

# Floating Objects Version 4: Two Blowers

Joshua Gutwill and Suzanne Buennagel

April 2003

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

Floating Objects Version 4: Two Blowers  
Testing Label & Number of Objects  
Formative Evaluation Report  
Joshua Gutwill & Suzanne Buennagel  
April 5, 2003

Floating Objects, with two blowers



## Goals

This evaluation study was conducted to investigate two issues at Floating Objects: Label and Number of Objects. Specifically, we attempted to answer the following questions.

### Label:

- Do visitors do more suggested activities when the label asks visitors to make predictions or when the label specifically directs parents to ask questions of their children?
- Do visitors engage in more or less investigative behavior with the different labels?
- Do the different labels affect overall holding time differently?

### Number of Objects

- How many times do visitors float an object in the airstream, and how many objects do they float? Is it affected by the number of objects offered at the exhibit?

- Does having fewer objects encourage visitors to do suggested experiments?
- Does the number of objects affect the overall holding time?

#### Overall

- Do visitors use both blowers to experiment? (or do they just enable more visitors to use the exhibit at one time?)

## Summary of Findings

### Label study

- There were no significant differences in the effects of the two labels.
- Those visitors who attempted the suggested activities spent significantly longer than those who did not, regardless of label treatment.

### Number of Objects study

- There was no significant difference in holding time as a function of the number of objects presented to visitors.
- When the exhibit offered more objects for visitors to use, visitors floated more objects in the airstream, but used both blowers less frequently than when the exhibit offered fewer objects to visitors.

## Methods

On April 5, 2003, three hours of video was recorded, rotating the label or number of objects every 30 minutes. The two different labels were both “main labels” and were mounted on the backboard of the exhibit, directly facing the visitors.

The different treatments were:

- “Parents, ask your kids” (Label 1) was used with only two basketballs and two wiffle balls, which were used on the label graphic. N = 20 visitor groups.
- The label was identical to Label 1, but the exhibit used all nine objects available: two basketballs, two beach balls, two wiffle balls (one with its holes covered with tape), onion, pear, apple, egg w/ tape, football, and golfball. N = 29 visitor groups
- “Make a Prediction” (Label 2) was used with all nine objects. N = 22 visitor groups.

## Findings

### Holding Time

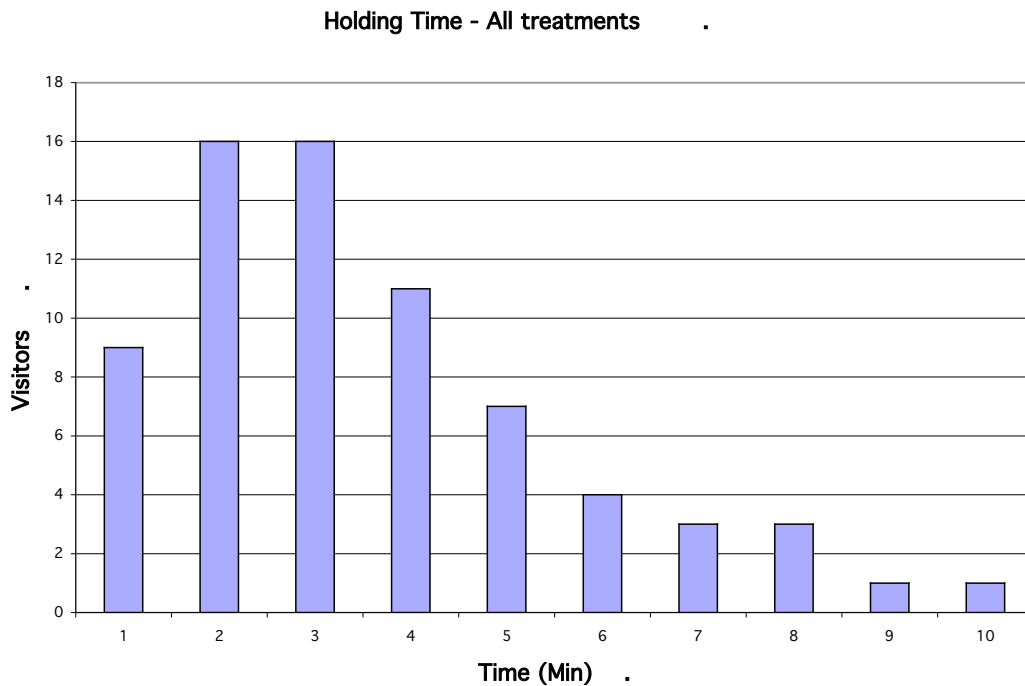
The holding time results are shown in Table 1

**Table 1. Holding time results in minutes**

Treatment	Mean	St Dev	Median	Maximum
Parents ask kids - 2 objects	3.1	2.1	2.9	8.8
Parents ask kids - 9 objects	3.1	1.8	2.5	7.9
Predictions - 9 objects	3.2	2.4	2.4	9.4
<b>Overall</b>	<b>3.1</b>	<b>2.1</b>	<b>2.6</b>	<b>9.4</b>

The differences in holding time were not statistically significant ( $F_{68} = 0.3$ ,  $p = .72$ ).

The overall distribution of holding time is shown in Figure 1.



**Figure 1: Distribution of overall holding time**

### How many visitors engaged in the suggested activities?

Table 2 shows the number of visitor groups that read or paraphrased aloud one of the activities on the label, or attempted one of the activities.

**Table 2: Groups attempting suggested activities**

Treatment	Visitor Groups	Percentage of Visitor Groups attempting suggested activities
Parents ask kids - 2 objects	6	30%
Parents ask kids - 9 objects	8	28%
Predictions - 9 objects	9	41%
<b>Overall</b>	<b>23</b>	<b>32%</b>

The apparent differences in Table 2 were not statistically significant ( $\chi^2 = 1.1$ ,  $p = .58$ ).

However, overall we found that the visitors who read the labels or attempted the suggested activities spent significantly more time at the exhibit (Mann-Whitney test for independence:  $p = .001$ ). Table 3 shows the holding time data for the two groups.

**Table 3. Holding time (minutes) as a function of attempting label activities**

Visitor behavior	Mean	St Dev	Median	Maximum
Read / attempted label activities	4.2	2.2	3.4	9.4
Did not read or attempt activities	2.6	1.8	2.2	8.8

### How many times did visitors float an object?

Table 4 shows the average number of times groups floated an object in each condition. There was a significant difference across treatment groups ( $F_{68} = 3.6$ ,  $p = .03$ ). A post-hoc comparison revealed that the 9-objects condition floated significantly more objects than the 2-objects condition, holding the label constant ( $p = .01$ ). There were no other significant differences in the post-hoc comparisons, which means that the label made no difference.

**Table 4. Average number of times visitors floated an object in each treatment group**

Treatment	Mean	St Dev	Median	Maximum
Parents ask kids - 2 objects	7.8	6.0	6	24
Parents ask kids - 9 objects	13.2	7.6	12	32
Predictions - 9 objects	11.2	6.6	10	30
<b>Overall</b>	<b>11.0</b>	<b>7.1</b>	<b>10</b>	<b>32</b>

### How many different objects did visitors float in the airstream?

We counted the number of different objects visitors used in each condition. There were a total of nine possible objects when all were included; two were the total possible in that condition.

As with number of objects floated, visitors floated a larger number of different objects in the 9-objects conditions than in the 2-objects condition (Main effect:  $F_{65} = 31.6$ ,  $p < .0001$ ; post-hoc comparison, holding label constant:  $p < .0001$ ). There was no significant effect of label. Table 5 shows the number of different objects visitors floated in each treatment group.

**Table 5.** Average number of different objects visitors floated in each treatment group

Treatment	Mean	St Dev	Median	Maximum
Parents ask kids - 2 objects	1.9	0.2	2	2
Parents ask kids - 9 objects	5.3	1.8	5	9
Predictions - 9 objects	5.2	1.8	5	8
<b>Overall</b>	<b>4.3</b>	<b>2.1</b>	<b>4</b>	<b>9</b>

### How many visitors exhibited investigative behavior?

Investigative behavior was defined as visitor groups that attempted to make predictions, hypotheses, conclusions, conducted experimental design regarding using the objects.

Table 6 below shows the number of visitors who were considered to show these types of behavior. There were no significant differences across treatment.

**Table 6.** Number of visitor groups exhibiting investigative behavior

Treatment	Visitor Groups	Percent of groups
Parents ask kids - 2 objects	3	15%
Parents ask kids - 9 objects	5	17%
Predictions - 9 objects	5	23%
<b>Overall</b>	<b>13</b>	<b>18%</b>

### How many visitors used both blowers in an activity?

This version of Floating Objects has two blowers. The exhibit is popular, and there were often multiple visitor groups using the exhibit simultaneously. Multiple visitor groups often each used a blower without interacting. When single groups did not share the exhibit with another group, the most common activity involving both blowers was to float an object between the two air streams.

A chi-square test reveals that significantly more visitor groups used both blowers in the 2-object condition than in the 9-object condition, holding label constant (Fisher exact  $p = .05$ ). There was no effect of the label. Table 7 shows the results.

**Table 7.** Number of visitor groups using two blowers

Treatment	Visitor Groups	Percent of groups
Parents ask kids - 2 objects	8	40%
Parents ask kids - 9 objects	4	14%
Predictions - 9 objects	5	23%
<b>Overall</b>	<b>17</b>	<b>24%</b>

### Do different visitor groups overlap at the exhibit?

Overall, most visitor groups (87%) do overlap with another visitor group for at least part of the visit to this exhibit. Although there is no difference between the 2-object and 9-object conditions, we did find that the Parent, Ask Your Kids label had marginally more overlapping groups than the Predictions label (93% compared to 73%, respectively; Fisher  $p = .06$ ).

### Conclusions

The “Parents, Ask Your Kids...” label did not seem to have any effect on visitor behavior. However, it seems that visitors who read the label and try the suggested activities – whatever those activities may be – tend to spend more time at the exhibit. It is possible that visitors use the label for some of their activities while also creating their own activities to engage in.

The number of objects did seem to have an effect on some of the behaviors exhibited by visitors. When nine objects were available, visitor groups used a larger number of objects and a more diverse set of objects than when there were only two objects available. In contrast, when two objects were available, visitor groups tended to use both blowers more than when nine objects were available. (This was not due to having fewer overlapping groups in the 2-object condition.)

### Acknowledgments

This material is based upon work supported by the National Science Foundation under Grant number 0087844. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

