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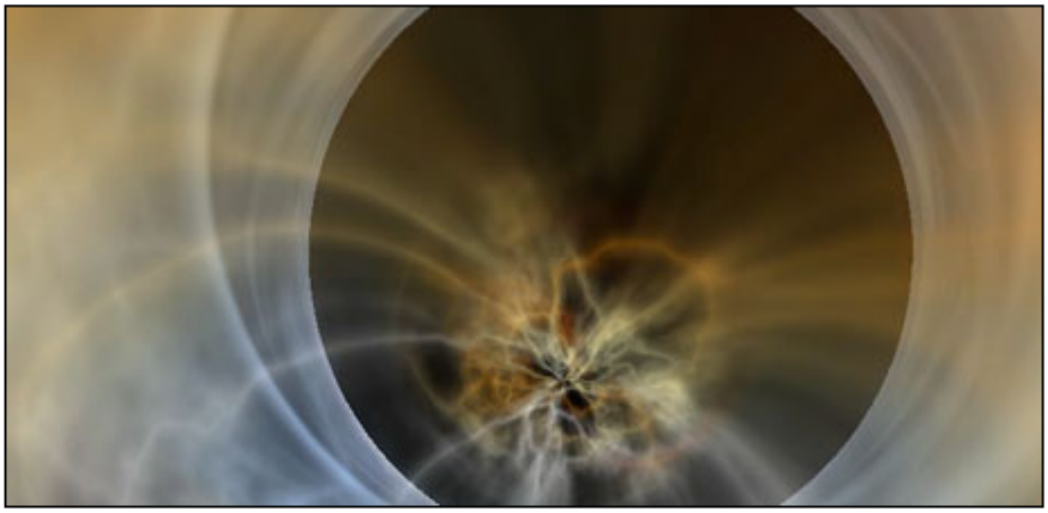
Black Holes: The Other Side of Infinity
Summative Evaluation of
Planetarium Show with Adults and Teens



Report for
Denver Museum of Nature and Science
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Research Report No. 06-006
June 16, 2006

This material is based on work supported by the National Science Foundation under Award No. 0337286. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

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EXECUTIVE SUMMARY
SUMMATIVE EVALUATION OF *BLACK HOLES* WITH ADULTS AND TEENS
MULTIMEDIA RESEARCH, JUNE 16, 2006

With support from the National Science Foundation, Denver Museum of Nature and Science and Thomas Lucas Productions have produced a planetarium show entitled, *Black Holes: The Other Side of Infinity*. The 20-minute full-motion program uses scientific simulations and data-based animations to illustrate the death of stars and the birth and characteristics of black holes. The summative evaluation focused on appeal to and impact on adult and teen museum visitors.

Method

A quasi-experimental separate-sample pretest/posttest design was used to evaluate the show in its natural theater setting. A random sample of 126 adults and teens completed questionnaires prior to viewing the show and a different random sample of 142 completed questionnaires after viewing. The pre and post viewing groups did not differ significantly on classification variables of gender, ethnicity, age group, education and number of planetarium shows ever seen. A small subset volunteered to answer follow-up questions via email one week after their planetarium visit.

Appeal

The most positive aspects of the show according to most (45%) respondents are the animation, visuals and graphics. Another 35% like best the informative quality of the show. Smaller portions of the sample like the clear and interesting explanations (15%); the experiential quality (13%); narration (9%); and colors (8%). On the other hand, respondents feel the show is too short (21%); confusing (15%); or lacking in information (11%).

Comprehension

Open-ended response questions reveal that viewing the planetarium show significantly improves understanding of what a black hole is and how scientists know that black holes exist. In addition, a true-false test indicates that viewers learn other specifics about black holes; for example, that black holes are not dark inside and that our galaxy has a supermassive black hole at its center.

Subsequent Activity

Of viewers contacted via email one week after their visit, 71% had recommended the show to others, 10% had read, seen or heard something in other media that relates to black holes and 3% had visited a website related to black holes.

In conclusion, the summative evaluation shows that *Black Holes: The Other Side of Infinity* successfully both entertains and educates adults and teens.

INTRODUCTION

With support from the National Science Foundation, Denver Museum of Nature and Science and Thomas Lucas Productions have produced a planetarium show entitled, *Black Holes: The Other Side of Infinity*. The 20-minute full-motion program uses scientific simulations and data-based animations to illustrate the death of stars and the birth and characteristics of black holes.

The summative evaluation reported here focuses on the following major outcomes:

- To what extent and in what ways did the show appeal to viewers?
- To what extent did the show achieve its intended viewing goals?
- Did viewing the show influence the audience beyond the museum visit?

METHOD

Research Design

A quasi-experimental separate-sample pretest/posttest design was used to evaluate the show in its natural theater setting. Over a period of three days at the Denver Museum of Nature and Science, researchers recruited random viewers older than 12 years and stratified by gender. A random sample completed questionnaires prior to viewing the show and a different random sample was surveyed after viewing. A small subset of the samples volunteered to answer follow-up questions via email one week after seeing the show. Several characteristics of the population and treatment (i.e., the planetarium show) led to the decision to use this research design.

First, the population to which we wish to generalize are self-selected museum visitors whose intention is to view a planetarium show. Locating an equivalent control group who would not view the show is virtually impossible. There are no comparable museum visitors from whom the treatment (the show) could be withheld. The best control group is a sample of museum visitors who intend to view the show but have not yet done so.

Secondly, we cannot assume that the scientifically predisposed museum visitors would be unfamiliar with the show content, thus it is important to include a pretest that establishes what the audience knows prior to seeing the show. Pretesting and posttesting the same sample, however, is not an acceptable procedure, because the pretest given just prior to viewing sensitizes the audience to the content of the show and affects their posttest results. The separate-sample design controls for the main and interactive effects of testing. One group is tested prior to seeing the show and a randomized equivalent group tested after seeing the show.

Third, random sampling is logistically simple in the theater environment where the audience lines up before showtime. Randomization is used to eliminate systematic bias between the pre-viewing sample and the post-viewing sample. As argued by Campbell and Stanley (1963), "the most adequate all-purpose assurance of lack of initial biases between groups is randomization"

(p. 25). In this evaluation, because of limited numbers lining up in the preshow area within 15 minutes of showtime, a stratified systematic random sampling procedure is used. This means that the first male and first female respondent is selected through the use of a random number between 1 and 5 (using a random-number table) and then every second male and female after that first random person is also recruited.

Finally, the drawbacks of this research design, in general, are its failure to control for history, maturation, mortality and the interaction of these. However, in this specific case, where the show treatment is only 25 minutes long and the audience is captive, there is little chance of changes in groups due to history, maturation, or mortality; thus, these are non-issues for this evaluation.

In conclusion, the separate-sample pretest-posttest design is considered the strongest approach for evaluating the planetarium show in the natural theater setting with a random sampling of the population of viewers.

Procedure

During a non-holiday period of Friday-Sunday in April, 2006, the sample was recruited from visitors, 13 and older, as they lined up for the show at the Gates Planetarium, Denver Museum of Nature and Science. The recruitment for the previewing sample alternated with recruitment for the postviewing sample over the course of 31 shows. Typically excluded from recruitment were school groups, single adults accompanied by children below the age of five and adults who were part of a group of five or more. As ticket holders lined up for the show, a random number determined who was first approached for recruitment; thereafter every second male and female was recruited. All visitors were offered a free IMAX theater ticket in return for completing a previewing or postviewing questionnaire. The previewing respondents completed the ten-minute questionnaire on clipboards while standing in line. The postviewing respondents were provided with colorful leis to help identify them in the exiting crowd and completed the fifteen-minute questionnaire at tables set up near the exit door.

Questionnaires

Draft questionnaires were twice pilot tested over two weekends with a total of 56 adults and teens, assessing readability, length, clarity and feedback on phrasing of true-false statements.

Demographic and Background Variables. Both the pre-viewing and post-viewing questionnaires established respondents' status with respect to five classification variables: gender, age group, ethnicity, education, number of planetarium shows ever seen.

Show Appeal. Postviewing respondents rated show appeal on a variety of descriptors and explained what they liked and did not like about the show and why.

Show Knowledge. Postviewing respondents rated the show's clarity of presentation and influence on knowledge. Both the previewing and postviewing questionnaires included a knowledge test to assess understanding of show content: two open-ended questions (as best you can, explain

what a black hole is and how scientists know that black holes exist) and ten "true-false-don't know" questions, as follows:

Influence of the show beyond the museum visit. Emailed questions, one week later, asked
(1) Did you recommend the show to anyone - family, friend, colleague? If so, what did you say about it?
(2) Since seeing the show, have you visited any websites related to black holes?
(3) Since seeing the show, have you read, seen or heard anything in OTHER MEDIA that relates to black holes?
(4) Have you taken any other actions that relate to seeing the "Black Holes" show?

Sample

Three researchers recruited over a non-holiday period of 1 weekday and 2 weekend days during 9 weekday shows and 22 weekend shows. Weekend respondents represented 83% of the final sample. The total number of usable questionnaires (N=268) included 126 previewing questionnaires and 142 postviewing questionnaires. Information from demographic and background questions was used to determine whether the two independent samples (pre and post) should be looked at as having come from the same population. Chi-square analyses revealed that the pre and post viewing groups did not differ significantly with respect to the classifications of gender, ethnicity, age group, education, and the number of planetarium shows ever seen. The distribution of the sample on these classification variables is presented in Table 1.

The sample, as planned, includes equal gender distribution, 21% teen and 24% minority representation. Colorado's census statistics indicate 25% minority population and 35% in Denver. Of our adult sample, 55% are college graduates compared with 33% in the Colorado population and 35% in Denver. One-fifth of the respondents were seeing their first planetarium show, and 29% were very experienced viewers, having seen four or more shows.

Table 1. Demographic and background variables (N = 268)

Variable	*Categories*	*Percent*
Gender	Female	50%
	Male	50%
Ethnicity	White	76%
	Minority	24%
Age Group	Teens	21%
Teen: Range =13-19; Mean = 16	Adults	79%
Adult: Range = 20-82; Mean = 40		
Education	Currently in grade __	16%
	Completed HS or less	12%
	Some college	27%
	College graduate	21%
	Post graduate	23%
Number of planetarium shows ever seen	This is my first show.	21%
	One other show.	18%
	2–3 other shows.	32%
	Four or more shows.	29%

Follow-up sample. Of the 213 adult respondents, 121 (57%) volunteered legible email addresses for a week-later follow-up contact. Volunteers were emailed the following questions:
1. Did you recommend the show to anyone - family, friend, colleague? If so, what did you say about it?
2. Since seeing the show, have you visited any websites related to black holes?
3. Since seeing the show, have you read, seen or heard anything in OTHER MEDIA that relates to black holes?
4. Have you taken any other actions that relate to seeing the "Black Holes" show?
Of the 121 volunteers, 31 (26%) responded within two weeks of the email request. This sub-sample is representative of the full sample's demographics except that the sub-sample includes 65% females.

Data Analysis

Chi-square, Fisher's Exact tests and two-sample t-tests are used where appropriate for statistical analysis. All relationships are analyzed for statistical significance, which is reported if p values are less than .05. Variables explored include grade and gender. Qualitative responses are sorted and analyzed by keyword and key phrase.

RESULTS: APPEAL

Quantitative Ratings

After viewing *Black Holes: The Other Side of Infinity*, respondents rated on a scale of 1 to 7 certain entertainment qualities of the show. Table 2 below presents the mean ratings for the show for each pair of descriptions, in the order presented in the questionnaire.

Respondents were quite positive about the overall entertainment value of the show. There were no sub-sample rating differences for age group, gender, ethnicity or educational background. However, frequency of exposure to planetarium shows significantly influenced the ratings: Those who had only seen this show and/or one other planetarium show gave significantly higher ratings on all the descriptors compared with those who had seen two or more other shows.

Table 2. Appeal ratings of show

	1	2	3	4	5	6	7	
Disliked the show						6.1		Liked the show
Visually dull							6.4	Visually exciting
Boring story					5.7			Engaging story
Decreased my curiosity						6.0		Increased my curiosity
Will not recommend						6.1		Will recommend

What was Liked about Show

In an open-ended question, viewers were asked what they liked about the *Black Holes: The Other Side of Infinity* and why. Table 3 below presents the major categories of what viewers liked most, in order of most to least frequently mentioned categories for the sample.

The majority (45%) of respondents focused on graphics, animation or visuals as the most positive aspect of the video. Another 35% liked best the informative quality of the show. Smaller portions of the sample liked that the explanation was clear (15%), the experiential quality (13%), the narration (9%), the colors (8%) and the section on Einstein and space-time (5%).

Table 3. What viewers liked about *Black Holes*[1]

Categories	*%*	*Examples of Responses*
Graphics, Animation, Visuals	45%	• *I really liked all of the visual explanations of Super Novas and their black holes. I am a visual learner so it was very interesting.* • *The graphics were good.* • *The visual effects, very cool to watch.* • *The visuals were spectacular.* • *Great animation; graphics.*
Informative	35%	• *Informative on a difficult subject.* • *Makes you think and discover new ideas.* • *Informational, widened my knowledge of Milky Way* • *Everything was very informative, it is interesting to know how they were formed.*
Explanation clear, interesting	15%	• *Explained a complex issue about as well as possible.* • *Simple explanation of what we were looking at.* • *Very interesting.* • *Concise presentation.*
Experiential quality	13%	• *I liked how it felt like you were there.* • *It made you feel in it.* • *I felt like I was really there,*
Narration	9%	• *Narration excellent.* • *Good narration.*
Colors	8%	• *I like the colors because they were cool.* • *It was very beautiful, I loved the colors.*
Einstein Space-Time section	5%	• *I liked how they compared it to the way Einstein saw a black hole as a fabric of time.* • *Very much liked the visual representation of Einstein's theories. I had never been able to really understand the 'meat and potatoes' of space-time.* • *The explanation of Einstein's time/space theory. I had not thought about it in regards to black holes before.*

[1] Percentages have been rounded off and add up to more than 100% because viewers listed more than one category liked.

What was Not Liked about Show

Table 4 presents categories of what viewers did not like about *Black Holes: The Other Side of Infinity*. One-fifth of viewers like all of the show; another fifth felt it was too short. Smaller portions of the audience felt confused by the show (15%), wanted more information (11%) or disliked part of the physical experience of the planetarium (10%).

Table 4. What viewers did not like about *Black Holes*[2]

Categories	*%*	*Examples of Responses*
Liked it all	21%	
Too short	21%	• *It was too short.* • *The program felt too short, abrupt, especially for the price.*
Confusing	15%	• *There was not a good definition of a black hole; that is, one I can relate to.* • *Wormhole not clear.* • *I got lost around the time of the wormhole and had a hard time distinguishing between what was scientific fact and what was a hypothesis.* • *The part where they were explaining bending space and where they showed the picture of Einstein was kind of hard to understand.* • *Just seeing the lights of black hole didn't give me a big picture. Maybe labels?* • *No points of reference after our galaxy.*
Still have questions; want more information	11%	• *Wanted to know a bit more, cold add more explanation partly about Einstein's theory and what scientists think now.* • *Could have explained a little bit more about Hawaii work.* • *Needed more on how black holes are being studied.* • *Not much new information was given. I already knew a lot of it.* • *Ending very abrupt – leaves a lot of questions open.* • *I didn't like how there was not closure at the end of the show. I felt like in the end it is all still "theory" and a lot is still to be proved.*
Physical space, experience	10%	• *My neck aches a bit from trying to look up and back in the seats.* • *My seat.* • *Made me a little sick feeling.* • *Music was too loud. It made me jump.*

[2] Percentages have been rounded off and add up to more than 100% because viewers listed more than one category not liked.

RESULTS: COMPREHENSION

Quantitative Ratings

After viewing *Black Holes: The Other Side of Infinity*, respondents rated on a scale of 1 to 7 certain content qualities of the show. Table 5 below presents the mean ratings for the show for each pair of descriptions. Respondents were moderately positive about comprehension of the show content. There were no sub-sample rating differences for age group, gender, ethnicity or educational background. However, frequency of exposure to planetarium shows significantly influenced the ratings: Those who had only seen this show and/or one other planetarium show gave significantly higher ratings on both descriptors compared with those who had seen two or more other shows.

Table 5. Comprehension ratings of show

	1	2	3	4	5	6	7	
Confusing presentation					5.6			Clear presentation
Learned nothing					5.5			Learned a lot

Impact on Knowledge

Recall of main content points as presented in *Black Holes: The Other Side of Infinity* was assessed via two open-ended questions and a 10-point True-False-Don't Know test.

What is a black hole? Participants explained as best they could what a black hole is. In order to assess whether those who had seen the show gave responses with better accuracy and fewer misconceptions than those who had not experienced the show, answers were first coded dichotomously according to six content categories in Table 6 below. Two response examples are given under each category. The percent of responses in each category is given for the pre-viewing sample (column 2) and the post-viewing sample (column 3). Significant Fisher exact tests are indicated in column 3 for the whole sample and columns 4-9 for sub-samples. Significance (SIG) means that the frequency of the category for previewing and postviewing respondents differed beyond chance; for example, in row 3, column 9, minorities who had viewed the show were more likely than minorities who had not seen the show to respond that black holes are a puncture in space-time.

Table 6. Response categories for what a black hole is

1	2	3	4	5	6	7	8	9
Category for what a black hole is	**All Pre**	**All Post**	**Adult**	**Teen**	**Female**	**Male**	**White**	**Minority**
A star dies, implodes, collapses, goes supernova, remnants of dead star; e.g., *End product of a dead star.* *Remnant of supernova; collapsed core of star.*	31%	54% SIG	SIG	-	SIG	-	SIG	-
A puncture, hole or dent in space-time; *A hole in space-time.* *A rip in the fabric of space-time…*	1%	13% SIG	SIG	-	SIG	SIG	SIG	SIG
Immense gravity, enormous gravitational pull, gravity to the max; e.g., *Gravity to the max.* *A massive force of gravity that forces everything into it.*	20%	25%	-	-	SIG	-	-	-
Light, matter cannot escape; e.g., *A place in space where nothing, not even light, can escape it.* *Nothing escapes black holes, not even light.*	22% SIG	11%	SIG	-	-	SIG	-	SIG
Very dense, matter packed densely, massive concentration of matter; e.g., *An area of extremely dense space…* *Point of incredible density…*	16%	10%	-	-	-	-	-	-
A singularity, e.g.; *A singularity in space…* *…resulting in an infinitely small singularity.*	5%	4%	-	-	-	-	-	-

Prior to seeing the show, respondents were most likely to write that black holes are the result of a collapsed star (31%); significantly more respondents (54%) described black holes in this way after seeing the show. The show also showed a significant influence on viewers' likelihood to describe a black hole as a puncture in space-time (1% pre vs. 13% post).

Similar percentages of respondents both before and after seeing the show described black holes as having immense gravity, extreme density, and a singularity. After seeing the show, significantly fewer respondents wrote that light or matter can not escape a black hole (22% pre vs. 11% post).

Sub-samples. After the planetarium experience, females were significantly more likely to point out that black holes are the result of a dying star, that they puncture space-time and have enormous gravitational pull. After seeing the show, males and minority respondents were significantly more likely to write that black holes are a hole in space-time and less likely to write about light not escaping a black hole.

To explore quantitative differences in understanding of what a black hole is, responses scored based on their correctness and number of ideas provided: Correct includes two or more correct ideas with no inaccuracies (3 points); Mostly correct includes two correct ideas but may include additional inaccurate statements (2 pts); Partially correct includes one correct idea but may include inaccurate statements (1 pt).

The mean achievement score after seeing the show is 1.2 for the postviewing sample, significantly higher than the mean score of 0.9 for the previewing sample.[3] Viewing the planetarium show significantly increased understanding of what a black hole is for the sub-sample of females (pre= 0.4 vs. post = 1.1) but not for teens, males or minorities.

How do scientists know that black holes exist? Participants explained as best they could how scientists know black holes exist. In order to assess whether those who had seen the show gave responses with better accuracy and fewer misconceptions than those who had not experienced the show, answers were coded dichotomously according to categories in Table 7 below. Eight categories of varying levels of correctness were applied to responses. Two response examples are given under each category. The percent of responses in each category is given for the previewing sample (column 2) and the post-viewing sample (column 3). Significant Fisher exact tests are indicated in column 3 for the whole sample and columns 4-9 for sub-samples. Significance (SIG) means that the frequency of the category for previewing and postviewing respondents differed beyond chance; for example, in row 1, column 6, females who had viewed the show were more likely than females who had not seen the show to respond that scientists know black holes exist because of their effect on motions of stars.

[3] Two sample t - test, $p < .01$.

Table 7. Response categories for how scientists know that a black hole exists

1	2	3	4	5	6	7	8	9
Category for how scientists know a black holes exist	**All Pre**	**All Post**	**Adult**	**Teen**	**Female**	**Male**	**White**	**Minority**
Effect on environment, motions of stars; e.g., *They can see stars are being thrusted quickly into orbit around the center of our galaxy.* *By using telescopes they can see stars orbiting around the hole.*	4%	29% SIG	SIG	-	SIG	SIG	SIG	-
Gamma rays; e.g., *Gamma rays from exploding stars shoot out and are detected.* *They emit gamma radiation.*	6%	14% SIG	SIG	-	SIG	-	SIG	-
Use theory, computers; e.g., *They have identified them using Einstein's theories.* *Through simulations.*	9%	27% SIG	SIG	-	SIG	-	SIG	SIG
Supernovae; e.g., *They know they exist by watching for stars that go supernova.* *Because they have recorded/seen when the super novas happen.*	1%	6% SIG	-	-	-	-	SIG	-
Use telescopes, satellites; *From powerful telescopes.* *They know because of the SWIFT telescope.*	24%	32%	-	-	-	-	-	SIG
Light bending, e.g.; *The bending of light toward a black hole.* *They watch light from stars bend or disappear through space.*	11%	4% SIG	-	SIG	-	SIG	-	-
Light, objects fall in; e.g, *From inference only. Observing actions of materials moving into the event horizon.* *Things are pulled into it.*	10%	2% SIG	SIG	-	SIG	-	-	-
Effects of gravity; e.g.; *Gravitational force.* *By gravitational pull of the areas around the black hole.*	6%	4%	-	-	-	-	-	-

Prior to seeing the show, respondents were most likely to write that scientists know that black holes exist through their use of telescopes or satellites (24%). This relatively non-specific answer remained popular after seeing the show (32%) but the difference in frequencies is not significant.

The show emphasized the work of Andrea Ghez measuring the acceleration of stars around a possible black hole. After seeing the show, audience members were significantly more likely to write that scientists know that black holes exist through their effect on motions of stars (29%). Significantly fewer (4%) participants suggested this possibility prior to viewing the show.

The roles played by Einstein's theory and computer simulations in knowing that black holes exist was identified by significantly more respondents after seeing the show (27%) than prior to seeing the show (9%).

That gamma rays are indicative of the existence of black holes was noted by 14% of those who had seen the show, significantly more than by those who had not yet seen the show (6%).

Small portions of those waiting in line to see the show provided answers that reflect misconceptions such as scientists know black holes exist because they see light bending around a black hole (11%) or see light and/or objects falling into a black hole (10%). After viewing the show, frequencies of responses in both of these categories decreased significantly (4%, 2%; respectively).

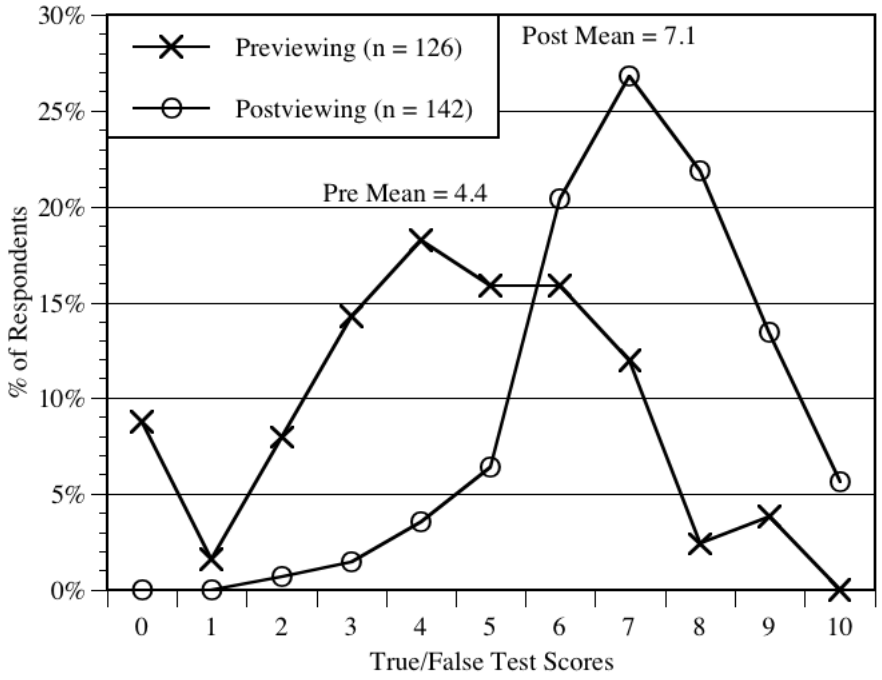
Sub-samples. After the planetarium experience, females were significantly more likely to say that scientists know that black holes exist because of the motions of surrounding stars, the detection of gamma rays, and the use of theory and computers. They were significantly less likely to think that scientists see light or objects falling into black holes. After seeing the show, males were significantly more likely to write that scientists know that black holes exist because of the motions of surrounding stars and less likely to write about light bending as an indicator of a black hole. Minorities who saw the show were significantly more likely than non-viewers to note that scientists use telescopes or satellites to detect black holes and use Einstein's theories and computer simulations.

To explore quantitative differences in understanding of the previewing sample and the post-viewing sample, responses were given points based on their level of correctness: effect on environment (4 points); spectra/gamma rays (3 pts); theory/computers (2 pts); telescopes/satellites (2 pts); supernovae (2 pts); light bending (1 pt); light/objects falling in (1 pt); gravity (1 pt). The mean achievement score after seeing the show is 2.9 for the whole sample, significantly higher than the mean score of 1.2 prior to seeing the show.[4] All sub-samples scored significantly higher on post-viewing responses than on pre-viewing responses. Viewing the planetarium show significantly increased everyone's understanding of how scientists know black holes exist.

[4] Two sample t - test, $p < .0001$.

True-False Test. In the True-False-Don't Know test, "Don't Know" was provided as a possible answer but was scored as "incorrect." Figure 1 compares the distribution of test scores for the previewing and postviewing samples, showing a positively skewed distribution for the posttest scores.

Figure 1. Distribution of Test Scores for Pre- and Post-viewing Samples



The mean achievement score for the postviewing group is 7.1, significantly higher than the mean score of 4.4 for the previewing group. All postviewing sub-samples scored significantly higher than their equivalent previewing sub-samples (see Table 6 of sub-sample means below):

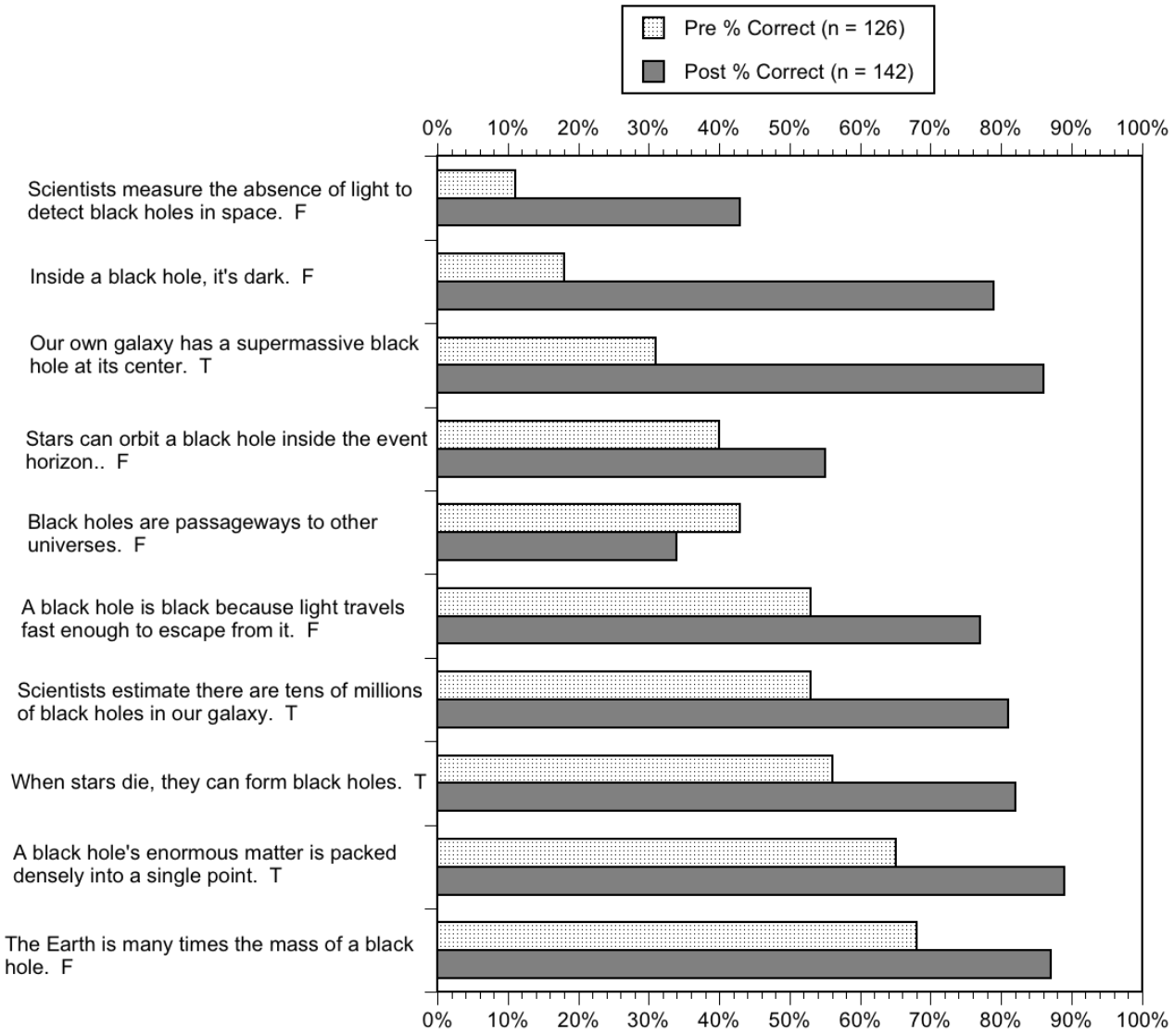
Table 6. Mean T/F scores for sub-samples

	Pre	Post		Pre	Post		Pre	Post
Adult	4.3	7.2	Male	5.2	7.5	White	4.5	7.3
Teen	4.6	6.7	Female	3.6	6.8	Minority	4.1	6.7

Males scored significantly higher than females on the pretest (5.2 vs. 3.6) and the posttest (7.5 vs. 6.8), but no other pre or posttest differences occurred for gender, age, education, ethnicity and frequency of viewing planetarium shows.

Figure 2 provides a more detailed presentation for individual test items. Significantly more show viewers chose correct responses compared to non-viewers for every statement but one ("black holes are passageways to other universes").[5] Seven of the 10 statements were answered correctly by 75% or more of the postviewing audience.

Figure 2: Percent correct responses for each true-false statement before and after viewing film



[5] The section of the show covering the content of the T/F statement "Black holes are passageways to other universes" was also identified as confusing for viewers in the formative evaluation focus group study, Oct. 5, 2005, by Focus Quest Market Research.

RESULTS: SUBSEQUENT ACTIVITY

Of 121 adult participants who volunteered their email addresses for further contact, 31 (26%) responded within two weeks of being contacted. Of this sub-sample, almost three-quarters recommended the show to others and one-quarter noted taking other actions related to the show – most frequently including the topic in conversations. Few had visited a website related to black holes or had read, seen or heard something in other media that relates to the topic.

- 71% of respondents recommended the show to others:

I always recommend people go to the planetarium. I am a huge fan…my dad founded Custom Microwave, and the company works with NASA, Ball, JPL, so it's been a part of my life.
I did recommend it to several people from my work, and friends. I told them how fascinating it was to take some different theories that scientists have developed, and what we know about the earth and black holes.
I enjoyed the show very much and recommended it to my friends. They are majoring in physics at the local university and thought they might find it interesting.
I have spoken to several people about seeing the Black Hole show and recommended to one adult with 3 children as worthwhile to see.
I recommended it to a friend who was reading a bio on Einstein. I said he'd like the movie because it put it into good visual perspective.
I recommended it to my adult children. I told them that it was beautifully done; of great interest; vast subject.
I recommended it to my co-workers. It was a good "movie" to see, it is something different for the kids to see other than the usual Disney movies
I was with my 30 year old son when I saw the show. We talked briefly about it. We both like it, but we both felt we were left with a feeling that we still had questions. .
Recommended it to friends, mentioned that the screen was big and the show was educational
Recommended to colleagues, said it was a good way to get broad perspective on BHs, and that my children liked it
Said that it was an interesting viewpoint and well put together, the images were amazing.
To friends. I told them it would enhance their knowledge and interest in black holes
We talked to 2 people about it and said it was very colorful. We enjoy the '60 minute in space' lectures. By contrast, the BH film contains much less information than do the lectures, so we did not recommend it based on that criterion.
I mentioned to several friends that I had seen a cool show at the IMAX on black holes. I discussed the show with the friend I viewed it with. Wonderful visual effects, but show left me still hungry for more information, more depth, more details.
Yes and we thought it was very good and informative!
I told the people in my immediate office that it was good and they should go see it.
I said it was very informative on Black Holes.
I said it was very interesting.
I was in Denver for a friend's wedding, gave my extra ticket for an IMAX to him. We recommended seeing BH to him and his wife.
My colleagues at work.
I did recommend the movie to a friend.
I recommended it to my sister, her husband, and our neighbor.

- Since seeing the show, 3% had visited a website related to black holes – respondent printed the show viewing schedule for friends to see the show.

- Since seeing the show, 10% had read, seen or heard something in OTHER MEDIA that relates to black holes. Two respondents were reading Brian Greene's "The Elegant Universe," and one respondent watched a related show on the Science channel.

❖ Since seeing the show, 26% noted other actions that relate to seeing the "Black Holes" show:

Had a conversation with my boyfriend, who knows a lot more than me about science, about the show, black holes and the implications of other space phenomenon. The topic has come up several times since.

I sounded very smart at a party recently when I explained that there was a super giant black hole at the center of the galaxy. Then we got into the idea of wormholes and Space Odyssey…

I talked to my brother about it, who is a rocket scientist.

I've thought about the film and astronomy more in general. I've also noticed I refer to the black holes in my conversation, as metaphors or similes. Just last night I was explaining how Argentine tango sucked me in as if it were a black hole.

I have decided I will try to see the one advertised about the Search for other Life.

Just added interest the next time I see an article that would relate.

We actually are planning on taking time at the library because those we went with seem to be enthralled to discover even more.

I homeschool my kindergartener and we are doing a unit about space and black holes, so we have books and movies on the subject. My son is especially interested in black holes, so we are currently looking for pictures or simulated pictures of them to make.