Desert Survivors: the design and implementation of a television program to enhance local scientific literacy

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Utz JC, Rausch CM, Fruth L, Thomas ME, van Breukelen F. Desert Survivors: the design and implementation of a television program to enhance local scientific literacy. Adv Physiol Educ 31: 1–4, 2007; doi:10.1152/advan.00030.2006.—Outreach efforts by faculty members are oftentimes limited in scope due to hectic schedules. We developed a program to enhance science literacy in elementary school children that allows experts to reach a tremendous audience while minimizing their time commitment. The foundation of the program is a television series entitled “Desert Survivors.” The episodes air on local cable access television and are available to teachers on DVD. Each episode features a guest expert who spotlights a particular organism and how that organism overcomes the myriad of hardships inherent to desert survival. Local classrooms are visited to solicit questions from students regarding the organism of interest. These videotaped questions are integrated into Desert Survivors television production and provide the guest expert with the basis to discuss the ecology, physiology, and evolutionary biology of the organism. The program is bolstered through the use of an interactive website. Assessment strategies are in place to ensure program efficacy. Herein, we describe the development of the program as a model for innovative outreach opportunities.

elementary education; outreach; integrated learning

SCIENCE LITERACY is a prominent societal issue. Despite the obvious need for increased science literacy, current efforts to promote that literacy oftentimes fall short. Elementary school teachers feel that they require additional professional development, specifically in science. Only 18–29% of elementary teachers feel very well qualified to teach life, earth, or physical sciences (8). In contrast, 60–76% of teachers feel very well qualified to instruct language arts and mathematics. The capacity for learning is greatest in elementary school children (6). Therefore, while students are of the age to learn science best, the resources may be limited. A common strategy to aid teachers in developing science literacy is for university faculty members to reach out to local school districts and provide additional scientific expertise through such activities as classroom visits and participation in academic events. Indeed, the National Science Foundation (NSF) encourages such activities under the auspices of the “Broader Impacts” of the NSF Grant Proposal Guide.

Unfortunately, many outreach activities involve relatively small numbers of students per interaction. Time constraints on faculty members limit the number of classrooms that can be visited. Hence, the goal of this project was to develop a system that would allow university faculty members to reach out to the community while limiting the time commitment. A recent survey (5) indicated that American households receive ~60% of their continuing science education through television programs and internet access. As part of an NSF Career Award, we developed an integrated educational package that includes a television program and an interactive website.

“Welcome to Desert Survivors…”

In response to a perceived ignorance of the local desert environment, we developed “Desert Survivors,” a television program designed to increase science literacy in elementary school children. In part, the program involves visits to local schools to solicit questions from students about our local desert organisms and how they survive; these questions are later answered by an expert both in the television studio and in the field. Further efforts to disseminate pertinent information in support of the program are made through the use of an interactive website. Finally, we developed the assessment strategy described below.

Program Components

Identification of guest experts. Each episode of Desert Survivors features a guest expert(s) who discusses a particular Mojave Desert organism and how it copes with abiotic stress. Most of the guests are university faculty members, graduate students, and/or representatives from state or federal agencies. Guests are selected based on their availability and expertise in local biota. A typical time commitment for a guest included 1 h of planning with the television show hosts to discuss the episode content, 1 half-day to videotape a field segment, and
2 h of studio time to videotape the bulk of the show, which primarily consisted of answering student questions. Special consideration will be made to continue to include underrepresented minorities as guest experts in future episodes.

Classroom visits. One of the main objectives of Desert Survivors was to provide upper elementary students an opportunity to ask questions of an expert scientist about the local environment and its inhabitants. We gained access to local schools after meeting with the school district Science Coordinator, who then facilitated communication with interested teachers. Classrooms were visited, and short PowerPoint presentations were given by the television show hosts. Presentations began with a discussion of basic facts about deserts and desert organisms, which allowed a later transition to the challenges a specific desert organism (e.g., pupfish) must overcome in order to survive. Presentations were designed to provide students with enough background information that they could ask informed questions. We found that detailed presentations offered fewer opportunities for students to develop independent and insightful questions. Therefore, we utilized an intermediate-level presentation to both convey information and solicit appropriate questions. We then videotaped students identifying themselves and asking their questions. The parents of all participating students signed a standardized school district publicity release. We maintain copies of these releases. While other students were being videotaped, the remaining students participated in review activities. Two exemplary activities included a word search that used vocabulary employed in the presentation and an activity where a beach ball covered with questions about the desert and its biota was passed from student to student; each student then read and answered a question. We found that visiting three classes for each episode provided sufficient suitable questions for the framework of the show. Each classroom visit took ~3 h.

Television program. Desert Survivors currently airs on UNLV-TV, a local cable access channel supported by the University of Nevada-Las Vegas (UNLV) and the Clark County School District (CCSD). This channel is part of basic cable television programming available to all cable subscribers in the Las Vegas area. Each episode runs for 26 min and 40 s in accordance with network requirements. UNLV-TV is a component of the Hank Greenspun School of Journalism and Media Studies and provides opportunities for UNLV students to gain experience in broadcasting while subsidizing university-related programming. As such, UNLV-TV is responsible for the technical aspects associated with producing Desert Survivors. UNLV-TV maintains a studio, editing facilities, and the personnel required to produce broadcast-quality programming.

A typical episode consisted of a brief introduction by the graduate student hosts (Candice Rausch and Jenifer Utz) to the organism of interest. Based on student questions, we found it necessary to provide general background information regarding the taxon and its associated environment. We then concentrated on how this organism fares in the desert. We used the student questions as a platform for the expert to discuss critical aspects of the organism’s life history. The videotaped questions were integrated into the television show during the editing process, making it appear to the viewer that the expert was directly responding to the students’ questions. We also included a field interview so that the expert could answer ecologically relevant questions more effectively. Additional segments included reviews of critical concepts, integration of cartoon schematics to reinforce specific ideas, liberal use of pop-ups where information was displayed at the bottom of the screen, and a closing vocabulary review.

Our first season’s episodes featured the red-spotted toad, microbial fauna of hot springs, zooplankton of temporary ponds, and desert pupfish. Whenever possible, we emphasized the importance of preserving the desert environment and its biota. We highlighted the uniqueness of our local environment and provided additional avenues for further exploration of Nevada’s resources. For instance, Nevada has more hot springs than any other state (4). We discussed the locations of nearby springs and how to explore these hot springs safely. Pertinent contact information and other resources were made available via the website.

Since Desert Survivors is a collaboration with UNLV-TV, the episodes are available via cable access television. However, we recognize that not all households will have access to cable television. To reach the target audience more effectively, we collaborated with the CCSD to ensure greater viewership. The Science Coordinator for CCSD actively advertises the program with teachers and principals in the ~200 elementary schools. DVD copies may be requested by teachers through the website. We anticipate that both UNLV and CCSD will add streaming video options in the near future.

Set design and production. The television studio set was designed by a UNLV graphic artist. We used a stylized desert scene made with mountain backdrops of foam board, artificial rocks for seating, and burlap to simulate sand. Set design and production took ~100 h of work.

Website. The website (http://sciences.unlv.edu/desertsurvivors) contains links for all 12 episodes of Desert Survivors. These links lead to additional resources and activities. Each episode page contains basic facts to facilitate an understanding of that desert survivor. Some resources include directions for places to visit, contact information for various experts, links to other websites that contain information related to the desert, and puzzles and other reinforcement tools. The site also has a secured login for teachers where they may access and share supplemental activities and lesson plans. A long-term goal of the Desert Survivors program is to successfully integrate science education with other core curriculum content. For instance, we foresee additional writing and arithmetic assignments that use a Desert Survivors episode as a central theme. The use of related tangible examples may enhance the students’ ability to interpret maps, graphs, and simple data sets. Contact information for key program personnel is made available so that students may continue their learning experience.

Assessment. When asked to define a desert, one student said, “The desert is the place where all the dead plants are.” Of concern to us was not merely the development of science literacy but also addressing common misconceptions that devalue the importance of the desert biotope. Students were alarmingly unaware of the diversity of life supported by the desert and the unique physiological and ecological strategies employed by desert organisms to survive in a seemingly harsh environment. Therefore, we are implementing a bipartite approach to assess the efficacy of the Desert Survivors program. Instruments to assess both changes in content knowledge as
well as changes in attitude toward the desert are currently under development in consultation with an expert in science education. All material to be used for assessment must gain Institutional Review Board approval from both the UNLV and school district before use. We are currently awaiting approval before assessment strategies may be initiated. However, discussions with students and teachers indicate widespread enthusiasm for the program and a desire to fully participate. We will collect preliminary data to evaluate our instruments for validity and reliability. Construct-related validity is a widely accepted measure of how well the instrument being used actually measures the desired parameter. The validity will be examined by factor analysis, which measures the correlation between different survey items to determine their interrelatedness (7). Reliability may be defined as the consistency of the instrument and will be determined through the use of Cronbach’s α-statistic (2). If necessary, appropriate adjustments will be made to the assessment instruments to ensure adequate validity and reliability. Full-scale data collection will begin after the completion of all 12 Desert Survivors episodes. We expect Desert Survivors will foster an appreciation of the diversity of life in the desert. Simply being aware that the Mojave Desert is an unexpected home to such diverse species as amphibians, aquatic invertebrates, thermophilic viruses, desiccation tolerant plants, and ringtail cats may result in more judicious decisions related to land use and conservation. We expect to reinforce curricular standards by providing real-life tangible examples for local students. Finally, we expect to provide professional development opportunities for elementary science teachers.

To assess the degree of adoption of the program by elementary school teachers, we will circulate a survey among the identified science coordinators for each elementary school through the cooperation of the district Science Coordinator. Since the television program airs on local cable television, it is highly likely that many students will also view the program independent of any school participation. Therefore, all assessment instruments will inquire if the students have had previous exposure opportunities. Furthermore, we will inquire as to how those students gained access so that we may more effectively advertise the availability of the program.

Timetables. The following timetables and budgets are appropriate for 12 30-min episodes as per our commitment toward the NSF Career Award. Costs for similar programs may vary depending on resource availability and the project scope. We produced 4 of the 12 episodes in our first year of funding. In March and April, we gathered resources, made appropriate contacts, and planned for the initial episodes. In May, we completed the set design and production. Classrooms were visited in May and June. All field and studio taping were completed during the summer. Shows began airing in September. We anticipate completing 4 additional episodes per year over the next 2 years.

Budgetary concerns. While the costs of producing a television show may seem to be inconsistent with current budgetary constraints, we found the production costs to be reasonable. Many participants were willing to volunteer time and resources toward this endeavor. Since Desert Survivors is a subsidized university-affiliated program, television studio time and editing costs amounted to approximately $1,500/episode. Additional costs included the set design and production ($2,000), DVD copying and dissemination ($1,000), T-shirt printing ($500), and travel expenses.

Impacts and Implications

As previously discussed, the availability of scientific programming on television is a major mechanism for the edification of the average American family (5). Desert Survivors is primarily aimed at fifth-grade students. Currently, there are >25,000 fifth-grade students from 189 schools in our local district (1). Faculty visitation to all of these classrooms would be logistically difficult. However, with a total investment of 1 day’s time, faculty members have the potential to reach out to literally thousands of students. The widespread availability of the show via DVD format, streaming video, and cable access television may promote greater scientific literacy in other students, their families, and the greater community.

In addition to potentially impacting thousands of students during a critical period of educational development, participation in a program similar to Desert Survivors may have more immediate practical outcomes. Many faculty members rely on NSF funding. Increased attention has been levied at the Broader Impacts of grant proposals. An informal inquiry to one’s colleagues will usually result in some confusion as to what appropriate Broader Impacts might be. This confusion seems to be widespread as members of an NSF advisory committee recently showcased exemplary Broader Impacts in an attempt to clarify the breadth and scope of this criterion (3). Participation in and/or implementation of an activity similar to Desert Survivors provides a wonderful opportunity to satisfy Broader Impact requirements.

A major strength of Desert Survivors is that it provides a unifying platform for seemingly disparate groups including students, parents, teachers, school district personnel, university faculty members and colleagues, representatives from specialized community education programs (e.g., museum staff), and governmental agencies (e.g., the National Park Service). It has been our experience that these various groups enthusiastically support efforts to enhance science literacy via the Desert Survivors program.

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REFERENCES


