

**G**OODMAN RESEARCH GROUP, INC.  
Program Evaluation • Consultation • Market Research

# **New Earth Explorers: Front-End Evaluation Report**

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## INTRODUCTION

Goodman Research Group, Inc. (GRG), a research firm with offices in Cambridge, MA and Los Angeles, CA, that specializes in the evaluation of education programs, materials, and services, has contracted with the Earth Images Foundation to conduct front end evaluation for *New Earth Explorers*, a four-part science documentary series in production for PBS. The series will target prime time PBS viewers with an aim to present information about earth science and relevant current research in a way that is engaging and visually stimulating for viewers. Related outreach for high school students will be developed with the intent to increase STEM (science, technology, math, and engineering) learning, and promote an understanding and appreciation of the earth sciences as an interesting field and potential career option.

## FRONT END EVALUATION OBJECTIVES

In spring 2006, during Earth Images Foundation's Planning Grant project period, GRG conducted a national web survey of PBS viewers, science programming viewers, and high school educators. The goal of this needs assessment survey was to obtain, from a diverse group of respondents, baseline information about the knowledge of and interest in earth science and related research among the series target audience. This information, along with additional data about their viewing habits and information-seeking behaviors may then inform the development of the four programs as well as the associated outreach activities.

Specific evaluation objectives have included:

- Obtaining a detailed profile of the target audience's viewing patterns and methods for seeking information about current science research
- Testing the series producers' assumptions about the PBS audience's impressions of and attitudes toward earth science, including what it is, how interesting it is, and its impact on our daily lives
- Identifying factors that would motivate this audience to become more interested in learning more about the earth sciences and current research
- Describing high school teachers' impressions of their students' interest in and motivation to learn about earth science

The producers plan to employ a format by which they will tie earth science research to known cultural and historical sites, with the goal that viewers will be engaged by these attributes and will learn from watching scientists conduct their research. Therefore, the evaluation also obtained information about viewers' interest in history, travel, arts, and culture.

The Earth Images Foundation production team continues work on production and editing of the series. Once the series is produced, GRG plans to conduct additional formative evaluation of early versions of the product. The purpose of the further evaluation is to examine appeal and comprehension of the general series concept, program segments, and the programs in their entirety.

## METHODS

### RESEARCH DESIGN AND SAMPLE SELECTION

GRG's front end evaluation for *New Earth Explorers* consisted of a national web survey to assess the baseline knowledge and interests of the series' target audience. GRG recruited participants to complete this survey via its internal Participant Database. The database is a resource developed by the company with background information for over 1,000 people from around the United States who have expressed interest in participating in GRG studies.

So as to gauge the potential success the *New Earth Explorers* program has in reaching its target audience and in sustaining viewers' interest, GRG recruited a sample of respondents with similar television viewing habits as those of the intended audience. These respondents were referred to as "general viewers." In order to participate as a general viewer, respondents had to be regular viewers of one or more of the following:

- General PBS Shows
- PBS Science Shows
- General Science Shows
- PBS History Shows
- PBS Travel Shows

We also recruited a sample of high school teachers to participate in this research. Since the outreach materials will be developed for high school-aged students, GRG targeted high school teachers to obtain their impressions of students' knowledge of and interest in the topics to be featured in *New Earth Explorers*, as well as their students' potential interest in the series format and potential outreach activities.

### DATA COLLECTION

The front-end survey used for this study was posted online on March 23, 2006 and closed for data collection the week of April 16th, 2006. Participants were notified of the launch via e-mail, and were sent three email reminders to complete the survey by the third week in April. As of April 16th, 151 of the 200 general viewers initially recruited had responded to the survey, and 33 of the 35 high school teachers initially recruited had responded.

All respondents were asked to complete a general portion of the survey designed to assess various components of knowledge and interest about topics that may be featured in the *New Earth Explorers* program. Survey questions included:

- Demographic and background information
- Current television viewing habits including general viewing interests and specific viewing of programs related to science, travel, history,

and the arts (i.e., programs related to the *New Earth Explorers* content)

- Interest in various subjects in the field of science and interest in learning more about these areas
- Current resources used to keep informed of the latest advancements in science
- Attitudes about the earth sciences and interest in learning more
- Interest in viewing PBS programming about earth science and specifically, interest in the new series including its proposed content and format

After this general survey, those respondents who identified themselves as high school teachers were directed to an additional section of questions inquiring about their students' interest in various topics and television program ideas related to the earth sciences. Teachers were asked not only to rate students' general interest in these topics and program ideas, but also the motivational impact that certain activities might have on students' interest in the topics and programs. The intent of these questions was to obtain information about possible activities to include in outreach materials that would engage students' interest in learning about the earth sciences. See Appendix A for a copy of the web survey.

## RESULTS

This section contains all of the findings from the web survey, including the response rate and a profile of respondents, followed by:

- Viewing habits and interests
- Interest in science and information seeking behaviors
- Perceived science knowledge
- Understanding of earth science
- Examination of underlying series assumptions
- Interest in viewing *New Earth Explorers* as currently conceived

The section concludes with feedback from high school teachers about impressions of areas that interest students, and activities that would increase their interest in learning about earth science.

Where relevant, results were analyzed statistically for differences between groups (e.g., interest in earthquakes by region of the country) and for differences within groups (e.g., interest in science vs. interest in learning more about science, among those who answered both survey questions). Throughout this section, statistically significant differences at the  $p < .05$  level are reported. Otherwise, results reflect the average response from the entire sample of survey respondents.

## RESPONSE RATE

From GRG's database of potential study participants (described in the previous section), we invited 235 people to complete the survey (200 "general viewers" and 35 high school teachers.). After three reminders to non-respondents, a total

of 184 people responded, yielding a 78% response rate (76% for general viewers and 94% for high school teachers).

## PROFILE OF RESPONDENTS

Among the 184 respondents, most were women and were White. We recruited viewers of history, travel, and arts programming in addition to science programming; this may explain the overrepresentation of women. It may also suggest that women will be receptive to the new series, despite the focus on science which often appeals to a more male audience. Nearly all states were represented, with the highest portions of respondents from Georgia (13%), California (12%) and New York (12%). Appendix B lists all the states in which respondents reside, while Table 1 shows the regions represented.

Table 1  
Profile of Survey Respondents

	<b>% of Respondents (N=184)</b>
<b><i>Gender</i></b>	
Female	73%
Male	27%
<b><i>Race/Ethnicity<sup>a</sup></i></b>	
American Indian or Alaskan Native	2%
Asian	9%
Black or African-American	12%
Hispanic or Latino	7%
Native Hawaiian or Other Pacific Islander	1%
White	75%
<b><i>Region of Country<sup>b</sup></i></b>	
West	19%
Mid West	19%
Northeast	31%
South	31%

<sup>a</sup>Total percent exceeds 100% because respondents selected multiple race/ethnicity categories.

<sup>b</sup>General regions used by the US Census Bureau

*Based on respondents' descriptions of their interests, it seems that the target audience would respond well to the New Earth Explorers series.*

Asked to describe themselves further, nearly half of the respondents reported they were travel enthusiasts and/or science enthusiasts, while few were actual scientists or historians. As shown in Table 2, just over one third (36%) described themselves as history enthusiasts, while just over one quarter (27%) said they were art enthusiasts. These descriptions are to be expected based on the viewers recruited for the survey. They represent groups who would be targeted by the *New Earth Explorers* series, and their self-described interests suggest they would respond well to the content and format of the series.

Table 2  
Respondents' Self-Descriptions

	<b>% of Respondents (N=184)</b>
Travel enthusiast	49%
Parent	46%
Science enthusiast	41%
History enthusiast	36%
Art enthusiast	27%
Student	19%
Educator	26%
Artist	15%
Researcher	9%
Professional	9%
Scientist	4%
Historian	4%

Among all respondents, 18% were high school teachers. This group (N=33) responded to an additional set of questions focused on their perceptions of high school students' knowledge and interests. Their responses are presented in a later section in order to help inform the development of outreach activities that will engage students and increase their interest in learning more about earth science and related research.

## VIEWING HABITS AND INTERESTS

As described earlier, respondents were recruited based on the fact that they reported regularly viewing general PBS programming, specific PBS science, history, or travel programs, or general science programs. In order to acquire a more detailed understanding of their typical viewing habits, we asked respondents to list up to five television programs they view nearly every time the program is on. Nearly all respondents listed at least three programs they watch regularly, 80% listed four programs and 75% listed five.

Programs were coded into several genres. Most commonly listed programs were dramas (between one third and one half each of respondents), reality programs (16% of respondents), and sitcoms (around 10% of respondents). Less than one in ten listed news programs (around 9% each) and informational science-related programs such as "NOVA" or "anything on the Discovery Channel (8% of respondents)"

Respondents rated the frequency with which they watch several types of programs on a six-point scale of *Never*, *4-6 times a year*, *once a month*, *2-3 times a month*, *once a week*, or *more than once a week*. As shown in Table 3, programs watched most often included news programs, sitcoms, and dramatic programs. Reality programs and children's programs reflected the most variation; one in five respondents reported watching *more than once a week* and one in five respondents *never* watch these types of programming.

*Dramatic programming is the genre watched by the most respondents.*



Current viewing habits suggest the target audience would be receptive to this type of series if broadcast on a regular weekly to monthly basis.

Around three quarters of all respondents watch: documentaries, science, history, arts and culture, and travel programs *at least once a month*; around half each watch this programming *2-3 times a week* or more. This suggests viewers in the target audience would be open to viewing the *New Earth Explorers* programs (produced to incorporate many of these program elements) and particularly if broadcast frequency was from once a week to once a month.

Table 3  
Frequency of Viewing Types of Programming

	Never	4-6 times a year	Once a month	2-3 times a week	Once a week	> once a week
News programs	1%	3%	3%	40%	9%	45%
Sitcoms	7%	8%	7%	33%	20%	27%
Dramatic programs	4%	11%	8%	33%	19%	25%
Reality programs	21%	8%	12%	20%	19%	21%
Children's programs	20%	26%	10%	17%	8%	19%
Science programs	5%	14%	25%	20%	22%	15%
History programs	4%	18%	19%	26%	21%	13%
Documentaries	1%	16%	28%	20%	23%	12%
Arts and culture programs	4%	18%	24%	23%	20%	11%
Travel programs	8%	18%	29%	17%	17%	10%

As shown in Table 4, in the past month, respondents had watched The Discovery Channel and The History Channel most often. The frequency with which respondents had watched science, history, and travel-related programs in the past month was positively correlated with how frequently they *typically* watch science programs, history programs, documentaries, arts and cultural programs, and travel programs. Again, this suggests a pattern of viewing and interests that correspond with the intended format of the *New Earth Explorers* series.

Table 4  
Frequency of Watching Science, History, and Travel Programs in the Past Month

	None	Once	2-3 times	4-5 times	More than 5 times
Discovery Channel programs	14%	12%	25%	18%	32%
History Channel programs	15%	22%	28%	12%	23%
Travel Channel programs	23%	20%	28%	10%	19%
National Geographic	24%	22%	23%	14%	17%
NOVA	32%	22%	22%	10%	15%
PBS travel programs	22%	28%	26%	10%	14%
Nature	29%	25%	25%	9%	12%
Scientific American Frontiers	52%	20%	16%	5%	7%



## SCIENCE INTEREST AND INFORMATION SEEKING

Respondents rated, on a scale from 1 (*Not at all*) to 5 (*Extremely*) their interest in several areas of science as well as their interest in learning more about each of those areas. As shown in Table 5, respondents indicated interest in most areas, particularly *science in general* and *scientific research*. The majority assigned ratings above the midpoint of the 5-point scale for each subject. Additionally, for all but Biology, respondents expressed significantly higher interest in learning more about each area. In other words, the more respondents were interested in a particular area, the more interested they were in learning more about that area.

Table 5  
Interest in Areas of Science and Research

	Mean Interest (Scale: 1-5)	
	Interest in the topic	Interest in learning more
Science in general	3.95	4.13
Scientific research	3.94	4.12
Earth Science	3.76	3.88
Biology	3.69	3.78
Physics	3.15	3.35
Engineering	3.06	3.22
Chemistry	2.95	3.17

N=184

Respondents selected from a list of resources those that they had used in the past year to keep informed about current scientific research. Next, they indicated the one resource, from that list, that they rely on the most for information on the latest advancements in science. As shown in Table 6, resources used by at least three quarters of respondents were national and local news on TV and science programming on TV. At least half of respondents also used print and radio news sources in the past year.

*Respondents already tend to rely on television sources for news and information about new advancements in science.*

Table 6  
Resources to Keep Informed about Current Scientific Research

	% of Respondents (N=184)
National news broadcast on TV	84%
Local news broadcast on TV	74%
Science programming on TV	74%
An online news source	70%
Regional/local newspaper	58%
Public radio news	52%
National newspaper	52%
Science-based Web sites	47%
Commercial radio news	26%
Academic journals	22%
Weekly newspaper science pieces such as The Science Times	20%
Science programming on the radio	18%
Other	7%
None of the above	<1%

“Other” resources listed included:

- Magazines (e.g., *National Geographic*)
- Conferences
- Other web sites/web searches

There was no clear standout as the one resource respondents rely upon the most to get the latest information. Between 10% and 20% each listed:

- Science programming on TV (18%)
- Online news sources (17%)
- National news broadcast on TV (15%)
- Science-based web sites (12%)
- Local news broadcast on TV (10%)

*Respondents turn to various and multiple sources for science related information and current research.*

This suggests that respondents are accustomed to relying on various and multiple sources for science related information and current research.

As an additional measure of science-related information seeking behavior, respondents reported how many times in the past six months they had visited a science museum or science center, and how often they had attended a science lecture or presentation. Consistent with the findings reported above – that the majority acquire science-related information from media sources – neither of these activities was conducted with much frequency by respondents. As shown in Table 7, more than half of the respondents had not visited a science center at all or had done so once in the past six months; half had not attended a science lecture or presentation in the past six months.

Table 7  
Science-related Information Seeking Behaviors in the Past Six Months

	Never	Once	2-3 times	4-5 times	>5 times
Visited a science museum or science center	20%	41%	25%	10%	4%
Attended a science lecture or presentation	50%	29%	10%	4%	6%

## PERCEPTIONS OF OWN SCIENCE KNOWLEDGE

Several questions were included to assess respondents' perceptions of their own knowledge and interests related to science in general, and earth science in particular. In comparison to others they know, just under half of the respondents considered themselves *more* interested in science, and *more* knowledgeable about the latest developments in science. See Table 8.

Table 8  
Interest and Knowledge Compared to Others

Compared to people you know:	Much less	Less	Same	More	Much more
How interested are you in science?	<1%	5%	24%	45%	25%
How knowledgeable are you about the latest developments in science?	2%	9%	26%	49%	15%

Regarding their own knowledge of current scientific research in general, respondents rated themselves at about the middle of the 5-point scale provided:

- I don't know very much at all 5%
- I know a little bit 30%
- I know a fair amount 45%
- I know a lot 19%
- I consider myself an expert 1%

Regarding knowledge of earth science in particular, ratings were a bit lower:

- I don't know very much at all 9%
- I know a little bit 46%
- I know a fair amount 34%
- I know a lot 11%
- I consider myself an expert 0%

*As the series producers expected, these PBS viewers represent a group of people particularly interested in advancing their science knowledge.*

## KNOWLEDGE ABOUT EARTH SCIENCE

In an open-ended format, respondents described what they think of when they hear the term “Earth Science.” Most listed more than one answer. Responses were coded for common themes and grouped generally into three categories: 1) The study of a particular area or areas of a science 2) General study of the earth, and 3) Reference to a course taken middle school, high school or college. Table 9 shows the percentage of responses per category; some representative quotes follow the table. See Appendix C for the full list of responses.

Table 9  
What Respondents Think of as “Earth Science”

	% of responses (N=283)
The study of...	
1) geology	22%
2) ecology/environmentalism	16%
3) climatology	13%
4) natural phenomena/disasters	9%
5) astronomy/meteorology	6%
6) oceanography	3%
7) geography	3%
8) biology	2%
9) paleontology	1%
10) physics	<1%
General study of the earth	21%
It reminds me of school (middle, high, college)	3%

Following are some representative descriptions of what they think of when they hear the term ‘earth science’:

- *I think of geology, evolution, rocks and sediments.*
- *When I hear "Earth Science," I think of geology, seismology, and plate tectonics.*
- *Geology and/or environmental science*
- *When I see or hear the term Earth Science, I think about landforms, nature, weather patterns, the layers of the Earth, natural resources and rocks*
- *Geology, Rainforests, Environmental Science, Volcanoes, Oceans, Glaciers... Big Things*
- *Geology, ecology, biology, meteorology, oceanography, hydrology, paleontology*
- *Anything to do with the earth and how it works*
- *Factual knowledge about all aspects of our planet*
- *Science about the Earth*
- *The study of our planet in order to understand it better*
- *I think of ninth grade Earth Science class when we studied rocks.*

*Respondents' descriptions of earth science encompassed many different fields of science.*

Respondents also listed one piece of news about earth science they had heard about recently. Fewer than 2 in 10 (16%) did not list anything. Of the remaining

respondents (N=145), a few listed more than one piece of news. Responses were coded according to common themes and are presented in Table 10. The table is followed by representative quotes from each topic mentioned.

Table 10  
Recent News about Earth Science

Topics	Percent of Responses (N=145)
Global Warming	43%
Natural Phenomena	25%
Pollution/Environment	8%
Space/Astronomy	8%
Weather-related	6%
Earth-related	4%

#### Global Warming

- *Global Warming in the Artic*
- *I recently heard about the polar melt-down taking place, and how the earth is significantly warmer today than it has been in the past few years.*
- *Because of global warming, the ice in the polar regions is melting at faster rates than scientists expected.*
- *Science Friday (NPR). The rising ocean temperatures*

#### Natural Phenomena

- *A recent cyclone of the northern tip of Australia and its devastation*
- *Flooding and erosion in Hawaii.*
- *Large population disasters due to shifts in housing patterns i.e., from inland to coastal areas (tsunami) or to areas prone to mudslide.*
- *Latest article in National Scientific Magazine about earthquake predictions along fault lines*

#### Pollution/Environment

- *Rock mining in the Everglades is posing a threat to the public water supply in Miami-Dade County.*
- *Pink snow fell in Russia early this week. Local meteorology experts blame it on dust particles blown from the Mongolian desert. Yellow snow on the island of Sakhalin was blamed on industrial pollution.*

#### Space/Astronomy

- *Possibility of building dwellings on the moon.*
- *Solar eclipse in Turkey*

#### Weather-Related

- *Weather in the famed "Bermuda Triangle" is highly dependent upon the Gulf Stream*

#### Earth-Related

- *The MSU earth science database*

- *Something about hot springs*

## EXAMINATION OF SERIES ASSUMPTIONS

The series producers shared with GRG some of their underlying assumptions about the target audience’s understanding of and attitudes toward earth science. In order to examine the accuracy those assumptions, GRG asked respondents to rate their agreement with a series of statements about earth science. They used a scale from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

*Respondents’ attitudes about earth science and their interest in learning more suggest receptivity to the new series.*

As shown in Table 11, respondents agreed strongly with several statements regarding the relevance of earth science to our lives and our future. They also agreed that earth science research uses high technology and can be exciting and cutting edge. Fewer respondents agreed with statements depicting earth science research as a more rudimentary field (i.e., primarily extracting resources from the earth) and about there being nothing new to learn about how the earth works.

Many of these attitudes reflect a more positive attitude about earth science and related research than the producers had expected. This information, along with their reported interest in the topic, and particularly interest in learning more about earth science, suggests they would be interested in the kind of information to be conveyed via the *New Earth Explorers* series.

Table 11  
Attitudes toward Earth Science

	<b>Mean Agreement (Scale: 1-5)</b>
There is much to learn from earth science research.	4.61
Earth science research may affect our future.	4.57
Earth processes are closely related to human progress.	4.25
Earth science research employs high technology.	4.22
Earth science is relevant to most people's daily lives.	4.21
Earth science research is exciting.	3.97
Earth science research is current and cutting-edge.	3.86
With the right training, anyone can conduct earth science research.	3.34
Men conduct most of the research about the Earth's processes.	3.33
Earth science research is interesting to the average person.	3.27
Earth science research primarily involves extracting resources from the earth.	2.92
Scientists know nearly all there is to know about how the earth works.	2.25

N=183

## INTEREST IN VIEWING NEW EARTH EXPLORERS

In order for us to gauge potential interest in the series under development, respondents rated their interest in viewing PBS programming about several topics that will likely be featured in the four-part series. Using a scale from 1 (*Not at all*) to 5 (*Extremely*), respondents indicated that they were interested in all of the topics listed (ratings were all above 3 out of a possible 5).

As shown in Tables 12 and 13, topics that received particularly high ratings were global warming, processes that cause earthquakes, cause of volcanoes, and well-known archaeological sites. Basic scientific research received the lowest interest rating; however the average rating was 3.8 out of 5, reflecting more than moderate interest.

Table 12  
Interest in Watching PBS Programming about Various Topics

	<b>Mean Interest (Scale: 1-5)</b>
Global warming	4.23
Processes that cause earthquakes	4.17
Causes of volcanoes	4.03
Processes that cause tectonic plate movement	3.96
How continents were formed	3.94
The age of the Earth	3.93
Processes that cause mountain building	3.90
Processes that cause erosion	3.88
Earth science research	3.84
Basic scientific research	3.80

N=184

None of the differences in interest for the various locations were significantly different from one another. The producers would not go wrong with any of their planned combinations of locations within each program.

Table 13  
Interest in Watching PBS Programming Featuring Various Sites

	<b>Mean Interest (Scale: 1-5)</b>
Well-known archaeological sites	4.01
Hawaii: past and present	3.99
Italy: past and present	3.96
Africa: past and present	3.93
The San Andreas Fault	3.90
Ancient Greece	3.86
India: past and present	3.84
Classic Maya civilization	3.83

N=184



*The integration of scientific research with historical context and known locations will increase potential viewers' interest.*

Next, respondents indicated whether and how the inclusion of various program elements would affect their interest in watching a program about a scientific discipline about which they knew very little. Respondents selected either: *I'd be MORE interested in watching*, *I'd be LESS interested in watching*, or *It wouldn't affect my interest*. As shown in Table 14, items related to the intended format of this new series (i.e., presenting science research in an historical context and/or well-known location), were selected by most as likely to increase their interest in viewing. The inclusion of historical sites or landmarks, while showing research conducted in countries they would like to visit or have visited, would increase nearly all respondents' interest in watching.

Very few items would make viewers less interested in watching. The presentation of famous people conducting scientific research and technical details about methods of data collection would appeal to some, but not to others. The data do not support the complete exclusion of these aspects of the program.

Table 14  
Elements that may Affect Viewing Interest

	<b>I'd be MORE Interested in watching</b>	<b>I'd be LESS interested in watching</b>	<b>I wouldn't affect my interest</b>
Historical sites or landmarks that you've read or learned about	84%	2%	15%
Research conducted in countries you would like to visit	83%	3%	14%
Research conducted in countries you have visited	79%	2%	19%
Historical sites or landmarks that you recognize	78%	1%	21%
Cultural artifacts that you recognize (such as paintings or sculptures)	75%	3%	22%
Famous archaeological sites	72%	4%	25%
Beautiful landscapes	71%	3%	26%
Different groups of scientists competing to solve the same research question	66%	5%	29%
Famous works of art	63%	6%	31%
Scientists from different countries working together	57%	4%	40%
Background information about the people conducting the research	48%	9%	43%
Male and female scientists working together	43%	0%	57%
Famous people conducting scientific research	39%	10%	51%
Technical details about methods of data collection	38%	26%	37%

N=184

After they rated their interest in the various elements that may be featured in the new series, respondents were provided with a definition of Earth Science: “All sciences related to the study of the Earth, including geology, meteorology, and oceanography.” They rated their interest in learning about Earth Science, as defined, on a scale of 1 (*Not at all interested*) to 5 (*Extremely interested*). The average rating of 3.84 was similar to that provided earlier (3.88) before this definition was presented.

Next, respondents read a brief description of the new series and rated their interest in watching on a scale from 1 (*Not at all interested*) to 5 (*Extremely interested*). The following description was presented to them:

“The new PBS 4-program series will feature scientists conducting earth science research in famous cultural and historical sites. The scientists’ theories and plans for solving real-life geologic problems will be woven into the storyline, which is structured as a mystery that the scientists attempt to solve. Scientists from various countries will be shown working together with American scientists, including women and men from various racial and ethnic backgrounds.”

The average rating was 3.97, reflecting a strong interest in watching the new series.

## HIGH SCHOOL TEACHERS' FEEDBACK

Those respondents who identified themselves as high school teachers were directed to an additional set of questions designed to obtain a sense, from their perspective, of students' knowledge and interest in earth science and related research, and about topics and activities that might motivate or increase student interest.

### Teaching Background and Experience

On average, teachers had been teaching for 10 years, ranging from 2 to 33 years. Just over half (19 of the 33) were science teachers. They had been teaching science for 10 years on average. Most teachers had either a Master's Degree (39%) or a Bachelors (39%); 15% had a doctorate or other post-graduate degree (See Table 15).

Table 15  
Highest Level of Education Completed

	<b>% of teachers (N-33)</b>
Some high school	0%
High school diploma or GED	0%
Some college/trade school	3%
Associates 2 year college degree	3%
Bachelors 4 year college degree	39%
Masters degree	39%
Doctorate/other post graduate	15%

All but two teachers reported teaching high school students only. Five teachers (15%) taught both middle and high school students, one teacher taught graduate level students and one taught graduate level and adult learners – both in addition to high school students. As shown in Table 16, most taught 10<sup>th</sup> grade, and taught either Biology or General Science. Teachers reported spending an average of 84 hours teaching about Earth Science in a typical year (range = 0 to 725 hours in a year).

Table 16  
Individual Grades and Courses Taught

	% of teachers (N=33)
<b>Grades</b>	
6 <sup>th</sup> grade	12%
7 <sup>th</sup> grade	18%
8 <sup>th</sup> grade	15%
9 <sup>th</sup> grade	55%
10 <sup>th</sup> grade	70%
11 <sup>th</sup> grade	58%
12 <sup>th</sup> grade	58%
College level	0%
Graduate level	6%
Adult learners	3%
<b>Courses</b>	
Biology	19%
General science	15%
Physics	13%
History	13%
Earth/Environmental Science	9%
Math	6%
All subjects	4%
English	4%
Chemistry	4%
Art/Music	4%
Other	9%

*Teachers had been teaching for 10 years on average and they expressed a confidence in reporting on their high school students' interests.*

### Perceived Student Interest

Teachers rated how interested they believed their students to be in several areas of science, as well as topics and locations that may be featured in the new series. They used a scale of 1 (*Not at all interested*) to 5 (*Extremely interested*). Teachers were also given the opportunity to indicate if they were unsure and did not feel able to rate student interest. None of the teachers used this option, suggesting they felt confident in reporting on their students' interests.

As shown in Table 17, teachers projected higher interest in Earth Science, Science in general, and Biology, and lower interest in Math and Art History.

Table 17  
Teacher-Reported Student Interest in Subject Areas

	<b>Mean Interest (Scale: 1-5)</b>
Earth Science	3.82
Science in general	3.64
Biology	3.63
Archaeology	3.36
Engineering	3.24
Physics	3.03
Math	3.00
Art history	2.97

N=32

Teachers reported students had higher interest in volcanoes, causes of earthquakes, and global warming, and lower interest in causes of mountain building and erosion (See Table 18).

Table 18  
Teacher-Reported Student Interest in Topics

	<b>Mean Interest (Scale: 1-5)</b>
Volcanoes	4.00
Causes of earthquakes	3.90
Global Warming	3.87
The San Andreas Fault	3.69
Tectonic plate movement	3.42
The formation of continents	3.31
The age of the Earth	3.31
Causes of mountain building	3.13
Causes of erosion	3.00

N=32

High school teachers who live in the Midwest assigned ratings indicating their students would have lower interest in the following items than did teacher in the South:

- Causes of erosion
- Ancient Greece
- India: past and present
- Africa: past and present

It would be worth exploring further to determine why this regional difference appears, and whether it is revealed by students themselves, as well.

Regarding locations and sites that may be featured in the series, teachers reported student interest was higher in Hawaii: past and present, and lower in Italy: past and present. (See Table 19.)

Table 19  
Teacher-Reported Student Interest in Locations

	<b>Mean Interest (Scale: 1-5)</b>
Hawaii: past and present	3.56
Ancient Greece	3.26
Africa: past and present	3.19
Classic Maya civilization	3.06
India: past and present	3.00
Italy: past and present	2.97

Next, teachers rated the extent to which several activities might motivate students' interest in a scientific discipline about which they knew very little, on a scale from 1 (*Not at all*) to 5 (*A great deal*). The top three activities were participating in a field trip, watching a popular movie about the topic, and conducting their own research about the topic. Teachers reported that watching a documentary about the topic would not be as effective in motivating student interest (See Table 20). This suggests, as the producers expected, that students may not be as interested watching in the full programs, but may respond well to the related outreach activities. Educational outreach materials often include clips from documentaries in their lessons. This inclusion would be worth exploring in future research.

Table 20  
Extent to Which Activities Would Motivate Interest

	Mean (Scale)
Participating in a field trip	4.39
Watching a popular movie about the topic	4.09
Conducting their own research about the topic	3.82
Guest lecturers in the classroom	3.76
Using an interactive web site about the topic	3.73
Participating in live online chats with scientists	3.67
Watching a program with actual scientists conducting research about the topic	3.58
Watching a documentary about the topic	3.39

Teachers also rated the extent to which several experiences might motivate students' interest in earth science research, on a scale of 1 (*Not at all*) to 5 (*A great deal*). As shown in Table 21, most experiences were rated quite strongly, particularly those that had to do with volcanoes or earthquakes. Again, teachers reported that student interest would be less motivated by watching a documentary about earth processes.

Table 21  
Teacher-Reported Experiences that Would Motivate Students

	<b>Mean (Scale: 1-5)</b>
Living near the site of a volcano or recent earthquake	4.58
Participating in a virtual field trip to a volcano or earthquake site	4.15
Knowing someone who lives near a volcano or recent earthquake	4.03
Watching a popular movie about earth processes	3.91
Conducting their own earth science research	3.76
Using an interactive web site about earth science research	3.73
Having guest geologists in the classroom	3.67
Participating in live online chats with geologists currently conducting earth science research	3.42
Watching a documentary about earth processes	3.12

## SUMMARY

Among general viewers who match the target audience for the *New Earth Explorers* series, there is a clear connection between the programs they currently view and types of programming that will be featured in the new series. Respondents watch, on a fairly regular basis, programming about science, history, and travel. All of these elements will be integrated into the four episodes. Additionally, respondents expressed interest in learning more about the science topics and about earth science research.

Respondents' impressions of earth science were more positive and accurate in some ways (e.g., recognizing that earth science research is ongoing and uses high technology) than the producers expected. Beyond that, respondents expressed interest in viewing programming about this type of research as well programs that featured the various elements planned for this series. The topics and locations proposed were rated as ones that would increase interest in watching. And provided with a specific definition of earth science and a description of the four-part series, respondents expressed interest in learning more and in watching the programs.

High school teachers who reported on their impression of students' interests reported that students are interested in learning more about earth science, and that they would be particularly interested in topics around natural phenomena. Student interest may be strengthened further by participating in field trips, conducting their own research, having a guest lecturer in the classroom, and using an interactive web site; all elements to be considered for the outreach materials.



## CONCLUSIONS AND RECOMMENDATIONS

Based on the findings presented throughout this report, the evaluators draw the following conclusions and recommendations for the producers of *New Earth Explorers*.

**PBS and general science viewers expressed they are open to learning more about earth science research, an area seen as ongoing, useful, and relevant to their daily lives. In addition, they are interested in learning more about the field. Producers appear to be on the right track with their intended target audience.**

**GRG recommends the producers continue as planned to target PBS viewers, including in that audience viewers of PBS science, history, and travel programming, as well as those interested in general science programming (not necessarily on PBS).** The survey respondents were accustomed to viewing these types of programming often for the purpose of obtaining information about advances in science.

**Those in the target audience were aware of current events related to earth science, and were most attuned to topics around global warming and natural disasters. They also expressed interest in learning more about such phenomena.**

**GRG recommends the producers focus the programs on those topics that are relevant to today's current events.** Viewers may be searching for answers to questions or concerns they have about the current state of the earth. This can be seen as a niche the new series can effectively fill.

**Some of the proposed elements of the series will reportedly increase viewers' interest in watching. In particular, location and historical landmarks are perceived as engaging, more so than the background or status of the scientists and researchers featured.**

**GRG recommends additional research to determine areas of the country that would most likely draw in viewers.** For example, Hawaii, Italy, and Africa were appealing to general viewers; Italy was not considered to be as strong a pull for high school students. The producers may choose to lead with spots considered more popular and appealing and move gradually to less well known areas and topics such as classic Maya civilization.

**High school teachers believe their students would be interested in learning more about earth science, particularly with some hands-on interactive experiences and ties to current events such as earthquakes and global warming.**

**GRG recommends the producers include opportunities for students to feel a part of the research, either by meeting someone affected by natural phenomena, or someone directly involved with current research.** Students will respond well to opportunities for them to participate in cutting

edge research that they can relate to their own experiences or to experiences of people they know.

As the producers move forward with series and outreach production, GRG will continue to work with them to obtain feedback from the target audience on appeal and interest in the programs, and expected outcomes of the associated outreach.