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Journey to the Stars Evaluation Report

Rockman et al
Independent · Insightful · Informative

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Executive Summary

Journey to the Stars, opened at the American Museum of Natural History's (AMNH) Hayden Planetarium in July of 2009. The show, created by a team of scientists, artists and educators at AMNH, is "based on authentic scientific observations, data, and models," and takes visitors "deep into space and through billions of years to witness the birth, life, and death of stars." (*Journey to the Stars: About the Show*, AMNH 2009)

To help AMNH understand the outcomes and impacts of their newest show, Rockman Et Al (REA) performed a summative evaluation, shortly after the public premiere of *Journey to the Stars*. The summative evaluation sought to measure the effectiveness and impact of the show on a variety of different audiences. Specifically, the summative evaluation sought to determine:

- Whether, and to what extent, the show led to audience understanding of the key scientific concepts,
- If the show stimulated audience interest and curiosity about stars, astronomy, and science in general, and
- The extent to which the show stimulates behavior and further learning.

To answer these questions, members of the REA evaluation team conducted visitor surveys and interviews immediately following screenings of the show and obtained input from a small group of visitors about a month and a half after their viewing experience. In addition to data from informal learning audiences, data was also collected from select groups of teachers and students.

Audience Understanding of the Key Scientific Concepts

Part of the challenge of creating an educational program for a mass audience is ensuring that it is accessible to a wide variety of viewers, including those with different knowledge and interest levels. Despite this challenge, AMNH was successful in providing content that held appeal and educational value for a wide range of viewers. Visitors of all ages readily picked up on the major themes and messages presented in *Journey to the Stars*. One viewer stated that "the info was presented in a way that everyone could understand." Another viewer felt that the show was "accessible and inspires more learning for learners of all ages."

Most viewers came to the viewing experience with at least a basic understanding of what stars are and what they do, however, many viewers indicated that they had learned more about our universe in general, and stars in particular—including their birth, life and death. Viewers who had very basic levels of knowledge and interest in astronomy felt that the show was presented at an appropriate level. Adult viewers with the least self-reported interest in astronomy were more likely to say that the show was the right level for them (i.e., viewers who selected "1," the lowest level on a five-point scale for how much interest a viewer has in astronomy, had an average agreement score of 4.25 for the question about level, based on a five-point Likert scale—the average response for all viewers was 4.08). Like-wise, viewers with the least self-reported knowledge of astronomy (i.e., those who said they knew "nothing" or "very little"), had a higher than average mean for how much they agreed the show was at the right level (i.e., the mean for those who said they knew "nothing" about astronomy was 3.97 and the mean for those who said they knew "very little" was 4.15, whereas the average mean for all viewers was 4.08).

Viewers who felt they knew more than average about stars and space still tended to feel they were learning new things, or at least *seeing* new things, i.e., things that they may have only had the opportunity to read about in the past. These viewers found great value in the visualizations

that helped to make abstract concepts more real for them and gave them a better understanding of the complex processes presented in the show. One viewer explained: “I had read a lot about these things and had seen photos...you can visualize all these things in your mind but to see them happening around you is really fantastic.” Astronomy enthusiasts who felt that they knew and understood things fully also felt there was benefit to having the concepts and knowledge be reinforced. As one viewer stated, “it anchors it—it reinforces it and it reminds you that there is so much beauty in what you’re seeing,” and another noted, “I learned more and got to prove what I already knew.”

Generally speaking, school-aged children felt that this was a fun way to learn about stars and several mentioned the benefit and value of being able to see things rather than read about them. Eighty-nine percent of children “agreed” or “strongly agreed” that they “learned new things from this show” (30% and 59% respectively), and 88% “agreed” or “strongly agreed” that they understood this show (35% and 53% respectively). “I like all the parts because I learned new stuff,” noted one child, and another shared that he “liked everything about this movie because I learned things – that is so cool!”

We asked teachers to indicate their rating of the educational value of *Journey to the Stars*. Overall, on a scale from one to five where 1=“no value,” 2=“little value,” 3=“moderate value,” 4=“lots of value,” and 5=“extremely valuable,” the average response was 4.38—i.e., teachers found the show to be highly educational. One teacher noted that “it had a lot of visuals and was not long—works well for my students with short attention spans.” Teachers also felt that the show would be a good way to introduce or reinforce topics being presented in the classroom, noting that it would be a good way “to start the unit to excite students about the topic” and “allow my students to get out of the textbooks and watch what actually occurs.”

In terms of specific content that viewers felt they learned more about in *Journey to the Stars*, the following topics were frequently mentioned: dark matter, the origin of our universe and stars (including their life/death cycles), the differences between different types of stars, the connection between stars and human life, and the unique features of the earth that help to shield us from harmful radiation.

Responses to a series of knowledge questions showed that viewers left the show with knowledge of the basic concepts being presented. The average percentage correct for adult respondents was 92% (with scores ranging from 84% to 99%); for youth the average percentage correct was 86% (with scores ranging from 75% to 98%). Interviews with viewers following the show further suggested that, for many viewers, this was information that was previously unknown, and therefore learned during the viewing experience.

Audience Interest and Curiosity about Stars and Astronomy

Viewers were quick to praise the overall quality of the multisensory experience, including things seen, heard and felt during *Journey to the Stars*. In fact, one of the most frequent comments made in response to questions about viewers’ favorite things about the show, and one of the most frequent comments about viewers’ first impressions of the show, was that it was “visually stunning,” i.e., a richly and skillfully blended mix of images and animations that helped viewers see new things and/or see things in new ways. One viewer stated: “I really enjoyed the visualizations about this program – our universe is a clear beauty and this show did an awesome job in bringing forth all the beauty.” Viewers noted the following visualizations being among their favorites: nebulae, supernova, illustrations of invisible forces (e.g., magnetic fields), and the animated diagram of our sun and related processes.

Viewers also like the fact that show made them feel like they were in space and moving through the universe. Comments like those that follow were common: “I liked how we seemed to be really moving, as if we could almost touch the things we were watching,” “It was the closest thing to being in space,” and the “title is just right—you really feel like you’re on a journey.”

As has been the case with previous space shows, *Journey to the Stars* succeeds in making viewers think about themselves in relation to the universe and come away with a sense of how small we are in comparison to everything else that is out there. Viewers noted that the show “inspires imagination,” and provides “reminders that we are but a small piece” of our universe. More so than their younger counterparts, adults frequently expressed comments that summarized the general awe-inspiring nature of the experience, for example, it “makes me more conscious of what’s beyond the blue sky—you feel like a grain of sand,” and “as if New York City doesn’t make you feel small, this will make you feel small.”

Another factor stimulating interest in science, and also holding the interest of science and astronomy enthusiasts was the use of real images and data. Many viewers were able to identify elements of the program that used real images and data obtained from space telescopes and exploratory satellites like Voyager. Even viewers who were familiar with some of the images felt that they were seeing things in a new, more vivid, way. Most visitors felt the science being represented in the show was accurate, but a few were curious about how scientists had learned about these things – e.g., “how they know what happened millions of years ago and how they know what will happen in the future millions of years from now.”

Viewers who were most interested in astronomy (using a five-point, self-rating scale) were also most likely to agree that the “show appeared to use and present authentic, scientifically accurate data.” The mean agreement score for those who said they were “very interested” in astronomy was 4.46; the average mean for all respondents was 4.32. There was also steady trend in more interested viewers feeling that there was greater importance in the images being “based on authentic, scientifically accurate data (average mean for those with an interest level of 1=4.00; 2=4.34; 3=4.46; 4=4.50, and 5=4.71). “I enjoy the way that the show provided accurate information and realistic/vibrant scenes that allowed me to capture the experience of space,” noted one viewer. Another felt that the show contained “very up-to-date and information.” Younger viewers, i.e., those under thirteen, also realized that the show contained real images and real data. Ninety-two percent of youth “agreed” or “strongly agreed” that “things in this show were real and not made up” (19% and 73% respectively).

Future Behavior and Further Learning

Adult viewers generally agreed that they would seek out additional information on one or more topic that they learned about in the show, with an overall mean of 3.63 (based on a Likert response scale where 1=“strongly disagree” and 5=“strongly agree”). There were higher than average means for respondents who said they were “extremely interested” and “experts” in astronomy (i.e., those with the highest levels of astronomy interest and knowledge had mean scores of 3.95 and 3.85 respectively).

Adults and youth alike, were quick to mention things that they would be interested in seeking out more information on, either at the museum or when they get home. At home, the most prevalent research strategy mentioned as a means to learn more was internet searching—with most viewers mentioning Google and Wikipedia searches as their primary means for gathering more information. Several adults indicated an interest in learning more about where the Voyager satellite has gone and what it has seen, and learning more about dark matter (a new concept to some and familiar to others). A nine year old girl, who said that she generally wasn’t interested

in science, indicated a desire to use her family's telescope to look at stars and do her own "research" about the different brightness, size and shape of different stars. Many viewers, including both youth and adults, with whom we spoke after the show also indicated an interest in going home and looking at the stars more frequently.

We followed up with a handful of viewers about a month and a half after they had viewed *Journey to the Stars* and they shared information about the related things they had done. The follow-up activities that were reported included: watching television programs about telescopes and the 40th anniversary of the moon landings, looking up information on Wikipedia (e.g., info about brown dwarfs), reading articles and books about Galileo, the lunar module and early astrophotography, reading the science section of the newspaper, visiting the NASA website to look at photos, and going stargazing.

Well more than half (59%) of adult viewers said that they would see this show again on a future visit—the mean level of agreement with a statement about viewing the show again in the future was 3.65 (based on a five-point Likert scale where 1="strongly disagree" and 5="strongly agree"). Fully three-quarters (75%) of youth said that they wanted to see the show again (with a mean score of 4.13, based on the same five-point Likert scale).

Viewers also indicated a desire to tell others about the show and encourage them to see it. Adult viewers were asked how much they agreed with the following statement: "I will encourage others to see this show." The average mean was 4.13 (based on a five-point Likert scale where 1="strongly disagree" and 5="strongly agree"). Their comments about the show included the following "Its like your average planetarium show on steroids," "I've seen other shows (in U.S. and abroad) but this is the biggest and the best," and "I would encourage others to see it – hard to describe, but definitely worthwhile." Seventy-eight percent of youth viewers said they would "tell friends to come see this show" as well (mean =4.19).

In conclusion, viewers responded positively to the new AMNH space show, *Journey to the Stars*, and felt they learned new things. They felt that their interest in astronomy was piqued, and many were motivated to continue learning after the show.

Overview of Evaluation

Rockman Et Al (REA) performed a summative evaluation of the American Museum of Natural History's *Journey to the Stars* space show, shortly after its opening in 2009. The summative evaluation sought to measure the effectiveness and impact of the show on a variety of different audiences.

Specifically, the summative evaluation sought to determine:

- Whether, and to what extent, the show led to audience understanding of the key scientific concepts,
- If the show stimulated audience interest and curiosity about stars, astronomy, and science in general.
- The extent to which the show stimulates behavior and further learning.

To answer these questions, members of the REA evaluation team conducted visitor surveys and interviews immediately following screenings of the show over the course of three days in July 2009 and obtained input from a small group of visitors about a month and a half after their viewing experience. In addition to data from informal learning audiences, data was also collected from select groups of teachers and students in September 2009.

This report summarizes all evaluation findings, including those that specifically answer the questions listed above, as well as comments that highlight areas for future improvements to programming of this nature and comments about viewing-environment and logistic factors mentioned by visitors as something that contributed to the overall viewing experience.

Methods

Members of the REA evaluation team worked collaboratively with stakeholders at AMNH to develop survey and interview instruments to capture visitor reactions to the show and other elements of the viewing experience, including the pre-show video.

During a three-day, onsite data gathering effort in July 2009, REA staff and local contractors gathered survey data from a sample of adult and youth audience members for thirty showings of *Journey to the Stars* (n=1289 adult, n=205 youth). Youth and adults were recruited as they were waiting in the pre-show area (prior to the start of the pre-show video). A smaller subset of viewers, diverse in terms of age, gender and ethnic backgrounds, were selected after the show to participate in follow-up interviews. About a month and a half later, we contacted the participants whom we interviewed to see if they'd be willing to answer a few additional questions about what they remembered from *Journey to the Stars* and what they had done to learn more after seeing the show.

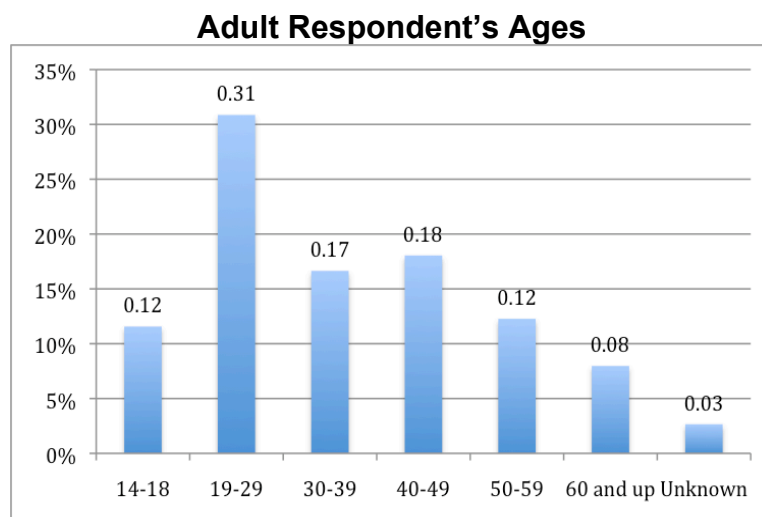
In addition to data from members of the general audience for *Journey to the Stars*, staff members at AMNH assisted REA in an effort to gather data from educators and students. Revised versions of the adult and youth survey were administered to teachers and students visiting the museum and participating in workshops in September 2009. Two focus group sessions were also held with high-school aged students who volunteer at the museum.

Evaluation Participants

A total of 1280 adult surveys and 205 youth surveys were gathered from *Journey to the Stars* viewers in July of 2009. The most pertinent data on participant demographics and characteristics is presented below.

Demographics of Adult Viewers

Among adults, there were slightly more females than males who responded to the viewer survey (54% versus 44%, respectively—with 2% unknown). More than a quarter of the respondents were from New York or New Jersey, but the vast majority were visiting from out of state or out of country. There were more 19-29 year old respondents than there were respondents in any other age category. With the exception of this outlier, there was a fairly normal distribution of respondents with more viewers in their thirties and forties, and fewer in their teens or over fifty, as seen in the table below.



Demographics of Youth Viewers

Of the 212 youth respondents, (i.e., children who used the youth version of the survey), 51% were female and 43% were male (6% did not specify a gender). Nineteen percent were ages eight and under (with the lowest respondent age being four, but only a handful of responses from four and five year olds), 37% were ages 9-11, and 36% were ages 12 and up (including responses from some 14 and 15 year olds who used the youth survey); 8% of respondents did not indicate an age, or were adult respondents using the wrong survey form. Comments from the later two groups were analyzed, but responses to other survey questions were not included with youth respondents' data for analysis purposes.

Viewer's Interest in the Sciences

We asked respondents to indicate how interested they were in different types of science. Adult responses are indicated in the table below. The averages presented in the table below are based on a scale from one to five, where 1="Not interested at all," 3="moderately interested," and 5="very interested."

Adult Viewers' Self-Reported Interest in the Sciences

	1	2	3	4	5	Average
Science in general	20 (2%)	97 (8%)	294 (23%)	851 (66%)	18 (1%)	3.95
Astronomy	23 (2%)	90 (7%)	317 (25%)	835 (65%)	15 (1%)	3.93
Earth Science	34 (3%)	130 (10%)	372 (29%)	729 (57%)	15 (1%)	3.68

Overall, we found that the vast majority of viewers were “moderately” (or more) interested in science and astronomy, with slightly less interest in earth science. We found gender differences in adult viewers’ science interest levels. These differences were statistically significant (male=3.97 and female=3.75, $p < .0001$).

Children also indicated fairly high levels of interest in science, astronomy and learning about the earth. Results are summarized in the table below and based on viewers’ responses using a one to five scale, where 1=“I don’t like it at all,” 2=“I don’t like it much,” 3=“Sometimes I like it, sometimes I don’t,” 4=“I like it,” and 5=“I like it a lot.”

Children’s Self-Reported Interest in the Sciences

	1	2	3	4	5	Average
Science	2 (1%)	2 (1%)	47 (23%)	60 (29%)	93 (46%)	4.18
Astronomy	7 (4%)	12 (6%)	49 (25%)	58 (29%)	73 (37%)	3.89
Earth Science	4 (2%)	5 (3%)	37 (18%)	65 (32%)	91 (45%)	4.16

Children were slightly more interested in “learning about the earth,” than adults were interested in learning about “Earth Science,” but overall, self-reported interest levels for were high among youth.

We also asked children to indicate their level of interest in seeing *Journey to the Stars*. Results are summarized in the table below and based on viewers’ responses using a 1-5 scale where 1=“Not at all,” 2=“Not very much,” 3=“Did not care either way,” 4=“A little,” and 5=“A lot.”

Children’s Desire to See *Journey to the Stars*

	1	2	3	4	5	Average
How much did you want to see this show?	1 (.5%)	5 (3%)	9 (4%)	57 (28%)	132 (65%)	4.18

There was a statistically significant difference between male and female youth for this question (i.e., males indicating more desire to see the show than females), but even though the difference was large enough to be significant, it was not huge (male=4.67; female=4.44; $p < .05$) and overall, interest in seeing the show was high among youth.

Viewer’s Knowledge of the Sciences

We were also interested in how much adult viewers knew about different sciences, including astronomy, earth science and science in general. We asked adult respondents how much they knew about each of these sciences and their responses are summarized in the table below.

Adult Viewers’ Self-Reported Knowledge of Sciences

	1	2	3	4	5	Average
Science in general	14 (1%)	182 (14%)	704 (55%)	361 (28%)	19 (1%)	3.18
Astronomy	33 (3%)	355 (28%)	657 (51%)	219 (17%)	16 (1%)	2.86
Earth Science	35 (3%)	309 (24%)	661 (52%)	255 (20%)	20 (2%)	2.93

On average, respondents felt that they knew relatively less about astronomy and space science than science in general or earth science. We also found significant differences between male and female adult viewers' self-reported knowledge of science (male=3.12 and female=2.88, $p < .0001$), and differences between age groups. Age group differences are summarized in the table below.

Adult Viewers' Self-Reported Knowledge of Sciences (by Age)

	13-18	19-29	30-39	40-49	50 and up	All
Science in general	3.32	3.19	3.12	3.12	3.15	3.18
Astronomy	2.89	2.92	2.79	2.83	2.83	2.86
Earth Science	2.98	2.96	2.85	2.90	2.93	2.93

Self-Reported knowledge for astronomy and earth science is fairly consistent across all age groups. However, respondents aged 13-18 using the adult version of the survey (162 out of 1280 respondents) seemed more confident in their knowledge of science than older respondents, with an average response of 3.32 (on a scale ranging from 1="know nothing" to 5="expert"), compared to the response averages for older age groups which ranged from 3.12 to 3.19. It is possible that youth in this youngest age category felt more knowledgeable about science because they are currently studying science in school. Differences could also be the result of youth feeling generally more confident in their knowledge than adults, or could also be due to the fact that younger respondents often have a different perception of what "knowing a lot" means (i.e., understanding the full range of what it is possible to learn about any given topic over a longer period of time).

Findings

In the following sections we will present data that speaks to each of the evaluation questions:

- I. Whether, and to what extent, the show led to audience understanding of the key scientific concepts (KNOWLEDGE),
- II. If the show stimulated audience interest and curiosity about stars, astronomy, and science in general (INTEREST/ATTITUDES), and
- III. The extent to which the show stimulates behavior and further learning (BEHAVIOR).

In other words, the remainder of this report is broken up sections that explore what viewers know, think and do as a result of viewing *Journey to the Stars*.

I. Viewers' Resulting Knowledge of Related Concepts

Part of the challenge of creating an educational program for a mass audience is ensuring that it is accessible to a wide variety of viewers, including those with different knowledge and interest levels. Our evaluation sought to determine whether, and to what extent, the show led to audience understanding of the key scientific concepts.

Despite this challenge, AMNH was successful in providing content that held appeal and educational value for a wide range of viewers. Visitors of all ages indicated that they learned new things and seemed to readily pick up on the major themes and messages presented in *Journey to the Stars* including how stars form and the different ways that their lives end, how our sun creates light and heat, and how the earth helps to protect us from the sun.

Adult Viewers' Responses about the Educational Nature of the Show (by Age)

The show I viewed today ...	13-18	19-29	30-39	40-49	50 and up	All
Was educational	4.25	4.45	4.43	4.48	4.49	4.44
Taught me new things	4.12	4.31	4.26	4.29	4.37	4.29
Was appropriate for my knowledge level	3.93	4.07	3.99	4.13	4.17	4.08

The averages in the table above and below are based on a five-point Likert Scale.

Children's Responses to Questions about *Journey to the Stars*

	1	2	3	4	5	Average
I learned new things from this show.	3 (2%)	7 (4%)	11 (6%)	56 (30%)	111 (59%)	4.41
I understood this show.	3 (2%)	4 (2%)	17 (9%)	65 (35%)	99 (53%)	4.35
This was a show for kids like me.	4 (2%)	10 (6%)	29 (16%)	55 (31%)	80 (45%)	4.11

Most viewers came to the viewing experience with at least a basic understanding of what stars are and what they do, however many viewers indicated that they had learned more about our universe in general, and stars in particular. The general consensus among viewers of different ages and science/astronomy knowledge levels was that show seemed geared toward general audiences with enough information to appeal to enthusiasts on the more knowledgeable end of the spectrum, but also accessible enough to younger and more novice audiences. Viewers who had also seen *Cosmic Collisions*, the previous space show produced by AMNH, thought that *Journey to the Stars* was slightly more accessible to younger viewers than its predecessor had been.

Viewers who had very basic levels of knowledge and interest in astronomy felt that the show was presented at an appropriate level. One viewer stated that “the info was presented in a way that everyone could understand.” Another viewer felt that the show was “accessible and inspires more learning for learners of all ages.” Other comments include the following:

- *The way it was worded [made it] easy for non-scientists to comprehend.*
- *Information presented in an easily understandable manner (i.e. narration, visuals, wording).*
- *I liked the way things were presented, making our universe simple for us to understand.*
- *Family friendly and easy to understand for all the general public.*
- *[It was] highly educational but accessible to all.*
- *the way the presentation is able to inform w/o being boring*

In fact, adult viewers with the least self-reported interest in astronomy were very likely to say that the show was the right level for them (i.e., viewers who selected “1” on a five-point scale for how interested they were in astronomy—indicating a low level of astronomy interest—had an average of 4.25, based on a five-point Likert response scale for the question that asked how much they agreed that the show was at the right level, while the average response viewers at all interest levels was 4.08. Likewise, viewers with the least self-reported knowledge of astronomy (i.e., those who said they knew “nothing” or “very little”), had a higher than average mean for how much they agreed the show was at the right level (i.e., the mean for those who said they knew “nothing” about astronomy was 3.97 and the mean for those who said they knew “very little” was 4.15, whereas the average mean for all viewers was 4.08).

None-the-less, viewers who felt they knew more than average about stars and space still tended to feel they were learning new things, or at least *seeing* new things, for example, things that they may have only had the opportunity to read about in the past. Viewers with higher levels of interest and knowledge in astronomy found great value in the visualizations and the parts of the show that helped to make abstract concepts more real for them. One viewer explained: “I had read a lot about these things and had seen photos...you can visualize all these things in your mind but to see them happening around you is really fantastic.” Astronomy enthusiasts who felt that they knew and understood things fully also felt there was benefit to having the concepts and knowledge be reinforced by the show. As one viewer stated, “it anchors it—it reinforces it and it reminds you that there is so much beauty in what you’re seeing,” and another noted, “I learned more and got to prove what I already knew.”

Generally speaking, school-aged children felt that *Journey to the Stars* was a fun way to learn about stars and several mentioned the benefit and value of being able to see things rather than read about them. Eighty-nine percent of children “agreed” or “strongly agreed” that they “learned new things from this show” (30% and 59% respectively), and 88% “agreed” or “strongly agreed” that they understood this show (35% and 53% respectively). “I like all the parts because I learned new stuff,” noted one child, and another shared that he “liked everything about this movie because I learned things – that is so cool!”

In terms of specific content that viewers felt they learned more about in *Journey to the Stars*, the following topics were frequently mentioned: dark matter, the origin of our universe and stars, the lifecycle of stars, the differences between different types of stars, the connection between stars and human life, and the unique ability of earth’s magnetic fields to shield us from harmful radiation from the sun. The following comments are all examples of things that viewers learned and/or found memorable:

- *Stars didn’t always exist - I thought that stars existed forever, didn’t know how they were formed.*
- *When/how stars were made.*
- *How stars die/That the sun will disappear – won’t always be here.*
- *Didn’t know about white dwarfs and brown dwarfs – also learned more about the lifecycle of stars.*
- *Didn’t know that stars had to be made – didn’t know that they died.*

In addition to information about the lifecycle of stars, viewers also latched onto information presented about the importance of stars. In addition to comments about the general importance, noted first below, viewers were also made aware of a connection to stars on a more personal level, (i.e., the fact that we, as humans, contain elements that were once part of stars). One nine-year old child wondered if doctors and nurses knew we had “stardust” in us – she planned to follow up by asking her doctor if he knew this. Other comments made by viewers whom we interviewed included the following:

- *Stars helped to create life and help to sustain life as we know it.*
- *Stars generate the elements that are necessary for life.*
- *Warms our body...without the sun it would be like ice.*
- *We need the sun more than we thought we did.*
- *We have a thimble full of material from stars in us/stuff in us from stars.*
- *We as humans are made of particles from stars.*
- *We are star stuff.*

Following the show, we overheard several conversations taking place as viewers were exiting the planetarium. We also had the opportunity to witness a handful of conversations and unique learning moments among visitors with whom we conducted interviews. The follow excerpt is from a four-person family group including one 6-year-old child and one 4-year-old child:

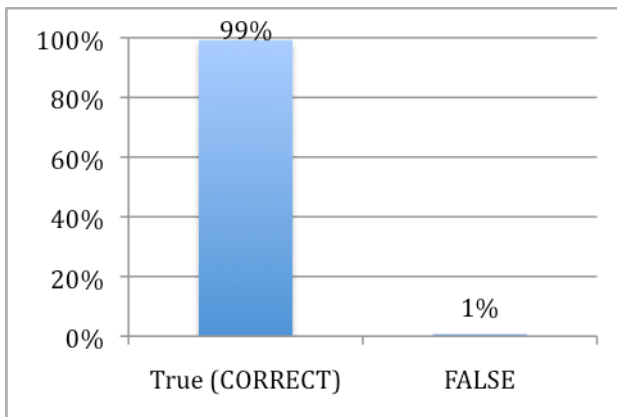
Interviewer: What is a star?
4-year old child: Like a planet
Interviewer: Is it bright?
Children: (nod)
Interviewer: Are they made of goo?
Children: (shake heads)

Interviewer: Are they made of gas?
 Children: (nod)
 4-year-old child: Hot gas...
 6-year old child: Exploded gas!
 Interviewer: Sometimes they do explode, don't they?
 Mom: Do you remember what it's called when they explode?
 6-year-old child: Nebula...
 Dad: That's good, a nebula is what's leftover after they explode!

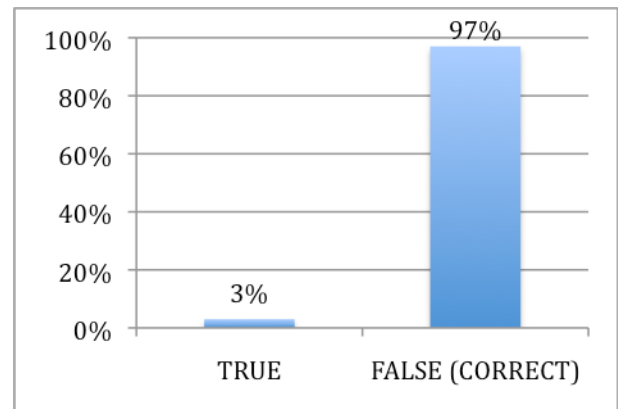
Responses to a series of knowledge questions helped to confirm that most viewers were coming away from their viewing experience with a better grasp of the basic concepts being presented. The overall percentage-correct for adult respondents was 92% (with scores ranging from 84% to 99%). For youth, the average percentage-correct was 86% (with scores ranging from 75% to 98%). Interviews with viewers following the show further suggested that, for many viewers, this was information that was previously unknown, and therefore learned during the viewing experience. Viewers' responses to specific knowledge question are summarized below.

Adults' Responses to True/False Knowledge Questions

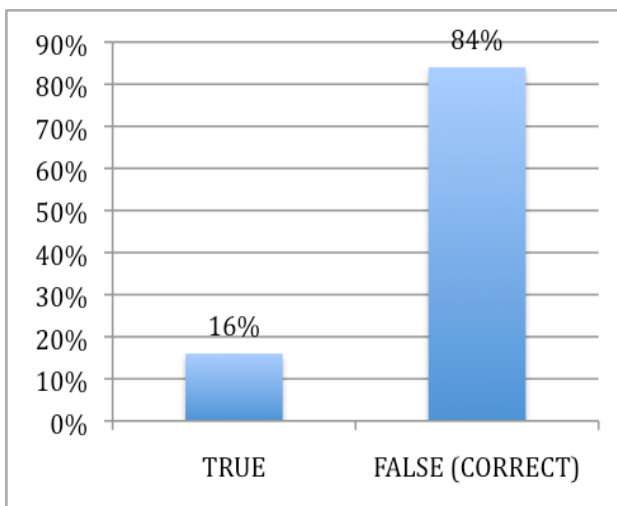
1) Our sun is a star.



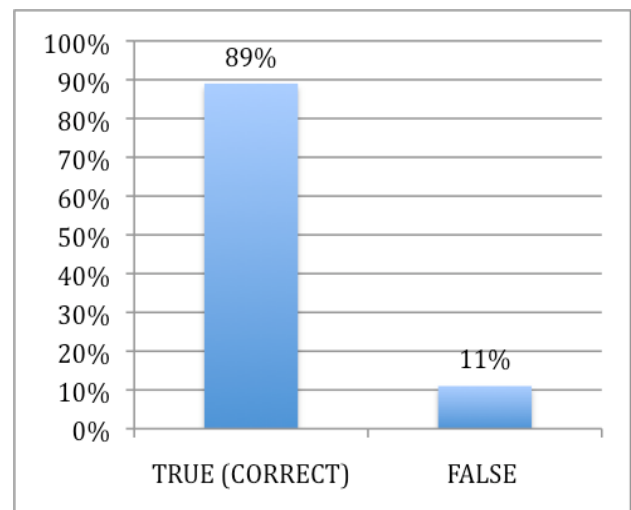
3) All stars are the same.



2) Stars have always existed.

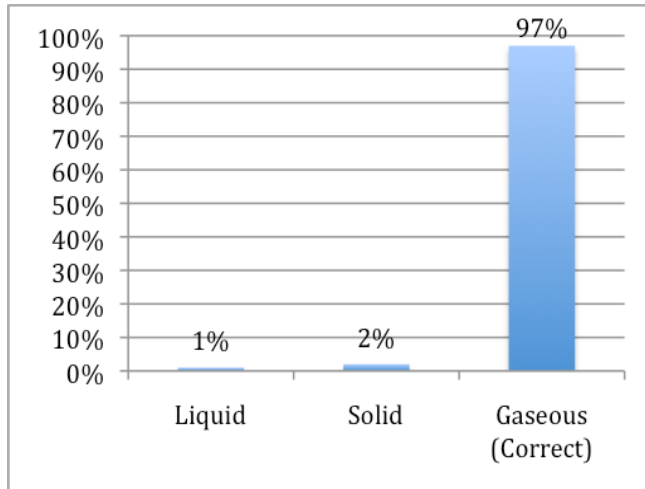


4) We are made of the same stuff as stars.

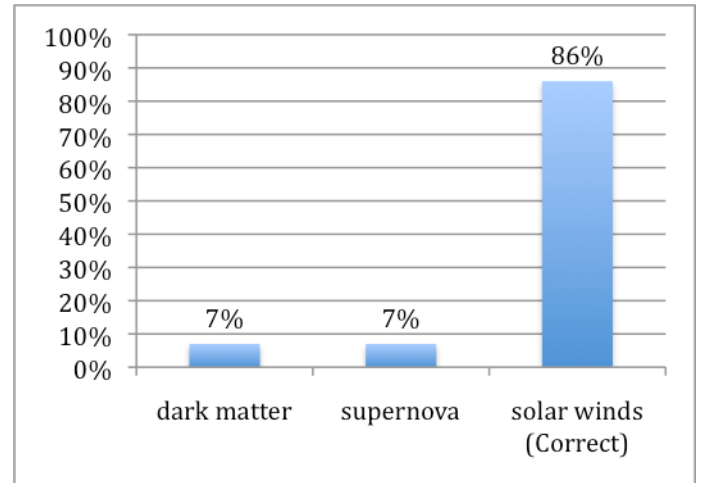


Adults' Responses to Multiple Choice Knowledge Questions

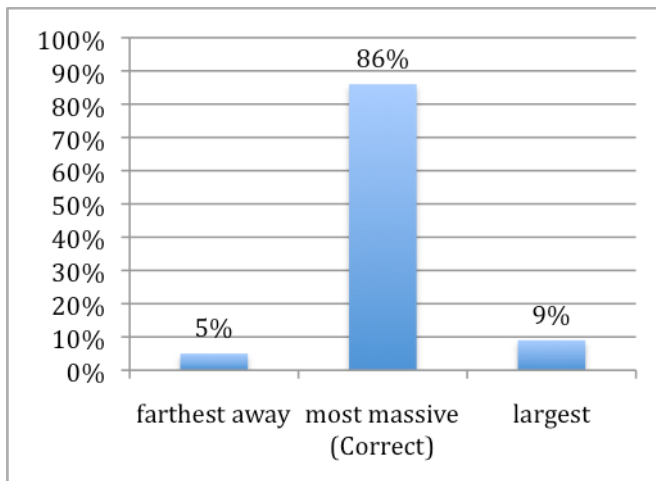
1) Stars are:



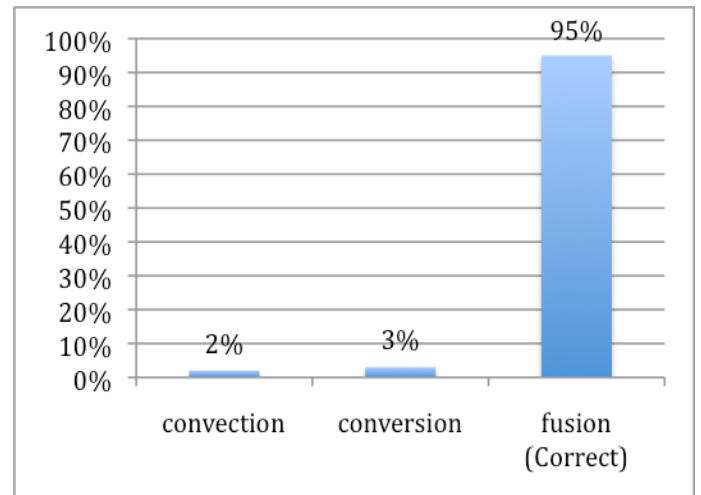
3) Earth's magnetic field protects us from:



2) The brightest stars are the:



4) Energy from stars is produced by:



Youth Knowledge Questions % Correct Overall

	Percentage Correct
T/F: Our sun is a star. (True)	98%
T/F: Stars have always existed. (False)	76%
T/F: All stars are the same. (False)	95%
T/F: We are made of the same stuff as stars. (True)	75%
Stars are..... (made of gas)	98%
The brightest stars are..... (the most massive)	78%
Earth's magnetic field protects us from..... (solar winds)	78%
Energy from stars is produced by..... (fusion)	94%
Total Percent Correct	86%

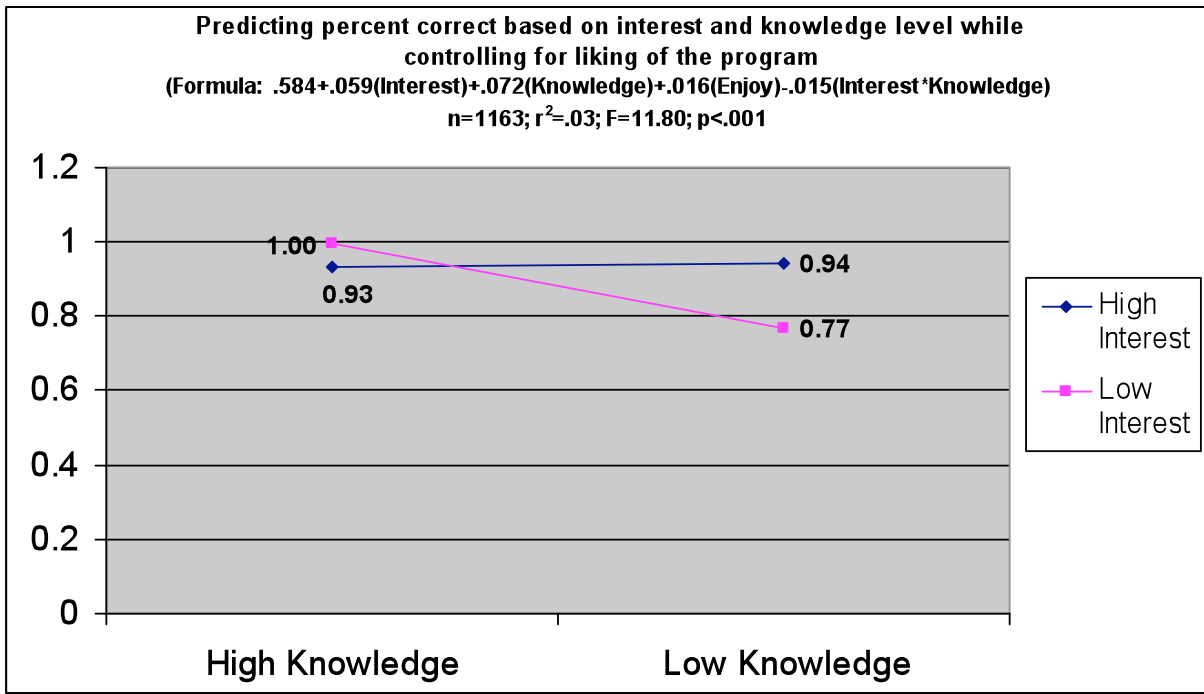
Overall, viewers exhibited a strong grasp on the basic concepts presented in the show. Combined percentage-correct scores were high for viewers of all ages, genders, and knowledge/interest levels, however there were a few statistically significant differences. For example, males were correct more often on the question about earth's magnetic field and solar winds than females (males were correct 88% of the time and females were correct 84% of the time ($p < .05$)). We also found differences based on respondents' ages, that are highlighted in the table below.

Percentage-Correct by Age

	“n”	Mean (% Correct)	SD
13-18 Yr olds	155	88%	.16
19-29 Yr olds	367	93%	.12
30-39 Yr olds	200	90%	.15
40-49 Yr olds	221	90%	.15
50-59 Yr olds	148	93%	.12
60+ Yr olds	92	93%	.10

Young adults, ages thirteen to eighteen, scored the lowest on the knowledge questions that were asked at the end of the survey. The mean percentage-correct for thirteen to eighteen year-olds was 88%—lower than the mean percentage-correct scores for other viewers. The differences were found to be statistically significant.

We also found a statistically significant relationship between adult's knowledge and interest and percent-correct (see graph below), but the amount of variation explained is very low ($r^2 = .03$). Overall adults' percent-correct on the knowledge questions was consistent when viewers' interest in science/astronomy was high, regardless of their knowledge level for science/astronomy. However, when interest is low (controlling for the level of enjoyment), the percent-correct decreases significantly as the knowledge level goes down.



We surveyed teachers on their thoughts about the show, and its potential value to them as educators. We asked teachers to indicate their rating of the educational value of *Journey to the Stars*. Overall, on a scale from 1-5, where 1="No Value," 2="Little Value," 3="Moderate Value," 4="Lots of Value," and 5="Extremely Valuable," the average response was 4.38 – i.e., teachers found the show to be highly educational.

Educators were also asked to rate their level of agreement with the statements in the table below, using a five-point Likert scale. Responses are broken down into averages for high school teachers, middle school teachers, and all teachers.

The show I viewed today...	HS Teacher Average	MS Teacher Average	All Teachers Average
Was educational	4.84	4.67	4.76
Taught me new things	4.42	4.53	4.47
Taught my students new things	4.73	4.10	4.43
Made me think about things in new ways	4.00	4.67	4.29
Was appropriate for my knowledge level	4.11	4.53	4.29
Was at a good level for my students	4.13	3.87	4.00

The following are examples of comments made by teachers about what they liked best:

- *It made me more curious about questions I already had. It made concepts easy to understand.*
- *The show and the models demonstrating visual representations of the scale and size of our universe.*
- *Gives an overview of the history of the universe in entertaining, understandable terms.*
- *It had a lot of visual and was not long. Works well for my students w/ short attention span.*

II. Viewers' Attitudes and Interests in Science and Astronomy

Many elements of *Journey to the Stars* seemed to pique viewers' interest in science and astronomy. We sought to learn more about the parts and features of the show that helped to stimulate audience interest and curiosity about stars, astronomy, and science in general.

The entertaining nature of the programming, along with high-quality imagery, engaging visualizations, and moving music were rated highly by viewers of all ages. Adults' responses are summarized by age-category in the table below.

Adult Viewers' Average Responses about the Show (by Age)

The show I viewed today...	13-18	19-29	30-39	40-49	50 and up	All
Was entertaining.	4.21	4.36	4.31	4.42	4.47	4.37
Made me think about things in new ways.	3.80	4.05	4.04	4.12	4.17	4.06
Was visually appealing.	4.39	4.58	4.42	4.51	4.63	4.53
Had music that appealed to me.	3.86	4.16	4.20	4.12	4.30	4.15

The averages in the table above are based on a five-point scale ranging from 1="Strongly Disagree" to 5="Strongly Agree."

Children also expressed appreciation for the show's entertaining qualities, its visual elements, and its music, and most children agreed that this was a show for kids like them. In the following table, children's responses are presented along with frequencies for each response option (1="Strongly Disagree" to 5="Strongly Agree").

Children's Responses to Questions about *Journey to the Stars*

	1	2	3	4	5	Average
I enjoyed this show.	0 (0%)	4 (2%)	5 (3%)	55 (29%)	126 (66%)	4.59
I liked the way the show looked.	2 (1%)	3 (2%)	4 (2%)	32 (17%)	147 (78%)	4.70
I liked the music.	3 (2%)	5 (3%)	18 (10%)	54 (29%)	108 (57%)	4.38
This was a show for kids like me.	4 (2%)	10 (6%)	29 (16%)	55 (31%)	80 (45%)	4.11

Overall, viewers were quick to praise the quality of the multisensory experience, including things seen, heard, and felt during *Journey to the Stars*. In fact, one of the most frequent comments made by viewers about the show was that it was "visually stunning," i.e., a richly and skillfully blended mix of images and animations that helped viewers see new things and/or see things in new ways. Another viewer noted: "I really enjoyed the visualizations about this program—our universe is a clear beauty and this show did an awesome job in bringing forth all the beauty."

Comments from viewers about the visual elements of the show included the following:

- *Visuals were high quality and realistic – helped to pull participants into the experience.*
- *Visually phenomenal.*
- *The visual presentation was great as well as the material presented.*
- *The visuals played to the strengths of the visual medium being used to tell the story.*
- *Visuals were fantastic – it actually felt like you were moving with the universe.*
- *It was beautiful. Gave me a clearer view of the cosmos.*
- *Visual effects make science more interesting and lively.*
- *Precise, amazing visuals that put in all perspective. Scale brought me to tears.*
- *Liked: Darkness and stars/beauty of earth. I cried.*
- *Visually and sonically impressive spectacle.*
- *Blend of music, narration, and visuals—everything came together well.*

Viewers noted the following visualizations being among their favorites: nebulas, supernova, illustrations of invisible forces (e.g., magnetic fields), and the animated diagram of our sun and related processes. Specific comments about other content that viewers appreciated or enjoyed included the following:

- *I liked the supernova and learning about the galaxy.*
- *The part about dark matter and how it started.*
- *Info on early formation of our galaxy.*
- *How a star works.*
- *Beginning of universe and fusion animation.*
- *The ability to see how space and the stars interact w/each other.*
- *Solar winds.*
- *I loved the movement and colors that identified how stars form.*

Viewers also like the fact that show made them feel like they were in space and moving through the universe. One viewer stated: “I liked how we seemed to be really moving, as if we could almost touch the things we were watching,” and another shared: “It was the closest thing to being in space,” and the “title is just right—you really feel like you’re on a journey.” Additional viewer comments included the following:

- *I enjoy the way that the show provided accurate information and realistic/vibrant scenes that allowed me to capture the experience of space.*
- *Images, were dynamic and gave a good impression of motion.*
- *Trippy visuals! Felt like flying through space.*
- *I liked how it looked so real.*
- *It was the closest thing to being in space.*
- *Like riding in space...thought we were going to break through the roof!*
- *Very educational experience and very interactive, I think it’s a very absorbing experience – takes you into the topic and you feel like you’re a part of it.*
- *Felt like you were observing/experiencing things (e.g., supernova) firsthand.*

As has been the case with previous space shows, *Journey to the Stars* succeeds in making viewers think about themselves in relation to the universe and come away with a sense of how small we are in comparison to everything else that is out there. Viewers noted that the show “inspires imagination,” and provides “reminders that we are but a small piece” of our universe. More so than their younger counterparts, adults frequently expressed comments that summarized the general awe-inspiring nature of the experience, for example, it “makes

me more conscious of what's beyond the blue sky—you feel like a grain of sand,” and “as if New York City doesn't make you feel small, this will make you feel small.”

On the other-hand, *Journey to the Stars* seemed to do a great job of helping viewers to make personal connections with the content. Viewers appreciated the connections being made to our star, the Sun, and things that directly affect life on earth. A few viewers mentioned the eventual end of the sun and the earth, but thought this subject was handled well and not presented in an overly dramatic fashion.

Another factor stimulating interest in science, and also holding the interest of science and astronomy enthusiasts, was the use of real images and data. Many viewers were able to identify parts of the show that used real images and data obtained from space telescopes and exploratory satellites like Voyager. Adults agreed that the show “appeared to use and present authentic, scientifically accurate data,” with a mean level of agreement of 4.32, (based on a scale from one to five, where 1=“strongly disagree” and 5=“strongly agree”). Likewise, youth agreed that the “things in this show were real and not made up,” with a mean level of agreement of 4.65.

Viewers who were most interested in astronomy were also most likely to agree that the “show appeared to use and present authentic, scientifically accurate data” (the mean agreement score for those who said they were “very interested” in astronomy was 4.46; the average mean for all respondents was 4.32). There was also a steady trend in more interested viewers feeling that the use of real data and real images was more important. Average means for the question that asked viewers how much they agreed that it was important “that the images used in a show like this are based on authentic, scientifically accurate data” increased steadily along with viewers' interest levels (i.e., those with an interest level of 1 had a mean of 4.00; 2=4.34; 3=4.46; 4=4.50, and 5=4.71). Younger viewers, i.e., those under thirteen, also realized that the show contained real images and real data. Ninety-two percent of youth “agreed” or “strongly agreed” that “things in this show were real and not made up” (19% and 73% respectively).

A few viewers commented on the accurate and up-to-date nature of the show: “I enjoy the way that the show provided accurate information and realistic/vibrant scenes that allowed me to capture the experience of space,” noted one viewer, and stated that she found the show “very up-to-date and information.” Another viewer who was a regular viewer of NASA's APOD (Astronomy Photo of the Day), said he recognized many of the images, but felt that he was seeing things in a new, more vivid, way.

Most viewers felt the science being represented in the show was accurate, but a few were curious about how scientists had learned about these things – e.g., “how they know what happened millions of years ago and how they know what will happen in the future millions of years from now.” In response, some viewers planned to seek out more information.

Perhaps most importantly, the show succeeded in sparking interest among those viewers that didn't previously have interest in this subject area. Several youth, for whom these concepts were new, indicated a desire to learn more. Another great example of the show's appeal came from a young girl who indicated that “this is not really my interest, but it really perked my interest.”

III. Viewers' Future Behavior and Further Learning

Journey to the Stars sparked viewers' interest in learning more about the topics that were presented in the show and doing more things related to astronomy in general. This section identifies the things that viewers said they would do, and that some actually did, after viewing the show.

One of the truest tests of impact, especially in terms of stimulated interest, is to look at what viewers intend to do and actually do as a result of viewing a show. We sought to examine the extent to which the show stimulated viewer behavior and future learning by asking viewers what they planned to do, and did do, after viewing the program.

Adult viewers generally agreed that they would seek out additional information on one or more topics that they learned about in the show, with an overall mean of 3.63 (based on a Likert response scale where 1="strongly disagree" and 5="strongly agree"). We found higher than average means for respondents who said they were "extremely interested" and "experts" in astronomy (i.e., those with the highest levels of astronomy interest and knowledge had mean scores of 3.95 and 3.85 respectively).

Adults and youth alike, were quick to mention things that they would be interested in seeking out more information on, either at the museum or when they get home. For example, a twelve-year old boy with whom we spoke was fascinated by the concept of dark matter and wanted to know how it got its name, how it was discovered, and more about what it does. He planned to look online for more information. Several adults indicated an interest in learning more about where the Voyager satellite has gone and what it has seen, and also learning more about dark matter (a concept that was familiar to some and quite new to others).

The most prevalent research strategy mentioned by viewers as a means to learn more was internet searching—with most viewers mentioning Google and Wikipedia searches as their primary means for finding more information online. Viewers were pleased to learn that there was additional information about the show available on the AMNH website.

In addition to looking up information, viewers also expressed greater interest in simply looking at the stars. Many viewers, including both youth and adults, with whom we spoke after the show indicated an interest in going home and looking at the stars more frequently. A nine year old girl, who said that she generally wasn't interested in science, indicated a desire to use her family's telescope to look at stars and do her own "research" about the different brightness, size and shape of different stars.

We followed up with a handful of viewers about a month and a half after they had viewed *Journey to the Stars* and they indicated that they had done the following things as a follow-up to their viewing experience: watched television programs about telescopes and the 40th anniversary of the moon landings, looked up information on Wikipedia (e.g., info about brown dwarfs), read articles and books about Galileo, the lunar module and early astrophotography, read the science section of the newspaper, visited the NASA website to look at photos and went stargazing.

Fifty-nine percent of adult viewers said that they would see this show again on a future visit—the mean level of agreement with a statement about viewing the show again in the future was 3.65 (based on a five-point Likert scale where 1="strongly disagree" and 5="strongly agree").

Fully three-quarters, (75%), of youth said that they wanted to see the show again (with a mean score of 4.13 based on the same five-point Likert scale). Children’s responses are summarized below along with frequencies for each response option.

Children’s Responses to Questions about *Journey to the Stars*

	1	2	3	4	5	Average
I want to see this show again.	5 (3%)	8 (4%)	32 (18%)	51 (28%)	86 (47%)	4.13
I will tell my friends to come see this show.	4 (2%)	8 (4%)	30 (16%)	49 (27%)	94 (51%)	4.19

The averages in the table above are based on a five-point scale ranging from 1=“Strongly Disagree” to 5=“Strongly Agree.”

Viewers also indicated a desire to tell others about the show and encourage them to see it. Adult viewers were asked how much they agreed with the following statement: “ I will encourage others to see this show.” The average mean was 4.13 (based on a five-point Likert scale where 1=“strongly disagree” and 5=“strongly agree”). Their comments about the show included the following “Its like your average planetarium show on steroids,” “I’ve seen other shows (in U.S. and abroad) but this is the biggest and the best, and “I would encourage others to see it – hard to describe, but definitely worthwhile.” Seventy-eight percent of youth viewers said they would “tell friends to come see this show” (mean =4.19).

In Conclusion

Viewers responded well to the new AMNH space show, *Journey to the Stars*. We found evidence to support the fact that viewers were learning new things and that the show was stimulating greater interest in science and astronomy and motivating viewers to seek out additional information. Viewers of all ages, genders, interest-levels, and knowledge-levels enjoyed *Journey to the Stars*, and nearly all felt inspired or informed as a result of their viewing experience.

Appendix: Instruments

Journey to the Stars - Visitor Survey

- 1) Gender: Male Female 2) Country: _____
 3) If U.S., State: _____
- 4) Age: 14-18 19-29
 30-39 40-49
 50-59 60+
- 5) Are you a member of this museum or institution? Yes No
- 6) In the past year* how many visits have you made to this museum? _____ Times
*e.g. Summer 2008 – Summer 2009
- 7) In the past year* how many total visits have you made to any museum (including this one?)
 _____ Times
- 8) How many times did you see a planetarium show during your visits to museums in the past year*? _____ Times

- 8) How **interested** are you in each of the following:
1=low/5=high Not Interested At All Moderately Interested Very Interested
- | | | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| a) Science in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Astronomy/Space Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Earth Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

- 9) How much do you **know** about each of the following:
1=low/5=high Nothing Very little Moderate Amount A lot Expert
- | | | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| a) Science in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Astronomy/Space Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Earth Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

- 10) With whom did you attend today's show?
- | | |
|---|---|
| <input type="checkbox"/> By myself | <input type="checkbox"/> With a group of children |
| <input type="checkbox"/> With friend(s) | <input type="checkbox"/> With parent(s) |
| <input type="checkbox"/> With my spouse | <input type="checkbox"/> With another relative (e.g. sibling) |
| <input type="checkbox"/> With my children/grandchildren | <input type="checkbox"/> Other: _____ |

- 11) Please rate the importance of each of the following factors in deciding to view this show?
1=low/5=high Not important at all Moderately Important Very Important
- | | | | | | |
|------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| a) Convenient time | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Price | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Title | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| d) Topic | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| e) Narrator | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| f) Educational value | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| g) New/hadn't seen it before | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

- 12) In general, I select planetarium shows that...
- | | | | | | |
|---------------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|
| | <u>Strongly Disagree</u> | | <u>Neutral</u> | | <u>Strongly Agree</u> |
| a) are educational | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |
| b) are entertaining | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |
| c) have topics that interest me | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |
| d) appeal to my whole family | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |

Please complete the back side of the survey after the show.

13) The show I viewed today...

	Strongly Disagree		Neutral		Strongly Agree	
a) was educational	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
b) was entertaining	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
c) taught me new things	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
d) made me think about things in new ways	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
e) was visually appealing	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
f) had music that appealed to me	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
g) was appropriate for my knowledge level	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
h) was what I expected	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	

If not, how did it differ from your expectations?

14) Please rate your level of **agreement** with each of the following statements:

	Strongly Disagree		Neutral		Strongly Agree	
a) This show appeared to use & present authentic, scientifically accurate data.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
b) It is important to me that the images used in a show like this are based on authentic, scientifically accurate data.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
c) I plan to seek out additional information on one or more topic that learned about in this show.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
d) I will encourage others to see this show.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
e) I would see this show again on a future visit.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
f) This show changed the way I see myself in relation to the universe.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
g) The pre-show presentation helped prepare me for what I saw.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	

15) Please identify each of the following statements as **True or False**.

a) Our sun is a star.	<input type="checkbox"/> True	or	<input type="checkbox"/> False
b) Stars have always existed.	<input type="checkbox"/> True	or	<input type="checkbox"/> False
c) All stars are the same.	<input type="checkbox"/> True	or	<input type="checkbox"/> False
d) We are made of the same stuff as stars.	<input type="checkbox"/> True	or	<input type="checkbox"/> False

16) Please select **one** answer to complete each of the following statements.

e) Stars are:	<input type="checkbox"/> liquid	<input type="checkbox"/> solid	<input type="checkbox"/> gaseous
f) The brightest stars are the:	<input type="checkbox"/> farthest away	<input type="checkbox"/> most massive	<input type="checkbox"/> largest
g) Earth's magnetic field protects us from:	<input type="checkbox"/> dark matter	<input type="checkbox"/> supernova	<input type="checkbox"/> solar winds
h) Energy from stars is produced by:	<input type="checkbox"/> convection	<input type="checkbox"/> conversion	<input type="checkbox"/> fusion

17) What did you like **most** about this program?

18) What did you like **least** about this program?

Journey to the Stars – Youth Survey

- 1) Are you a: Boy or Girl
- 2) How old are you? _____ years
- 3) How much do you like **Science**?
- I don't like it at all
 - I don't like it much
 - Sometimes I like it, sometimes I don't like it
 - I like it
 - I like it a lot
- 4) How much do you like **Astronomy**?
- I don't like it at all
 - I don't like it much
 - Sometimes I like it, sometimes I don't like it
 - I like it
 - I like it a lot
- 5) How much do you like learning about the **Earth**?
- I don't like it at all
 - I don't like it much
 - Sometimes I like it, sometimes I don't like it
 - I like it
 - I like it a lot
- 6) How much did you want to see **this show**?
- Not at all
 - Not very much
 - Did not care either way
 - A little
 - A lot

PLEASE ANSWER THE FOLLOWING QUESTIONS AFTER THE SHOW.	Strongly Disagree	Disagree	Don't Agree or Disagree	Agree	Strongly Agree
7) How much do you agree with each sentence below? (1 is low/strongly disagree...5 is high/strongly agree)					
a) I enjoyed this show.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
b) I learned new things from this show.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
c) I understood this show.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
d) I liked the way the show looked .	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
e) I liked the music and sounds .	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
f) Things in this show were real and not made up.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
f) This show was a show for kids like me .	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
g) I want to see this show again .	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
h) I will tell my friends to come see this show.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

8) Read each statement and pick "True or False":

- a) Our sun is a star. True or False
- b) Stars have always existed. True or False
- c) All stars are the same. True or False
- d) We are made of the same stuff as stars. True or False

9) Read each statement and pick the right answer:

- e) Stars are: made of liquid solid made of gas
- f) The brightest stars are the: farthest away most massive biggest
- g) Earth's magnetic field protects us from: dark matter supernova solar winds
- h) Energy from stars is produced by: function fraction fusion

10) Please use the back to write about anything you especially liked or didn't like about the show.

**AMNH Space Show Interview Questions
For *Journey to the Stars***

Interviewee(s):

Interviewer:

Day/Time:

1. What was your **general impression** of this show?
2. What did you **like most**? (in general and more specifically) Why?
 - a) Was there anything that you **didn't like**? (in general and more specifically) Why?
 - b) What would have **made it better**/How could it have been improved?
3. What were the **most memorable** parts of this show? **Why** were they memorable?
4. Was there anything that **didn't make sense** to you? What/why?
5. How would you **describe** this show to someone else?/What was it about?
6. Tell me a little more about what you **learned**...
(prompt: what did you know before, what did you learn from the show?)
 - a) ... **What** is a star?
 - b) ... **Where** do stars come from?
 - c) ... How are stars different from one another? (How do they **vary**?)
 - d) ... Why are stars **important**?
7. Do you think that this show has had an impact on how you'll think about things in the **future**? How so?
8. What will you do, if anything, to **learn more** about the topics presented in this program? (prompt: follow-up with magazines, web, television, book, lecture?).

Journey to the Stars - Teacher Survey

- 1) Gender: Male Female 2) Age: 14-18 19-29 3) School:
 30-39 40-49
 50-59 60+
- 4) Grade(s) Teaching: 1 2 3 4 5 6 7 8 9 10 11 12
- 5) Subjects Teaching: All Subjects Science Math Language/Reading Other:
- 6) How many, if any, times have you brought students to AMNH? ____ Times
- 7) How many, if any, teacher workshops have you attended at AMNH? ____ Times

- 8) How **interested** are you in each of the following:
1=low/5=high Not Interested At All Moderately Interested Very Interested
- | | | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| a) Science in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Astronomy/Space Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Earth Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

- 9) How much do you **know** about each of the following:
1=low/5=high Nothing Very little Moderate Amount A lot Expert
- | | | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| a) Science in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Astronomy/Space Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Earth Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

- 10) To what extent do you cover the following topics with your students?
1=low/5=high Not at all A moderate amount Extensively
- | | | | | | |
|----------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| a) What a star is | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Where stars come from | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) How stars differ | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| d) Why are stars important | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| e) How scientists study stars | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| f) Scientific process in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| g) Space science in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

- 11) As a teacher, I select planetarium shows that...
- | | | | | | |
|---------------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|
| | <u>Strongly Disagree</u> | | <u>Neutral</u> | | <u>Strongly Agree</u> |
| a) are educational | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |
| b) are entertaining | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |
| c) have topics that interest me | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |
| d) appeal to my students | <input type="checkbox"/> SD | <input type="checkbox"/> D | <input type="checkbox"/> N | <input type="checkbox"/> A | <input type="checkbox"/> SA |

Please complete the back side of the survey after the show.

12) The show I viewed today...

	Strongly Disagree		Neutral		Strongly Agree	
a) was educational	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
b) was entertaining	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
c) taught <u>me</u> new things	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
d) taught <u>my students</u> new things	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
e) made me think about things in new ways	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
f) was visually appealing	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
g) had music that appealed to me	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
h) was appropriate for my knowledge level	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
i) was at a good level for my students	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
j) was what I expected	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
If not , how did it differ from your expectations?						

13) Please rate your level of **agreement** with each of the following statements:

	Strongly Disagree		Neutral		Strongly Agree	
a) This show appeared to use & present authentic, scientifically accurate data.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
b) It is important to me that the images used in a show like this are based on authentic, scientifically accurate data.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
c) I plan to seek out additional information on one or more topic that I learned about in this show.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
d) I will encourage my students to seek out additional information on one or more topic in the show.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
e) I would see this show again on a future visit.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
f) This show changed the way I see myself in relation to the universe.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
g) The pre-show presentation helped prepare me for what I saw.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	

14) Overall how would you rate the educational value of this program?

- No Value Little Value Moderate Value Lots of Value Extremely High Value

15) How could you use this show to further your student's understanding of stars and our universe?

16) What did you like **most** about this program?

17) What did you like **least** about this program?

Journey to the Stars - Student Survey

1) Gender: Male Female

2) Grade: 9th 10th 11th 12th

3) Which of the following sentences best describes you:

- a) I am White or Caucasian.
- b) I am Hispanic or Latino.
- c) I am Black or African American.
- d) I am a Native American.
- e) I am Asian.
- f) None of the above describe me well/Other: _____

4) How **interested** are you in each of the following:

- | 1=low/5=high | <u>Not Interested At All</u> | <u>Moderately Interested</u> | <u>Very Interested</u> | | |
|----------------------------|------------------------------|------------------------------|----------------------------|----------------------------|----------------------------|
| a) Science in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Astronomy/Space Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Earth Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

5) How much do you **know** about each of the following:

- | 1=low/5=high | <u>Nothing</u> | <u>Very little</u> | <u>Moderate Amount</u> | <u>A lot</u> | <u>Expert</u> |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| a) Science in general | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Astronomy/Space Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Earth Science | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

6) How much do you **like** doing each of the following:

- | 1=low/5=high | <u>Not at All</u> | <u>Very little</u> | <u>Neither like/dislike</u> | <u>A little</u> | <u>A lot</u> |
|----------------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|
| a) Viewing educational programs. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| b) Visiting Museums. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| c) Visiting Planetariums. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

7) Before viewing the show, please tell us what you know about stars? (what they are, why they are important, etc.)

Please complete the back side of the survey after the show.

8) The show I viewed today...

	Strongly Disagree		Neutral		Strongly Agree	
a) was educational	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
b) was entertaining	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
c) taught me new things	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
d) made me think about things in new ways	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
e) was visually appealing	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
f) had music that appealed to me	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
g) was appropriate for my knowledge level	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
h) was what I expected	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	

If not, how did it differ from your expectations?

9) Please rate your level of **agreement** with each of the following statements:

	Strongly Disagree		Neutral		Strongly Agree	
a) This show appeared to use & present authentic, scientifically accurate data.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
b) It is important to me that the images used in a show like this are based on authentic, scientifically accurate data.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
c) I plan to seek out additional information on one or more topic that learned about in this show.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
d) I will encourage others to see this show.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
e) I would see this show again on a future visit.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
f) This show changed the way I see myself in relation to the universe.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	
g) The pre-show presentation helped prepare me for what I saw.	<input type="checkbox"/> SD	<input type="checkbox"/> D	<input type="checkbox"/> N	<input type="checkbox"/> A	<input type="checkbox"/> SA	

10) Please identify each of the following statements as **True or False**.

a) Our sun is a star.	<input type="checkbox"/> True	or	<input type="checkbox"/> False
b) Stars have always existed.	<input type="checkbox"/> True	or	<input type="checkbox"/> False
c) All stars are the same.	<input type="checkbox"/> True	or	<input type="checkbox"/> False
d) We are made of the same stuff as stars.	<input type="checkbox"/> True	or	<input type="checkbox"/> False

11) Please select **one** answer to complete each of the following statements.

e) Stars are:	<input type="checkbox"/> liquid	<input type="checkbox"/> solid	<input type="checkbox"/> gaseous
f) The brightest stars are the:	<input type="checkbox"/> farthest away	<input type="checkbox"/> most massive	<input type="checkbox"/> largest
g) Earth's magnetic field protects us from:	<input type="checkbox"/> dark matter	<input type="checkbox"/> supernova	<input type="checkbox"/> solar winds
h) Energy from stars is produced by:	<input type="checkbox"/> convection	<input type="checkbox"/> conversion	<input type="checkbox"/> fusion

12) What did you like **most** about this program?

13) What did you like **least** about this program?