Space Tours Live! Audience Choice for a Live Planetarium Show

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BIOGRAPHIES

Ka Chun Yu has developed real-time interactive planetarium visualization software; been involved in live and pre-rendered fulldome show productions; given hundreds of public lectures, professional development programs, classes, and media appearances; and researched the use of digital planetariums for astronomical and Earth systems education.

Naomi Pequette is an Earth and Space Science Programs Specialist at the Denver Museum of Nature & Science. Her focus is developing space science demonstrations, facilitations, and live planetarium shows, as well as training staff and volunteers. Naomi holds a B.S. in Physics and Astrophysics from the University of Denver.

Samantha Sands is an Earth and Space Sciences Program Specialist at the Denver Museum of Nature & Science. Samantha earned her Master’s in Museum Studies from the University of Colorado and her Bachelor’s in Environmental Geology from the University of Michigan. She develops programs and trains staff and volunteers in exhibits as well as live planetarium programming.

Dan Neafus has produced engaging audience experiences for 40 years. As executive producer, his fulldome works include Black Holes: The Other Side of Infinity, Bella Gaia – Beautiful Earth, Super Volcanoes, and Dynamic Earth. Dan is a frequent speaker at international conferences focusing on “The Language of Immersive Cinema” and fulldome business cooperation.

Greg Mancari has worked at the Gates Planetarium for over 10 years and has helped to develop and present successful programming including Astronomy Learning for Immersive Virtual Environments, the Worldviews Network, and Space Tours Live!

ABSTRACT

Space Tours Live! is a guest-driven, live interactive digital planetarium show at the Denver Museum of Nature & Science’s Gates Planetarium. A host guides the audience on their journey following one of three different programmatic outlines, but using requests from the crowd to build a show narrative that appears fresh each time. After initial conversations with visitors, the host picks the theme of either “Cosmic Distance,” “Habitability,” or “Cosmic Collisions.” The guests also suggest places in the Solar System they would like to travel to, and these locales plus answers to audience questions are woven into the story. The presenter builds a coherent narrative by relating information specific to the chosen theme for each body encountered. We describe how our presenters—many of whom do not have astronomical backgrounds—trained for these multiple storylines, discuss the public feedback from our ongoing evaluation, as well as the lessons learned from the development of this program.

INTRODUCTION

The first planetarium audiences in 1920s Germany saw classroom-style lectures and demonstrations from planetarium directors who were former university professors. Later shows evolved to be less didactic and more appropriate for general public audiences (Hagar 1973). The combination of visuals from a planetarium projector and narration from a live presenter became the initial model for the “star talk” in a dome. However, by the early 1950s, planetarians, like Richard Emmons, were experimenting with taping presentations for playback (Emmons 2005). Planetarium staff now began to record their best house presenters. Instead of being lucky enough to catch a first-rate lecturer on her finest day, anyone attending a planetarium show could now hear the best “take” from the talent.

Show recording and playback was a widespread enough phenomenon that by the 1960s, there were debates over whether taped or live programs were more effective (Friedman 1991). Over time, larger planetariums began to hire outside celebrity voices for their show recordings. In 1973, the Miami Planetarium had a recording session with 17 actors, including Star Trek’s Leonard Nimoy (Geoghegan 1973). The final audio tracks, which included music and sound effects, were bundled with annotated scripts and slide projector visuals for rental or sale to other planetariums (Gronauer 1978; pp. 160-161). Although sharing show content had been discussed by planetarium directors as early as the 1950s (Marché 2005, pp. 107-108), it was not until the 1970s that show distribution of this type became common. The Strasenburgh Planetarium in Rochester, New York and the Hansen Planetarium in Salt Lake City, Utah were the two most prominent institutions distributing pre-packaged content nationwide to other planetariums (Marché 2005, p. 172). Science fiction adaptations were a popular genre. Fred
Hoyle’s novel *The Black Cloud* appeared at the Hansen Planetarium in 1969 (n.a., 1974), while Isaac Asimov’s classic 1956 science fiction short story *The Last Question* appeared as a co-production from the Strasenburgh and Abrams Planetarium (in East Lansing, Michigan) in 1972, and was sold to other theaters for $825 (n.a., 1972).

The evolution of “canned” programming turned next to the development of fully automated systems, where a single operator could control the audio and visuals for an entire show. Triggers for the slide and special effects projectors were recorded as inaudible cues on the same magnetic tape as the audio narration. The all real risk of a tape breaking in the middle of a performance meant that early computer control systems were created to run multimedia (Wieser 1977). Many planetariums had a mix of both live and canned programming. Charles Gronauer reported that each of the Strasenburgh Planetarium’s nine pre-recorded programs had a live introduction by a host who would explain the planetarium technology and answer any questions before the canned show was played back (Gronauer 1978, pp. 164-165).

For the last 70 years of their existence, planetariums have had two competing philosophies for delivering programs. The first and more traditional mode was with a live lecturer, who could provide spontaneity and interaction with an audience, and who could tailor each program to the specific needs of the visitors in the theater. The second mode was via a narration track recorded by a polished presenter, augmented by music and sound effects, and which could be played back repeatedly day after day. Many planetariums did not strictly adhere to one paradigm over the other. Instead, planetarium directors understood that pre-recorded and live programs both had their merits. The decision to pick one over the other was based on multiple considerations, including the objectives of the program, the intended audience, the number of times the program would be repeated, the complexity of the show, and the reliability of the playback equipment (Del Chamberlain 1972).

**I. THE BENEFITS OF LIVE VS. PRE-RECORDED NARRATION**

This tension between live and canned programming continues to today, although there is a strong recent movement to highlight and disseminate the best of live interactive presentation techniques (Berglund 2011). Video playback in modern fulldome planetariums has advanced so that a lone individual, with no training in astronomy or even the operation of the real-time simulation software, can push a button to start a program. Senior management worried about the planetariums competing philosophies for delivering programs. The latter assertion is almost entirely anecdotal, because there is no published research that makes a straightforward comparison of these two delivery practices.

An unpublished visitors study report from the Denver Museum of Nature & Science (DMNS) however shows the clear benefits of a live program over its canned counterpart (Koke 1999). Sixty visitors were shown one of two shows on asteroids, comets, and meteors, with the same script, but with the narrator performing live in the Gates Planetarium in one, and heard via a recording in the second. The show explained five different actions the audience could take in case they saw a meteor in the sky. In the post-treatment survey immediately after the program, visitors were asked how many of the five actions they could remember. Those who saw the show with the live narrator tended to remember more actions (Table 1). A greater fraction of the live audience compared with the pre-recorded audience could recall each of the actions (Table 2).

<table>
<thead>
<tr>
<th>Table 1 – Number of Correct Responses from Visitors (from Koke 1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recorded Show</strong></td>
</tr>
<tr>
<td>0 correct</td>
</tr>
<tr>
<td>1 correct</td>
</tr>
<tr>
<td>2 correct</td>
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<tr>
<td>3 correct</td>
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<td>4 correct</td>
</tr>
<tr>
<td>5 correct</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2 – Visitors Recalling a Specific Action (from Koke 1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recorded Show</strong></td>
</tr>
<tr>
<td>Keep eyes on object</td>
</tr>
<tr>
<td>Use fist to measure</td>
</tr>
<tr>
<td>Note time/location</td>
</tr>
<tr>
<td>Note presence of sound</td>
</tr>
<tr>
<td>Note direction of object</td>
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Visitors from the live show were all aware that they had witnessed a program with a live narrator. Interviews with the presenters suggest that even in a darkened theater, the audience could hear subtle cues that the presenter was in the room, including soft breathing and clearing of throats. The presenters also believed the audience was aware of them shifting their positions inside the theater. From their interviews, visitors felt the live narrator to be more personal, and was speaking to them directly: “I would say the difference between a live narrator and a canned one is like when a human answers a phone, rather than an answering machine.”
Four planetarium staff who participated in the study were also asked about what they thought was happening during the live presentations. Because they were in the same room as the crowd, the presenters believed that a “conversational dynamic” was established between them and the audience. After being subtly conscious that they were part of a conversation, the audience became more attentive and involved as part of the expectations of being a partner in an oral exchange, even though they may not actually have spoken up during the program. Furthermore, the presence of a narrator created an “illusion of the first time;” the audience felt that the engagement was unique and tailored for them alone, making them feel special. The study inferred that the pre-recorded show audience was not affected by these factors, leaving them less engaged and attentive.

II. COSMIC CRUISIN’

Despite this strong evidence for the utility of live over canned programs, DMNS management made the decision to have only film playback when the Gates Planetarium reopened after its remodel into a fulldome theater in 2003. The theater seat-count shrunk because of the new uni-directional seating layout within a tilted dome, which meant that the each show would have only a half hour turnaround. There would be insufficient staff available for such a fast-paced schedule of programming.

Instead of a strong director, DMNS planetarium programming decisions are made by an operations team consisting of staff from multiple departments: Planetarium Operations, Research & Collections (for scientific review), Programs (for educational review, performer staffing), Guest Services (for ushers and ticketing), and Marketing. The cross-departmental nature of dome theater operations means that the development of new shows—especially ones that break from the default playback mode—must involve and have support from multiple divisions in the Museum. Therefore, new live programming faced a number of different barriers. In the past, the Programs division did not have enough staff to cover the daily shows. The Marketing department was concerned about the consistency and quality of live presentations; they expected each Educator Performer’s performance to meet the same high standard of excellence. Even the Finance department expected that ticket sales from a new live show to at least match, if not exceed, the revenue from an existing show that it was replacing in the same time slot.

Despite this, Planetarium staff (including authors Neafus and Mancari) and Programs staff had long been interested in reviving a live program at DMNS. Assistant Coordinator for Space Gallery Programs Dave Cuomo began prototyping a free program called Cosmic Cruisin’ in late summer 2009 using an open half-hour block during lunchtime. It would feature SCISS AB’s Uniview software, which was already being used in Gates Planetarium evening programs. As a staff educator delivered the live presentation while mingling with the audience, a second person would “fly” Uniview in the dome. This operator was initially a Museum Galaxy Guide volunteer docent, who had experience with the software on the Orbits Table tabletop interactive in DMNS’ Space Odyssey exhibit. (Eventually, Programs staff eventually took over this role as well.)

Instead of a traditional star talk, Cosmic Cruisin’ quickly evolved into a free-form program, where audience feedback was essential for shaping the narrative. The presenter asked visitors where in the universe they wanted to go or what they wanted to see. Audiences tended to ask for flights to different worlds in the Solar System, as well travel out into galactic and extragalactic space. Some presenters opted to emphasize what was visible in the night sky, but the show mostly focused on simulating space travel to locations throughout the universe.

The Cosmic Cruisin’ presenters eventually included not just the staff educators, but also talented Galaxy Guides and DMNS scientists. Generally, staff educators were discouraged to go outside the Solar System since were not knowledgeable enough to talk comfortably about galactic and extragalactic astronomy. However, there were researchers or talented volunteers who could address visitor questions in those domains. Themes would emerge for each presentation depending on the expertise and interests of the presenter, including observational astronomy, astrobiology, and even talks by a geologist focused on Earth features visible from low orbit.

For the first year of the pilot phase, the only way that visitors knew Cosmic Cruisin’ was happening was if they happened to walk by the open doors of the planetarium as the presenter pitched the program like a carnival barker, in the few minutes before the show started. By the following summer in August 2010, staff had enough experience that Cosmic Cruisin’ appeared on the regular planetarium schedule. Although there was some discussion about switching to a paid ticket model, the show was kept free for the public. At this time, in addition to its regular lunchtime slot, Cosmic Cruisin’ also began appearing as an offering during evening Members Nights and other special events.

III. GENESIS OF SPACE TOURS LIVE!

In November 2015, the Gates Planetarium began running Adler Planetarium’s Destination Solar System, a hybrid program with a presenter who interacts with a character in the fulldome film, thus combining the engaging presence of a talented performer with the polish and consistency from a pre-rendered film. Although Cosmic Cruisin’ had been successful the previous five years, it was discontinued as a daily show in order for it not to compete with a live program that was generating ticket revenue.

In the year after this changeover, Cosmic Cruisin’ did not entirely go away. In the Space Odyssey exhibit, staff Educator Performers hooked up a Uniview-enabled laptop to the 3.6 meter-wide, flat “Space Screen,” to run “Travelin’ the Universe,” a

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1 At DMNS, Educator Performers have communications training, and often come from acting or improvisational backgrounds.
variant of Cosmic Cruisin’ with more night sky and constellation story content. A version of Cosmic Cruisin’ in the dome also appeared in an evening, adults-only event, the Great Space Escape, which involved a host of other space and astronomy live programs and activities in addition to the dome show. There were even occasional queries from daytime guests wondering what had happened to the regular Cosmic Cruisin’ offering in the planetarium. Despite the lack of a daily show, the variations on the Cosmic Cruisin’ theme proved popular enough to ensure that it would eventually be resurrected in a new form.

Planetarium staff continued to investigate how Cosmic Cruisin’ could be revived, and submitted several proposals to DMNS leadership for funding to develop a new program. In December 2016, approval was finally given for a follow-up, with 8-weeks allotted for development starting in January 2017. Now known as Space Tours Live!, the new program would have several essential elements. It had to be a high quality, consistent experience for audiences, regardless of who was delivering it. The technical aspects of running the program would also be smooth and invisible to the audience. The Educator Performers also had to be focused on their presentations, and not distracted by the user interface, the workings of the software, or the underlying hardware.

III.1 Storylines
The free-for-all nature of Cosmic Cruisin’ meant that the Uniview operator ended up hopscotching around the Solar System (and sometimes the universe, depending on the presenter) based on audience requests. This often resulted in a disjointed performance, and not as polished and professional as a live program could be. Another challenge was to create a satisfying storytelling experience with a beginning and end, but which still incorporated the open-ended audience requests. A free-form audience-driven show meant that different presenters with their own content knowledge and experience with astronomy and planetary science would create a broad range of experiences for their audiences.

We decided to create three different pre-defined storylines for Space Tours Live!: “Cosmic Distances,” “Types of Planets in the Solar System,” and “Habitability.” The scripts for the first two were completed by mid-February 2017, with the final story done a month later. Each narrative would be supported by examples from places the audience requested to visit. Guests would feel that they were experiencing a wholly audience-driven show, even though the narrative was actually constrained. At the same time, the audience experience would be more polished and narrative-driven than Cosmic Cruisin’. Five years of running Cosmic Cruisin’ let us know what the most common audience questions were. For instance, we received requests for the same Solar System objects (Mars, Saturn, Jupiter, Uranus, and Pluto). There were few quantitative questions like “how hot is it?”, or “how far away is it?” Instead the frequently asked questions were ones involving origins (“Why is it rocky?”, “How did it get there?”), human space travel (“Have people visited Mars?”, “When are they going there?”), scale (“How big is it?”), and questions about specific objects and features (e.g., Saturn’s rings, Jupiter’s Great Red Spot).

III.2 Training
A cadre of twelve Educator Performers were delivering Destination Solar System shows four times a day. This team were chosen also for Space Tours Live! These presenters came from a larger pool of 30-40 part-time Educator Performers, who operated throughout DMNS in exhibit gallery programs, on- and off-site school programs, evening events, and in-house science camps for schoolchildren. Most had performance and/or teaching backgrounds. Although they may have had experience working in other DMNS educational programs, they did not necessarily have any astronomy training. (One performer admitted that he did not know the names of the planets in their correct order when he was hired for Destination Solar System!) Despite the initial varying levels of ability, all of these Educator Performers shared an innate curiosity, a willingness to learn, and the ability to convey excitement about science to their audiences.

Many of the Educator Performers training for Space Tours Live! had space science content training from working in the Space Odyssey exhibit. There they also picked up Uniview skills by delivering the “Travelin’ the Universe” version of Cosmic Cruisin’. Such interactions were important, since they were used to delivering only scripted responses in Destination Solar System. Those who did not have any Uniview-related experience started practicing their presentation skills with the “Travelin’ the Universe” talk or on the tabletop projection Orbits Table. Such activities were low risk, since DMNS guests were not paying any additional fee for such programs (whereas they normally would in the planetarium). Audiences would be more forgiving of mistakes and glitches. The Educator Performers were also gaining experience by having authentic interactions with guests, which would be more difficult when practicing with other staff members. Some performers also practiced in the planetarium itself, working in the dome before or after the daily public shows.

Educator Performers who had little astronomical backgrounds had the greatest challenge, since they had to appear as experts to the public. Program specialists (authors Sands and Pequette), who were responsible for training, provided them with educational content sheets, pointed to NASA websites, and sent them to watch the Crash Course Astronomy videos hosted by Phil Plait on YouTube. Educator Performers were also encouraged to prepare with one another via mutual discussions and quizzes. Most of the Educator Performers actively sought out new content knowledge on their own, even after their official training ended, so that their shows would stay fresh.

The Educator Performers also covered programs throughout the building, so training had to accommodate their existing work schedules. With a dozen staff to prepare, a detailed calendar was developed to allow time for instruction, rehearsal, and final
sign-off by the program specialists. Each Educator Performers had 1-2 training sessions in the Gates Planetarium, where they were able to practice operating Uniview using the Panels interface on a handheld tablet, and playing to an audience consisting of other staff. In addition to making sure that they were able to perform at least one of the storylines, they also practiced handling situations where an audience member presented them a question they did not know the answer to. The goal was to have all staff gained the same comfort with the technology, and the same competency in content knowledge needed to deliver the storylines. As they improved their skills, the Educator Performers also had to make sure their enthusiasm for the topics and the spontaneity of their performances—necessary for audience engagement—did not wane. They were still expected to meet the high audience expectations for live presenters at DMNS. By the end of the in-dome training sessions—typically 2-3 weeks after training started—they were signed off by the program specialists.

III.3 Technical Operations

Uniview can be controlled from a tablet with the user-programmed Panels interface. These easy-to-create layouts allowed the Planetarium Technician (Mancari) to create a unique interface allowing Educator Performers to swipe back and forth between different pages for the *Space Tours Live!* storylines. Each page was designed to be sparse, to minimize confusion. Notes containing additional information were found on each page. The deliberately simple interface was meant to accommodate Educator Performers with a range of technical ability, from those who were technically savvy to those not comfortable with computers. The tablet also allowed the Educator Performer to control the dome while standing visibly near the audience, instead of being tied to the control desk in the back of the theater. Overhead lighting was left on at a subdued level initially for the audience to see the presenter, but was turned off afterward to maximize the impact of the dome visuals.

The Gates Planetarium runs Evans & Sutherland's Digistar software for pre-rendered show playback, while Uniview is used for real-time presentations. The Educator Performer staff were given instructions for switching the dome between playback and the real-time systems, as well as toggling a KVM controller so that the keyboard and mouse governed the appropriate cluster. For each live show, the Educator Performer donned a headset that fed the microphone audio to the dome sound system. A hand strap attached to the tablet allowed it to be held with one hand, and controlled with the other. Background music came from a second tablet which started playing before the start of *Space Tours Live!* and unplugged afterwards when the dome went back to show movies. A procedural checklist helped staff complete their tasks in the proper order.

Technology-related problems with the Educator Performers have been minimal, although they occasionally appear. For instance, after background music was added, each of the twelve Educator Performers had to be individually re-trained to take note of the new steps in the procedures to turn on and off the music. Something as simple as an operating system update to the tablet resulted in a change in the appearance of the user interface, which resulted in concerns for a few of the presenters who were nervous about computers. There have been instances when a presenter has forgotten to turn off the mic to the headset after they have finished a show, which let the audience hear ambient noises around them after they had left the dome. The common solution to these different issues was to update the training materials, and to refresh each presenter with the revised procedures.

IV. SPACE TOURS LIVE! GOES LIVE

On 17 March 2017, *Destination Solar System* switched to two shows daily, with *Space Tours Live!* taking up the remaining two live show spots. The presenters initially offered two different programs, “Cosmic Distances” and “Types of Planets in the Solar System.” Rehearsals had started on the third topic, “Habitability,” which was adopted by only the most experienced of the Educator Performers, who were more comfortable with the advanced content.

Over the next several months, the Educator Performers experimented with their deliveries, and slowly discovered a set of best practices and recommendations, which were reported back to the planetarium team via two different “Show Shop” workshops in the summer of 2017. Some of the difficulties with the initial version of *Space Tours Live!* was due to narratives that were too script-like. The word “script” itself implied text that had to be repeated verbatim by the presenter, whereas *Space Tours Live!* was intended to be more free-form and less confining. To create more satisfying storytelling, Programs staff decided that the introductions and the endings for each story would be scripted, but the middle would be a looser, adaptive narrative, created on the fly by the presenter. As a result, the “scripts” evolved into “programmatic outlines.” Content knowledge was published in separate content sheets for each storyline, emphasizing that even in the training materials, a variety of content could be grafted onto each user-driven story.

The Educator Performers also found that audiences often did not enter the dome excited and ready to offer ideas for places they wished to visit. To get visitors to open up, the presenters now engaged with them as they stood in line waiting to enter the theater. During these 5-10 minutes, the guests connected with the host, learned about the show format, and became primed to be more participatory, instead of waiting to sit and watch passively. Again to emphasize the free-form nature of the experience and move away from a didactic classroom, Educator Performers asked “What are you wondering about?” or “Are there any places in the Solar System that you are curious about?” instead of “Do you have any questions?”

At the start of *Space Tours Live!* most of the Educator Performers selected “Types of Planets in the Solar System” because they believed the content was easier to learn. The storyline had two main threads, one on terrestrial planets, and the other on
gas giants. Visitors were asked to select a planet from each group. Visitor feedback showed that they preferred to have more flexibility in their options. The programmatic outlines were later remediated to give the audience more freedom of choice.

The “Habitability” show was also altered. The first version of the show had the presenter offering up a list of planets within and outside of the habitable zone around the Sun. To the audience, having two broad options again felt like they did not have much of a choice. After further refinements, guests are now given more options, including the ability to visit moons and even the Sun.

Over the summer, one of the Educator Performers started to develop a “Cosmic Collisions” story. This narrative had a variety of different options, and engaged the audience in visual thinking, by asking them to report what they were observing on the dome. This show was immediately successful with both the Educator Performers—four of them picked it up within weeks of the release of its programmatic outline in October 2017—as well as visitors. At this time, the least popular show, “Types of Planets,” was retired from the list of offerings.

V. EVALUATIONS

Early feedback from audiences was extremely positive, but anecdotal. During special evening programs when Space Tours Live! competed with other live and interactive offerings elsewhere in the museum, the live planetarium show usually ranked first. The first formal evaluation was conducted in May 2018 by DMNS’ Audience Insights evaluation team. Ninety-five visitors who had attended six different Space Tours Live! shows were surveyed. When asked about the live Educator Performer, the vast majority of audience members “agreed” or “strongly agreed” that the presence of a live facilitator helped them learn more (a combined total of 92% in the two categories), made the show more engaging (94% in the combined two categories), and enjoyable (87% in the combined two categories).

Visitors were also asked to rank the show using the Overall Experience Rating (OER) survey, which was originally developed by and had been used continuously at the Smithsonian Institution for the last 14 years (Pekarik, Schreiber, & Visscher 2018). The instrument uses a five-point Likert scale, with ratings of Poor, Fair, Good, Excellent, and Superior to capture feelings of the overall experience. Its consistent use at all Smithsonian museums to survey over a hundred exhibits and programs provides a stable baseline for the comparison of new programs. Like many other museums (Pekarik et al. 2017), DMNS has adopted OER as a way to inter-compare its exhibits and visitor programs.

Smithsonian’s Office of Policy & Analysis found that the fraction of visitors surveyed using OER who ranked an exhibit or program Excellent was typically in the range 40%-60%, whereas the rankings below or above Excellent could vary greatly from one program to the next (Perkarik et al. 2018). The OER is argued to be a better indicator of whether an experience excites the most enthusiastic visitors, because it offers a rating beyond mere Excellent. Based on statistics gathered at Smithsonian museums, the typical fraction of audiences that give the highest Superior ratings is 20%.

DMNS has not gathered as many OER evaluations for any comparisons to be meaningful. But for visitors who saw Space Tours Live!, 10% ranked the show as less than Excellent (i.e., Poor, Fair, or Good), while 49% gave it Excellent marks, and 41% ranked it Superior. If like the Smithsonian museums, DMNS programs on average also receive a rating of Superior by 20% of its visitors, then the Space Tours Live! Superior score of 41% has an error of roughly 10% at the 95% confidence level.

VI. FUTURE OF SPACE TOURS LIVE!

The current set of storylines for Space Tours Live! are fixed for months at a time, since it takes more time and resources to create new stories, program in new visuals, and train the Educator Performers. For future iterations of the program, we are exploring how we can incorporate current science to make the show more topical. This would involve selecting a current news story, and have a procedure in place for scripting, scientific review, adding new content into Uniview, re-programming the Panels interface, testing, and training. Educator Performers would not be expected to integrate this new content into their presentations until they had sufficient practice, and were comfortable telling the new story.

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REFERENCES


