MarsQuest Summative Evaluation

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EXECUTIVE SUMMARY

INTRODUCTION

This report presents the findings of a summative evaluation of *MarQuest*, conducted by Randi Korn & Associates, Inc. (RK&A), for the Space Science Institute in Boulder, Colorado. *MarsQuest* is a traveling exhibition funded by the National Science Foundation and, as such, data collection took place at two venues: in July 2001 at the Park Place Mall in Tucson, Arizona (a temporary satellite site for the Tucson Children's Museum) and in March 2002 at the Hampton Air and Space Museum in Hampton, Virginia. The evaluation was undertaken to document the scope of the exhibition's impact and effectiveness at two different sites via timing and tracking observations and exit interviews.

Only selected highlights of the study are included in this summary. Readers are urged to consult the body of the report for a detailed account of the findings.

I. PRINCIPAL FINDINGS: TIMING AND TRACKING OBSERVATIONS

Visitor Demographics

A total of 125 drop-in visitors, ages nine years and older were observed (26 in Tucson and 99 in Hampton).

- The total sample of visitors observed included 52 percent males and 48 percent females. Fifty-six percent of visitors were between 25 and 44 years of age.
- In the total sample, 67 percent of the visitors were visiting *MarsQuest* in groups comprised of both adults and children.

Comparison of Venues

To understand whether visitors' behaviors in *MarsQuest* differ between the Tucson venue and the Hampton one, a series of statistical comparisons were made.

<u>Comparison of Average Total Time</u>

- Visitors spent an average time of 55 minutes in *MarsQuest* at the Tucson venue and 28 minutes in the Hampton venue.
- To compare the total time spent in *MarsQuest* in the two venues, RK&A used Serrell's "Sweep Rate Index" (SRI) (1998). The SRI is calculated by dividing the exhibition's square footage by the average total time spent in the exhibition. The lower the SRI, the more time visitors spent per square foot of space (i.e., the slower visitors are moving through the exhibition).
    - In Tucson, the SRI was 85 square feet per minute and in Hampton the SRI was 163 square feet per minute. This means that visitors moved slower though *MarsQuest* in the Tucson venue than they did when it was in the Hampton venue.

- However, the SRI of *MarsQuest* at both venues is considerably lower than Serrell's average SRI for large nondiorama exhibitions, meaning visitors are moving slower through *MarsQuest* than are visitors in exhibitions of similar size. This suggests that *MarsQuest* sufficiently held visitors' attention, causing them to move slowly through the exhibition—a characteristic some practitioners value.

Comparison of Average Total Stops

- Visitors made an average of 24 stops in *MarsQuest* in the Tucson venue and 10 stops in the Hampton venue.

- Because each venue had a different number of exhibits available, the percentage of exhibits stopped at was also calculated. On average, visitors in Tucson stopped at a higher percentage of the exhibits than did those in Hampton (46 percent and 12 percent, respectively).

- To compare the average stops made at the two venues, RK&A used Serrell's "Percentage Diligent Visitor Index" (%DV) (1998). The %DV is obtained by calculating the percentage of visitors who stopped at more than half of the exhibits. The higher the %DV, the more thoroughly the exhibition was used.

  - The %DV for *MarsQuest* at the Tucson venue is 42 percent, and the %DV for the Hampton venue is 8 percent. This means that visitors at the Tucson venue used *MarsQuest* more thoroughly than did visitors at the Hampton venue.

  - The %DV for the Tucson venue of *MarQuest* is higher than Serrell's average %DV for large nondiorama exhibitions, which means visitors used the Tucson version of *MarsQuest* more thoroughly than did visitors in exhibitions of similar size.

Comparison of Stops and Time Spent at Different Types of Exhibits

- Visitors in Tucson venue stopped at more touch exhibits, mechanical interactives, computer interactives, panels, models, and videos than did visitors in Hampton.

- Visitors in Tucson spent more time at computer interactives, videos, mechanical interactives, touch exhibits, and panels than did visitors in Hampton. No statistically significant difference was found for time spent at models.

Comparison of Adult-child Interactions

- In Tucson, adult-child interactions occurred in all of the groups comprised of adults and children; whereas, in Hampton, they occurred in 69 percent of the families.

- Visitors had an average of 11 adult-child interactions in *MarsQuest* at the Tucson venue and 4 adult-child interactions at the Hampton venue.

Visitor Experience in MarsQuest

In addition to examining differences in visitors' behaviors in *MarsQuest* at the two venues, the visitor experience in *MarsQuest* as a whole was also analyzed.

Comparison of Behaviors Among Demographic Characteristics

- When the entire sample was examined by demographic characteristics, a few statistically significant relationships were found. Females made more stops in *MarsQuest* and had more adult-child interactions than did males. Children spent more time in *MarsQuest* than did adults.

Stops Made at Each Exhibit

- The exhibit at which the most visitors stopped was the programmable rover (73 percent).
- One-half stopped at the volcano and skyscraper comparison, virtual tour of Pathfinder landing site, fog exhibit, and small volcano stations (52 percent, 51 percent, 50 percent, and 50 percent, respectively).
- The seven exhibits that attracted the fewest visitors were all panels. The fewest visitors stopped at the Mars timeline and the Landing site formation panel (each 10 percent).

Time Spent at Each Exhibit

- The exhibit at which visitors spent the most time was the Imagination Theater (median time of 7 minutes), followed by the programmable rover (median time of 3 minutes).
- Visitors spent the least amount of time at the Surveyor model and the canyon photomural and panel (each median time of 12 seconds).
- When the amount of time visitors spent at each exhibit was compared by venue, one statistically significant relationship was found. Visitors in Tucson spent more time in the Imagination Theater than did those in Hampton (median times of 11 minutes and 6 minutes, respectively).

Adult-child Interactions at Each Exhibit

- The exhibit at which the most visitors had adult-child interactions was the Mars news computer interactive (52 percent).
- No visitors had adult-child interactions at the canyon formation panel and few did so at the Mars timeline (8 percent).

II. PRINCIPAL FINDINGS: INTERVIEWS

Background Information

- Fifty visitor groups were interviewed (30 in Tucson and 20 in Hampton). In Tucson, the 30 visitor groups interviewed were comprised of 73 visitors. In Hampton, the 20 groups interviewed were comprised of 25 visitors.
- In total, 51 percent of the interviewees were female and 49 percent were male. Twenty-eight percent of the interviewees were between 25 and 44 years of age.
- In the total sample, 46 percent of the visitor groups interviewed were infrequent museum visitors (i.e., they reported having visited museums 0 to 2 times in the past 12 months).

Reasons for Visiting MarsQuest

Overall, visitors in Tucson were highly motivated, having made a specific trip to see *MarsQuest* in the Park Place Mall. Most were attending the exhibition because of an existing interest in Mars; others sought it out as educational enrichment for their children. In contrast, visitors in Hampton had not come to the museum specifically to see *MarsQuest*.

Overall Opinion of MarsQuest

Most interviewees said the interactive and educational qualities of *MarsQuest* worked well for both adults and children.

Favorite and Least Favorite Exhibits

The programmable rover and the Imagination Theater were named by the most interviewees as favorite exhibits. Only half of the interviewees identified a least favorite exhibit. Of those who did, several were displeased with the supplementary exhibits added by the Tucson Children's Museum, and a few complained about the workings of the simulated soil puffer and the large erupting volcano.

Understanding of the Main Idea

Interviewees identified three different possible main ideas for *MarsQuest*. They said it intended to explain Mars exploration efforts, basic characteristics of Mars, and comparisons between Mars and Earth.

New Information Learned

The comparison of Mars characteristics and features with those on Earth helped many interviewees learn new facts about Mars.

DISCUSSION

MarsQuest provided visitors with engaging and educational experiences. It was well received by visitors in Tucson and Hampton, despite the differences in the venues themselves and the attending audiences.

The Visitor Experience

Visitors spoke highly of the exhibition, complimenting the interactive nature of the exhibits, the high quality of the still and video images, and the variety of experiences offered. Many aspects of Mars surprised visitors, and they enjoyed discovering new things about its landscape and characteristics as well as the exploration efforts. Visitors thought the exhibition's activities and the information worked well for both adults and children.

Visitors' favorite exhibit and the exhibit at which the most visitors stopped and spent considerable time was the programmable rover. Adults and children said they enjoyed watching the rover move and programming it. Parents were especially complimentary of the programming aspect—that their children had to make a plan, watch the outcome, and then try again, rather than simply moving a joystick. The Imagination Theater was also frequently mentioned by interviewees and attracted a high number of visitors. Interviewees were impressed with the animation and the clarity of the high-definition images. Interestingly, visitors in Tucson spent a much longer time in the Imagination Theater than did those in Hampton. One reason for this difference may be that in Tucson the Imagination Theater was in a separate alcove, providing a true theater atmosphere. In Hampton, the Imagination Theater consisted of the screen and rows of chairs in an open area of the exhibition. In another study RK&A conducted (2001) the finding was similar, providing a theater setting for a video presentation greatly increases its ability to hold visitors' attention. In future projects, SSI may want to consider allocating funding and square footage for an enclosed theater space.

Visitor Learning

MarsQuest provided educational experiences for visitors. All of the interviewees were able to articulate at least part of *MarsQuest*'s main message. In other summative evaluations, RK&A has found the opposite to be true. It is common for visitors to be unaware that there is coherent idea connecting the exhibits or to be unable to describe the exhibition's main message. In *MarsQuest*, all of the interviewees also were able to recall specific facts about Mars, especially information that compared Mars with Earth (e.g., the fact that landscape features are much larger than on Earth, differences in Mars' size, temperature, gravity as compared with Earth). The fact that visitors remembered information and commented on the Mars-Earth comparison is especially remarkable, as the exhibition's intended introduction area was not optimally placed in either venue. In Tucson, components from the introduction area were dispersed within the exhibition space, with the bulk of them being located to the left of the entrance. Typically, visitors turn to the right when they enter an exhibition (Melton, 1935). In Hampton, again, the introduction area exhibits were not grouped together, and they were placed towards the back of the exhibition space. The consistent use of the Mars-Earth interpretive strategy throughout the

exhibition provided visitors with a framework for understanding the content regardless of the fact that neither venue used the introduction area as it was intended.

There were other aspects of *MarsQuest* that enhanced visitors' educational experiences, making its success not contingent upon how the exhibition was installed at each venue. The exhibits fostered adult-child interactions in the majority of families—a behavior associated with learning in museums (Borun, et.al., 1996). Time on task—how long visitors spend doing a particular activity—has also been connected with learning from and satisfaction with a museum visit (Serrell, 1998). As such, the considerable amount of time visitors spent in *MarsQuest* in both Tucson and Hampton is most striking. Both venues had much lower Sweep Rate Indices (SRI) (Serrell, 1998) than other exhibitions of similar size—that is, visitors were moving much slower in *MarsQuest* than were visitors in comparable exhibitions. Additionally, visitors moved through *MarsQuest* slower than any exhibition RK&A has studied—a testament to how engaging and interesting *MarsQuest* is for visitors.

Differences in the Venues

There were a few differences between visitors' behaviors in Tucson and Hampton that are worth mentioning. Tucson visitors were highly motivated and primed for their experiences in *MarsQuest*. Most had come to the Park Place Mall specifically to see *MarsQuest*, having read about it in the newspaper, seen advertisements for it, or heard about it through the Tucson Children's Museum. There was no such press for *MarsQuest* at the Hampton venue, and none of the visitors at this site had come specifically to the museum see the exhibition. That is, Hampton visitors stumbled upon *MarsQuest* while visiting the Hampton Air and Space Museum for other reasons.

The media coverage most likely also impacted who the exhibition attracted—as did the nature of the host museum. More women and children were observed and interviewed in Tucson than were in Hampton. Many mothers explained that they had seen the advertisements for *MarsQuest* and decided it would be an educational outing for their family. Others said they knew the exhibition would work well for their children being associated with the Tucson Children's Museum. Few visitors were visiting the Park Place Mall and then happened upon *MarsQuest*. That is to say that having the exhibition in a mall did not seem to attract people who never visit museums. Instead, it did the opposite—it brought people who go to museums but avoid shopping malls to a mall. Additionally, Tucson interviewees thought having an educational exhibition in a shopping mall was philanthropic of the Tucson Children's Museum, as they perceived the mall venue as reaching underserved audiences. These findings could be used by organizations that market traveling exhibitions as a selling point for shopping malls considering being exhibition venues.

While the Tucson venue did not reach new audiences, it did impact visitors' behavior in a positive manner. Visitors moved through *MarsQuest* even more slowly in Tucson than did those in Hampton. Additionally, visitors used *MarsQuest* more thoroughly than did those in Hampton. There are a few possible reasons for these behaviors. It is likely that visitors having made a special trip to the Park Place Mall to see *MarsQuest* wanted "to get their money's worth"—a trend seen in other timed ticketed exhibitions (Doering, et. al., 1997). Also, many Tucson

visitors had an existing interest in Mars and were drawn to the exhibition to learn more about Mars. Moreover, unlike in a museum, there were no other exhibits competing for visitors' attention. All of these findings suggest the importance of marketing and the potential of non-museum venues, such as shopping malls, for having a successful traveling exhibition.

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INTRODUCTION

This report presents the findings of a summative evaluation of *MarQuest*, conducted by Randi Korn & Associates, Inc. (RK&A), for the Space Science Institute in Boulder, Colorado. *MarsQuest* is a traveling exhibition funded by the National Science Foundation and, as such, data collection took place at two sites: in July 2001 at the Park Place Mall in Tucson, Arizona (a temporary satellite site for the Tucson Children's Museum) and in March 2002 at the Hampton Air and Space Museum in Hampton, Virginia. The evaluation was undertaken to document the scope of the traveling exhibition's impact and effectiveness at two different sites. The specific objectives of the evaluation were to determine:

- how much time visitors spend in the exhibition
- how much time visitors spend at individual components
- the components at which visitors stop
- the frequency of select behaviors
- visitors' cognitive experiences
- quantitative and qualitative differences in visitors' experiences at two different sites.

METHODOLOGY

Two data collection strategies were employed to assess visitors' experiences in *MarsQuest*: timing and tracking observations and uncued exit interviews.

Timing and Tracking Observations

Visitors are often observed to provide an objective and quantitative account of how visitors behave and react to exhibition components. Observational data indicate how much time visitors spend within an exhibition and suggest the range of visitor behaviors.

All visitors nine years of age and older were eligible to be unobtrusively observed in the exhibition. The observed visitors were selected following a continuous random sampling method. In accordance with this method, the observer was stationed at the entrance of the exhibition, and the first eligible visitor to enter was observed. The observer followed the selected visitor through the exhibition, recording the exhibits used, select behaviors, and total time spent in the exhibition (see Appendix A for the observation forms). Upon the completion of a visit, the observer returned to the entrance to await the next eligible visitor to enter the exhibition.

Exit Interviews

The purpose of conducting open-ended interviews is to encourage and motivate interviewees to describe their experiences, express their opinions and feelings, and share with the interviewer the meaning they constructed from an experience. Open-ended interviews produce data rich in information because interviewees talk about their experiences from a very personal perspective.

Upon exiting the exhibition, visitors nine years of age and older were eligible to be selected (following a continuous random sampling method, as described above) to answer several questions about their experiences (see Appendix B for the interview guide). The interview guide was intentionally open-ended to allow interviewees the freedom to discuss what they felt was meaningful. All interviews were tape-recorded with participants' awareness and transcribed to facilitate analysis.

DATA ANALYSIS

The observational data were quantitative, and were entered into a computer to be analyzed statistically using SPSSPC+, a statistical package for personal computers. Frequency distributions were calculated for all categorical variables (e.g., gender, age group). To examine the relationship between two categorical variables (e.g., use of an exhibit and age group), cross-tabulation tables were computed to show the joint frequency distribution of the two variables, and the chi-square statistic (X^2) was used to test the significance of the relationship.

Summary statistics, including the mean (average), median (data point at which half the responses fall above and half fall below), and standard deviation (spread of scores: "±" in tables), were calculated for the time data.[1] To compare the means of two visitor subsets (e.g., visitor groups with children and those without children), ANOVA and Mann-Whitney U tests (the nonparametric equivalent to an ANOVA) were computed.

The level of significance was set at 0.05 because of the moderate sample size. When the level of significance is set to $p = 0.05$, any relationship that exists at a probability (p-value) of ≤ 0.05 is termed "significant." When a relationship has a p-value of 0.05, there is a 95 percent probability that the relationship being explored truly exists; that is, in 95 out of 100 cases, there really would be a relationship between the two variables (e.g., gender and preferences for visiting). Conversely, there is a 5 percent probability that the relationship does not really exist; in other words, in 5 out of 100 cases, a relationship would appear purely by chance. Within the body of the report, only statistically significant results are discussed.

Visitors' responses to the interview questions were analyzed qualitatively, meaning that the evaluator studies the responses for meaningful patterns. As patterns and trends emerge, similar responses are grouped together and exemplified by verbatim quotations.

[1] For the most part, medians rather than means are reported in this document because, as is typical, the number of components used and the time spent by visitors were distributed unevenly across the range. For example, whereas most visitors spent a relatively brief amount of time with exhibition components, a few visitors spent an unusually long time. When a distribution of scores is extremely asymmetrical (i.e., "lopsided"), the *mean* is strongly affected by the extreme scores and, consequently, falls further away from the distribution's central area. In such cases, the *median* is the preferred measurement because it is not sensitive to the values of scores above and below it—only to the number of such scores.

METHOD OF REPORTING

The data presented in this report are both quantitative and qualitative in nature. For the quantitative data, tables are regularly used to display the information in a manner that makes it easily accessible. Percentages within tables may not always equal 100 due to rounding. The findings within each topic are presented in descending order, starting with the most frequently occurring.

Interviewees' verbatim quotations (edited for clarity) are used to illustrate major trends in the data and to convey visitors' thoughts and feelings as fully as possible. Within quotations, an asterisk (*) signifies the start of a different speaker's comments. The interviewer's remarks appear in parentheses.

Findings in each report are presented in two main sections as follows:

I. Timing and Tracking Observations
II. Interviews

I. PRINCIPAL FINDINGS: TIMING AND TRACKING OBSERVATIONS

DATA COLLECTION CONDITIONS

In Tucson, observers timed and tracked visitors for five days in July 2001. In Hampton, observations were collected over 10 days. At both sites, data collection occurred on weekdays and weekend days. A total of 125 drop-in visitors, ages nine years and older were observed (26 in Tucson and 99 in Hampton).

As Table I.1 shows, the majority of observations in the total sample were conducted during low visitation conditions (87 percent).

Table I.1.
Level of Crowding during the Observations
(Tucson *n* = 26, Hampton *n* = 99)

Crowding Level	Tucson %	Hampton %	Total %
Low	73.1	90.9	87.2
Moderate	23.1	9.1	12.0
High	3.8	0.0	0.8

VISITOR DEMOGRAPHICS

As Table I.2 shows, the total sample of visitors observed included slightly more males than females (52 percent and 48 percent respectively). In Tucson, more females were observed than were in Hampton. Conversely, in Hampton more males were observed than were in Tucson. In the total sample, the majority of visitors were between 25 and 44 years of age (56 percent). However, in Tucson more visitors were children, ranging in age from 9 to 12 years, than were in Hampton.

Table I.2.
Demographics of Visitors
(Tucson *n* = 26, Hampton *n* = 99)

Characteristic	Tucson %	Hampton %	Total %
Gender[1]			
Male	30.8	57.6	52.0
Female	69.2	42.4	48.0
Age Group[2]			
9 to 12 years of age	46.2	7.0	15.2
13 to 15	7.7	5.0	5.6
16 to 18	0.0	3.0	2.4
19 to 24	3.8	12.1	10.4
25 to 44	26.9	63.6	56.0
45 to 64	7.7	6.1	6.4
65 years or older	7.7	3.0	4.0

[1] $p = 0.01$ [2] $p = 0.00$

As Table I.3 shows, the majority of visitors in the total sample were in groups comprised of both adults and children (67 percent).

Table I.3.
Group Composition
(Tucson *n* = 26, Hampton *n* = 99)

Group Composition (*n* = 125)	Tucson %	Hampton %	Total %
Adults and children	84.6	62.6	67.2
Adults only	15.4	32.3	28.8
Children only	0.0	5.1	4.0

COMPARISON OF VENUES

Comparison of Average Total Time

One way to examine the visitor experience in an exhibition is to record how much time people spend there. Visitors spent an average time of 55 minutes in *MarsQuest* in Tucson and 28 minutes in the Hampton venue (see Table I.4).[2] When the total times of the two exhibitions were compared statistically, the relationship was highly significant. That is, the fact that visitors spent more time in *MarsQuest* at the Tucson venue than at the Hampton one was not due to chance.

Table I.4.
Total Time Spent in the Tucson and Hampton Venues
(Tucson *n* = 26, Hampton *n* = 99)

Venue	Mean	±
Tucson*	55 min. 29 sec.	12 min. 59 sec.
Hampton*	27 min. 40 sec.	13 min. 51 sec.
Total sample	21 min. 49 sec.	24 min. 37 sec.

*$p = 0.00$

To further compare the total time spent in *MarsQuest* at the two venues, RK&A used Serrell's "Sweep Rate Index" (SRI).[3] The SRI is calculated by dividing the exhibition's square footage[4] by the average total time spent in the exhibition.[5] The lower the SRI, the more time visitors spent per square foot of space. As Figure 1 shows, in Tucson the SRI is 85 square feet per minute and in Hampton the SRI is 163 square feet per minute. This means that visitors moved slower though *MarsQuest* in the Tucson venue than they did when it was in the Hampton venue.

The SRI of *MarsQuest* at both venues is considerably lower than Serrell's average SRI for large nondiorama exhibitions,[6] meaning visitors are moving slower through *MarsQuest* than are visitors in exhibitions of similar size. In Figure 1, the horizontal line is Serrell's average SRI and the vertical lines dissecting each bar indicate the large standard deviation for Serrell's average SRI.

[2] RK&A usually reports medians rather than means for time data, because time data not are evenly distributed. However, means are reported in this section to conform with the Serrell Sweep Rate Index model. Readers should note that a nonparametric test was used to analyze the significance of the two exhibitions' time data.

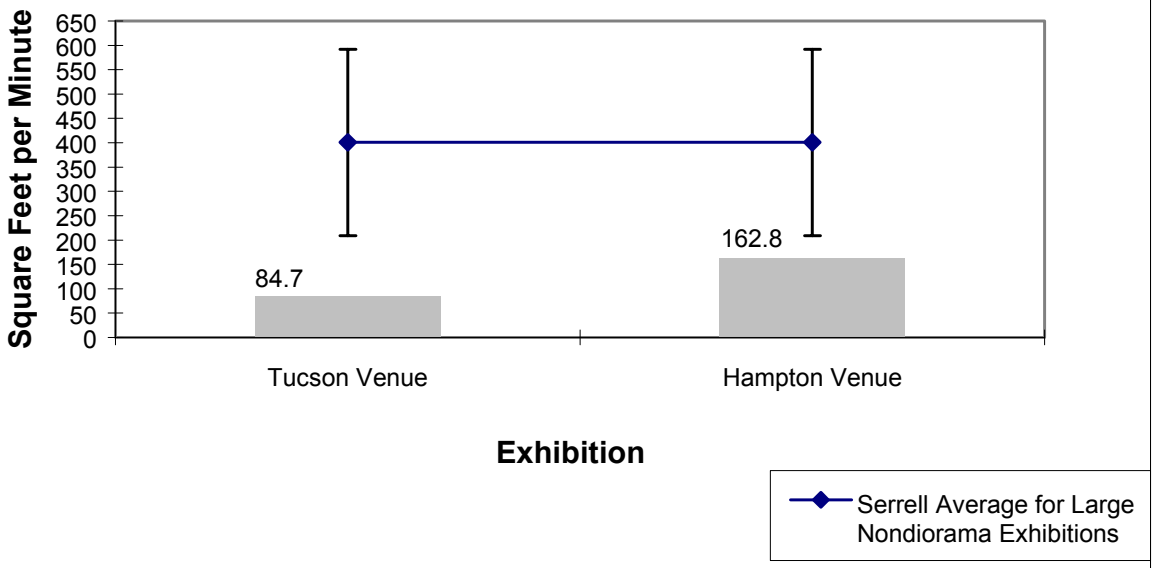
[3] Serrell, B. (1998). Paying attention: visitors and museum exhibitions. Washington, DC, American Association of Museums.

[4] The Tucson venue was 4,700 square feet and the Hampton venue was 4,500 square feet.

[5] The average total times were used in the SRI calculation in accordance with Serrell's methods. Throughout the rest of the report, the median times are reported, as the median is standard for time data that is unevenly distributed across its range.

[6] Serrell reports an average SRI of 400.5 (±191.5) for large (>3,900 square feet) nondiorama exhibitions.

Figure 1.
***MarsQuest* Sweep Rate Index by Venue**



Comparison of Average Total Stops

Another method of gauging the visitor experience in an exhibition is to count the stops visitors make. **For the purposes of this study, a "stop" was defined as a visitor standing for three seconds or longer in front of a given component. If a visitor returned to a component at which he or she had previously stopped, this return was not counted as an additional stop, but the amount of time spent was included in the total time spent at the component.**

Visitors made an average of 24 stops in *MarsQuest* at the Tucson venue and 10 stops at the Hampton venue (see Table I.5). In Tucson, there were a total of 53 exhibits in *MarsQuest*; in Hampton there were 43 exhibits. To compare the total number of stops made in the two venues, the average percentage of exhibits that visitors stopped at was examined. On average, visitors in Tucson stopped at a higher percentage of the exhibits than did those in Hampton (46 percent and 12 percent, respectively).

Table I.5.
Total Stops in the Tucson and Hampton Venues
(Tucson *n* = 26, Hampton *n* = 99)

Venue	Mean Number of Stops	±
Tucson	24 stops	6 stops
Hampton	10 stops	7 stops
Venue	**Mean Percentage of Stops**	**±**
Tucson*	46.0%	23.1%
Hampton*	11.6%	16.3%

*$p = 0.00$

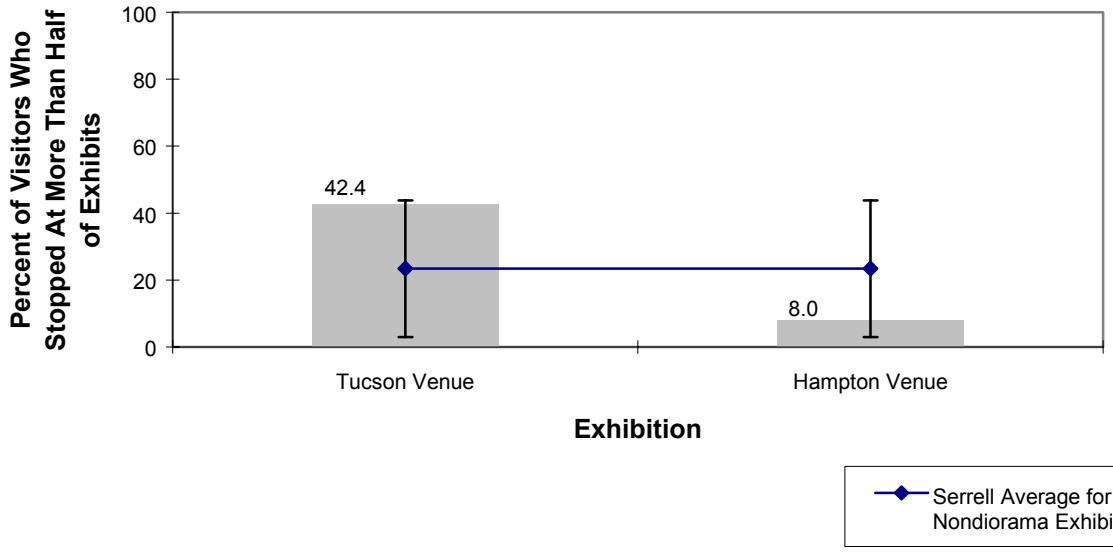
To compare the total stops made in the two venues, RK&A used Serrell's "Percentage Diligent Visitor Index" (%DV).[7] The %DV is obtained by calculating the percentage of visitors who stopped at more than one-half of the exhibits. The higher the %DV, the more thoroughly the exhibition was used. As Figure 2 shows, the %DV for *MarsQuest* at the Tucson venue is 42 percent, and the %DV for the Hampton venue is 8 percent. This means that visitors at the Tucson venue used *MarsQuest* more thoroughly than did visitors at the Hampton venue.

The %DV for the Tucson venue of *MarQuest* is higher than Serrell's average %DV for large nondiorama exhibitions,[8] which means visitors stopped at more exhibits in the Tucson version of

[7] Serrell, B. (1998). Paying attention: visitors and museum exhibitions. Washington, D.C., American Association of Museums.
[8] Serrell reports an average %DV of 23.4 percent (±20.4) for large (>3,900 square feet) nondiorama exhibitions.

MarsQuest, compared to exhibitions of similar size. Visitors in *MarsQuest* at the Hampton venue stopped at fewer exhibits than did visitors to exhibitions of similar size but still within one standard deviation of Serrell's average %DV. Again, the horizonal line is Serrell's average %DV and the vertical lines dissecting each bar indicate the large standard deviation for Serrell's average %DV.

Figure 2.
***MarsQuest* Percentage Diligent Visitor Index by Venue**



Comparison of Stops and Time Spent at Different Types of Exhibits

Comparisons of the two venues were also made for the number of stops and amount of time spent at each type of exhibit found in *MarsQuest*: models, computer interactives, touch exhibits, panels, mechanical interactives, and videos.

As Table I.6 shows, statistically significant differences between visitors at the Tucson venue and those in Hampton were found for each type of exhibit. Visitors in the Tucson venue stopped at more touch exhibits, mechanical interactives, computer interactives, panels, models, and videos than did visitors in Hampton.

Table I.7 shows the differences in the amount of time visitors spent at each exhibit type at the two venues. Visitors in Tucson spent more time at computer interactives, videos, mechanical interactives, touch exhibits, and panels than did visitors in Hampton. No statistically significant difference was found for time spent at models.

Table I.6.
Differences in the Number of Stops Made at Each Type of Exhibit by Venue

Type	Number Available	Tucson				Hampton			
		n	Mean Stops	±	Median Stops	*n*	Mean Stops	±	Median Stops
Touch Exhibits*	7	26	5.2	1.9	5.0	99	2.5	2.4	2.0
Mechanical interactives*	6	26	4.9	1.3	5.0	99	2.2	1.8	2.0
Computer interactives*	6	26	4.1	1.2	4.0	99	2.2	1.4	2.0
Panels*	13	26	4.2	2.9	4.0	99	1.1	1.8	0.0
Models*	4	26	1.5	0.9	2.0	99	1.0	0.9	1.0
Videos*	3	26	1.3	0.7	1.0	99	0.6	0.9	0.0

*$p \leq 0.01$

Table I.7.
Differences in Time Spent at Each Type of Exhibit by Venue

Type	Number Available	Tucson				Hampton			
		n	Mean Time	±	Median Time	*n*	Mean Time	±	Median Time
Computer interactives*	6	26	12 min. 12 sec.	12 min.	8 min. 59 sec.	99	2 min. 48 sec.	3 min. 36 sec.	1 min. 22 sec.
Videos*	3	26	10 min. 14 sec.	7 min. 41 sec.	10 min. 24 sec.	99	2 min. 9 sec.	4 min. 51 sec.	0 sec.
Mechanical interactives*	6	26	5 min. 17 sec.	2 min. 22 sec.	5 min. 5 sec.	99	1 min. 47 sec.	2 min.	1 min. 3 sec.
Touch Exhibits*	7	26	4 min. 4 sec.	2 min. 27 sec.	3 min. 59 sec.	99	1 min. 21 sec.	1 min. 40 sec.	46 sec.
Panels*	13	26	2 min. 36 sec.	2 min. 18 sec.	2 min. 2 sec.	99	52 sec.	3 min. 9 sec.	0 sec.
Models	4	26	1 min. 5 sec.	1 min. 48 sec.	28 sec.	99	32 sec.	1 min. 23 sec.	10 sec.

*$p \leq 0.01$

Comparison of Adult-child Interactions

The final way the visitor experience in the two venues was compared was by examining the number of adult-child interactions that took place in the exhibition.

In Tucson, adult-child interactions occurred in all of the groups comprised of adults and children (see Table I.8). In Hampton, adult-child interactions occurred in 69 percent of the families.

Table I.8.
Differences in the Frequency of Adult-child Interactions Between the Two Venues
(Tucson *n* = 22, Hampton *n* = 64)

Adult-child Interactions	Tucson %	Hampton %
Had adult-child interactions*	100.0	68.8
No adult-child interactions*	0.0	31.2

*$p = 0.00$

As Table I.9 shows, visitors had an average of 11 adult-child interactions in *MarsQuest* at the Tucson venue and 4 adult-child interactions at the Hampton venue. When the total number adult-child interactions of the two venues was compared statistically, the difference was found to be highly significant. That is, the fact that visitors had more adult-child interactions in Tucson than in Hampton was not due to chance.

Table I.9.
Differences in the Total Number of Adult-child Interactions Between the Two Venues
(Tucson *n* = 22, Hampton *n* = 64)

Venue	Mean	±
Tucson*	11 interactions	7 interactions
Hampton*	4 interactions	4 interactions

*$p = 0.00$

VISITOR EXPERIENCE IN *MARSQUEST*

In addition to examining differences in visitors' behaviors in *MarsQuest* by venue, the visitor experience in *MarsQuest* as a whole was also analyzed. To do so, the data from both of the venues was examined as one data set.

Comparison of Behaviors Among Demographic Characteristics

When the entire sample was examined by demographic characteristics, a few statistically significant relationships were found. As Table I.10 shows, females made more stops in *MarsQuest* and had more adult-child interactions than did males. Children spent more time in *MarsQuest* than did adults.

Table I.10.
Differences in Behavior by Gender and Age (*n* = 125)

	Female		Male	
Behavior*	**Mean**	**±**	**Mean**	**±**
Total number of stops	15.3	8.2	11.7	9.3
Total number of adult-child interactions	8.1	6.5	3.2	4.1
	Children		**Adults**	
Behavior*	**Mean**	**±**	**Mean**	**±**
Total time spent in exhibition	36 min. 29 sec.	35 min. 44 sec.	17 min. 29 sec.	18 min. 32 sec.

*$p \leq 0.03$

Stops Made at Each Exhibit

As Table I.11 shows, the most visitors stopped at the programmable rover (73 percent). One-half stopped at the volcano and skyscraper comparison, virtual tour of Pathfinder landing site, fog exhibit, and small volcano stations (52 percent, 51 percent, 50 percent, and 50 percent, respectively).

Table I.11.
Exhibits at Which More Than One-third of Visitors Stopped

Exhibit Name	Exhibit Type	Total %
Programmable rover	Computer interactive*	72.8
Volcano and skyscraper comparison	Mechanical interactive	52.0
Virtual tour of Pathfinder landing site	Computer interactive	51.2
Fog exhibit	Touch	50.4
Small volcano stations	Mechanical interactive	50.4
"Innies and Outies"	Mechanical interactive	48.0
Soda can exhibit	Touch	48.0
Hot and cold globes	Touch	44.0
Simulated soil puffer	Mechanical interactive	43.2
Laser altimeter	Computer interactive*	43.2
Imagination Theater	Theater	43.2
Large volcano station	Mechanical interactive	40.8
"Greetings from Mars, Or Is It Earth?"	Mechanical interactive	40.0
Volcanic rock samples	Touch	36.0
Spinning globes	Computer interactive	36.0
Mars globe	Model	34.4
Image processing	Computer interactive	33.6

*In addition to the computer interactive, these exhibits include additional enhancing elements (e.g., the programmable rover includes a test bed and a working rover model, the laser altimeter includes a working laser and topographic model).

The seven exhibits that attracted the fewest visitors were all panels (see Table I.12). The fewest visitors stopped at the Mars timeline and the Landing site formation panel (each 10 percent).

Table I.12.
Exhibits at Which Less Than One-third of Visitors Stopped

Exhibit Name	Exhibit Type	Total %
Sojourner and Yogi models	Model	32.8
Simulated soil finger holes	Touch	32.0
Touchable canyon	Touch	32.0
Manned mission to Mars	Model	28.8
Touchable volcanoes	Touch	24.8
Terrain puzzle	Touch	22.4
Mars news	Computer interactive	21.6
"Countdown to the Pathfinder"	Panel and video	20.8
Canyon formation	Panel	20.8
Rust sample	Touch	19.2
"Search for Life on Mars"	Panel and flipbook	16.0
"Around the Solar System"	Video	16.0
Volcano photomural	Panel	16.0
Mars North Pole photomural	Panel	16.0
"Cool Ground"	Panel	15.2
"Compare Volcanoes on Earth and Mars"	Panel	15.2
Surveyor model	Model	14.4
Landing site photomural	Panel	12.8
"Is Mars Like Earth?"	Panel	12.0
Canyon photomural and panel	Panel	11.2
"Before You Tour Mars"	Panel	11.2
"A Volcano the size of Colorado"	Panel	11.2
Mars timeline	Panel	10.4
Landing site formation	Panel	9.6

Time Spent at Each Exhibit

As Table I.13 shows, visitors spent the most time in the Imagination Theater (median time of 7 minutes, 24 seconds), followed by the programmable rover (median time of 3 minutes, 20 seconds).

Table I.13.
Exhibits at Which Visitors Spent More than Thirty Seconds

Exhibit Name	Exhibit Type	Total Sample Median Time (Seconds)
Imagination Theater	Theater	444.5
Programmable rover	Computer interactive	200.0
Mars news	Computer interactive	124.0
Spinning globes	Computer interactive	108.0
Large volcano station	Mechanical interactive	70.0
"Around the Solar System"	Video	64.0
"Greetings from Mars, Or Is It Earth?"	Mechanical interactive	63.5
"Search for Life on Mars"	Panel and flipbook	60.5
Mars timeline	Panel	57.0
Laser altimeter	Computer interactive	54.5
Small volcano stations	Mechanical interactive	53.0
Virtual tour of Pathfinder landing site	Computer interactive	47.0
"A Volcano the size of Colorado"	Panel	43.0
Image processing	Computer interactive	42.5
Mars North Pole photomural	Panel	42.0
Fog exhibit	Touch	40.0
"Cool Ground"	Panel	38.0
Simulated soil puffer	Mechanical interactive	37.5
Volcano and skyscraper comparison	Mechanical interactive	37.0
Touchable canyon	Touch	36.0
Rust sample	Touch	35.5
"Compare Volcanoes on Earth and Mars"	Panel	35.0
"Innies and Outies"	Mechanical interactive	33.0
Soda can exhibit	Touch	31.5

Visitors spent the least amount of time at the Surveyor model and the canyon photomural and panel (each median time of 12 seconds) (see Table I.14).

Table I.14.
Exhibits at Which Visitors Spent Thirty Seconds or Less

Exhibit Name	Exhibit Type	Total Sample Median Time (Seconds)
"Countdown to the Pathfinder"	Panel and video	30.0
Hot and cold globes	Touch	30.0
Sojourner and Yogi models	Model	29.0
Landing site formation	Panel	24.0
Canyon formation	Panel	22.0
Terrain puzzle	Touch	22.0
"Before You Tour Mars"	Panel	21.5
Simulated soil finger holes	Touch	20.5
Mars globe	Model	18.0
Touchable volcanoes	Touch	18.0
"Is Mars Like Earth?"	Panel	16.0
Volcanic rock samples	Touch	15.0
Landing site photomural	Panel	15.0
Volcano photomural	Panel	14.5
Manned mission to Mars	Model	14.0
Surveyor model	Model	12.5
Canyon photomural and panel	Panel	12.0

When the amount of time visitors spent at each exhibit was compared by venue, one statistically significant relationship was found. Visitors in Tucson spent more time in the Imagination Theater than did those in Hampton (see Table I.15).

Table I.15.
Differences in the Time Spent in the Imagination Theater at Each Venue
(Tucson *n* = 23, Hampton *n* = 31)

	Tucson	Hampton
Mean	11 min. 10 sec.	6 min. 1 sec.
±	7 min. 20 sec.	5 min. 29 sec.

$p = 0.01$

Adult-child Interactions at Each Exhibit

Table I.16 and I.17 present the percentage of visitors that had adult-child interactions at each exhibit. The exhibit at which the most visitors had adult-child interactions was the Mars news computer interactive (52 percent). Nearly one-half of the visitors also had adult-child interactions at the "Cool Ground" panel and the simulated soil puffer (47 percent and 46 percent, respectively).

Table I.16.
Exhibits at Which At Least One-third of Visitors had Adult-child Interactions

Exhibit Name	Exhibit Type	Total %
Mars news	Computer interactive	51.9
"Cool Ground"	Panel	47.4
Simulated soil puffer	Mechanical interactive	46.3
Fog exhibit	Touch	44.4
Simulated soil finger holes	Touch	42.5
Rust sample	Touch	41.7
Laser altimeter	Computer interactive	40.7
Touchable canyon	Touch	40.0
Large volcano station	Mechanical interactive	37.3
"A Volcano the size of Colorado"	Panel	35.7
Programmable rover	Computer interactive	34.7
Volcano and skyscraper comparison	Mechanical interactive	33.8
"Innies and Outies"	Mechanical interactive	33.3
Small volcano stations	Mechanical interactive	33.3

No visitors had adult-child interactions at the canyon formation panel and few did so at the Mars timeline (8 percent).

Table I.17.
Exhibits at Which Fewer than One-third of Visitors had Adult-child Interactions

Exhibit Name	Exhibit Type	Total %
"Greetings from Mars, Or Is It Earth?"	Mechanical interactive	32.0
"Compare Volcanoes on Earth and Mars"	Panel	31.6
Hot and cold globes	Touch	30.9
Mars globe	Model	30.2
Mars North Pole photomural	Panel	30.0
Touchable volcanoes	Touch	29.0
Terrain puzzle	Touch	28.6
"Before You Tour Mars"	Panel	28.6
"Countdown to the Pathfinder"	Panel and video	26.9
Volcanic rock samples	Touch	26.7
Soda can exhibit	Touch	26.7
Spinning globes	Computer interactive	26.7
Imagination Theater	Theater	25.9
Landing site formation	Panel	25.0
"Search for Life on Mars"	Panel and flipbook	25.0
Image processing	Computer interactive	23.8
Sojourner and Yogi models	Model	22.0
Virtual tour of Pathfinder landing site	Computer interactive	21.9
Canyon photomural and panel	Panel	21.4
"Is Mars Like Earth?"	Panel	20.0
Landing site photomural	Panel	18.8
Manned mission to Mars	Model	16.7
Surveyor model	Model	16.7
"Around the Solar System"	Video	15.0
Volcano photomural	Panel	10.0
Mars timeline	Panel	7.7
Canyon formation	Panel	0.0

UNIQUE EXPERIENCES IN THE TUCSON VENUE

The Children's Museum in Tucson added 11 exhibits to *MarsQuest*. Of the unique Tucson exhibits, the light demonstration was stopped at by the most visitors (58 percent) (see Table I.18).

Table I.18.
Stops at Exhibits Unique to the Tucson Venue (*n* = 26)

Exhibit Name	Tucson %
Light demonstration	57.7
Odyssey gamma ray spectrometer display	42.3
Pathfinder landing site 3-D photograph	38.5
Lego station	34.6
Space toys cases	26.9
Space art through the ages	26.9
Birds eye view of Pathfinder landing site	15.4
"Draw a spaceship" chalk board	15.4
Movie posters	11.5
"Draw a space home" chalk board	3.8
NASA Mars Video	3.8

Visitors spent the most time at the "Draw a spaceship" chalk board (median time of 1 minute, 43 seconds) (see Table I.19).

Table I.19.
Time Spent at Exhibits Unique to the Tucson Venue

Exhibit Name	Tucson Median Time (Seconds)
"Draw a spaceship" chalk board	103.5
Light demonstration	87.0
Space art through the ages	77.0
Lego station	60.0
Odyssey gamma ray spectrometer display	59.0
NASA Mars video	32.0
Pathfinder landing site 3-D photograph	25.0
Space toys cases	20.0
Birds eye view of Pathfinder landing site	15.0
Movie posters	14.0
"Draw a space home" chalk board	7.0

The Children's Museum in Tucson also provided a scavenger hunt. As Table I.20 shows, less than one-half of the visitors used the scavenger hunt (46 percent).

Table I.20.
Percentage of Visitors that Used Scavenger Hunt in the Tucson Venue (*n* = 26)

Exhibit Name	Tucson %
Did not use scavenger hunt	53.8
Used scavenger hunt	46.2

II. PRINCIPAL FINDINGS: INTERVIEWS

BACKGROUND INFORMATION

Visitor Demographics

Fifty visitor groups were interviewed (30 in Tucson and 20 in Hampton). In Tucson, the 30 visitor groups interviewed were comprised of 73 visitors. In Hampton, the 20 groups interviewed were comprised of 25 visitors.

In total, one-half of the interviewees were female and one-half were male (51 percent and 49 percent, respectively) (see Table II.1). More than one-quarter of the interviewees were between 25 and 44 years of age (28 percent).

More than three times as many interviewees at the Tucson venue were accompanied by children eight years old or younger than were at the Hampton site (29 percent and 8 percent, respectively). This is not unexpected considering the sponsoring institution in Tucson was a children's museum.

Table II.1.
Demographics of Interviewees
(Tucson *n* = 73, Hampton *n* = 25)

Characteristic	Tucson %	Hampton %	Total %
Gender			
Female	50.7	52.0	51.0
Male	49.3	48.0	49.0
Age			
8 years old or younger	28.6	8.0	23.2
9 to 12	21.4	12.0	18.9
13 to 15	2.9	0.0	2.1
16 to 18	2.9	8.0	4.2
19 to 24	0.0	8.0	2.1
25 to 44	22.9	44.0	28.4
45 to 64	20.0	16.0	19.0
65 years or older	1.4	4.0	2.1

Prior Museum Visitation

In the total sample, almost one-half of the visitor groups interviewed were infrequent museum visitors (46 percent) (see Table II.2).

Table II.2.
Frequency of Museum Visits in Past 12 Months
(Tucson *n* = 30, Hampton *n* = 20)

Frequency of Museum Visits	Tucson %	Hampton %	Total %
Infrequent (0 to 2 times)	46.7	45.0	46.0
Moderate (3 to 4 times)	16.7	20.0	18.0
Frequent (5 or more times)	36.7	35.0	36.0

As Table II.3 shows, about two-thirds of the visitor groups interviewed had visited *MarQuest*'s host museum—either the Tucson Children's Museum or the Hampton Air and Space Museum (66 percent).

Table II.3.
Visitation of Host Museum
(Tucson *n* = 30, Hampton *n* = 20)

Behavior	Tucson %	Hampton %	Total %
Previously visited Tucson Children's Museum/Hampton Air and Space Museum	60.0	75.0	66.0
Never visited Tucson Children's Museum/Hampton Air and Space Museum	40.0	25.0	34.0

REASONS FOR VISITING *MARSQUEST*

Overall, visitors in Tucson were highly motivated, having made a specific trip to see *MarsQuest* in the Park Place Mall. Most were attending the exhibition because of an existing interest in Mars; others sought it out as educational enrichment for their children. In contrast, visitors in Hampton had not come to the museum specifically to see *MarsQuest*.

Nearly all of the interviewees in Tucson were visiting the Park Place Mall specifically to see *MarsQuest*; whereas, only a few interviewees in Hampton were aware of the exhibition prior to arriving at the Air and Space Museum.

Interviewees in Tucson had learned about *MarsQuest* through media coverage (e.g., local newspapers, *Arizona Highways* magazine) and advertising by the Tucson Children's Museum. Most cited a prior interest in space, in general, or in Mars, in particular, as their reason for visiting *MarsQuest*. Several parents said they look for "teachable moments" during the summer and thought *MarsQuest* would be both fun and educational for their children.

Interviewees in Tucson were also asked their opinion of having a traveling science exhibition in a shopping mall. All made positive comments about having exhibits in this nontraditional setting. Some interviewees would have visited *MarsQuest* regardless of what type of venue featured it, because they have high interest in Mars (see the first quotation below). Others interviewees liked the idea of being able to shop and see an exhibition in the same location, as well as the mall's suburban location (see the second quotation). A few thought having an exhibition in a mall might attract people who would not visit a museum (see the third quotation).

> (How do you feel about having a science exhibition in the mall?) Shopping malls usually don't have that much to offer as far as learning and that's why we're here—to see [*MarsQuest*] and learn about Mars. . . . We usually don't go to malls. It doesn't really matter where [*MarsQuest*] was. We would have gone to the children's museum, too, to see this exhibit.

> (How do you feel about having a science exhibition in the mall?) I think it works great. (What about it is a good idea?) It's nice because you can do two things at once. And I don't have to drive downtown.

> (How do you feel about having a science exhibition in the mall?) It's a good idea, because of the traffic, maybe you'll get people that hang out at the mall that wouldn't go to a museum.

VISITOR EXPERIENCE IN *MARSQUEST*

Overall Opinion of MarsQuest

Most interviewees said the interactive and educational qualities of *MarsQuest* worked well for both adults and children.

Nearly all of the interviewees in Tucson and most in Hampton had very positive opinions about *MarsQuest*. Many praised the interactive quality of the exhibits, stating that this quality works well for both adults and children (see the first quotation below). Some appreciated the exhibition's educational nature (see the second quotation). A few stressed that *MarsQuest* was especially "kid-friendly" in the way the exhibits were designed and the level of information provided (see the third quotation). A few were impressed by the "beautiful" images of Mars.

> The hands-on activities were really great. Kids and adults like that kind of stuff. We all like to try things out for ourselves.

> I learned a lot of new things—Mars is like Earth is some ways and different in others. I didn't know that Mars was smaller than us [the Earth] and has less gravity. This exhibit was very educational, even for adults.

> I thought it [*MarsQuest*] was well planned out. It wasn't over-powering in its presentation of information. . . . That made the information accessible to all ages. The same goes for how the exhibits are—kids know how to use them. It's like they were made with kids in mind.

Some interviewees made negative comments about *MarsQuest*. A few in Tucson said *MarsQuest* was too advanced for children younger than eight years old. They were disappointed that the exhibition was not geared for their child's age group. A few interviewees in Hampton complained that the exhibition was for designed for children rather than adults. They had hoped the exhibition would have higher-level information about Mars. A few others were somewhat ambivalent about *MarsQuest*.

Favorite and Least Favorite Exhibits

The programmable rover and the Imagination Theater were named by the most interviewees as favorite exhibits. Only one-half of the interviewees identified a least favorite exhibit. Of those who did, several were displeased with the supplementary exhibits added by the Tucson Children's Museum, and a few complained about the workings of the simulated soil puffer and the large erupting volcano.

Many interviewees identified the programmable rover as their favorite exhibit. Children enjoyed making and watching the rover move, while adults appreciated the programming aspect (see the first quotation below). The Imagination Theater presentation was also popular, especially with adults (see the second quotation). Some interviewees also liked the exhibits that compared Mars with Earth, naming the soda cans and the hot and cold globes as favorites. Others mentioned enjoying the experiences provided by the fog exhibit, touchable canyon, and small volcano stations.

> Driving the rover was really good. . . . (What did you like about the rover?) To see my kids doing [something] scientific. They'd try something and then they would check it and see how it turned out. Then they'd go back and modify their plan, go check it again,

> and go back and forth to move the rover where they wanted it to go. That's great—for them to see what the scientists went through to [move] the rover.
>
> We really liked the movie. . . . I liked the actual footage and the computer enhancements. *It was concise and very well put together. . . . It had lots of good images to help you understand that they were talking about. . . . It explained a lot of stuff about the Pathfinder mission that I, as an adult, didn't know.

One-half of the interviewees said they enjoyed all of the exhibits they had used. The other one-half were able to identify a least favorite exhibit. Seven interviewees in Tucson had negative opinions about supplementary components added by the Tucson Children's Museum (e.g., the light demonstration, the space toys). Four complained that the simulated soil puffer did not work well. Three had similar comments about the large erupting volcano, stating that it either was not working or took too much time to erupt. The remaining least favorite exhibits were non-interactive exhibits, such as text panels, images, and models in cases.

VISITOR LEARNING

Understanding of the Main Idea

Interviewees identified three different possible main ideas for *MarsQuest*. They said it intended to explain Mars exploration efforts, basic characteristics of Mars, and comparisons between Mars and Earth.

When interviewees were asked to describe the main idea of *MarsQuest*, their responses fell into three general categories. More than one-third thought *MarsQuest* explained what scientists have learned from exploring Mars and the technologies involved in the explorations (see the first quotation below). Another one-third said the exhibition showed the conditions on Mars and other basic information about this planet (see the second quotation). A little less than one-third said the exhibition explained how Mars is similar to and different from Earth (see the third quotation).

> It shows how scientists have been exploring Mars—the tools they use and how they operated the rover. . . . They've learned a lot from exploring Mars, so they're showing you the highlights of what they've learned.
>
> This exhibit [*MarsQuest*] gives you a sense of what it's like on Mars. There are volcanoes on Mars. Just some information about the temperatures there, why it's red—facts about what Mars looks like.
>
> Mars is similar to Earth is many ways and different, too. It has mountains, volcanoes, canyons, but they're bigger [than on Earth]. It's smaller than Earth and things weigh less there.

New Information Learned

The comparison of Mars characteristics and features with those on Earth helped many interviewees learn new facts about Mars.

When asked if they had learned anything new about Mars, most interviewees named several facts they had gleaned from the exhibition. Many were amazed by the geological features on Mars, in particular their existence and their size (see the first quotation below). Others were surprised to learn that the surface of Mars is cold, as they had thought it was hot. Some specifically said the similarities and differences between Mars and Earth was new information for them (see the second quotation). Several were intrigued by the presence of fog on Mars, while a few said they had learned that there is frozen water on Mars.

> (What, if anything, was new or surprising to you about Mars?) That there's volcanoes on Mars and I liked the part that compared the Grand Canyon to the giant canyon that's on Mars. I learned the difference in [their] sizes. I thought that was pretty amazing—to see how big the canyon on Mars is.

> I liked the comparisons of Earth to Mars. It puts it in better perspective. We tend not to realize how large our planet is in comparison to some of the other planets. . . . We take the properties of our planet for granted. It's helpful to know that in some ways another planet is like ours and in other ways not like ours. It was interesting to see the images of Mars and Earth—some of them look so similar—and then learn that Mars is actually really cold and has less gravity than Earth.

APPENDICES

Removed for proprietary reasons