

***MY DOME:
DEFINING THE COMPUTATIONAL AND COGNITIVE
POTENTIAL OF REAL-TIME INTERACTIVE SIMULATIONS IN
AN IMMERSIVE DOME ENVIRONMENT***

University of New Hampshire
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Year 2 Draft Evaluation Report
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My Dome
Draft Evaluation Report

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INTRODUCTION

In August 2009, the Program Evaluation and Research Group (PERG) at Lesley University contracted with the project's PI at the University of New Hampshire to evaluate *My Dome: Defining the Computational and Cognitive Potential of Real-Time Interactive Simulations in an Immersive Dome Environment*, an NSF-funded grant. The project focuses on creating interactive experiences in immersive virtual environments, and builds off previous work the PI and co-PIs have done in developing films and immersive experiences in domes and traveling domes. The project involves staff from the Carnegie Museum of Natural History (CMNH) in Pittsburgh, the Houston Museum of Natural Science (HMNS), and the Sasakawa International Center for Space Architecture (SICSA) at the University of Houston.

Related to the work of creating immersive experiences, the project has two primary objectives (from the project proposal): 1) To conduct research on the opportunities for learning during real-time immersive experiences that will be designed for group interaction in the dome environment, and 2) to use the research findings to develop marketable immersive products. Through My Dome, a series of experiences will be developed and tested, including The Temple of Horus, an archaeological exploration of Ancient Egypt, and several other environments including the forest, life on the moon, and a Mayan village.

PROJECT DESCRIPTION

During Years 1 and 2, My Dome staff has developed and/or refined four different immersive dome shows for both school and museum/public audiences. Each is introduced briefly here, and in more depth in the Findings section.

The first show, Temple of Horus, was created as part of a previous grant; through the My Dome project it was extended to be viewable in a portable dome environment, providing it with the flexibility to travel to schools. The Temple of Horus takes viewers inside an ancient Egyptian temple, where they become immersed in the culture and architecture of the civilization. The show is led by a presenter, but is also interactive, as audience members are asked to participate and engage in some of the practices and customs of Egyptian culture.

The second production, Ghosts of Tikal, is a simulation of the ancient Mayan city of Tikal. This adventure is experienced in the form of a cooperative game, based on the design of the Challenger Learning Center Missions at HMNS. The ultimate goal of the experience is to determine why Tikal became uninhabited and what happened to the

people who lived there. Participants can be grouped into different teams with different roles, including: Navigators/Drivers, Ecologists, Archeologists, Anthropologists, Astronomers, and Engineers. Each team has its own task list at a variety of locations throughout the city. The navigator and driver work together to interpret a map of the city and take the teams where they need to go using a remote control. At each location, one or more of the teams have to find an item or solve a problem, which are provided on a clipboard. Currently, the project is working to address particular challenges to the game, work out accompanying materials, and determine the different, and most effective ways to guide participants within it. See the 'Findings' section for a more detailed description of this process.

Two additional projects are currently under development. One, being developed at HMNS, is a simulation of a Lunar Colony. The environment is being constructed so that there are resources and supports to sustain a certain number of humans indefinitely. At this time, development teams are still working to determine what the participant interaction piece will look like when the environment is ready.

Co-PIs at CMNH and UNH are guiding design teams to create a fourth interactive environment, a temperate Living Forest. In this simulation, primarily designed for the portable dome, users will explore a small area of a forest, which changes over a simulated period of 100 years. Students will be able to take scientific measurements at various locations within the area, measuring the amount of light, biomass, and trunk size, among other things. Measurements can be compared from the time of a young forest, to that of an old one, extending the amount of data that can be collected in the field. This environment will initially be tested with schools that are part of the Forest Watch program at UNH, in which students collect similar types of data in the field.

The following is a list of additional project activities in year 2:

Development:

- Living Forest - planning and production onto the dome
- Lunar Colony - planning stages

Presentations:

- Immersive Education Summit, May 13-15, Boston College, Boston, MA – Annette Schloss (UNH) and Kerry Handron (CMNH) demonstrated the Temple of Horus and Ghosts of Tikal to attendees throughout the 2-day conference in the Discovery Dome.
- American Educational Research Association, April 8-12, 2011, New Orleans, LA – Kerry Handron (CMNH), Tony Butterfield (HMNS) and Jeffrey Jacobson (PublicVR, development contractor) demonstrated the Temple of Horus and

Ghosts of Tikal.

Demonstrations:

- Girl Scout Science Career Event, Institute for the Study of Earth, Oceans and Space, University of New Hampshire, May 13, 2011. Tikal was demonstrated to girls grades 4-12.
- Career Day, Newmarket School, Newmarket NH, May 19 2011. Tikal was demonstrated to 4th graders interested in learning about science and technology career paths.

EVALUATION ACTIVITIES

During Year 2, the evaluators maintained ongoing contact with the project PI and the co-PIs, in order to track the development of the various immersive experiences. A PERG evaluator visited CMNH in April 2010 to observe testing of the Temple of Horus and collected surveys from participating youth. An evaluator also visited UNH to observe preliminary testing of Tikal with a group of Girl Scouts in May of 2011. The evaluators used a variety of methodologies to validate and triangulate project data, including interviews, surveys, observations, and discussions with project staff.

- Interviewed project PI and co-PIs in May 2011
- Participated in monthly teleconferences with project staff in spring 2011
- Observed Temple of Horus testing & survey collection at CMNH
- Co-PI at CMNH collected additional surveys on the Temple to supplement evaluator-collected data
- Observed implementation of Tikal at UNH with groups of Girl Scouts

EVALUATION QUESTIONS

The evaluation questions, developed in conjunction with project staff, consist of the following:

- 1) How do visitors interact with the technology? Which visitors benefit the most from the exploration of virtual environments? What age group, learning style, interests, and other demographics are best suited for these types of immersive experience shows?
- 2) Which tools and presentation techniques best facilitate the interactions with the show?
- 3) What challenges occur [for visitors and for the developers] in producing this type of show/immersive experience?

4) What is the ideal group size for these interactive experiences? How does the group aspect of the exploration affect an individual's experience (and do their roles within the group have an impact on their experience?)

5) How do the concepts, skills, and content presented in the shows relate to participants' broader life experiences? For example: Does the Temple of Horus reinforce students' learning in the classroom? Do these interactive experiences spark students' interest in STEM careers?

While these original evaluation questions are, for the most part, still applicable, the focus of the evaluation has shifted slightly to accommodate the present needs of the project, and of each individual show/immersive experience. Summative data was collected on the Temple of Horus show, because it was in its final stage, and the method for implementation was fully developed and finalized. Currently, the other shows are still under development, and evaluators are collecting formative data that can help identify best practices and challenges based on a number of iterations.

REPORT

This report focuses on the period from August 2010 to June 2011 and consists of the following sections: Introduction; Evaluation; Findings; Discussion, and Summary.

FINDINGS

As of June 2011, evaluation findings are available only for the Temple of Horus show and the Ghosts of Tikal simulation. Data on the shows under development will be available in next year’s report.

TEMPLE OF HORUS

PERG evaluators collected data at the Carnegie Museum of Natural History in April 2010. This original data was analyzed and presented as a memo during the summer of 2010 (see appendix A) and included responses from both children and adult visitors. Over the course of the next year, museum staff collected additional data from visiting youth groups, which was merged with the original data where possible. It was on that data set that the following analysis was performed.

A total of 73 youth were given surveys after participating in the Temple of Horus show. Of these, 50 students saw the show in an inflatable dome, and 23 were in the CMNH Earth Theater, which is a panoramic screen, but not a full dome. The following table provides the gender and age breakdown of the sample.

Table 1: Gender and Ages of Youth Sample for Temple of Horus

	Male	Female	Gender Unknown	Total
7 to 9 years old	7	2	0	9
10-11 years old	7	4	0	11
12-13 years old	22	12	0	34
Age unknown	12	6	1	19
Total	48	24	1	73

OUTCOME QUESTIONS

Questions used to determine the success of the show for different groups included four multiple-choice content questions, as well as the following rating-scale questions (strongly disagree to strongly agree), which were used as a measure of engagement and interest in the topic:

- The experience kept me engaged/interested
- I would recommend this show to my friends
- I would like to learn more about Egyptians now that I've seen the show

The following multiple-choice questions were used to measure the percentage of students who learned new content about Egyptian culture. The table below outlines the questions and percentage of correct responses for the entire sample.

Table 2: Percentage of Sample Responding Correctly to Content Questions

	# Correct	% Correct
Q1: How did the Egyptians Interact with their Gods? (n=71)	50	69%
Q2: What was the meaning of the columns in the temple? (n=69)	48	66%
Q3: What does the hawk statue represent? (n=48)*	40	55%
Q4: What was the boat in the inner sanctuary for? (n=45)*	28	38%

*Q3 and Q4 were only asked on one of the two versions of the survey used during data collection

Overall, more than half of students responding to the first three content questions answered them correctly. Question 4 proved to be difficult for students.

Table 3: Rating Scale Responses on Engagement Questions for Entire Sample

	Strongly disagree/Disagree	Not Sure	Strongly Agree/Agree
I liked hearing about Egyptians/Show kept me engaged (n=71)	10%	21%	69%
I would recommend the show to friends (n=71)	14%	14%	72%
I would like to learn more about Egyptians (n=72)	24%	29%	47%

Results indicate that most participants enjoyed the show (69%), and would recommend it to their friends (72%). A somewhat lower percentage said that they would like to learn more (47%), and a quarter said that they would not like to learn more (24%).

PARTICIPANT VARIABLES

Surveys were designed to answer a variety of hypotheses about participants’ experiences at the Temple of Horus. Three main variables were used to compare participant outcomes:

- Whether visitors saw the show in the dome or the theater,
- How often they play video games, and
- What type of learning they preferred to do in a museum setting.

For each of these variables, the analysis compares the percentage in each group answering the content questions correctly, their self-rating of engagement, if they would refer the show to friends, and if they are now curious to learn more about Egyptians.

Dome Vs. Theater Participation

The major variable examined in this analysis was that of the dome versus the theater. Comparing results between students who participated in Temple of Horus in these two venues returned mixed results. For content questions 1 and 4, a higher percentage of theater viewers answered correctly, while the percentage answering correctly on question 2 showed the reverse outcome, and 3 was almost equal. However, the two groups were *not matched* in all other demographics; those in the theater were older, and groups were kept together by classroom.

Table 4: Percentage of Dome vs Theater Viewers answering Content Questions Correctly

	Q1: Interact with Gods	Q2: Columns	Q3: Hawk	Q4: Boat
Dome (n=50)	66%	68%	81%	50%
Theater (n=23)	74%	61%	83%	74%

Results indicate that a higher percentage of students who viewed the show in the inflatable dome agreed that they were engaged in the show.

Table 5: Ratings of Engagement/Liking of Show by Dome/Theater Viewers

<i>I liked hearing about Egyptians/Show kept me engaged</i>	Strongly disagree/Disagree	Not Sure	Strongly Agree/Agree	No Response
Dome (n=50)	10%	22%	64%	4%
Theater (n=23)	17%	35%	48%	0%

However, as is shown in tables 6 and 7 below, a higher percentage of those viewing in the theater would recommend the show to friends than those in the dome. There were no differences in the desire to learn more about Egyptians based on where students viewed the show.

Table 6: Percentage of Students Who Would Recommend Show to Friends Dome vs Theater Viewings

<i>I would recommend the show to my friends</i>	Strongly disagree/Disagree	Not Sure	Strongly Agree/Agree	No Response
Dome (n=50)	16%	14%	66%	4%
Theater (n=23)	9%	13%	78%	0%

Table 7: Ratings of Desire to Learn More about Egypt by Dome/Theater Viewers

<i>I would like to learn more about Egyptians</i>	Strongly disagree/ Disagree	Not Sure	Strongly Agree/Agree	No Response
Dome (n=50)	26%	26%	46%	2%
Theater (n=23)	17%	35%	47%	0%

Overall, a comparison of student responses of those who saw Temple of Horus in the inflatable dome versus the theater showed few consistent trends.

Frequency of Video Game Use

Participants were asked to indicate how often they play video games in which they see through the eyes of a character, like the Temple of Horus show. Of the 72 responses, 64% said they play video games once or twice a week or more. Another 32% play games a few times a month, and only 4% say that they rarely play these types of games.

Project staff, along with evaluators, hypothesized that students who play video games frequently would be more engaged in the show, and therefore answer the content questions correctly more often. Table 8 below shows that there are few consistent trends in the data related to video game frequency. Seventy-three percent of those who play every day answered question 1 correctly, but only 46% answered questions three and four correctly. Those who play only once or twice a month were more likely to answer questions two and three correctly.

Table 8: Percentage of Correct Responses by Frequency of Video Game Use

Frequency	Q1: Gods	Q2: Columns	Q3: Hawk	Q4: Boat
Almost Every Day (n=11)	73%	64%	46%	46%
Once or twice/week (n=35)	63%	57%	57%	46%
Once or twice/month (n=23)	70%	74%	65%	30%

Rarely (n=3)	100%	100%	na	na
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Table 9: Ratings of Engagement/Liking of Show by Video Game Usage

<i>I liked hearing about Egyptians/Show kept me engaged</i>	Strongly disagree/ Disagree	Not Sure	Strongly Agree/Agree	No Response
Almost Every Day (n=11)	18%	9%	63%	9%
Once or twice/week (n=35)	14%	23%	51%	3%
Once or twice/month (n=23)	0%	17%	83%	0%
Rarely (n=3)	0%	67%	33%	0%

Results indicate that viewers who play video games only once or twice a month were most likely to indicate that they were engaged in the show, and those who play once or twice a week were least likely to be engaged. (Only three students said they rarely played video games; the small sample size is not sufficient to draw conclusions about this group).

Table 10: Percentage of Students Who Would Recommend Show to Friends by Video Game Usage

<i>I would recommend the show to my friends</i>	Strongly disagree/ Disagree	Not Sure	Strongly Agree/Agree	No Response
Almost Every Day (n=11)	27%	18%	54%	0%
Once or twice/week (n=35)	11%	14%	71%	3%
Once or twice/month (n=23)	13%	13%	70%	4%

Rarely (n=3)	0%	0%	100%	0%
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Data show that those who play video games most often were least likely to recommend the show to friends. 71% of those who play weekly or monthly would recommend the show, versus only 54% of those who play almost every day.

Table 11: Percentage of Students Who Would Like to Learn More by Video Game Usage

<i>I would like to learn more about Egyptians</i>	Strongly disagree/ Disagree	Not Sure	Strongly Agree/Agree	No Response
Almost Every Day (n=11)	27%	18%	55%	0%
Once or twice/week (n=35)	29%	23%	46%	3%
Once or twice/month (n=23)	17%	35%	48%	0%
Rarely (n=3)	0%	67%	33%	0%

Types of Preferred Museum Experiences

Participants were asked to rate how often they like to learn in different ways in a museum setting. Results indicate that this sample of students most often like to experience, touch, feel, or interact with materials (80%), followed by watching a video about the subject (48%). Thirty-four (34%) percent of the sample said that they don't like to listen to someone *talk about* an exhibit.

Table 12: Percentage of Students Enjoying Different Types of Museum Learning (n=73)

	Don't like	Sometimes like	Usually like	No Response
Listen to someone talk about an exhibit	34%	41%	23%	1%
Read the description of parts of an exhibit	27%	51%	19%	3%
Experience, touch, feel, or interact with materials	6%	12%	80%	3%
Talk with or ask questions about an exhibit with an expert	22%	53%	21%	4%
Watch a video about a topic	10%	40%	48%	3%

The following set of tables compares participants who indicated that they like or don't like the different means of learning above, and their ratings of engagement with the show. The most glaring differences were in tables 13 and 14, where students who said they usually like to ask questions and talk with experts or watch a video on a topic were *much more likely* to say that they liked/enjoyed the Temple of Horus show.

Tables 13-16: Percentage of Students Agreeing with Engagement by Liking of Types of Learning

	<i>I liked hearing about Egyptians/ Show kept me engaged</i>		
<i>Listen to someone talk about an exhibit</i>	% Disagree	% Not sure	% Agree
Don't like (n=23)	13%	22%	65%
Usually like (n=16)	13%	13%	74%

	<i>I liked hearing about Egyptians/Show kept me engaged</i>		
<i>Ask questions or discuss with an expert</i>	% Disagree	% Not sure	%Agree
Don't like (n=16)	31%	38%	31%
Usually like (n=14)	0%	0%	100%

The other means of museum learning were very popular with students, with only three and six participants, respectively, indicating that they “don’t like” to experience or interact with materials, or watch a video about a topic in a museum. Because of this, the numbers of the groups were too small to make conclusions about the data in the following tables.

	<i>I liked hearing about Egyptians/Show kept me engaged</i>		
<i>Experience, touch or interact with an exhibit</i>	% Disagree	% Not sure	%Agree
Don't like (n=3)	33%	0%	67%
Usually like (n=58)	7%	25%	68%

	<i>I liked hearing about Egyptians/Show kept me engaged</i>		
<i>Watch a video</i>	% Disagree	% Not sure	%Agree
Don't like (n=6)	33%	0%	67%
Usually like (n=34)	0%	18%	82%

A similar cross tabulation was performed using the first content question [about how Egyptians interacted with their gods]. This question was chosen because it had the highest percentage of the entire sample answering correctly (69%), thus allowing for the greatest *n*. However, results indicate little to no clear trends in the data related to the type of learning that students enjoy in a museum.

Tables 17-20: Percentage of Students Answering Content Question 1 Correctly by Liking of Types of Learning

<i>Listen to someone talk about an exhibit</i>	% Correct
Don't like (n=23)	63%
Usually like (n=16)	64%

<i>Experience, touch or interact with an exhibit</i>	% Correct
Don't like (n=3)	67%
Usually like (n=58)	68%

<i>Ask questions or discuss with an expert</i>	% Correct
Don't like (n=15)	60%
Usually like (n=14)	64%

<i>Watch a video about a subject</i>	% Correct
Don't like (n=6)	83%
Usually like (n=14)	71%

In summary, evaluation data indicates that the majority of youth audiences in the Temple of Horus show were engaged and enjoyed the experience, would recommend it to friends, and were able to answer some simple content-based questions after viewing it. Participants viewing the show in both the dome and the theater provided similar responses on surveys for most questions, and there did not appear to be any differences based on student video-game use or type of learning preference.

GHOSTS OF TIKAL

Tikal was under development during Year 1 and most of Year 2. It became available for testing late in Year 2, so limited data was available for this report. Currently, project staff and evaluators are still collecting formative data in order to determine how to best implement the show. The basic premise of the show is to split the audience into groups and provide them with tasks to complete as they explore the virtual environment. Tikal can be presented to audiences in a variety of ways, which is one of the show's strengths. Therefore, there may not be one 'best way' to present the show. For example, depending on the size of the visiting group and the time allotted for the activity, the game can be modified. Not all scientist teams need to be used in every game. If a class is especially interested in studying archeology and anthropology instead of the ecological environment, they can only use those teams and focus on tasks surrounding those scientists. Each scientist team has a clipboard with task sheets, and these could be modified for longer or shorter sessions in the dome by adding or removing tasks.

Evaluators visited a Girl Scout Careers in Science Day at UNH in May of 2011 where Tikal was tested. Through observations, it appeared that there were a number of variables that would play a role in the success of the show. In addition to the number of teams used and the time available for play, *these variables included:*

- Participants' ages
- Participants' relationships with each other (i.e. Were they already used to working together?)
- Team/group size
- Prior knowledge of Maya or Tikal
- Navigation and driving ability
- Facilitator knowledge
- Number and skill of chaperones/adults
- Difficulty of tasks on each team

Based on these initial observations, an observation and reflection sheet was created so that project staff could reflect upon all their trials with the show. Because each implementation is slightly different, collecting these reflections in writing and then aggregating them will provide valuable insights into the most productive methods for implementing Ghosts of Tikal. The observation data from the UNH visit is provided below, and the reflection sheet is in Appendix B. At this time, aggregated data is not available, as testing is ongoing.

UNH TIKAL TESTING ANALYSIS

Implementation

Testing took place with about 60 girl scouts and their leaders at an afternoon workshop for scouts at UNH. Girls ranged from 4th through 7th grade, and in groups of 12-17 – accompanied by 3-4 adults at a time. Groups were rotated through in 30-minute intervals (due to scheduling constraints).

Upon each group's arrival, participants were told that they were going to be exploring a video game that takes place in an ancient Mayan city. The group was asked who had played video games before, and who plays them often. Generally, two older girls with experience playing video games were selected to be the driver and navigator. Everyone else, including adults, was split into four other randomly-selected groups; ecologists, anthropologists, archeologists, and astronomers. There were usually 4-6 individuals in each group, including at least one adult. Participants were given clipboards with their task sheet, a marker, and a light. Each group was told they would be visiting different locations listed on their sheet, and that their group would have particular questions to answer at most, but not all, locations.

Once inside and settled in the dome, the navigators would begin exploring the first location, the village. The groups with things to find in the village would begin looking and instructing the navigators on what to find, with guidance from the facilitator.

Again, with the facilitator's guidance, the group headed to Temple 4. Once there, different groups wanted to explore different things. Depending on the assertiveness of the individuals, some groups managed to attract the navigator's attention, and others did not. Not all questions were usually answered at Temple 4. A few of the groups proceeded to the next location, in similar process, if prompted by the facilitator.

Analysis

The analysis, based on observations of an afternoon of testing, is broken up into different key issues that should be focused on by the project team in moving forward. The reflection sheets, developed by PERG for future testing, are based on this analysis.

Driving the game – For the most part, participants were able to drive the game using the Xbox controller fairly well. With more difficult tasks such as climbing the temples and jumping, it often took a few minutes and a few tries for participants to learn the correct technique. Driving did not prove to be too difficult for youth once they had a few moments practice. However, it does require the larger group to wait while the driver figures out how to get up to the top of the temple, or figures out which direction to go. Navigating using the map did give this team some difficulty, and require guidance of the facilitators.

Communications/teamwork - There was lots of chatter among the groups about what they were seeing, and what was on their sheets. The navigators could not always hear what teams were asking them to do, as they were often talking with each other about where to go in the game and how to drive. Having a facilitator present to guide and organize everyone was essential. Without that, navigators would have to manage conversation between groups of peers, which is difficult to do while also navigating and driving in Tikal.

Questions and tasks – As this was the first time Tikal was tested with participants at UNH, the facilitators had difficulty answering questions. Without adequate time to explore every house in the village, for example, it is hard to find the farmer's bowl. It is also difficult, given the [limited] communication in the dome, to get the driver to stop and focus on the bowl for long enough to identify its contents. Other questions simply aren't always clear. What constitutes a "chamber" of the temple? What is in the stump-like objects in the field? Each question should be reviewed and clarified, for a range of ages. If someone else (outside of project developers) were facilitating the game they would need to know what most, if not all, of these objects are.

Content knowledge/context/background – With only 30-minute slots for this trial, there was no time to discuss relevant content or provide much background. A few participants knew something about the Mayans, but it appeared unlikely that anyone left knowing anything new, except that the Mayans had temples and that there were lots of geckos. A clear introduction needs to be created. For school visits or classrooms, there are many possibilities for an in-depth introductory lesson and another follow-up lesson. For museum groups, there would need to be a briefer introduction and post-game discussion. Without this context, it is unlikely that students will learn much from the game.

Group demographics – These were relatively small groups, with a high adult to student ratio. School groups would be larger with fewer adults to facilitate. Already, with 4-6 students in a group, it was difficult to involve everyone, and it appeared that the student holding the clipboard and those directly next to her were the ones working on the questions. With larger teams it would be harder to engage everyone in each task. Also, the younger girls in this test seemed to be barely able to complete/understand some of the tasks. At this point of preliminary observation it appeared middle school youth would be a more appropriate demographic.

Time – Thirty minutes was insufficient time for this experience. At least an hour is needed, and even that would be minimal. A 10-15 minute introduction, 30 minutes to play (which doesn't seem to be sufficient) and another 10-15 minute discussion, amounts to almost an hour. It is important to consider that when visiting a school, class periods are often less than an hour, so planning logistics could be difficult. It might be possible

to make a shorter version with less navigation and fewer stops so that participants don't feel they are missing out on half the game.

Facilitator – The facilitator was essential in helping this group navigate the show. Without a facilitator, the scientist groups would have no order/procedure to communicate with the navigators. Facilitators ultimately need to be well-acquainted with the game, so they can guide participants to the correct areas when necessary, and answer questions about both the environment and the Mayan culture. This may be a challenge in the future when the game is disseminated beyond the program developers.

Summary of Tikal

As described above, there are many variables that can impact the success of the game's implementation. Project staff have developed a teacher guide to accompany the Ghosts of Tikal game, which provides background to both the game and Mayan culture for the teacher. Additionally, HMNS has developed a video on the Maya, part of which would serve as a perfect introduction to set the context for the game. Testing using the game paired with the video is ongoing. Additional testing is being done to refine the exact tasks of the game, the issues surrounding the map and navigation, as well as variations of the group size and makeup.

SUMMARY

The first two years of the My Dome project have explored and developed ways to make immersive virtual experiences available and effective in educational settings. At this point, one show, Temple of Horus, has been fully developed and is currently showing daily at CMNH. Evaluation data indicates that the majority of youth audiences in the Temple of Horus show were engaged and enjoyed the experience, would recommend it to friends, and were able to answer some simple content-based questions after viewing it. Participants viewing the show in both the dome and the theater provided similar responses on surveys for most questions, and there did not appear to be any differences based on student video game use or type of learning preference. The show is an example of a presenter-guided experience that provides historical, cultural and architectural information to an audience while making connections to the modern world. Temple of Horus can be viewed by both youth and adults, in public settings, or during school visits in the portable dome.

The Ghosts of Tikal game is nearing completion and will be undergoing final testing during the summer of 2011. The game contains a wealth of possibilities for the experience and can be completely student-driven or guided by a facilitator. Preliminary evaluation data through observations of youth have enabled evaluators to identify a variety of key variables that can influence the implementation of the game. If implemented by an experienced facilitator, it can potentially be integrated with a variety of curriculum, including science, math, and social studies. Additional testing will help to refine supplementary materials for the game so that teachers and other educational leaders can more easily implement it.

Finally, two additional immersive experiences are currently under development. The Lunar Colony and the Living Forest will be further refined and tested during Year 3 and reported on in the summative evaluation report.

RECOMMENDATIONS

Moving into the final year of the project, the evaluation team recommends the following based on data collected from the program so far:

- During development of the Lunar Colony, be sure to focus on concrete learning goals during development, including identification of the appropriate setting, audience, and curricular connections that will make it useful and marketable to schools and museums alike.
- Test out and refine the best use of a facilitator for the Ghost of Tikal simulation to determine if a movie and teacher's guide are sufficient for an independent facilitator to learn to implement the game with students.
- Sample and experiment with all of the tasks on the group worksheets in Ghost of Tikal to be sure that they are clear and manageable for the targeted age group to complete.
- Decide upon and implement a marketing or dissemination plan for the Temple of Horus, so that it can be used beyond CMNH. This same plan could be used for the other products as they are completed.

APPENDIX A

To: MyDome Team

From: Elizabeth Osche

RE: MyDome preliminary data results

How do people react to the show?

Overall, people reacted positively to the show. Adults agreed that the show kept them engaged, informed them about Egyptian culture, and that they would recommend it to others for its immersive experience. Youth responses indicated that they overwhelmingly thought that “the show was fun” and that they agreed that they learned something about Egyptians. Youth did not respond as favorably to asking and answering questions with the presenter.

Who did we collect data from:

- 23 Youth: ages 5-17, with a mean of 10.7 years – most between the ages of 10 and 13
- 26 Adults – 16 female 11 male

Age	n
Under 40	13
In their 40's	9
Over 50	4

What was their background knowledge?

Youth

- The majority of youth had learned about Egyptians before, in any context (83%)
- 15/23 youth (65%) had visited the CMNH exhibit that day
- Almost all youth showed at least some interest in Egyptians before the show – adults on diff scale (converted)

	Youth	Adults
Not very interested	2	5
A little interested	13	17
Very interested	8	4

Total	23	26
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Adults

- Adult **familiarity** – 2.38 (15/26 at 1 or 2)
- 58% of adults rated their **interest** in Egypt BEFORE the show as low (1 or 2 on a scale of 1-5) (only one adult rated interest as a 4 or higher) (average 3.03before)
- 73% of adults said they have high **interest in the 3D** environment (rated 4 or 5) average 3.92 (only 1 “2 or lower” –)
- So this is saying that for adults, it’s the environment that brings them in moreso than the content...

Characteristics of Sample:

How often do they play video games with features similar to the Temple show?

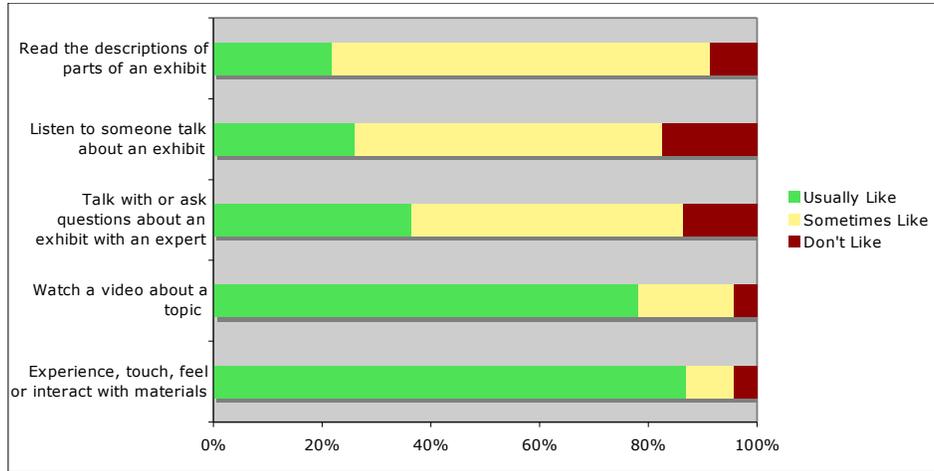
	Youth	Adult
Rarely/Never	3	19
Once or twice a month	6	5
Once/twice a week	10	2
Almost every day	5	0

Did people who enjoy listening, experiencing or videos answer them right, draw it better or have more fun?

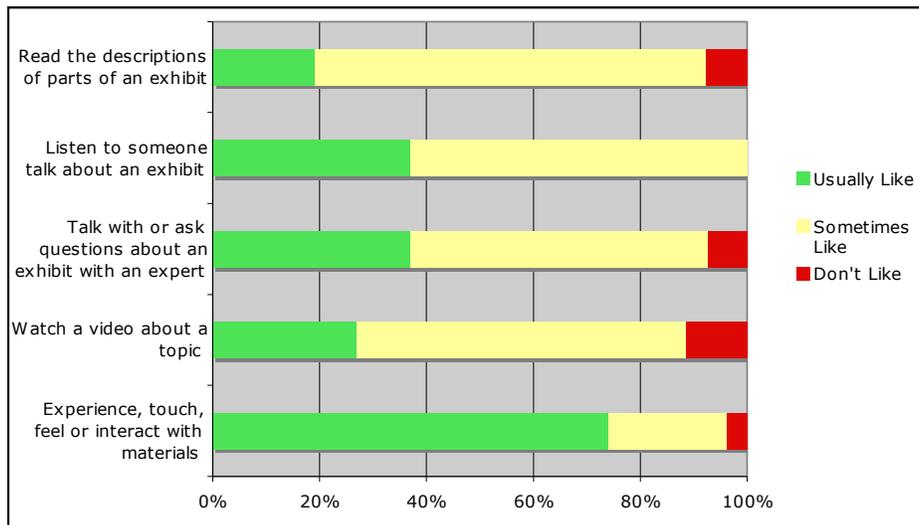
Youth indicated that when they go to museums, they enjoy interactive experiences the most, followed by watching videos about a topic. Adults also enjoyed the interactive, hands on experiences, however preferred to listen to a lecture or talk with someone about a topic rather than see a video about it.

What do you like to do when you visit a museum?

Youth



Adults



- Youth are more likely to want to watch videos about a topic
- All visitors really enjoy experiencing and interacting with materials, and least enjoy reading descriptions of exhibits

Overall reactions to the show

Youth

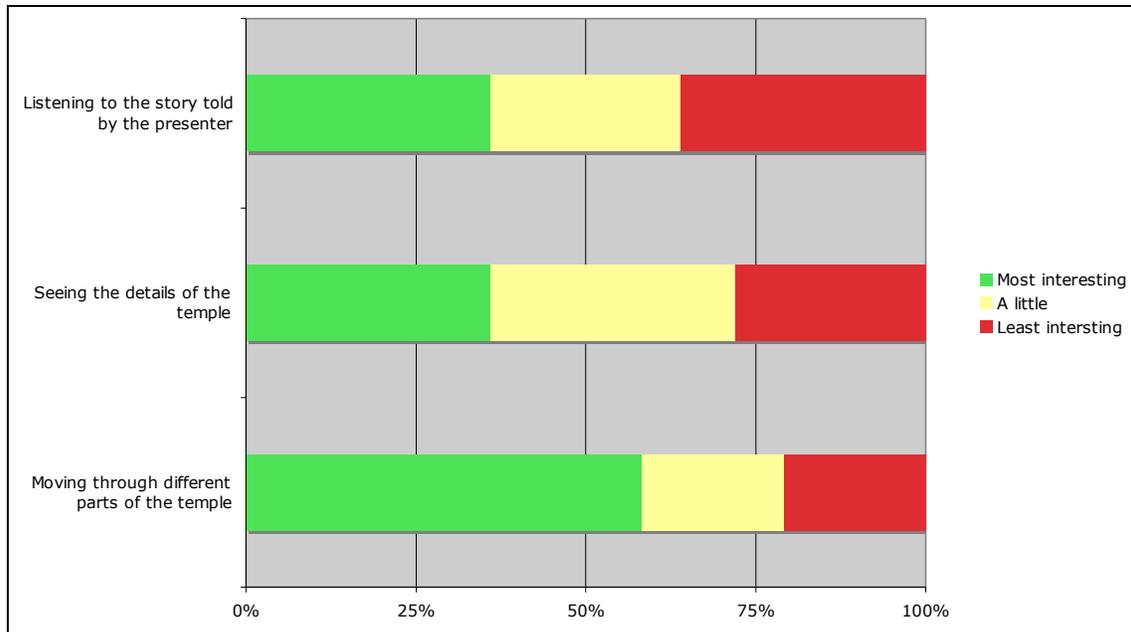
	Disagree a Lot	Disagree A Little	Not Sure	Agree A Little	Agree a Lot	No Response
I liked hearing about what Egyptians did in the Temple	0	0	6	10	6	2
I would recommend this show to my friends	1	1	6	7	8	1
I liked asking and answering questions with the presenter	4	5	1	7	6	1
I think the show was fun	0	0	2	6	15	1
I think I learned a lot about Egyptians during the show	0	2	3	9	9	1
I would like to learn more about Egyptians	0	4	4	5	10	1

Adults

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	No Response
The experience kept me actively engaged	0	1	3	20	5	1
I learned about Egyptian culture and religion	0	0	1	21	5	1
I learned the meaning of some Egyptian architecture	0	0	1	15	11	1
I understand some connections between Egyptian culture and modern cultures	0	0	8	14	5	1
I would recommend this show to others to learn about Egyptian culture	0	0	4	16	7	1
I would recommend this show to others to experience the interactive, immersive environment	0	0	2	17	8	1

I am not interested in learning more about Egypt	0	1	4	19	3	1
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Adults rating of parts of the show



Length of show

75% of adults said just right; others said too short – same responses for youth – shows ranged from 15-20 minutes long.

APPENDIX B

Tikal Reflection Sheet

Observer Name:

Facilitator Name (could be same):

Implementation/Process:

Location (school, museum, etc):

of participants per show:

Ages/range:

Any adults/chaperones present?:

Amount of time spent in dome:

How many/which teams were used:

How many students to a team?:

Was there any context/lesson given prior to the experience?:

Which tasks were you trying to accomplish?:

How far did you get in the game?:

Outcomes:

Please comment on how things went in each of the following areas

Drivers (capable, easy to navigate?):

Team work/communications with driver:

Tasks/Questions (did they understand them, could they answer them?):

- Anthropologists:
- Archeologists:
- Astronomers:
- Ecologists:
- Engineers:

Context/content knowledge (did the group have any background knowledge, or context for the game?):

Group demographics (groups too big, too small, too young, needed adult, went well?)

Time (enough? Did they get bored? Did they want to continue?):

Facilitator (how much did they need to guide):

Other observations/reflections:

If there is a teacher/adult contact for this group, please provide name and email or phone number: