BEYOND ENTERTAINMENT:
EDUCATIONAL IMPACT OF FILMS
And Companion Materials

Viewers believe they are learning from giant screen films. But are they really learning, and what are they learning?

BY BARBARA FLAGG

When describing giant screen films, 73 percent of viewers choose the word "educational"—more than choose "exciting" (69 percent) or "fun" (66 percent), according to TNS Intersearch's GSTA-sponsored survey of more than 1,400 respondents in 11 countries. Viewers believe that they are learning from giant screen films. But are they really learning, and what are they learning? What impact does viewing a film have, and do companion materials add significant educational value? The goals of this article are to review how evaluators look for learning impact and what evaluators have discovered about learning from giant screen films and their adjunct materials.

The Informal Science Education division of the National Science Foundation (NSF), a U.S. federal agency, has funded 18 currently available giant screen films, focusing on science, math or technology content. NSF requires that each funded project assesses impact on target audiences of the film and ancillary materials in order to establish a project's success in terms of both entertainment and educational value. Summative evaluations for 10 NSF-sponsored films provide the basis for this article's summary of the educational value of films and their ancillary materials for adult and student audiences. See the table on page 52 for a list of the 10 film projects and their independent summative evaluation contractors.

METHODOLOGY FOR EVALUATIONS WITH GENERAL ADULT AUDIENCES

Summative evaluations for adult NSF film viewers in American institutional theaters have three general objectives:

1. To assess the achievement of intended goals, whatever those have been defined to be; for example, cognitive, affective, attitudinal or behavioral outcomes.
2. To look for unintended or unplanned outcomes.
3. To explore the possibility of effects beyond viewing the film or interacting with an exhibit; that is, how does the project influence the lives of the audiences beyond the entertainment of the museum viewing?

To look for achievement of planned and unplanned outcomes, the first nine summative evaluations listed in the top three rows of the table on page 52, used a quasi-experimental separate-sample pre-test/post-test research design. Don't let the jargon throw you; it's a relatively simple design in practice.

Implementation of this research design in the natural theater setting means that researchers ask randomly chosen adults to complete a questionnaire prior to viewing the film and ask a different random sample to complete the questionnaire after viewing the film. Several characteristics of the giant screen viewer population and the film treatment make this research design most appropriate for the following reasons.

First, we can assume that the scientifically predisposed museum visitors are familiar with some of our film content; to wit, six of the reviewed

Projects	Summative Evaluation Contractors
Journey Into Amazing Caves; Special Effects; Stormchasers	Multimedia Research Barbara Flagg flaggb@aol.com
Coral Reef Adventure; Dolphins; Everest; Island of the Sharks; The Greatest Places	Edumetrics Art Johnson art.johnson@post.harvard.edu
Jane Goodall's Wild Chimpanzees	Knight-Williams Research Communications Valerie Knight-Williams val@knightwilliams.com
Tropical Rainforest	St. Cloud State University Mark Minger maminger@stcloudstate.edu
Special Effects (students only with exhibit and activities)	Responsive Methodology Marcus Lieberman buckml@lobo.net

summative evaluations recorded that 30–49 percent of viewers of NSF films have occupations related to science. Consequently, a post-test alone is not effective assessment. It is critical to include a pre-test that establishes what the audience knows or believes prior to seeing the film.

Second, using the same sample for pre- and post-tests is not the best procedure because the pre-test given just before seeing the film sensitizes the audience to film content and may affect their post-test answers. In the worst case, pre-tested viewers might spend their 40 minutes just hunting for answers to give on the post-test! There are statistical controls that can be used when the same samples get both tests, but it is easier to obtain cooperation from filmgoers to complete only one survey rather than two. Typically, about 200 volunteers at one site are recruited for each separate pre and post samples. Unlike the first nine evaluations in the table above, that for *Tropical Rainforest* used the same randomly chosen adult sample for both pre- and post-tests.

Third, the population to which we wish to generalize our findings is self-selected museum visitors whose intention is to view a particular giant screen film. Locating an equivalent control group who would not view the film is virtually impossible. One could use a group viewing a different film in the same theater, but adults choosing to see *Jane Goodall's Wild Chimpanzees* are possibly systematically different from adults choosing to see *Special Effects,* for example. The best control group in this case is a sample of museum visitors who intend to view our film but they have not yet done so. These are the adults who line up at the theater door before seeing the film; they act as a control group for those who see the film and complete the post-viewing survey.

Fourth, random sampling is logistically simple in the theater environment where the audience lines up before showtime. Researchers use randomization to eliminate systematic bias between the pre-viewing sample and the post-viewing sample. A random set of visitors is asked to complete the survey on clipboards while standing in line, and simultaneously another random set of visitors is recruited to complete the post-viewing survey. When sufficient respondent numbers cannot be achieved through random sampling in the time period available (e.g., in a smaller museum theater), researchers resort to recruiting the full population of viewers in line, for pre and post. This is the case for two of the nine summative evaluations using the quasi-experimental design. In all nine studies, however, statistical comparisons of demographic characteristics of pre- and post-viewing samples indicate no significant differences in distribution of gender, age, educational background, ethnicity and number of giant screen films previously experienced. So the two comparison groups can be looked at as having come from the same population.

Finally, the drawbacks of this kind of research design, in general application, are its failure to control for history, maturation, mortality and the interaction of these. However, in our specific case where a film treatment is only 40 minutes long and the adult audience is virtually captive, there is little chance of changes in people due to history, maturation, or mortality; thus, these are non-issues for the giant screen theater setting.

To explore the possibility of effects after viewing the film, five of the summative studies included phone interviews a week or two later, and one study interviewed three months after the viewing. About 40 percent of those completing post surveys volunteer their names and phone numbers, and typically 15 males and 15 females in local area codes are called and interviewed.

EDUCATIONAL IMPACT OF FILMS

Changes in knowledge

Learning outcomes for giant screen films are typically focused on changes in verbal knowledge, as measured by paper-and-pencil tests, using true/false, multiple choice and short answer questions. Average test scores before and after seeing the film are statistically significantly different for adult viewers of all 10 films listed in the table above. Thus, the 10 giant screen science films are successful, beyond chance, at meeting their educational viewing goals of improving science

The author thanks the following representatives of the film organizations for permission to review summative evaluations from their NSF-funded projects: Mike Day, Science Museum of Minnesota; Janna Emmel & Greg MacGillivray, MacGillivray Freeman Films; Diane Perlov, California Science Center; Susanne Simpson, WGBH/NOVA.

All studies found that viewing each of the nine films significantly increased student knowledge of the content assessed.

knowledge, to the extent measured by paper tests. For example, viewers of *Special Effects* came away from the film knowing significantly more about how filmmakers produce effects of movement, scale, three-dimensionality, explosions and realistic computer images. Viewing *The Greatest Places* significantly increased adults' knowledge about the age of the solar system, the creation of the Tibetan plateau, the characteristics of lemurs, and the locations and details of the various places presented. Those adults who saw *Coral Reef Adventure* significantly increased their understanding about the life cycle of coral and coral reefs.

Evaluations for all of the films except *Coral Reef Adventure* explored change in knowledge for middle school students using pre- and post-viewing content tests. All studies found that viewing each of the nine films significantly increased student knowledge of the content assessed. Evaluation shows that giant screen films effectively communicate science content to middle school audiences. For example, after seeing *Journey Into Amazing Caves,* eighth graders knew significantly more about cave life, cave exploration techniques and cave formation. Seventh graders who viewed *Island of the Sharks* showed significant improvement in their understanding of the effect of Earth's magnetism on fish, sea animals' use of electric fields to find food and the impact of ocean currents on sea life.

Most interesting things learned

In seven of the ten summative evaluations, adults were also asked an open-ended question to describe what most interesting things they learned from the films. At the top of their minds as they exited the theater, adult viewers of *Jane Goodall's Wild Chimpanzees* most frequently noted specific information about the social behavior of chimpanzees; viewers of *Island of the Sharks* most frequently mentioned details about El Niño and about sharks and other aquatic creatures around Cocos Island; and viewers of *Everest* most frequently reported learning information associated with acclimatizing to the mountain's altitude. Student viewers reported learning similar things from these films.

Perceptions of scientists and researchers

A number of giant screen films present scientists and researchers as main characters. Three summative evaluations focused on whether viewers learned anything new about scientists and researchers. Over half of the *Stormchasers* adult and student respondents felt they learned something new—that scientists get actively involved with storms themselves; that they are dedicated to their work; that they track and predict storms; that the work is complex; and that scientists are responsible for making decisions that affect people's lives. Three-fifths of adults and half of students seeing *Jane Goodall's Wild*

Students viewing *Dolphins* showed significant increase in interest in learning more about dolphins. Viewing a giant screen film can positively influence student interest in science.

Chimpanzees felt they learned something new about researchers—that they can be dedicated and patient, that they use modern scientific methods to study chimps and that a new generation of researchers is carrying on Goodall's work. Almost two-thirds of adults and two-fifths of students who viewed *Journey Into Amazing Caves* felt they learned something new—that scientists would do dangerous activities, that they would search caves for specimens, that they don't just work in labs and that they are dedicated and need athletic skills. The results indicate that giant screen films can successfully push viewers to broaden their image of scientists beyond the stereotype of white-coated lab researchers.

Changes in interest

It is hoped that seeing giant screen films will increase student interest in and curiosity about film topics. Before and after seeing the film and during related classroom activities, five of the ten evaluations asked students to rate their interest in film-related topics. Two films elicited significant changes in interest. Student viewers of *Stormchasers* were significantly more interested after viewing the film in making a model tornado, in viewing a museum exhibit on severe storms and in speaking to people who study severe storms. Also, students viewing *Dolphins* showed significant increase in interest in learning more about dolphins. Viewing a giant screen film can positively influence student interest in science.

Changes in attitudes

Giant screen films may influence attitudes, but we have little information on the success of such efforts. Only the summative evaluation of *Tropical Rainforest* attempted to measure pre- and post-viewing attitudes and found significant contributions of the film to a more positive attitude toward the rainforests of the world by adults, youth and child viewers.

Later impacts

For six films, 30 to 40 adults were interviewed by phone one week to three months later to explore further influences of the film viewing. In these evaluations, most viewers had discussed the film with others and recommended it. And the films had raised their awareness of the content—visitors had read something or saw something on television that related to the film content. On average, slightly less than half said the film had influenced what they had thought about or done in the week following exposure; for example, they looked for further information, bought a book, rented a content-related video or were inspired to plan a content-related outing or activity. So giant screen films do impact viewers' lives beyond the 40 minutes in the theater, and the trickle-down effect is gradually being documented more effectively by evaluators in follow-up interviews.

For example, viewers of Jane *Goodall's Wild Chimpanzees* interviewed one week later all reported discussing the film with others; three-quarters said they continued to think about the film and recommended the film to others; and three-quarters had seen something in other media that related to the film. A few reported that they had been inspired to some kind of action such as attending a Goodall lecture or joining a conservation organization.

Viewers of *Dolphins* were interviewed by phone three months after exposure. All respondents had discussed the film with others and had recommended the film. But more importantly, almost one-fifth of the interviewed sample had taken action related to preserving the ocean environment, reporting, for example, "We've joined a group that regularly goes down to the beaches to help clean them up."

Impact of companion materials

Four evaluations have found little to no impact of companion materials on adult viewers of giant screen films. The *Dolphins* Family Fun Guide, an informative brochure, was distributed to ticket purchasers; one-fifth of surveyed respondents recalled reading the brochure during their visit, but those who read it did not differ significantly in post-viewing knowledge scores from those who did not recall the brochure. However, the brochures were intended as a take-home item. To follow-up on this type of usage, 30 adults surveyed after seeing *Journey Into Amazing Caves* were given a Family Fun Guide and interviewed by phone one week later. Two-thirds recalled having received the guide; half of these respondents had read the brochure, noted the information but felt the activities were either not relevant to their situation or required materials (e.g., sand) that they did not readily have available.

In the summative evaluation of *Coral Reef Adventure,* two theater sites were compared: one that had a small film-related exhibit displayed adjacent to the theater entrance lobby and one that did not display the exhibit. Of the surveyed adults, one-third had interacted with the exhibit, but exhibit exposure did not improve post-viewing learning outcomes as measured by a content test. Many viewers perceived the exhibit as a promotional display for the film rather than an interactive learning exhibit.

Educational Impact of Films continued on page 66

AD INDEX

Educational Impact of Films continued from page 56

For the evaluation of *Journey Into Amazing Caves,* walk-through cave exhibits were in a different museum space and were not marketed as part of the film experience. However, 29 percent of surveyed adults had seen the cave exhibits prior to seeing the film, but exhibit exposure did not significantly affect their film content recall.

The influence of various companion classroom activities for students on change in knowledge is significant for two of nine films assessed. The summative evaluations with student activities involve a different design from the adult evaluations—a quasi-experimental non-equivalent group design in which a random set of intact middle school classes are exposed to just the film and other classes are exposed to both the film and a set of activities. The classes complete a pre-test one to three weeks before seeing the film and complete a post-test a day to a week after seeing the film, depending upon whether activities occurred before or after the film viewing. Three evaluations presented activities before viewing the film, and five evaluations used activities after viewing. From the film teacher guides, activities were chosen that were thought to have the closest correspondence with the film content. Activities ranged from two to four hands-on student-centered activities and teacher demos, to seven to eight reading/writing activities, to web-based searching and reading activities.

Pre and post content tests demonstrate that students, like adults, learn significantly from viewing the films. However, for only two of the nine films, the addition of class activities improved knowledge significantly beyond what the students learned from the film alone. For one film, *Dolphins,* post-test learning scores of students who performed three hands-on classroom activities during one class period on the day after viewing improved significantly more compared with students who were exposed to the film only. For *Jane Goodall's Wild Chimpanzees,* exposure to a post-viewing 40-minute web activity improved student understanding about typical wild chimpanzee behaviors and attributes but not student learning about chimpanzee research. Hence, it is possible, but difficult, to get value added through classroom activities, and clearly there is a need to explore in more detail how that happens.

Finally, one summative evaluation has focused on a film with both student activities and a related museum exhibit. *Special Effects II* was designed to show how special effects are created and the role that science plays in that creation, via a giant screen film, interactive exhibit and classroom activities. The goal of the evaluation was to pre- and post-test students in all seven possible combinations of the three program components. Pre-teens learned significantly more from exposure to all three components together than from the individual components or other combinations. Students also learned differentially across the components; for example, those who saw the film were able to give most correct examples of special effects; those who experienced the exhibit were able to explain most correctly how a movie appears to move; and those who did classroom activities gave most correct examples of how science is used in special effects. This study suggests that seeing a film, experiencing an exhibit and doing school activities are an effective combination for improving student science knowledge and that individual components teach different kinds of information.

Summative evaluations of 10 giant screen films indicate that the NFS's grants have been well spent. Viewing these films significantly increases the science knowledge base of adults and students; improves interest in and attitudes toward science content; broadens viewers' understanding of what scientists do; and positively impacts viewers' actions after a museum visit. However, evaluations of companion materials of exhibits, brochures and classroom activities indicate that significant added value is more difficult to show in these instances. ■

Dr. Flagg is director of Multimedia Research, which specializes in front-end, formative and summative evaluations of technology-based educational products. She can be reached at 631-286-8925, FlaggB@aol.com.