A Roadmap for Giant Screen Research:

Results of the
Setting the Agenda for Giant Screen Research Workshop

Table of Contents   **Page Number**

June 2015

Dear Colleagues,

This report is a product of the *Setting the Agenda for Giant Screen Research* Workshop held October 18, 2013 in Albuquerque, NM, which grew out of many years of discussions about the potential of the giant screen (GS) format to educate, engage and entertain, and in response to the multiple calls for research on GS films. Over the course of one day, invited participant thought leaders representing GS filmmakers, marketers, exhibitors and distributors joined with immersive practitioners and academic researchers to identify the key research questions for a GS research agenda.

However, as the term "agenda" suggests a concrete research focus, we have decided to rename the outcome of the Workshop to A Roadmap for Giant Screen Research. This simple change of name recognizes that:

- As an outcome of the Workshop, this report is a fluid, living document that should be aligned to the needs of the community, rather than driving the community needs.

- This report is not a synthesis or final accounting of what should be done, but a "report out" of the day's events that speaks to the need for giant screen research.

- It was beyond the scope of this grant to *set* the agenda for research—rather, the goal of the Workshop was to redress the lack of research by generating the community focus needed to catalyze the establishment of a GS research program.

The Workshop followed on the efforts of the Center for the Advancement of Informal Science Education (CAISE) and others in promoting a research-to-practice link to promote innovation and advancement in practice, complemented by a website devoted to linking research to practice through research agendas and roadmaps (http://informalscience.org/research/research-agendas).

A special thank you to the NSF for their generous financial support of the Workshop, to ASTC for in-kind support and guidance, to the Workshop participants for their time

and efforts, and Drs. Jeffrey Jacobson and Valerie Knight-Williams for their invaluable assistance in Workshop development.

Tammy Seldon
Executive Director, GSCA

Mary L. Nucci, Ph.D.
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Introduction

Supported by a grant from the National Science Foundation (NSF), with additional support from the Giant Screen Cinema Association (GSCA) and the Association of Science-Technology Centers (ASTC), GSCA hosted the *Setting the Agenda for Giant Screen Research* Workshop on October 18, 2013, in Albuquerque, New Mexico. The one-day Workshop convened a group of 32 giant screen (GS) stakeholders, immersive practitioners, academic researchers and GS-industry affiliated experts to consider the key issues for a GS research roadmap. (The list of Workshop participants may be found in Appendix A.)

Through a series of three breakout discussions, Workshop participants were asked to identify key research issues, define potential research questions and develop a list of constraints and barriers in promoting a giant screen research roadmap. (The schedule for the Workshop can be found in Appendix B.) Specifically, the breakout sessions focused on the following 3 questions:

- **Breakout 1:** What are the key research issues—thematic areas, guiding topics— for GS research?
- **Breakout 2:** Identify 3-5 key research questions from the key topic areas defined in Breakout 1: Audience, Outcomes and their impacts, Learning, Nature of the GS experience, and Industry.
- **Breakout 3:** What are the pragmatics—the nuts and bolts that need to be considered in developing and implementing research programs: barriers, opportunities, justifications, funding etc.?

For each breakout session, participants were divided into 6 groups comprised of individuals with similar or diverse industry backgrounds depending on the breakout question. During the Workshop, results of the breakout session discussions were recorded on paper by each group and presented as a verbal report-out to all participants. The group records and notes were collected for later compilation and analysis. This methodology used inductive coding to create a summary of content.

The results of the breakout sessions are presented in three sections in the report below, sharing participants' feedback from the first, second and third breakout sessions, respectively. In each section, results are presented in order by group number. There is no inherent importance attached to the lists of possible research questions as the choice of which research questions to address first is based on a combination of researcher

interest, funding and stakeholder involvement. Rather, the results that follow are intended to serve as a platform to engage and stimulate action towards GS research.

Additionally, 9 months after the Workshop, participants who were not involved in organizing, hosting or facilitating the Workshop were invited to review a draft of this report and share feedback about elements of the Workshop outcomes that were missing, inaccurate or needed to be fleshed out. These participants were also encouraged to: contribute any new thoughts or ideas they had since participating in the Workshop, describe their post-Workshop activities related to GS research and share suggestions for next steps. To streamline the feedback process, participants were asked to respond to the above set of issues through an online survey prepared and hosted by the independent evaluation firm, Knight Williams, Inc. Their feedback on the Workshop and the Workshop draft report is presented in Appendix G.

Breakout Results

Breakout 1

> **Question:** What are the key research issues—thematic areas, guiding topics—for GS research?

Results[1]
In the first breakout, participants were asked to develop a list of the broad areas and topics that should be used to drive giant screen (GS) research. Breakout groups were comprised of a mix of GS stakeholders, immersive practitioners, academic researchers and GS-industry affiliated experts. Analysis of the group discussions from Breakouts 1 pointed to five main categories of interest for a research roadmap:

- Audiences
- Outcomes and impacts, and their indicators
- Learning
- Nature of the GS experience
- Industry
    - Our community of practice ad its culture
    - Our value chain and business model

Audiences
Broadly, the Workshop participants were interested in defining the GS audiences' demographics and psychographics (beliefs, attitudes, values and life experiences). The question was raised, however, whether we as an industry can define who we are trying to convince and how to reach them?

Participants indicated that the research roadmap should evaluate if and how the audience is changing, what audiences expect of GS in a media-rich world ("how changing media sphere shifts the expectations"), and whether their expectations are being met. Participants wanted the research roadmap to evaluate whether audiences are willing to "wrestle with difficult topics" such as microbes and climate change and to consider whether there are optimal topics for the format (e.g., space science, inaccessible places, interconnectedness, system science).

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[1] Notes from the participants' discussions are found in Appendix C.

The social aspect of the audience experience was mentioned by two groups: understanding whether an audience experience made a difference and whether the group dynamic alters the viewing experience.

Workshop participants also wanted to know why audiences are selecting to see a GS film, and although defining the motives for choosing to see a GS film was noted as an important research concern, by corollary, it was equally important to examine the reasons why an audience chooses to *not* see a GS film. This ties in to the idea of retention in that one group felt it was important to understand the reasons why audiences do not return to see GS films over time.

Audiences: Possible Research Questions:
What are the demographics and psychographics of the GS audience?
Is the GS audience changing and how?
What are the audience expectations of GS and are they being met?
What are the optimal topics for GS films (audience interest; best for format)?
Does the social aspect of the GS experience affect impact?
What are the reasons for audiences going to see a GS film? Not going to see a GS film?
What is needed to promote audience retention?

Outcomes and impacts, and their indicators

Key to developing research on the impact of GS films was defining what impact means. Is impact knowledge (retention), attitude (desire to learn more), behavior (seeking more information) or some combination of the three?   Is impact defined as meeting educational goals? Can we tease apart learning versus influence? Does it mean something different to the audience than it does to the industry? It is clear that there is no clear definition to "impact" and that how it is defined will affect the research questions and methods used to answer them. But participants were clear that we should not limit defining impact as learning only, as social or emotional impacts (e.g., watching a GS film for pleasure) are as much a part of the experience.

However, multiple breakout groups noted that a research focus on impact should not just evaluate the evidence for meaningful outcomes from GS films, but should also develop the rigorous methods for measuring impact, for both audience and industry (for example, one group asked whether there can or should be brain level studies while watching GS films).

Research should define, develop and operationalize impact (long term, engagement, knowledge) that go beyond learning to include how the unique attributes of GS ("the machine") impact the audience not just through cognitive gain (learning), but also through such variables as physiological/kinesthetic, emotional/social, neurological, and psychological measures (e.g., memory, processing, sense of presence, affect, and recall/synthesis/activation) of GS films. This "richer vocabulary of impacts" could use such terms as framing, interaction, activation, participation, conversation, engagement, the sublime, communities, participation, motivation, and discourse to evaluate and define the impact of GS films.

> *Outcomes and impacts: Possible Research Questions:*
> How do we define impact? Knowledge? Attitude change? Behavioral change?
> What is the relationship between learning and influence?
> What does learning mean for the audience? For the industry?
> How is impact measured?
> What methods exist and what methods need to be developed to measure impact?
> How do the unique attributes of GS impact the audience?
> Do the traditional methods and sweet spots of GS still have the same impact?
> What alternative methods can be used to evaluate GS (e.g., brain scan, eye tracking)?

Learning

Learning was identified as a key theme for a research roadmap, with one group noting that funders were looking for lifelong learning outcomes and that it is lifelong learning that justifies GS.

Participants felt that research should focus on how to understand what's going on with the learner during a GS experience, and generate longitudinal data on learning and behavior after watching a GS film. The idea of what kind of learning was supported by GS was raised by several groups with a focus on researching whether GS films have a greater effect or support for learning as engagement, as knowledge gain, as skills development, as identity change, etc.

The role of format in learning was considered important. Participants noted that it was important to examine the effect of different kinds of immersion in 2D, 3D, dome, or flatscreen GS films on learning; whether the history of GS viewing impacts learning (i.e., is learning most effective on the first viewing of a GS film or is learning stable regardless of how many GS films the viewer has seen); whether there was a role for

incorporating a learning scientist in the production process for proof to provide a pathway to next generation GS; and the long term educational experience of GS film viewing.

After the Workshop, participants noted that a roadmap for research on learning in GS must recognize that learning is a complex topic, moving from the historical idea of learning as rote recall to a broader, sometimes more elusive definition that includes issues of attitude, emotion, science identity, and practice as seen in the National Research Council report (2009; see Appendix E) which identified six distinct learning strands in informal environments, shared below. Research on learning in GS will need to identify specific learning outcomes based on this broader understanding of what learning is:

- Strand 1: Experience excitement, interest, and motivation to learn about phenomena in the natural and physical world.
- Strand 2: Come to generate, understand, remember, and use concepts, explanations, arguments, models, and facts related to science.
- Strand 3: Manipulate, test, explore, predict, question, observe, and make sense of the natural and physical world.
- Strand 4: Reflect on science as a way of knowing; on processes, concepts, and institutions of science; and on their own process of learning about phenomena.
- Strand 5: Participate in scientific activities and learning practices with others, using scientific language and tools.
- Strand 6: Think about themselves as science learners and develop an identity as someone who knows about, uses, and sometimes contributes to science.

Learning: Possible Research Questions:
How do we define learning? How is it measured?
What methods, with sufficient rigor, need to be developed to measure learning?
What changes occur in the learner watching a GS film?
What are the long term effects on learning and behavior post viewing?
Does GS have a greater role in learning as engagement, as knowledge gain, as skills development or as identity change etc.?
What is the role of format on learning?
Does the history of GS viewing impact learning?
How can the inclusion of a learning scientist in the production process promote innovation and outcome?

Nature of the GS experience

Participants were interested in the unique attributes of GS, and in research questions that disentangled what is physically on the screen from the story, the content and the editing. They wanted research to address what are the key qualities of GS, how to evaluate them, and to examine whether it is possible to generate best practices using these features to achieve desired outcomes ("big box of mastery"). Recognizing that GS has "wow" moments, participants were also interested in whether we can develop a taxonomy of these moments and articulate a grammar of GS film for greatest impact.

The question of what are the key features ("sweet spots") of GS was raised by several groups. What are the characteristics of GS that make it impactful? Research should examine whether and how we know that GS attributes (e.g., sound, story, medium, technology (3D), immersion, film-making techniques, content, visualization, spatial, presence, time for reflection, and information density) are unique features of the medium. Participants noted that a research roadmap should also examine the role of narrative technique in GS filmmaking.

Research should also examine the potential for future innovation for next generation GS experiences such as nonlinearity, second screens, user-generated content inclusion, distance learning and custom content.

> *Nature of the GS experience: Possible Research Questions:*
> What are the unique attributes ("sweet spots") of GS and how do they impact the viewer?
> How can the unique attributes of GS be evaluated?
> What are the "wow" moments in GS filmmaking and how are they generated?
> Can we develop a best practices toolkit for GS filmmaking?
> How can we innovate GS filmmaking and is there a role for nonlinearity, second screens, user-generated and custom content and distance learning in next generation GS?
> Does emotional arousal scale with size of medium?
> What content is best suited to GS wow moments? Is there a formula?

Industry
- Our community of practice and its culture
- Our value chain and business model

Participants were focused on industry-related research that would promote industry's taking a lead role on determining outcomes and direction to ensure the success of GS (films and theatres). An industry research roadmap should focus on challenges to the format and future potential, and address the expectations, doubts and lore about GS films. Participants wanted to know how GS fit into an evolving and fragmented media landscape and the role of transmedia in GS filmmaking. Participants also called for research that considers the financial success of GS film, such as return on investment (ROI), demand, and value.

> *Industry: Possible Research Questions:*
> What are the expectations, doubts and lore about GS films?
> How does GS fit into the media landscape?
> What is the role for transmedia dissemination of GS films and content?
> How can we ensure the financial success of GS films?
> What is the role of ROI, demand and value in GS filmmaking?
> How will interactivity impact and change GS?

Breakout 2

Question: Identify 3-5 key research questions from the key topic areas defined in Breakout 1: Audience, Outcomes and their impacts, Learning, Nature of the GS experience, and Industry.

Results[2]
This second breakout aimed to have participants identify potential research questions from the topic areas identified in Breakout 1. Recognizing that the participants represented a range of GS stakeholders, the goal for this breakout was to pull on the wide knowledge and experience of the participants. Breakout groups were comprised of a mix of GS stakeholders, immersive practitioners, academic researchers and GS-industry affiliated experts.

Participants' Proposed Research Questions: Audience
What are the characteristics of current GS audiences?

Who makes the ticket buying decisions (e.g., personal choice to see a certain film beforehand, chance, part of a museum/center visit, teacher-chosen, mother or children making the decisions)?

What are the expectations of current audiences, and how/are we meeting them?

What is the non-user (i.e., has never watched/does not watch GS films, does not watch GS films any more) perception of the GS film experience?

Why are audiences coming to GS films and why not?

Participants' Proposed Research Questions: Outcomes and impacts, and their indicators
Have GS films inspired academics and or career trajectories in STEM?

What is the film intended to do for the audience? And which audience?

How does a GS film position an audience member as an expert?

Can we do a current meta-analysis of the existing information on outcomes/impacts of GS films?

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[2] Notes from the participants' discussions are found in Appendix C.

Can giant screen support and augment message?

Are certain subjects better on giant screen?

Does emotional content (e.g., fear, wonderment, romance, empathy, humor) scale with the medium?

If emotion is driven by scale, then is action also driven by this scale?

Does the brain process narration and information differently in giant screen vs other media?

What affects impact: emotional response, physical response, narrative structure, etc.?

Does the immersive nature of GS cinema contribute to increased engagement and other impacts (e.g., changes in learning, attitude, behavior)?

Does grandiosity or spectacle contribute to increased engagement and other impacts (e.g., changes in learning, attitude, behavior)?

What characteristics of GS create impact (e.g., narrative structure, wow/grandiosity moments, sense of place, 3D, visualizations of the unfamiliar, active viewing)? What moments create the greatest impacts?

Does the immersive nature of GS film contribute to increased engagement?

What types of responses does the GS experience engender?

Participants' Proposed Research Questions: Learning
Is GS a gateway experience for learning?

Is GS more effective for some topics (e.g., evolution, climate change)?

Is GS effective for controversial topics?

Does GS sensitize the viewer to topics more effectively than other media?

Does GS prime for future learning?

Is the place-based experience more effective than abstract concepts?

What is the impact of the active experience in learning?

What are the factors for creating quality and engagement that will increase learning?

What are the intersection points between the positive educational outcome and success characteristics?

What is the benefit of this platform to learning?

How do immersion and presence affect the brain and learning?

Participants' Proposed Research Questions: Nature of the GS experience
How do we define the tools used to communicate aesthetic language of expression (best expression)?

How can the unique characteristics of GS films be optimized/maximized to promote learning and lifelong learning outcomes?

What is the neurological sense of presence created by the GS experience compared to the actual experience?

What is the perceived value or need for digital technology (capture and delivery) to meet or exceed the quality of GS film?

To what degree can new digital technology create experiences for targeted audiences, thereby expanding audiences?

Is the value of the GS experience its immersiveness, or the social context of the theatrical experience?

What is the effect of the various technical differences (aspect ratio, flat vs. dome, 2D vs. 3D, GS vs. head mounted displays)?

Do GS specifications (contrast, 2D, 3D, resolution, brightness, geometry, aspect ratio, color, dome, flat, etc.) affect input/output?

Are there physiological changes in audiences watching a GS film as compared to watching the same content on other platforms?

Do audiences experience positive affect more on giant screen than on other formats (same content)?

What is the range of outcomes/impacts of audiences who watch a GS film, and why do they vary and under what conditions and for whom?

<u>Participants' Proposed Research Questions: Industry (Community of practice and its culture/Value chain and business model)</u>
What is the benefit of this platform to delivery of mission?

How does the context of the GS theater influence its outcome/impact?

What is the GS theater's contribution to its community?

What do communities want their GS theaters to be/do/serve?

How do we measure return on investment (ROI)?

What are purposes of GS experience?

What complementary experiences make up the GS experience (pre- and post-film, web, transmedia) and how does each affect response?

Breakout 3

> **Question:** What are the pragmatics—the nuts and bolts that need to be considered in developing and implementing research programs: barriers, opportunities, justifications, funding etc.?

Results[3]

In contrast to the first two breakout groups, participants were grouped with people from the same representative group (GS stakeholders, immersive practitioners, academic researchers and GS-industry affiliated experts).

<u>Constraints and barriers to a GS research roadmap</u>
Mission versus money versus focus

Theater participation in research
- Need cooperating museums and science centers
- What's in it for institutions?

Administrative resources

GSCA/industry consensus on project
- Roadmap
- Process
- Expert advice
- Resources
- GSCA funded vs. NSF-funded

Funding
- Funding the grant writing process
- Funding for follow through
- Help science centers pay for participation
- Finding a source for a grant
- Will NSF stop funding films?
- Dollars driving the roadmap

Willingness to experiment and collaborate

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[3] Notes from the participants' discussions are found in Appendix C.

Identifying a leader
- To develop and conduct the research
- To shepherd the process and establish the research team
- To develop studies with sufficient rigor that are doable
- To find a logical home for research
- To advocate
- To disseminate
- To match make

Reporting, synthesizing and forecasting
- Dissemination of results: will GSCA take a leadership role?
- What stakeholders need what information for funding/approvals?

Creating a community of practice
- Partnerships with university and industry researchers

Political context
- How do we compete with the formal education emphasis?
- How do we relate the GS experience to STEM?

Going digital
- Challenges and opportunities

Attempting to prove the past instead of envisioning the future

Measurement techniques (research methods)

Summary and Final Remarks

Summary
The one-day Workshop brought together GS stakeholders, immersive practitioners, academic researchers and GS-industry affiliated experts to consider the key issues for a GS research roadmap. In a series of 3 breakout discussions, participants were asked to identify key research issues, define potential research questions and develop a list of constraints and barriers in promoting a research roadmap. Over the course of the one-day Workshop:

- Participants identified five broad GS research categories:
    - Audience
    - Outcomes and impacts, and their indicators
    - Learning
    - Nature of the GS experience
    - Industry
        - Our community of practice and its culture
        - Our value chain and business model

- Participants repeatedly acknowledged that having a defined process was critical to the success of a GS research roadmap and that this process should consider:
    - *Who* the research is for (e.g., filmmakers, distributors, theaters, exhibitors, funders)
    - *What* research can be most easily undertaken (ease of completion)
    - *What* research is most critical (prioritization)
    - *How* to ensure the sharing of data and evidence among GS stakeholders

- Participants recognized that the research roadmap will only be successful if:
    - Stakeholders understand what research is and is not
    - The industry and stakeholders support the roadmap
    - Funding be available to support research programs

- Participants observed that opportunity *arises* from a research roadmap—it has the potential to help envision a successful future, rather than only justifying past practices.

Final Remarks

Throughout the Workshop, participants continually emphasized that a roadmap alone was not sufficient to ensure the successful implementation of a research program. *For the roadmap to be successful, the participants generally agreed that the following were key:*

- Creation of a research mindset in the GS community that recognizes that:
    - Research should be grounded in notions of what drives practice
    - Research should have intentionality and drive the field forward
    - Research is generative
    - Research must be supported by a network of researchers and practitioners

- Stakeholder consensus in the need and perceived value of research on GS, including leadership from within the GS community to promote and support research programs.

- The building of capacity for an active research program by:
    - Encouraging participation by all segments of the GS industry
    - Creating partnerships between the GS industry, researchers and collegial organizations (e.g., IMERSA, ASTC, CAISE, VSA etc.)
    - Developing a research network to disseminate research results

- Funding to support an active, ongoing research program.

- Establishment of a reflective process that builds upon past success and reflects future directions.

After 40 years of creating engaging films, the giant screen industry has begun to take definitive steps towards recognizing the role and value of research in practice. Future success will be predicated on the creation of a vital, active community of giant screen stakeholders: filmmakers, exhibitors, educators and researchers. However, momentum is key to developing a GS research program. It will be critical for the industry, if committed to the idea of addressing questions about giant screen, to continue the efforts started here. Next steps by GSCA might include:

- Disseminate this report to the GSCA community and connected communities (ASTC, CAISE, IMERSA, VSA[4]) for review and comment.

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[4] Association of Science-Technology Centers, Center for the Advancement of Informal Science Education, Immersive Media Entertainment, Research, Science & Arts, Visitor Studies Association.

Recommendation: That GSCA establish a system for regular review of and reflection on the roadmap by industry stakeholders to ensure the roadmap stays current to the community's needs and priorities for research.

Recommendation: That GSCA continue to further existing relationships with likeminded industry organizations (ASTC, CAISE, IMERSA, VSA) to encourage collaboration and promote STEM media research and practice.

- Create a research process within the GSCA that will foster, support and (potentially) implement GS research.

Recommendation: That GSCA establish an internal group of industry stakeholders and GSCA members and staff to promote the value of GS research and coordinate GS research efforts[5].

- Develop a readily accessible source of research information within the GSCA community.

Recommendation: That GSCA actively encourage the sharing of resources (data, films, audiences) needed for research activities through venues such as the GSCA website, the ASTC Museum Screens Community of Practice and the *LF Examiner.*

Recommendation: That GSCA disseminate research data both inside and outside the organization through venues such as the GSCA website, the ASTC Museum Screens Community of Practice, the *LF Examiner*, industry conferences (GSCA, ASTC, VSA, IMERSA), and peer-reviewed publications (e.g., *Science Communication, Journal of Research in Science Teaching, Public Understanding of Science)*.

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[5] In 2014, the GSCA established the Research Task Force to promote and support research on GS.

Appendix A: Workshop Participants

Jamie Bell	Center for Advancement of Informal Science Education
Steve Bishop	Whitaker Center for Science and the Arts
Kim Cavendish	Museum of Discovery and Science
Jane Crayton	University of New Mexico
Michael Daut	Evans & Sutherland
Rita Deedrick	COSI
John Falk	Oregon State University
John Fraser	NewKnowledge.org
Kelly Germain	GSCA
James Hyder	Cinergetics, LLC
John Jacobsen	White Oak Institute
Jeffrey Jacobson	PublicVR [Workshop Contributor]
Mina Johnson-Glenberg	Arizona State University
Mark Katz	National Geographic Cinema Ventures
Valerie Knight-Williams	Knight Williams Inc. [Evaluator]
Lynn Liben	Penn State
Robb Lindgren	University of Illinois at Urbana-Champaign
Marti Louw	University of Pittsburgh
Mike Lutz	IMAX Corporation
Shaun MacGillivray	MacGillivray Freeman Films
Wendy MacKeigan	SK Films
Erica Meehan	Meehan Media Consulting
Toby Mensforth	Mensforth and Associates
Dan Neafus	Denver Museum of Nature & Science
Mary Nucci	Rutgers, the State University of NJ [Workshop Leader]
Deborah Raksany	Giant Screen Films
Robert Russell	Space Science Institute
Annette Schloss	University of New Hampshire
Tammy Seldon	GSCA
Frieda Smith	Saint Louis Science Center
Ryan Wyatt	California Academy of Sciences
Ka Chun Yu	Denver Museum of Nature & Science

Appendix B: Workshop Schedule

<u>Friday, October 18, 2013</u>
8:00 am, Welcome: General introductions, review operations, goals.

8:30 am, Breakout: Research questions: Identify key research questions and what we know now.

10:30 am, Coffee break: Review breakout results

11:00 am, Group report and discussion

12:00 pm, Working lunch

1:00 pm, Breakout: Research approaches

3:00 pm, Coffee break: Review breakout results

3:30 pm, Group report and discussion

4:30 pm, Breakout: Practical: Develop ideal research approaches and dissemination of results.

6:00 pm, Working dinner: Review breakout results.

7:00 pm, Group discussion of pragmatics, next steps

7:45 pm, Wrap up

8:00 pm, Adjourn

Appendix C: Breakout Notes

Table 1 Breakout 1
Impact to industry:
- Financial success
- ROI
- Allowing audiences to achieve educational impact goals

What are the characteristics of the GS experience that make it impactful?

What does impact mean to the audiences? How do you define the audiences?

How do you measure impact to the audiences? How do you measure impact to the industry?

1. Characteristics of GS experience?
- Sound
- Story
- Medium
- Technology-3D
- Immersive
- Film making technologies
- Content

How do we know this?
What is missing?

2. Define impacts
- Knowledge (retention)
- Attitude (desire to learn more)
- Behavior (seeking more information)

Role of emotion

Educational goals

3. Audiences
- Demographics
- Psychographics (beliefs, attitudes, values, life experiences)

Table 2 Breakout 1
What is the value-add of doing a presentation in giant screen?

How do we better understand what's going on with the learner during a GS experience?

Recipe for success (current GS experience)
- storyline/ narrative
- time for reflection
- information density
- immersion / 'IMAX moments'
- capturing experiences beyond usual first person

Next generation GS experience
- nonlinear
- second screen
- inserting user-generated content
- distance learning
- more custom content

More rigorous assessment
- long term retention
- engagement / attitudes etc. as well as "knowledge"

Role of learning scientist during scripting (keywords)
- value – add
- characteristics
- success factors
- learning - (retention / breadth)

Goal: Future proof: research to provide next generation path forward

Table 3 Breakout 1

Topics (subject matter)

<u>Optimal topics for format</u>   <u>what are the sweet spots?</u>
Space science   immersion
Inaccessible places   visualization
Interconnectedness   spatial
System science   virtual presence

Overcome/address nature deficit disorder?
How do these films fit into a fragmented media landscape?
Transmedia?

Thematic areas

Audience
- How is it changing?
- What motivates people to come or not to come - fundamental motivations?

to come or not come in?

Impact
- defining and operationalizing impact criteria   richer vocabulary
- broaden scope beyond learning   of impacts

framing   activation   communities of interest
interaction   conversation/support discourse   participation
    transmedia?   Engagement   motivation
                        experience of the sublime

Meta questions

Who is this research for?
- Filmmakers, distributors, theaters /exhibitors, funders?

What research is low-hanging fruit?
- Synthesize existing research? can we overcome reluctance to share data?
- Identify easily-undertaken projects?
- How do we do formative evaluation on these large scale projects?

Table 4 Breakout 1

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Manipulation Audience Box

Expectations box How is media evolution influencing

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Can they perceive effects through the machine?

Benchmark: how changing media sphere shifts the expectation

Industry

Expectations, Doubts, Lore

How do the unique attributes of the GS experience ("the machine") impact the audience?

Can we start to understand the capabilities of "the machine" in the hands of a master?
- extrapolate for learning potential and translate into best practices for achieving desired outcomes
- innovation

What are the expectations of the audience in this rapidly changing media rich world?

Industry needs to take an active role in determining what the outcomes should be

Big box of mastery
user / creator makers
manipulation
anticipated result
techniques
skills of technicians
tools?

Machine impacts
- physiological / kinesthetic
- emotional social
- neurological, psychological (memory, processing)
- sense of presence (affective process)
- impacts -> recall, synthesis, activation

Industrial definitions = whadda we really wanna do

Need to develop research questions that disentangle what's physically on the screen from the story, the (science) content and the editing.

What is the role of the social experience in learning in GS?

How much overlap is there between cinema language writ large and giant screen?

We need longitudinal research on learning and behavior post GS viewing!

Is it possible to develop a taxonomy of "wow" moments in GS films?

We need to articulate the "grammar" of various media (GS, film)

Are, or can/should there be studies that study what happens at the brain level while experiencing GS?

Giant screen may be more like exhibits than like other media and that can inform research questions.

At what level of learning does GS best operate: e.g., engagement, knowledge, skills, identity?

What are inherent unique qualities of a giant screen as a medium? How can they be evaluated?

Table 6 Breakout 1

Is "research" limited to learning?
- Lifelong learning (LLL) is what funders are seeking
- LLL write large
- LLL justifies GS

What kinds of learning GS supports?

What are the values that those films provide audiences?

Will findings in our areas ("special understandings") limit untested areas?

Is the serial dynamic of an audience gathering important? How does the group experience work?

Can we define who we are trying to convince and how can we reach them?
- museum CEO's
- advances

What are the values that GS theaters provide their institutions and communities?

Is there demand and cost values for what we do?

Hard evidence that there are meaningful outcomes from GS films
- These films are so powerful because…?

Do we learn differently in different versions of GS?
- different kinds of immersion (2D/3D, dome/flat, first viewer/15th viewer)

How do long term members see GS films?

How do we identify and understand audiences who get outcomes and they get long term impact?

How do our admissions data reveal perceived value?

Intuition of experienced producers' vs research to public
- producers bound to be better
- fit of content to medium

What is the role of narrative technique?

What are the differences with experience and story?

Are people more willing to wrestle with difficult topics? (e.g., microbes, climate)

How do we measure our impact? For whom and under what conditions?

What is the focus of the research roadmap?

How do we ensure that GS is successful?
- Films
- theaters

Long term educational experiences, community building experiences?

Breakout 2

Breakout 2 Question: Identify 3-5 key research questions from the key topic areas defined in Breakout 1: Audience, Outcomes and their impacts, Learning, Nature of the GS experience, and Industry.

Table 1 Breakout 2

Audience
What are the characteristics of current GS audiences?
What are the expectations of current audiences, and how are we meeting them?
What is the non-user perception of GS film experiences?

Technology
To what degree can new digital technology create experiences for targeted audiences, thereby expanding audiences?
What is the perceived value or need for digital technology (capture and delivery) to meet or exceed the quality of GS film?

Industry
What are the intersection points between the positive educational outcome and success characteristics?
What is the benefit of this platform to learning?
What is the benefit of this platform to delivery of mission?

Film
What is the film intended to do for the audience? And which audience?
How does a GS film position an audience member as an expert?
What are the factors for creating quality and engagement that will increase learning?
What is the neurological sense of presence created by the GS experience compared to the actual experience?

Address audience and mission ➡ Success and sustainability ➡ Museums and producers

Funding

Table 2 Breakout 2

All about perceived value of the GS experience

Audiences
Why are audiences coming to GS films and why not?

What are their expectations?

Who makes the ticket buying decisions?
- Personal choice to see a certain film beforehand?
- Chance?
- Part of a museum / center visit?
- Teacher chosen?
- Is it mothers or their kids who are making those decisions on the spot? Planned?

What is the range of outcomes/impacts of audiences who watch a GS film, and why do they vary and under what conditions and for whom?

What are the best research methods to use to examine these 2 previous questions?
- presumably a multi method process that develops / generates then test relevant hypothesis and using some control testing

Film
What are the unique characteristics of GS films? What are their unique impacts and given that there are many variables / challenges to measuring these 2 elements; what are the best methods to use
- cognitive, physiological, neurological, social (community experiences)

How can the unique characteristics of GS films be optimized / maximized to promote learning and lifelong learning outcomes?

Can we do a current meta-analysis of the existing information?

Technology
What effect does the GS screen have vs other screens including head mounted displays?

Is the value of the GS experience its immersiveness, or the social context of the theatrical experience?

What is the effect of the various technical differences (e.g., aspect ratio, flat vs dome, 2D vs 3D)?

Table 3 Breakout 2

Industry
How does the context of the giant screen theater influence its outcome/impact?

What is the giant screen theaters contribution to its community (public value)?

What do communities want their giant screen theater to be/do/serve?

Technology
Do giant screen specifications (contrast, 2D/3D, resolution, brightness, geometry, aspect ratio, color, dome/flat etc.) affect input/output?

How does the immersion and presence affect the brain and learning?

Film
What complementary experiences make up the giant screen experience (pre/post film: web, transmedia) and how does each affect input/output?

What are the attributes of excellence?

What is the definition of excellence?

What are the purposes of giant screen experience?

How do we measure SROI?

Audiences
How do we grow the giant screen learning audience?

How diverse is our audience?

How do we address access?

What audiences are most affected by our tools?

How to measure satisfaction (Net producers score (NPS), repeat score, personal value)?

WHY IMPORTANT	WHO IS IMPORTANT TO	WHAT APPROACHES
films are not experienced in isolation	Operators, Filmmakers	Comparison evaluation. exist stuff
key influencers and social/civic leaders	Civic leaders	museum association, "museums change lives"
to make good choices for future investments (key influencers and civic leaders)/choices	Audiences, Funders, Filmmakers, Operators, Civic leaders	
to identify areas for improvement what works why?	Filmmakers, Operators	
to inform how best to create effective products to advance products	Learning scientists, Filmmakers, Funders	
films are part of a bigger learning don't study a part beyond the whole learning science research	Learning scientists, Filmmakers, Funders, Operators	
to establish aspirational goals to strive for better	Filmmakers, Operators	
clarify hypothesis	Funders, Operators	Management workshop and policy
to identify possible performance measures	Funders, Operators	
to define goals for new products and communications and make $	Operators, Filmmakers, Funders	
to build a better stronger democracy	Civic leaders, Operators, Funders, Filmmakers	
to help target the products	Filmmakers, Operators, Funders, Learning scientists	
to help explain and understand and improve personal value	Audiences, Operators, Filmmakers	MA "museums affect lives"

Table 4 Breakout 2

Does emotional content scale with the medium? (Fear, wonderment, romance, empathy, humor)
- Why ➡ if we don't connect emotionally then we may not connect
- possible of ethics transference
- who ➡ producers, ROI, educators
- How/what approach ➡? small, medium, large of same content

If emotion is driven by scale, then is action also driven by this scale?
- Why?
    o further STEM education if it drives action
    o what is quantifiable
- Who?
    o society, educators for continued support, producers to support of medium
- How/what?
    o interactive follow up, post action

How do we define the tools used to communicate aesthetic language of expression (best practices)?
- Why?
    o hasn't been done, not successful without, can't proceed or progress
- Who?
    o industry, ROI, producers
- How/what?
    o survey, prior work, experiment test tools, document/communicate to industry

Table 5 Breakout 2

Does the immersive nature of GS cinema contribute to increased engagement and other impacts (changes in learning, attitude, behavior)?
- Does grandiosity or spectacle contribute?
- What types of responses are engendered?
    - experiential ⎤ cognition
    - reflective
    - emotional, physical

What creates these impacts?
- narrative structure
- wow - grandiosity moments
- sense of place
- 3D
- visualizations of the unfamiliar
- active viewing

Does the immersive nature of GS film contribute to increased engagement?
- What moments create the greatest impacts?
- What types of responses does the experience engender?
    - Experiential
    - Reflective
- Does the grandiosity or spectacle contribute to learning or attitude?

What new assessment tools can we use?

Could we use tools from the quantified self-movement to gauge arousal or other physiological responses?

Pre/post surveys and interviews could be combined with this data

What is the history of GS cinema?

Immersion: difference btw GS vs TV
- What are science topics across media channels?
- Can GS support and augment message?

Certain subjects better on GS?

Younger people each 2nd screens with TV: different experiences

Social experience in theatre?
- Group participation

Design based approach

Gateway experiences
- More effective for some topics (e.g., Evolution? Climate change? Controversial topics?)
- sensitization to topics
- priming for future learning
- place - based experience (more effective than abstract concepts)
- active experience

What affects impacts?
- emotional response
- physical response
- narrative structure
- lead to impacts- noble pursuit of screens, identity and role models

How to measure
- longitudinal surveys
- ecology of learning--cumulative learning over years
- physiological measures
- surveys and assessments
  - pre/post surveys, interviews

Future
- new assessment tools/NSF PRIME
- partner with universities and industry

Table 6 Breakout 2

Film
Does the brain process narration and information differently on the GS vs other media?
- Why? provides better learning outcomes / improves practice
- For whom? filmmakers and film buyers

Technology
Are there physiological changes in audiences watching a GS film as compared to watching same content on other platforms?
- Why? may correlate to broadly defined learning
- For whom? producers, theater owners
- How? heart rate, perspiration, pupil size, eye tracking

Do audiences experience positive affect more on giant screen than on other formats (same content)?
- Why? enjoyment is gateway to learning
- To whom? all stakeholders

Giant screen vs dome? 2D vs 3D?

Audiences
Have GS films inspired academics and / or career trajectories in STEM?
- Why? gives industry a foundation to act upon
- For whom? all stakeholders

Breakout 3

Breakout 3 Question: What are the pragmatics—the nuts and bolts that need to be considered in developing and implementing research programs: barriers, opportunities, justifications, funding etc.?

Table 1 Breakout 3

Challenges
Roadmap
- mission vs money and focus

Participation?
- theaters

Administration
- resources

GSCA / industry consensus of project
- agree on roadmap
- agree of process
- get expert advice / input resources
- Budget? -> funding -> NSF vs self-funded

Table 2 Breakout 3

Interactivity and activity (with or without technology)
Why?
- dominate attention
- effective in other educational contexts
- flexible content with interactive tools
- films and interactivity = retention
- old planetarium shows have a kind of interactivity
- realism is sometimes important, sometimes not
- doing something creates much longer retention
- mix of movies and interactive entertainment
- vary degree of immersion and similar activity
  - forest exploration
  - seasons - orbit mechanics of, reasons for temperature

Change point of view and have same activity
- Dede's magnetic fields
- first person vs exocentric

Table 3 Breakout 3

Barriers and Opportunities
The cost of funding the grant writing process?

Identifying who is leading and shepherding this process to establish a team to work on the grant

Who is developing and conducting the research studies

Leadership with the right links and connections across the industry
- Finding a source for the grant
- Funding team to identify sources

Writing team to put together the grant
- who feeds into the proposal development
- Develop timeline goals - time limits to make useful

ASTC and GSCA have huge dissemination capabilities
- Will GSCA take on the leadership role?

What is the political context: how do we…
- "Compete" with "formal ed" emphasis?
- Relate the big screen experience to STEM?

Will NSF stop funding films?

It's all about audience and outcomes and impact or it's just a bunch of film experiences

Going digital
- "Film based" institutions will need to make this decision in the next 18 months

Who needs this information to make their arguments to "funders/approvers"?
- Identify stakeholders more specifically (e.g., school boards)

Need cooperating museums for the study: What's in it for the science centers?
- must be funded sufficiently to engage and follow through overtime

Help science centers "pay" for inducements to get visitors to participate

Finding the expertise to develop studies that are both
- Rigorous enough and doable!

Table 4 Breakout 3

Barriers and Opportunities
- the problem is attempting to prove the past instead of visioning the future
- dollars drive the roadmap
- if no money ⟹ parasite other roadmaps that are funded
- industries

Industries with sustained success fund R&D to drive innovation

A vision for a new future is way sexy to bucks

Willingness to experiment and collaborate

Research roadmaps need:
- logical home [$$$]: library function
- advocate

Promotion (external)   dissemination   promotion (internal)

- match makers
- reporting
- synthesis and forecasting
- community of practice

Table 5 Breakout 3

Does GS cinema provide a gateway experience? [Knowledge, attitude, behavior]
- sensitization to a topic
- priming for future learning
- Is it more effective for certain topics than others?
- is it effective for controversial, challenging topics
  - e.g. evolution and climate change
- Is it effective for civic engagement or discourse?

What are differences between GS and less immersive media (e.g., TV)?
- Are certain subjects suited to one or the other media?
- social experience of being in a GS cinema
          Vs.
- social experience of other media (e.g. "2nd screen" effect)

Measurement techniques
- pre / post surveys
- interviews and focus groups
- physiological responses to measure arousal and valence
- self-reporting assessments for presence

What are the new assessment tools that need to be developed?
- opportunity: NSF PRIME program

What partnerships can we make with university and industry researchers to advance the field?
- e.g. big data visualizations, high pixel count displays

Table 6 Breakout 3

What is the range of outcomes/impacts on audiences who watch GS films?

Specifically determine if the GS film experience is unique both the film and the extended educational outreach undertaken with museums.

Appendix D: Definitions, Links and References

Written by Jeffrey Jacobsen and Mary Nucci

Giant screen

In 2009 the Technical Task Force of the GSCA developed a set of requirements for a theater to be defined as giant screen. Whether flat-screen, panoramic, or dome theater (2D or 3D; film or digital), a giant screen fills a large part of each audience members' field of view. If the screen is flat, it must be 70 feet wide or 3100 sq. feet in area or, if it is a dome, at least 60 feet in diameter. All seating must be within one screen width of the screen plane, so everyone's horizontal viewing angle is at least 53 degrees. Though not included as requirements for designating a theater as giant screen, resolution, brightness and theater architecture are considered essential components of the giant screen experience. Digital delivery specifications (Digital Immersive Giant Screen Specifications; DIGSS) for flat and dome screens were developed by the DISCUSS Colloquium (partly funded by the US National Science Foundation).

Links

http://giantscreencinema.com
http://www.giantscreencinema.com/MemberCenter/DIGSS.aspx
http://www.giantscreencinema.com/MemberCenter/GiantScreenSpecifications.aspx

Readings

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Research and Evaluation

Research and evaluation are not the same: Research is the systematic study directed toward fuller scientific knowledge or understanding of the subject studied. *Basic* is concerned with the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. *Applied* research looks to satisfy a specific need. In both cases, the goal is to establish some theory that guides further inquiry or applications. Research employs many of the same tools and methods used in evaluation, and there are valid lines of inquiry that could be classified as either.

From http://www.uniteforsight.org/evaluation-course/module10
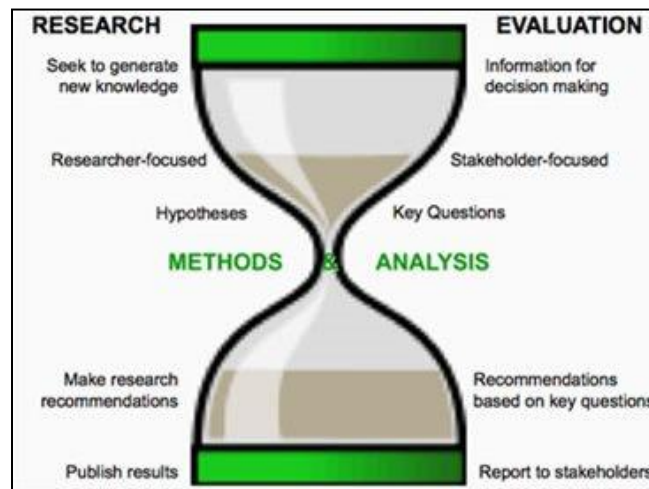
Evaluation is the systematic measurement of an experience or a curriculum in order to understand its impact and improve its performance. The General Accounting Office defines evaluation as

> "A program evaluation is a systematic study using research methods to collect and analyze data to assess how well a program is working and why. Evaluations answer specific questions about program performance and may focus on assessing program operations or results. Evaluation results may be used to assess a program's effectiveness, identify how to improve performance, or guide resource allocation" (GAO, 2012).

Evaluation is used to measure effects on the audience, the experience itself (e.g. to analyze its structure), or the production process and answers questions such as:
- How well does the program work?
- Does the program do what we intended it to do?
- Does the program work for the reasons we think it does?
- Is the program cost-effective? Are the benefits worth it?
- What are the unintended consequences of the program?

Formative evaluation happens before and during the process of creating the experience or curriculum to guide design decisions in order to improve the final product. *Summative* evaluation occurs after the program is put into use, primarily to measure its effectiveness. This stage may use the control groups and comparative analysis usually associated with research. Lessons learned from summative evaluation will inform the most effective use of the product and inform similar projects.

Links
http://www.hfrp.org/evaluation/the-evaluation-exchange/issue-archive/reflecting-on-the-past-and-future-of-evaluation/michael-scriven-on-the-differences-between-evaluation-and-social-science-research
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Informal Learning
Informal learning happens throughout people's lives in a highly personalized manner based on their particular needs, interests, and past experiences. NSF defines informal as "out-of-school learning that makes learning Lifelong, Life Wide (occurring across multiple venues) and Life Deep (occurring at different levels of complexity)" (NSF, 2013). This type of multi-faceted learning is voluntary, self-directed, and often mediated within a social context. It provides an experiential base and motivation for further activity and subsequent learning. It occurs in a wide variety of settings and

through a rich palette of designed environments and products —among them, film and broadcast media, science centers and museums, zoos and aquariums, botanical gardens and nature centers, cyberlearning and games, and youth, community, and out of school time programs. Grounded in a view of the human as naturally curious, social, and actively engaged in learning, informal science education is characteristically pleasurable, open-ended, equitable, and accessible.

Links
http://www.nsta.org/about/positions/informal.aspx
http://informalscience.org/
http://www.nap.edu/catalog/12190/learning-science-in-informal-environments-people-places-and-pursuits

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STEM
NSF defines STEM as "all of science, technology, engineering, and mathematics (STEM). As defined by the National Research Council STEM subjects include,
- Science is the study of the natural world, including the laws of nature associated with physics, chemistry, and biology and the treatment or application of facts, principles, concepts, or conventions associated with these disciplines.
- Technology comprises the entire system of people and organizations, knowledge, processes, and devices that go into creating and operating technological artifacts, as well as the artifacts themselves.

- Engineering is a body of knowledge about the design and creation of products and a process for solving problems. Engineering utilizes concepts in science and mathematics and technological tools.
- Mathematics is the study of patterns and relationships among quantities, numbers, and shapes. Mathematics includes theoretical mathematics and applied mathematics.

STEM education can be an interdisciplinary or trans-disciplinary approach to learning where rigorous academic concepts are coupled with real-world problem-based and performance-based lessons. At this level, STEM education exemplifies the axiom "the whole is more than the sum of the parts." There is a movement to expand STEM to include arts, and change STEM to STEAM.

Links
http://informalscience.org/nsf-aisl
http://stemtosteam.org/

Interaction/Interactivity
The level of interaction or interactivity in a giant screen experience is governed by how the visual environment responds to the audience. This can be in direct response to actions by members of the audience or through a tour guide acting as a mediator or surrogate. The more ways in which the environment can change or respond according to real-time input, the more interactive it is said to be. However, these responses must also be plausible--consistent, believable, comfortable, and even pleasurable. The interaction does not have to be realistic, which simulates some aspect of our current reality.

With the notable exception of live interactive planetarium shows, most giant screen presentations have been movies, where all the action is on the screen and in the audience member's head. Today, new all-digital projection equipment creates many more opportunities for interactivity. This creates great opportunity for educational design, because interactive elements of the experience will dominate attention and greatly enhance learning, but only if it is well designed. It can be difficult to provide a meaningful interactive experience to every member of an audience, when they have to share the virtual environment.

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Immersion
The degree of immersion provided by a display is a function its technical ability to provide the virtual environment to the audience. For a movie, this depends on the

quality of the sound and visuals and the degree to which they surround the audience. For example, the broader the audience field of view, the more directions the viewer can look. The higher the resolution of the image, the closer the audience can focus on the image. Also, the more interactive presentation is, the more immersive it will be. However, the interactivity must be well designed, or it will have the opposite effect.

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Presence, Place Illusion and Plausibility Illusion
In the virtual reality research of the 1980's and 90's, and in some later giant screen related papers, *presence* had been defined as the feeling of *being there* or being *in* the virtual world projected or represented. The concept is compelling and useful for description, but it was not sufficiently rigorous to support research. Research studies conducted by the virtual-reality community that attempted to measure presence, its causes, and education effects were often inconclusive.

More recently, researchers have been striving toward concepts that are more specific and more testable.   Dr. Slater has redefined presence as *place illusion*, a construct of the mind which gives the feeling of being present in the virtual world. Properly employed, the immersion provided by a giant screen theater can be used to support *place illusion*,

but that is not enough, by itself. The narrative of the experience must also explicitly place the audience in the virtual environment.

With virtual reality, most researchers require that the environment be interactive, as defined above, and the more the better. In that case, *plausibility illusion is also* desirable— that is the expectation that the virtual environment will respond in a believable way.

Readings
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Appendix E: Workshop and Report References

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Appendix F: Publicly Available Giant Screen and Related Media Evaluation Reports

This is a list of publicly available giant screen and related media evaluation reports.

Apley, A. (2003). Summative Evaluation of *The Human Body*. Accessible at http://informalscience.org/evaluation/ic-000-000-001-954/Summative_ Evaluation_of_The_Human_Body

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Fraser, J., Yocco, V. & Gruber, S. (2011). *DISCUSS Colloquium Evaluation*. Accessible at http://informalscience.org/images/evaluation/Colloquium_Evaluation_2011_06_31.pdf

Knight-Williams, V. (2008). *Evaluation Report: Connecting Society with Science: The Greater Potential of Giant Screen Experiences.* Available on request from mnucci@rutgers.edu.

Knight-Williams, V., Williams, D., Meyers, C. & Sraboyants, O. (2008). *Sea Monsters: A Prehistoric Adventure Summative Evaluation Report*. Accessible at http://informalscience.org/evaluation/ic-000-000-003-206/Sea_Monsters_A_Prehistoric_Adventure_Summative_Evaluation_Report

Koster, E., Nucci, M. & Knight-Williams, V. (2008). *Final Report to the National Science Foundation Connecting Society with Science: The Greater Potential of Giant Screen Experiences* Grant No. DRL-0803987. Accessible at http://www.giantscreencinema.com/Portals/0/2008%20Symposium%20final%20report.pdf

Leblang, J. & Osche, E. (2011). *Ice Planet Earth: Summative Evaluation Report.* Accessible at http://informalscience.org/images/evaluation/Final_IPE_sum_draft.pdf

NOTE: Informalscience.org website is an invaluable resource for research, reports and evaluation of informal learning programs.

Setting the Agenda for Giant Screen Research Workshop

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A Review of Participant Feedback on the Workshop and Workshop Draft Report

Prepared for

GSCA

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Table of Contents

Introduction

Supported by a grant from the National Science Foundation (NSF), with additional support from the Giant Screen Cinema Association (GSCA) and the Association of Science-Technology Centers (ASTC), GSCA hosted the *Setting the Agenda for Giant Screen Research* Workshop on October 18, 2013, in Albuquerque, New Mexico. The one-day Workshop convened a group of 32 giant screen (GS) stakeholders, immersive practitioners, academic researchers and GS-industry affiliated experts to consider the key issues for a GS research roadmap.[6]

The Workshop goals, as outlined in the conference proposal submitted to the NSF, were to:

> *"Foster and engage researchers in aligned disciplines to define the key issues in giant screen research and develop an active research community to address these questions through collaboration."*

Through a series of three breakout discussions, Workshop participants were asked to identify key research issues, define potential research questions, and develop a list of constraints and barriers in promoting a giant screen research roadmap.

Nine (9) months after the Workshop, participants who were not involved in organizing, hosting, or facilitating the Workshop were invited to review a draft of the resulting report and share feedback about elements of the Workshop outcomes that were missing, inaccurate, or needed to be fleshed out. The participants were also encouraged to: contribute any new thoughts or ideas they had since participating in the Workshop, describe their post-Workshop activities related to GS research, and share suggestions for next steps.

Method

To streamline the feedback process, participants were asked to respond to the above set of issues through an online survey (bit.ly/gscaworkshop) prepared and hosted by the independent evaluation firm, Knight Williams, Inc. The survey invitation further informed participants that: their frank and honest feedback was appreciated, their responses would be combined with those of other participants and reported to GSCA in the aggregate, and their name would not be associated with their responses.

Of the 26 Workshop participants invited to review the draft report and complete the survey, 12 provided feedback through the online form, for a response rate of 46%. One participant shared additional feedback via two methods: (1) a three-page memo and (2) comments made in a digital copy of the draft. Where applicable, this participant's supplemental feedback is considered alongside the survey responses.

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[6] Additional information about the Workshop history, goals, process, and outcomes is available in the resulting GSCA report A Roadmap for Giant Screen Research: Results of the *Setting the Agenda for Giant Screen Research* Workshop, to which this review is an appendix.

Findings

A detailed consideration of survey participants' feedback is shared below, in three parts. Part 1 examines participants' reflections on the breakout session results, Part 2 shares their additions to the breakout session results, and Part 3 presents their post-Workshop activities, thoughts about missing stakeholders, and suggestions for next steps.

Part 1: Reflections on the breakout session results

After reviewing the draft report, participants were invited to reflect on the breakout session results. For each of the three breakout sessions, they were asked if elements of the draft were missing, reported incorrectly, or needed to be better defined or fleshed out.

The questions or topics for the 3 breakout sessions were as follows:

> *Breakout 1: What are the key research issues—thematic areas, guiding topics—for GS research?*

> *Breakout 2: Identify 3-5 key research questions from the key topic areas Audience, Impact, Learning, Technology, and Industry.*

> *Breakout 3: What are the pragmatics—the nuts and bolts that need to be considered in developing and implementing research programs: barriers, opportunities, justifications, funding etc.?*

Participants' feedback about the results of each breakout session is shared below.

***Breakout 1: What are the key research issues—thematic
areas, guiding topics—for GS research?***

Missing elements

Participants were first asked what, if anything, they found missing from the part of the draft report focused on Breakout 1. Of the 11 participants who responded to the question, most indicated that nothing was missing, with a few adding that this section was "*comprehensive*," "*thorough*," and "*well done*." A handful shared miscellaneous feedback about elements they thought should have been included, focusing on how best to research some of the technological considerations, the relevance of the Museum Indicators of Impact and Performance (MIIP) research to GS research, the value to visitors beyond the learning experience, and if and how audience experience impacts learning. Participants' feedback is shared below:

- *Links to current work in Dome theater specifications. (http://imersa.org/standards) Research questions related to challenges and differences between giant screen experiences; dome vs flat screen, levels of immersion, composition etc.*
- *When I talk about additional areas of impact, I have in mind the results of the MIIP analysis, which found that museums collectively measure and are measured by indicators of fourteen areas of potential service. [It uses] outcomes at an individual viewer/level and impacts at a societal, annual collective level. Many individual outcomes can become a societal impact. GS theater, films and experiences may be able to claim value (and attract revenues) for outcomes and impacts in some of the following areas, [called] the MIIP Services Framework:*

		# of indicators
Public Values		
A	Broadening participation	85
B	Preserving heritage	47
C	Strengthening social capital	76
D	Enhancing public knowledge	43
E	Serving education	56
F	Advancing social change	40
G	Communicating public identity & image	27
Private Values		
H	Contributing to the economy	85
I	Delivering corporate community services	9
Personal Values		
J	Enabling personal growth	147
K	Offering personal respite	4
L	Welcoming personal leisure	11
Institutional Values		
M	Helping museum operations	308
N	Building museum capital	87
Total		1025

Learning is the largest sub-set of Enabling personal growth, and education is core to Serving education. A key research question is: What do our audiences get for their freely chosen: effort to visit, one hour of leisure, and $10? Why is it valuable to them? What do they say they are getting in return? Why is it less valuable now? Learning is bound to be among their values, but I suspect the experience, if done well, is its own pleasurable reward. Framed in research terms: Can the GS experience induce intrinsic pleasure that viewers find valuable?

Can GS experiences induce pleasure hormones? While this may lead to drug analogies, the audience at the Frick Museum (NYC) is there for the intrinsic pleasures of gazing at sheer beauty of the Rembrandts and Vermeers in an immersive, amazing setting. They are not going there for "art learning outcomes," though those happen too. In several instances I suggest building on existing frameworks and definitions. While requiring upfront research, this ultimately leverages time-tested approaches and leads toward standardization and sharing of data.

- *One question that may influence what audiences learn or experience while viewing a GS film is the question of the context of the experience. One participant in my group suggested that an "innovation" for the medium might be complementing screenings with speakers, researchers, or exhibitions that support common learning goals, inspire interest in science careers, etc. Based on our experience with [a recent GS film] it appears that these related activities strengthen the learning from the film, inspiring viewers to watch in a way that provokes more questions or draws attention to certain aspects of content. It would be valuable to assess existing information about ways that exhibitors can strengthen the learning impacts of GS films through audience engagement and related exhibition content, and to determine whether there is a meaningful connection through further evaluation.*

Inaccuracies reported

Participants were then asked what, if anything, had been reported inaccurately in this section of the draft. Most of the 8 participants who responded to the question indicated that they thought everything was accurate, although a few shared miscellaneous potential inaccuracies, including a typo and information that one participant did not think was discussed in the first breakout session. Another participant shared his or her opinion about the need to prioritize learning value research over financial value research and suggested the report make mention of the tension and differing viewpoints on this subject. Participants' responses are shared below:

- *There may be a missing word on page 5, line 2. It seems like it should say: "…evaluate whether audiences ARE willing to…"*
- *I don't recall any discussion of including a "learning scientist" in production of a film.*
- *As a film producer, I do not feel a strong need to research the "ROI" on development of GS content--the market will likely reveal this to most interested parties. GS films are not as successful as they were in previous decades, for a variety of reasons. I am more interested in learning how films can be made successful to support learning and exhibitors' missions--I think the question of whether GS theaters generate "ROI" or value should not be a primary aim of GSCA's efforts or of NSF's, especially given our limited resources. Perhaps the report could reflect that there are differing viewpoints on whether this endeavor would have value.*

Need for further definition/fleshing out

Finally, participants were asked if there was anything in this section of the draft report that they thought could have been fleshed out or better defined. Among the 10 participants who responded to the question, a handful indicated that there was nothing that could have been fleshed out or better defined. The remaining participants: recommended that the final draft include more technical information about topics like GS theaters and brain wave measurement, suggested digging deeper into the subject of impact, advised including more information about learning/education and existing research in the field, and/or shared ideas about the structure of the final report and a potential research agenda. Participants' responses are shared on the following page:

- *The difference between planetarium full dome style theatrical environments and giant screen cinematic environments.*
- *How to use more affordable brain measurement technologies. The Neurosky sensor is now only $80.*
- *Regardless of defining "attributes" of the GS experience, there was discussion about the fact that the traditional methods and sweet spots may not be as powerful to audiences as they once were. So, how to regain impact was a topic.*
- *Love the start on learning and education, like to see more.*
- *Examples of existing research, lit references, evaluation reports in similar domain areas that showcase appropriately scoped research questions and examples of methods and instruments to address them.*
- *It might be useful/interesting to actually name the participants at each table, in order to see how the particular mixture of experience, expertise and point of view informed what was discussed, documented and reported out.*
- *Workshops are quick, top-of-mind events, and their organizing frameworks should not be taken verbatim, but rather as indications of where they were headed. We generated ideas within five areas, but the ideas often escape the corral, and the territories of the loosely named corrals were never defined. To become a true research agenda, the report need to rise above the verbatim to the clear and comprehensive. I suggest the following re-positioning:*

Current Draft	Suggested Re-positioning	Research Question
Audiences	Audiences	Who are our current and potential audiences?
Impact (measures and outcomes)	Outcomes and impacts, and their indicators	What are a GS film's potential outcomes and impacts? What indicates success?
Learning	Learning	What kinds of learning can (and do) happen in GS films?
Technology (giant screen attributes and characteristics)	The nature of the GS experience	How does the GS experience work, and what effects can it have on viewers?
Industry	Our Community of Practice and its culture	Who are we? And what is our culture and practice?
	Our value chain and business model	What values can we provide to which audiences and supporters to make us economically, environmentally and socially sustainable?

Something like this table becomes a research agenda. Give it some numbers, and folks can cite sections in their grant proposals. It also suggests synthesizing Breakouts 1 & 2 into a combined summary paragraph with combined questions for each topic. This combination can then be titled "The Research Agenda for the GS Field". Breakout 3 then becomes a "Process Considerations" chapter for implementing the Research Agenda.

**Breakout 2: Identify 3-5 key research questions from the key topic
areas Audience, Impact, Learning, Technology, and Industry**

Missing elements

Relating to Breakout 2, participants were first asked what, if anything, they found missing from this part of the draft report. Of the 9 participants who responded to the question, most indicated that nothing was missing. A few made miscellaneous suggestions, including recommendations that this section of the final report further illuminate the distinction between learning and impact, consider the plurality of possible impacts, and highlight the balance between story and experience. One participant described the presentation of information in this section as a "*laundry list.*" Participants' responses are shared below:

- *Not exactly missing…but the idea that Learning and Impact are different. For example, you may not "Learn" anything new from a good GS experience. However, its "Impact" may cause changes in behavior or attitude about the known information. And the impact can be just as important, or more important, than the function of "learning" which implies gaining new information.*
- *We don't define 'impact' as much as we need to list impacts…[Also, it's] important to think in plurals. There is no one meaning for impact, but there are many potential impacts. This is where the list of possible services/impacts might be referenced. What [is] important is to note the possibility of many socially beneficial outcomes, even if your research agenda ends up focusing only on the learning outcomes…[Additionally, a] key fulcrum for me is story vs. experience. Is a great GS film a great story, or a sensational experience? Can the GS experience induce intrinsic pleasure?*
- *This feels like a laundry list. Some synthesis of the research questions, possibly ranking in terms of ease would be helpful.*

Inaccuracies reported

Participants were then asked what, if anything, was inaccurate in this section of the draft. Of the 7 participants who responded to the question, almost all indicated that they thought everything was "*accurate*" and "*well covered.*" However, one participant suggested two changes to the draft report, pointing to the NSF's Advancing Informal STEM Learning (AISL) program as a potential framework for learning outcomes research and suggesting the final report weigh in on the need to reframe the expectations and goals for GS research. This participant's feedback is shared below.

- *The NSF AISL has a good framework for different kinds of learning (knowledge, understanding, attitude, behavior, skills, etc.) Please use that one for listing possible learning outcomes. They are all valid options. [Also]…no one can or should ensure a film's financial success or it will be boring. But what the field and research can do is reduce/mitigate risk. Focus on stopping failures, not guaranteeing success.*

Need for further definition/fleshing out

When asked if there was anything they thought could have been fleshed out or better defined in this section of the draft report, a few of the 8 participants who provided a response said nothing needed to be further developed. Some of the participants shared miscellaneous suggestions for foundational elements, such as "*a taxonomy of WOW moments,*" descriptions of various GS theater spaces (which the participant also

thought would be a valuable addition to the first breakout session results), and information about the current media landscape. Additionally, one participant recommended merging this section of the report with the first breakout session's results, another reiterated a comment about the second section feeling like "*a laundry list,*" and a third repeated a suggestion about clarifying the distinction between learning and impact. Responses from survey participants are shared below:

- *Is anyone doing a "taxonomy of WOW moments"? Love that idea!*
- *The difference between planetarium full dome style theatrical environments and giant screen cinematic environments.*
- *Consider merging this section with the previous breakout. [Also]…there is a question about where GS fits in the media landscape which requires a research question at a higher level ("What is the media landscape?"). CAISE facilitated a convening two or so years ago that resulted in the media CoP, and they may be right group to provide this foundational work. John Falk and others did a study of the ISE landscape which has been useful in relating science centers to public television and community centers and others involved with STEM learning. If we had a diagrammed landscape of media platforms, we might be able to plan transmedia packages that provide a single campaign with a variety of different learning styles/media. Huge amount of work already done on defining learning, and more coming with the Co-STEM initiative. We should not waste effort defining learning, but adopt existing definitions to find out what kinds of learning GS is best at.*
- *This feels like a laundry list. Some synthesis of the research questions, possibly ranking in terms of ease would be helpful.*
- *Not exactly missing…but the idea that Learning and Impact are different. For example, you may not "Learn" anything new from a good GS experience. However, its "Impact" may cause changes in behavior or attitude about the known information. And the impact can be just as important, or more important, than the function of "learning" which implies gaining new information.*

***Breakout 3: What are the pragmatics—the nuts and bolts that need
to be considered in developing and implementing research
programs: barriers, opportunities, justifications, funding etc.?***

Missing elements

Next, participants were asked what, if anything, they found missing from the part of the draft report focused on Breakout 3. Of the 9 participants who responded to the question, most indicated that nothing was missing. A handful shared miscellaneous feedback, suggesting a formatting change and the inclusion of implementation suggestions and "*synthesis and action plans.*" Participants' responses are shared below:

- *Constraints and barriers to a GS research agenda seems to be the only actual heading here, leaving out opportunities, etc. While other areas are actually covered in the bullet points, it would be slightly [clearer if] each "pragmatic" was listed as a heading with bullet points under each (although maybe actual process played out differently?)*
- *Consider turning these notes into implementation considerations.*
- *Synthesis and action plans or ideas how to tackle as group/community the issues raised in both abstract and concrete ways.*

Inaccuracies reported

When asked what, if anything, had been reported inaccurately in this section of the draft, all 7 of the participants who provided a response indicated that they had not identified any errors.

Need for further definition/fleshing out

When asked if there was anything they thought could have been fleshed out or better defined in this section of the draft, half of the 10 participants who provided a response said "*no.*" Those who thought aspects of this section of the report could have benefitted from better definition generally pointed to big picture pragmatics, like the complexity of determining research priorities, relationships (and tensions) between stakeholders, next steps, and the future of the field. Participants' responses are shared below:

- *I felt that our producers' breakout session included questions about "research" priorities--particularly if GSCA is leading an initiative, it will be important to define which questions are most valuable to the long-term future of GS content development. Concrete data that shows that films influence audiences in terms of "attitude" or "behavior" could be helpful to secure sponsor funding. More "pedantic" research, assessing mechanisms of cognitive change, while interesting, is probably less useful for to that end. Some industry-related questions have more to do with market research--what do viewers want? Who are our audiences? How have their perceptions of GS changed? etc. and do not really relate to "learning" at all. GSCA should consider all these priorities if we are reaching out to institutions to do research/evaluation--it's very difficult to get these exhibitors involved and we'd like to achieve the highest "bang for the buck," especially if we're asking them to contribute financially. If we're going to NSF, many of the industry-related questions are completely irrelevant.*
- *Might have been interesting here to identify how each representative/affinity group responded to each of these areas, to surface tensions between stakeholder groups.*
- *This section should be re-worked to result in implementation suggestions based on thinking about the suggested pragmatics.*
- *Whether GS can serve as priming for future learning.*
- *The idea of envisioning a successful future rather than justifying the past practices.*

Part 2: Additions to breakout session results

In the second part of the survey, participants were invited to share new thoughts or ideas they had since participating in the Workshop. Their responses are shared below, organized by breakout session topic.

Breakout 1: What are the key research issues—thematic areas, guiding topics—for GS research?

Reflecting on the first breakout session – during which they had been asked to consider the key research issues for GS research – a few of the 8 participants who responded to the question indicated that they had no new ideas. Remaining participants shared a range of suggestions on topics as diverse as: finding new audiences, learning value, long term impact, and how the Workshop might have been improved. Participants' feedback is shared below:

- *Is it realistic to think that a significant NEW audience can be found for traditional GS films? We've just done research on existing audience.*
- *As discussed in the meeting I am most interested in the holistic experience of seeing an educational giant screen film in a learning setting -- and how that affects and impacts learning, and also how that inspires people to learn more.*
- *I think we are looking at where the GS might create aha moments of transformational learning for people watching GSC programs.*
- *Retention of content…[and] choosing to become a scientist or explorer whatever life choice impact the movie had on adults....*
- *A reflection on the question posed for breakout session 1, one year later (this is not a comment on the report itself per se)- before defining the key research issues and areas, it might have been instructive to further unpack the values (about giant screen, learning, etc.) that participants brought to the table, as well as the current trends in informal STEM education, giant screen industry that would inevitably inform this session and the Workshop writ large.*

Breakout 2: Identify 3-5 key research questions from the key topic areas Audience, Impact, Learning, Technology, and Industry

Reflecting on the second breakout session – during which they had been asked to identify key research questions relating to audience, impact, learning, technology, and industry – a couple of the 6 participants who responded to the question indicated that they had no new ideas. A handful shared comments about miscellaneous subjects, including the best content for GS films (in terms of audience response), how interactivity would change GS, and how the structure of the Workshop had facilitated the development of ideas. Additionally, one survey participant re-shared a thought about learning value that was inspired by the first breakout session. Participant responses are shared below:

- *Which content is best suited to GS wow moments - what is the formula, is there one? Priming for future learning does emotional arousal scale with size of medium?*
- *Interactivity is the next level, how will that impact and change GS...much more research need to be done.*

- *Might have been interesting here to report on how the potential questions/grain size that surfaced here compared to/evolved from those brainstormed in breakout 1, via another level of synthesis (perhaps that's the next step in this process?)*
- *As discussed in the meeting I am most interested in the holistic experience of seeing an educational giant screen film in a learning setting -- and how that affects and impacts learning. And also how that inspires people to learn more.*

Breakout 3: What are the pragmatics—the nuts and bolts that need to be considered in developing and implementing research programs: barriers, opportunities, justifications, funding etc.?

During the third breakout session, the Workshop focused on the pragmatic elements of developing and implementing research programs. When asked if they had new thoughts on this subject since the Workshop, a handful of the 7 survey participants who responded to the question indicated that they had no new ideas. A few participants shared miscellaneous responses, commenting on the importance of recognizing barriers or establishing partnerships, and one repeated his or her response to the previous question, asking about the best content for GS films (in terms of audience response). Participants' responses are shared below:

- *Barriers include open source vs. commercial choking the technology and innovation pipeline and holding back the industry.*
- *Developing partners for research is critically important. GSCA can't fund it alone.*
- *Which content is best suited to GS wow moments - what is the formula, is there one? Priming for future learning does emotional arousal scale with size of medium?*

Part 3: Post-Workshop activities, missing stakeholders, and suggestions for next steps

In the third and final part of the survey, participants were asked about: research questions or Workshop related activities they had pursued or planned to pursue since participating in the Workshop 9 months earlier, stakeholders who should have been at the Workshop, recommendations for GSCA's next steps, and any final thoughts about the Workshop and GS research. Their feedback on each of these topics is shared below.

Research questions pursued after the Workshop

Six (6) of the 12 participants indicated that they had already pursued at least one of the research questions generated at the Workshop. One explained that s/he planned to do so in the future, and just under half of the participants said that they had not pursued any research questions and had no plans to do so.

Those who pursued research question(s) or planned to take this step indicated that they were interested in the topics of audiences, learning, innovation in the field, and GS immersion. One participant declined to provide additional information about research question(s) pursued. Participants' responses are shared below:

- *GSCA has pursued audience research, with the cooperation of theaters around the world, including mine.*
- *I plan to map some of the learning related questions to those that have emerged in other informal STEM education research agenda processes, looking for overlaps, gaps and synergy.*
- *We are pursuing many of the questions that have to do with the impact of the giant screen on learning.*
- *Format and learning.*
- *How can the inclusion of a learning scientist in the production process promote innovation and outcome? - I am working on a similar question to this in [my research], not exactly, but looking at how actual STEM content can be explored by students when producing fulldome content, and how they express STEM content within their fulldome productions using authentic project based learning and how students innovated new fulldome production techniques to accomplish their fulldome productions using basic cameras and software.*
- *I have written and presented a paper [about immersive cinema]. We have established a standards outline for digital domes…*

A handful of participants provided information about how they had pursued or planned to pursue these research questions. One explained that s/he conducted a case study and analyzed his or her own data, another created "*an inventory of learning related questions in other research agenda development processes*," and two applied for a grant from the NSF. The NSF was the only agency mentioned by participants who indicated that they had submitted or planned to submit a giant screen research proposal to a funder.

Post-Workshop activities

Next, participants were asked if they had taken part in specific activities since the Workshop. Of the 11 participants who responded to the question, more than half each indicated that they had *discussed* giant screen research questions addressed in the Workshop with colleagues who didn't attend and/or *informed* colleagues who didn't attend about the ASTC Museum Screens Community of Practice, while half *engaged* in further giant screen research discussions with other Workshop attendees. Just under half each indicated they had *disseminated* information about the Workshop to colleagues who didn't attend and/or *participated* in the ASTC Museum Screens Community of Practice.

A handful each indicated that they *completed and submitted* a proposal involving giant screen research to a funder and/or *received funding* (or were in the process of receiving funding) for a proposal involving giant screen research. One participant explained that s/he *began working* on a new giant screen research project and another indicated s/he had taken another action (which this participant described as: "*Worked closely with GSCA on the audience study*"). None of the participants indicated they had started working on a proposal involving giant screen research but had not yet submitted it to a funder.

Missing stakeholders

Participants were then asked if they could identify any stakeholders or individuals who were not present at the Workshop but might have been valuable additions to the event. Of the 6 participants who responded to the question, one indicated that there were *no* missing stakeholders. The remaining participants shared miscellaneous recommendations, pointing to: "*CEOs of museums, science centers, [and] aquariums with Giant Screen Theaters,*" "*the community of evaluators who work in informal learning media evaluation and research,*" "*members from the dome research team at Plymouth University,*" and those generally involved in "*education and learning research.*" Finally, one participant reflected on the group that *was* assembled for the Workshop, as in: "*I thought the range of participants was good. At first it seemed like the filmmakers had a stronger voice, but as the day went on, I felt we all were heard equally well.*"

Suggestions for next steps

Participants were then asked what steps they would like to see GSCA take "*to help further encourage the development of an active research community.*" Ten (10) of the participants responded to this question, with some making multiple suggestions. More than half suggested GSCA take a leadership position – either directly or indirectly – by organizing a task force, coordinating funding requests, connecting likeminded organizations, and planning future Workshops, among other efforts. Specific suggestions are shared below:

- *Direct the new Task Force to conduct a study on the ways a giant screen experience impacts people differently than a non-giant screen experience (TV, conventional-sized screen, computer screen).*
- *Lead funding requests for prioritized research outlined in the report.*
- *Should promote, fund and support research and case studies in this field.*

- *Identify the true, committed champions who will pursue an agenda that will inform giant screen practice and identify questions that will resonate across other informal learning sectors. May I humbly suggest a week-long online forum with the wider community on informalscience.org?*
- *I also think it would be meaningful to connect interested parties to other groups that might have an interest in assessing the impact of STEM institutions and learning (Visitor Studies Association, for example). It would be very helpful to integrate some of our questions into existing efforts with active participating partners.*
- *The Workshop was well planned and paced should do another one.*

At the same time, several suggested GSCA play a role in disseminating information within and beyond their network, as in:

- *At the GSCA would be good to include this subject in the Lifelong learning committee meeting.*
- *The GSCA should narrow the research questions to a small and manageable list of the top research priorities and have its Lifelong Learning Committee engage institutional and industry leaders to address the questions in a defined time-frame.*
- *Strongly seek sharing of information by GSCA members who have received NSF funding for film production. Those grants always involve evaluation of some type. It should be shared with the industry, but it has not been shared.*
- *Disseminate progress reports and opportunity news.*

Finally, a handful of participants suggested GSCA conduct further research, gaining information from their members and from partners such as the Center for the Advancement of Informal Science Education (CAISE), as in:

- *I think it would be useful to survey the membership regarding "research" activities and GSCA's role in the effort. What are our GSCA's priorities? * Do we want to understand the mechanisms by which GS might influence learning? * Do we want to better inform the process of filmmaking to create content that effectively achieves learning goals? * Do we want to demonstrate the value of GS theaters to institutional stakeholders and funders (do theaters support learning, engagement, strengthen community, influence behavior etc.)? * Do we want to learn more about our audiences and their interests so we can improve our product, marketing strategies, programming, etc.? Depending on the association's interests, GSCA can help facilitate formation of interest groups related to those areas (perhaps within existing or new committees), and topics that have the strongest backing from members could be addressed by GSCA.*
- *Perhaps use the CAISE evidence wiki to gather the lit on what is known, and what questions are being asked. Also connect to larger research trends across ISE.*

Final thoughts regarding the Workshop and related activities

At the end of the survey, participants were invited to share additional feedback about the Workshop and any related activities they had been involved with since attending. Of the 8 participants who responded to the question, the majority thanked and/or praised the Workshop team, as in:

- *It was a really a great networking event for me and a grant came out of it - so very positive experience there.*
- *Thanks for including me!*
- *THANKS for the hard work and productive sessions. I really enjoyed meeting and working with the team members for this important effort.*
- *I found the workshop to be very useful to my organization and for the GSCA in general, which we hope will result in our next project being even stronger due to the insights gained at the workshop. The workshop was very well organized and we accomplished a great deal in a short time. I was not only able to focus on some of the question areas in formulating the details of our next project and its educational outreach components in particular, but also was able to consult 3 of the workshop attendees who are specialists in various elements of educational outreach over several months in the development process of our next GS project.*
- *I really enjoyed the opportunity to participate in this focus group, thanks again.*
- *The report on the workshop is the most thorough I have seen of any research agenda development process to date. Kudos.*

Finally, one participant commented on how GS research could address values other than learning and shared a suggestion for the Workshop team, while another shared concerns about the challenges of achieving consensus and synthesis at research agenda meetings that convene professionals of diverse backgrounds. Their responses are shared below:

- *GS films have other impacts in addition to learning and some of these other impacts are even more important to the business model than learning…STEM learning is the NSF's overt agenda, and the evaluation of any NSF-funded initiative has to evaluate its STEM learning outcomes and their advancement. However, GS films have many other kinds of outcomes and provide many other kinds of values to other funding sources. While our field could not have advanced without the catalytic support of the NSF, their annual funds are a small share of the GS field's annual revenues, and they are only one of the field's audiences and supporters. The GS field's research agenda should be much broader than learning. Pragmatically, because funding for research comes mainly from the NSF, as many as possible of the other research topics should coattail on learning. For instance, we can find out all about our audiences under the umbrella of understanding the current and potential audiences for GS STEM learning experiences…[Also]…please turn this list of breakout flip chart thoughts into an organized research agenda with sub-questions and an implementation plan...This evaluation form is tied to the breakout sessions, and not to the more relevant task of synthesizing the long lists into a cogent research agenda. Maybe that's your next step -- to which I look forward!*
- *Research agenda meetings I find are notoriously difficult synthesis and build consensus. This is in part due to a lack of intrinsic cohesion of ideas and goals when the community is diverse both in terms of practitioners/professionals and across research fields.*

Summary of findings

Nine (9) months after the *Setting the Agenda for Giant Screen Research* Workshop held on October 18, 2013, participants who were not involved in organizing, hosting, or facilitating the Workshop were invited to review a draft of the resulting report and complete a survey, sharing their thoughts about elements of the Workshop outcomes that were missing, inaccurate, or needed to be fleshed out. The participants were also encouraged to: contribute any new thoughts or ideas they had since participating in the Workshop, describe their post-Workshop activities related to GS research, and share suggestions for next steps.

Of the 26 Workshop participants invited to review the draft report A Roadmap for Giant Screen Research: Results of the *Setting the Agenda for Giant Screen Research* Workshop and complete the survey, 12 provided feedback via the online form prepared and hosted by the independent evaluation firm Knight Williams Inc., for a response rate of 46%. One participant shared additional feedback via two methods: (1) a three-page memo and (2) comments made in a digital copy of the draft. Where applicable, this participant's supplemental feedback was considered alongside the survey responses.

Survey participants' responses are summarized below in three parts. Part 1 examines their reflections on the breakout session results, Part 2 shares their additions to the breakout session results, and Part 3 presents their post-Workshop activities, thoughts about missing stakeholders, and suggestions for next steps.

Part 1: Reflections on the breakout session results

After reviewing the draft report, participants were invited to reflect on the breakout session results. For each of the three breakout sessions, they were asked what elements of the draft were missing, reported incorrectly, or needed to be better defined or fleshed out. A summary of their feedback is shared below.

Breakout 1: What are the key research issues—
thematic areas, guiding topics—for GS research?

- *Missing elements:* Most of the 11 survey participants who answered the question indicated that nothing was missing from the part of the draft report focused on Breakout 1. A handful shared miscellaneous feedback about missing elements, including how best to research some of the technological considerations, the relevance of the Museum Indicators of Impact and Performance (MIIP) research to GS research, the value to visitors beyond the learning experience, and if and how audience experience impacts learning.

- *Inaccurate elements:* Most of the 8 survey participants who responded to the question indicated that they thought everything was accurate in this section of the draft report. A few shared miscellaneous potential inaccuracies, including a typo and information that the participant did not think was discussed in the first breakout session. One participant shared his or her opinion about the need to prioritize learning value research over financial value research and suggested the report make mention of the tension and differing viewpoints on this subject.

- *Elements needing better definition:* Of the 10 survey participants who responded to the question, a handful indicated that there was nothing that could have been fleshed out or better defined in this

section of the draft report. Remaining participants made miscellaneous suggestions. They recommended that the final draft include more technical information about topics like GS formats and brain wave measurement, suggested digging deeper into the subject of impact, advised including more information about learning/education and existing research in the field, and shared ideas about the structure of the final report and a potential research agenda.

Breakout 2: Identify 3-5 key research questions from the key topic areas Audience, Impact, Learning, Technology, and Industry

- ***Missing elements:*** Of the 9 participants who responded to the question, most indicated that nothing was missing from the part of the draft report focused on Breakout 2. A few made miscellaneous suggestions, including recommendations that this part of the final report further illuminate the distinction between learning and impact, consider the plurality of possible impacts, and highlight the balance between story and experience. Additionally, one participant described the presentation of information in this section as a "*laundry list.*"

- ***Inaccurate elements:*** Of the 7 participants who responded to the question, most indicated that they thought everything in this section of the draft report was "*accurate"* and "*well covered*." However, one survey participant suggested two changes, pointing to the NSF's Advancing Informal STEM Learning (AISL) program as a potential framework for learning outcomes research and suggesting the final report weigh in on the need to reframe the expectations and goals for GS research.

- ***Elements needing better definition:*** Half of the 8 participants who provided a response said nothing needed to be fleshed out or better defined in this section of the draft report. Some of the survey participants shared miscellaneous suggestions for foundational elements, such as "*a taxonomy of WOW moments,*" descriptions of various GS theater spaces, and information about the current media landscape. Additionally, one participant recommended merging this section of the report with the first section, another reiterated a comment about the second section feeling like "*a laundry list,*" and a third repeated a suggestion about clarifying the distinction between learning and impact.

Breakout 3: What are the pragmatics—the nuts and bolts that need to be considered in developing and implementing research programs: barriers, opportunities, justifications, funding etc.?

- ***Missing elements:*** Of the 9 participants who responded to the question, most indicated that nothing was missing from the part of the draft report focused on Breakout 3. A handful shared miscellaneous feedback, suggesting a formatting change and the inclusion of implementation suggestions and "*synthesis and action plans.*"

- ***Inaccurate elements:*** All 7 of the participants who provided a response indicated that they had not identified any errors in this section of the draft report.

- ***Elements needing better definition:*** Half of the 10 participants who provided a response said nothing needed to be fleshed out or better defined in this section of the draft report. Remaining survey participants generally pointed to big picture pragmatics, like the complexity of determining research priorities, relationships (and tensions) between stakeholders, next steps, and the future of the field.

Part 2: Additions to breakout session results

In the second part of the survey, participants were invited to share new thoughts or ideas they had since participating in the Workshop. A summary of their responses is shared below, organized by breakout session topic.

- *Breakout 1:* Reflecting on the first breakout session – during which they had been asked to consider the key research issues for GS research – a few of the 8 participants who responded to the question indicated that they had no new ideas. Remaining participants shared a range of suggestions on topics as diverse as: finding new audiences, learning value, long term impact, and how the Workshop might have been improved.

- *Breakout 2:* Reflecting on the second breakout session – during which they had been asked to identify key research questions relating to audience, impact, learning, technology, and industry – a couple of the 6 participants who responded to the question indicated that they had no new ideas. A handful shared comments about miscellaneous subjects, including the best content for GS films (in terms of audience response), how interactivity would change GS, and how the structure of the Workshop had facilitated the development of ideas. Additionally, one participant re-shared a thought about learning value that was inspired by the first breakout session.

- *Breakout 3:* Reflecting on the third breakout session – during which they had been asked to focus on the pragmatic elements of developing and implementing research programs – a handful of the 7 participants who responded to the question indicated that they had no new ideas after the Workshop. Remaining participants shared miscellaneous responses. A few commented on the importance of recognizing barriers or establishing partnerships, and one repeated his or her response to the previous question, asking about the best content for GS films (in terms of audience response).

Part 3: Post-Workshop activities, missing stakeholders, and suggestions for next steps

In the third and final part of the survey, participants were asked about research questions they had pursued or planned to pursue, post-Workshop activities they had taken part in, stakeholders who should have been at the Workshop, recommendations for GSCA's next steps, and any final thoughts about the Workshop and GS research. A summary of their feedback on each of these topics is shared below.

- *Research questions pursued after the Workshop:* Half of the full group of 12 participants indicated that they had pursued at least one of the research questions generated at the Workshop. One explained that s/he planned to pursue a research question or questions in the future, and just under half of the survey participants said that they had not pursued any research questions and had no plans to do so.

  Those who pursued research question(s) or planned to take this step indicated that they were interested in the topics of audiences, learning, innovation in the field, and GS immersion. Additionally, a handful of the participants provided details about how they had pursued or planned to pursue these research questions. One explained that s/he had conducted a case study and analyzed his or her own data, another created "*an inventory of learning related questions in other research agenda*

development processes," and two applied for a grant from the NSF. The NSF was the only agency mentioned by survey participants who indicated that they had submitted or planned to submit a giant screen research proposal to a funder.

- **Post-Workshop activities:** When asked if they had taken part in specific activities since the Workshop, more than half each of the 11 participants who responded indicated that they had *discussed* giant screen research questions addressed in the Workshop with colleagues who didn't attend and/or *informed* colleagues who didn't attend about the ASTC Museum Screens Community of Practice, while half *engaged* in further giant screen research discussions with other Workshop attendees. Just under half each indicated they had *disseminated* information about the Workshop to colleagues who didn't attend and/or *participated* in the ASTC Museum Screens Community of Practice. A handful each indicated that they *completed and submitted* a proposal involving giant screen research to a funder and/or *received funding* (or were in the process of receiving funding) for a proposal involving giant screen research. One participant explained that s/he *began working* on a new giant screen research project and another indicated s/he had taken another action (which this participant described as: "*Worked closely with GSCA on the audience study*"). None of the participants indicated they had started working on a proposal involving giant screen research but had not yet submitted it to a funder.

- **Missing stakeholders:** Of the 6 participants who responded to the question, one indicated that there were *no* missing stakeholders. Those who thought the Workshop would have benefited from the inclusion of additional stakeholders shared miscellaneous recommendations, pointing to CEOs of museums/aquariums/science centers with GS theaters, evaluators, specific researchers, and the education and learning research community in general. Finally, one participant shared a comment about the group that *was* assembled for the Workshop.

- **Suggestions for next steps:** Ten (10) of the participants shared suggestions for next steps they would like to see GSCA take, with some making multiple recommendations. More than half suggested GSCA take a leadership position by organizing a task force, coordinating funding requests, connecting likeminded organizations, and planning future Workshops, among other efforts. Others suggested GSCA play a role in disseminating information within and beyond their network, and a handful suggested GSCA conduct further research, gaining information from their members and from partners such as the Center for the Advancement of Informal Science Education (CAISE).

- **Final thoughts regarding the Workshop and related activities:** Of the 8 participants who opted to share additional feedback about the Workshop and related activities, the majority thanked and/or praised the Workshop team. At the same time, one participant commented on how GS research could address values other than learning and shared a suggestion for the Workshop team, while another shared concerns about the challenges of achieving consensus and synthesis at research agenda meetings that convene professionals of diverse backgrounds.

Final remarks

This report summarized survey participants' responses to the draft Workshop report entitled A Roadmap for Giant Screen Research: Results of the *Setting the Agenda for Giant Screen Research* Workshop, a product of the *Setting the Agenda for Giant Screen Research* Workshop held on October 18, 2013. Reflecting on the purpose of the evaluation, the Workshop and evaluation teams' primary goal was to gather the type of feedback from Workshop attendees that could be effectively incorporated into the report draft given the relatively small scale and budget of the Workshop evaluation. To that end, the follow-up survey generally focused on participants' thoughts about the draft report – and, to a lesser extent, the Workshop and their post-Workshop activities – rather than providing participants the opportunity to share additional feedback on the topics considered over the course of the one-day Workshop.

Taken together, the survey participants' suggestions provide insight into the draft report, the Workshop, and their goals for GS research. Looking across the findings and at themes that emerged in numerous places, we briefly summarize a few issues that might help inform the Workshop team's revisions to the draft report and future planning.

- Looking at the background of the Workshop participants, the 12 participants who provided feedback on the Workshop draft report through the online survey were from diverse professional backgrounds and organizations. Similarly, the remaining 14 participants who didn't provide feedback *also* came from a variety of professional backgrounds and organizations. Though the reasons why just over half of the Workshop participants did not complete the survey are unknown, there did not appear to be significant differences between the responding and non-responding groups in terms of professional background and industry perspective.

- The Findings section of the report shows that fluctuating numbers of participants answered the survey questions, from a low of 6 to a high of 12. Though the reasons for the variability in these response rates are unknown, participants were generally thoughtful and thorough in their responses, indicating that they may have left a question or questions blank only when they felt they had nothing to add – the equivalent, in other words, of writing comments like "*looks good*," "*nothing*," or "*feels comprehensive*," as some participants did occasionally throughout their surveys.

- Overall, the survey findings indicate that participants were impressed by and appreciative of the draft report, calling it "*comprehensive*," "*thorough*," and "*well done*." Additionally, when asked to review the results of the three breakout sessions, most participants indicated that there wasn't anything missing or inaccurate in these sections. At the same time, the group as a whole commented on a number of elements that they thought could have been fleshed out or better defined in the results of the three breakout sessions. This was likely expected at the draft stage, and speaks to the value of the survey participants' constructive, thorough feedback.

- Participants' responses throughout the survey indicate they were also generally supportive of the original goals of the Workshop, which were to: "*Foster and engage researchers in aligned disciplines to define the key issues in giant screen research and develop an active research community to address these questions through collaboration.*" Some participants further shared comments about the value of connecting GS research to larger trends in informal science education (ISE) and STEM learning, and

others remarked on the need to assess the current landscape and pinpoint research priorities in order to move forward most effectively.

- A number of participants expressed considerable interest in the issues of learning and impact, commenting on the effects of immersion and audience experience, the plurality of possible impacts, the differences between impact and learning, and the tension between learning value and financial value, among other topics. The participants' general interest in learning and impact may have been influenced by the NSF's support of the giant screen industry's efforts to promote lifelong learning, and/or by the positions and personal interests of the 12 participants who completed the follow-up survey, among other factors.

- Although it was not the focus of the survey, some participants opted to share their thoughts about the Workshop itself. These participants generally described the event in positive terms (for example, remarking that it was "*a really great networking event,*" "*productive,*" and "*very useful to my organization and for the GSCA in general*") and/or thanked the Workshop organizers for their efforts with the event, the report, and the follow-up survey. In general, the participants seemed to particularly value the opportunity to network and collaborate with a range of stakeholders at the Workshop, further underscoring the overall consensus that future GS research should encourage participation from and partnerships across all sectors of the GS industry.

- At the time participants completed the survey, 9 months after the Workshop, more than half indicated they had pursued one or more post-Workshop-related activities since attending and more than half indicated they had taken steps or made plans to pursue at least one of the research questions generated at the event. These are promising findings, as the Workshop organizers anticipated it could take up to or beyond a year for such activities to unfold. Further follow-up would be needed to determine if and how additional time has influenced (or might influence) exploration of the research questions in particular, if the participants encountered any barriers in their efforts, and the kinds of support they and others might benefit from moving forward. Such an effort might be undertaken as an addendum to the report, spearheaded by GSCA.

- Finally, many of the participants indicated that the field as a whole would be well served by ongoing leadership from GSCA through efforts such as: forming a task force, coordinating funding requests, connecting likeminded organizations, planning future workshops, disseminating information, and conducting further research, among others.