific) (2 visitors)
  Visitor1: more to look at. Larger.
  Visitor14: things a little more detailed, I like it better at 5x, the reason why is you can see the whole thing at 5x, and it’s more clear
SUMMARY

- There was no clear preference for UV light over normal light when viewing the GFP Zebrafish at 5x. However, visitors seem to prefer the UV light to normal light at the higher, 10x, magnification. The reasons visitors gave for this preference suggest that some visitors wanted to look at the whole Zebrafish embryo before they zoomed in on details. Once they had zoomed in that the UV light gave more definition to what they saw.

This suggests that the activities we design should introduce UV light at higher magnification when visitors have already looked at the Zebrafish under normal light at 5x. UV light may be useful to visitors in ‘pointing’ out details, which may be difficult to see under normal light.

This also indicates that just having the specimen glow is not enough of a ‘wow’ in and of itself. Instead, switching to UV light needs to be embedded in a motivating activity context.

- The results also indicate that most visitors notice the heart. As we begin to design the storylines and interpretations for the GFP Zebrafish, we may wish to use this as a lead-in to encouraging visitors to make more detailed observations and making connections to the specimen’s biomedical relevance.

- Finally, a list of questions visitors have is included in this report. These questions may be useful in designing the content information that will accompany this specimen.

ACKNOWLEDGEMENTS

This material is based upon work supported by the National Institutes of Health Grant R25 RR15627 and the David and Lucile Packard Foundation (Grant 4365).
APPENDIX A: Setup

Equipment used

- Axiovert200M
- MCU28
- Display
  - Optronics DEI750D camera
  - HP L1800 LCD Monitor – 18inch
- Metamorph version 5.0
- Control Software: Zeiss_control_2003_10_08_FL
- Interactive Media\(^1\) (on touch screen) : zFishv7Works

\(^1\) The touchscreen was not working. Instead, visitors controlled the magnification and the light with a mouse.
APPENDIX B: Questions

We’re trying out a new specimen at the microscope exhibit there [point]. Would you be willing to look at it with me and give me some feedback on it? Your feedback will help us improve the exhibit. This will take about 10 minutes. Is that okay?

I would like you to look at something. These are zebrafish. They're a special kind of zebrafish. They're special because they glow under UV, or ultraviolet light. So, you're looking at them now under normal light. I would like you to use the exhibit to look at the zebrafish.

You can move the slide with this joystick and focus the microscope with this knob. You can also change the magnification and the light with these buttons on this monitor.

1. What, if anything, do you find interesting to look at when the zebrafish is under normal light at this magnification (5x)?

2. What, if anything, do you find interesting to look at when the zebrafish is under UV light at this magnification (5x)?

3. Do you have any questions about what you see (under UV)?

4. [For 5x] Is the zebrafish more interesting to look at under UV light or under normal light? Or, is it about the same under the two kinds of light.

   UV LIGHT   NORMAL LIGHT   SAME

5. [if NOT SAME for Q3] Can you tell me why you found the xxx light more interesting?

6. What, if anything, do you find interesting to look at when the zebrafish is under normal light at this magnification (10x)?

7. What, if anything, do you find interesting to look at when the zebrafish is under UV light at this magnification (10x)?

8. Do you have any questions about what you see?

9. [For 10x] Is the zebrafish more interesting to look at under UV light or under normal light? Or, is it about the same under the two kinds of light.
10. Is the zebrafish more interesting to look at under UV light at 5x or at 10x. Or, is it about the same under 5x and 10x. So, this is 5x and this is 10x.

<table>
<thead>
<tr>
<th>UV LIGHT</th>
<th>NORMAL LIGHT</th>
<th>SAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x</td>
<td>10x</td>
<td>SAME</td>
</tr>
</tbody>
</table>

11. [if NOT SAME for Q10] Can you tell me why you found the yyy more interesting?