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Summative Evaluation
Teachers' Domain: Physical Science
A Web Site Containing a Digital Library/Repository
of Contextualized Teaching and Learning resources

Report for

WGBH Boston
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by
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September 24, 2004

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Executive Summary
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PROJECT DESCRIPTION – The summative evaluation reported here focuses on a digital library/repository of contextualized teaching and learning resources, collectively titled *Teachers' Domain: Physical Science*, that K-12 teachers can access via a Web site easily and productively for their own professional development, as well as to enrich classroom activities with students.

EVALUATION GOALS – The general goals for this summative evaluation study are twofold. One goal is to inform our understanding about the impact that use of project support materials (e.g., lesson plans) has on teaching. Consequently, research efforts were made to assess teachers' use of the site and changes in their instructional strategies, if any, as the result of having the project support materials available for lesson planning and instruction. A second goal is to determine the impact of the *Teachers' Domain: Physical Science* features and resource material on student learning of science as described in the National Science Education Standards in the areas of physical science content and process. Toward these ends, both descriptive and explanatory findings are reported. The researcher looked for patterns in the quantitative and qualitative data to explain the effective and ineffective aspects of the Web site. Credibility of findings were established through triangulation of methods. Communication between the evaluator and project staff took place at the outset of research in order to review developments and agree upon specific evaluation issues.

EVALUATION DESIGN – Summative evaluation research involved placing *Teachers' Domain: Physical Science* in its designated Internet context with appropriate high school, middle school, and elementary school level target groups to discern the usability of the Web site and the impact its use has on its intended educator and student audiences. The purpose for this evaluation effort is to examine the effectiveness of the Web site under normal use conditions with the intention of implementing changes to the project that will better serve the teaching and learning needs of its users. Toward this end, evaluation activities were performed over the course of one school term (beginning January, 2004) to obtain both a depth and breadth of information about *Teachers' Domain: Physical Science* implementation. Evaluation efforts included naturalistic studies that were carried out in schools located in different geographical settings. Pre- and post-use questionnaires were administered to assess teachers' use of the site and changes in their instructional strategies as the result of using these resources. Research efforts were also made to assess the Web site's usability and changes in students' interests, attitudes, and knowledge regarding physical sciences (specifically, properties of objects and matter, sinking and floating, air is matter, heat, gravity, describing motion, pushing and pulling objects, and sound) as a consequence of using the Web site and its resources.

DEMOGRAPHICS – Two high schools participated in this evaluation: Searsport, District High School (Orland, ME) and Sarasota High School (Sarasota, FL). Four middle school classrooms located in Hyde Park, MA, Maynard, MA, Keene, NH, and Waynesboro, GA also participated. In addition, two elementary school classrooms located in Brookline, MA and Hamilton, OH were also research participants. The high schools provided a total of 2 teachers and 119 students (59 male, 60 female). The middle schools provided a total of 4 teachers and 325 students (167 male, 158 female). The elementary schools provided a total of 2 teachers and 39 students (17 male, 22 female). Only data from students who completed both the pre- and post-use questionnaires were analyzed. Consequently, findings presented in this report reflect feedback received from a total of 8 teachers and 483 students (243 male, 240 female).

SUMMARY OF RESULTS – The findings summarized below reflect teachers' and students' responses to written questionnaires. The report contains additional finer-grained findings and respondents actual written feedback.

<p style="text-align:center">**High School Results**</p>
<p style="text-align:center">Student Feedback</p>

Background Variables. Prior to use of the *Teachers' Domain: Physical Science* Web site 70.6% of the high school students who participated in this study describe their ability to use a computer as being either "advanced" or "above average." Similarly, 73.1% of the students indicated that they have either "advanced" or "above average" experience with exploring the Internet.

Expectations. Prior to using the site 107 of the 119 students in the high school sample described the things they would like to see or do when they visit a Web site that contains information about physical science. Their broad ranging written responses to this inquiry are presented in the report unsorted to convey the large variety of expectations.

Ways Students Used Teachers' Domain. High school students indicated that they used information contained on the Web site primarily for completing class assignments, preparing for exams, and enhancing learning. Their often overlapping remarks are again presented unsorted to convey the full nature of their thoughts.

Overall Rating of Web Site. After using the Web site over the course of one school term, high school students gave the site an overall rating of 4.21 rating on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good) with 93.3% of the sample rating the site as either "Very Good" or "Good." When asked what word best describes *Teachers' Domain: Physical Science*, 28.6% of the participating high school students described it as "Educational/Informative," 23.5% described it as "Interesting," and 16.0% described it as "Helpful/Useful."

Learning Outcomes. Both the pre-use and post-use student surveys included a knowledge test to assess understanding of content associated with the *Teachers' Domain: Physical Science* use goals. Toward this end, students were asked to provide responses to a combination of 12 open-ended and multiple-choice content questions drawn directly from questions contained on the Web site. Correct answers received one point. Thus, there is a total of 12 points possible for each survey. The criteria for question selection was based upon (1) relevance of their content to standard physical science learning objectives and (2) correspondence with Web site content.

The post-use mean achievement score for the high school sample is 8.25, significantly higher than the pre-use mean score of 4.95, as tested by a paired t-test. Thus, the learning outcomes resulting from high school students' use of *Teachers' Domain: Physical Science* is statistically significant.

Rating Informative Value. Moving from learning outcomes to subjective assessment of the site, when high school students were asked to indicate how informative they think the Web site is, 93.3% rated it as either "Very Informative" or "Moderately Informative." Another 6.7% of the sample rated its informative value as "Okay." None of the students perceived the site to be either "Slightly Informative" or "Not Informative."

Overall Appearance. When asked to rate the overall look of the Web site, 68.1% of the high school sample rated it as either "Very Attractive" or "Attractive" and 29.3% rated it as "Somewhat Attractive."

Overall Readability. Asked to rate the overall readability of text contained on the Web site, 95.8% of the high school sample rated its readability as either "Very easy to read" or "Easy to read."

Rating the Homepage. When high school students were asked to rate the Web site's homepage, 64.7% of the respondents rated its appeal as either "Very Inviting to read" or "Inviting." Another 30.3% rated it as "Somewhat Inviting." As a follow-up question, when students were asked if the homepage gives them a good sense of the content on the site 68.1%

responded by specifying that it gives either a "very good sense" or "good sense" of the site's content. A little over a quarter of the students (29.4%) reported that the homepage gives an "okay sense" of the site's content.

Changes of Interest in Related Topics. Both prior to and after using the Web site, high school students were asked to rate their interest level in learning about the eight physical science topics specified below.

- Properties of Objects and Materials
- Sinking and Floating
- Air Is Matter
- Heat
- Gravity
- Describing Motion
- Pushing and Pulling Objects
- Sound

On average, the students' ratings of interest in each of these topics increased over the course of the study. When asked directly if their use of the site had increased their interest in physical science, 71.4% of the high school sample reported that it had.

Navigation and Finding Information. When asked if they experienced any problem(s) navigating/moving around in the Web site, 83.2% of the high school sample reported having no difficulty. Some of the other students did not report having any navigation problem, but did comment that they experienced technical difficulties at the school that resulted in slow Internet access to Web site. Four students indicated that use of the links was problematic.

Asked to specify how easy or difficult it was for them to find information they were looking for on the site, 57.1% of the high school sample reported that information was "easy" to find. Another 41.2% thought that it "took a little searching" to find what they were looking for. Probing further, when students were asked to specify what, if anything, they looked for on the site but were unable to find, 34.5% indicated that there was "nothing" on the site that they looked for but were unable to find. Another 46.2% concluded that they were unable to locate specific information because it is not available on the site. An additional 19.3% reported that it was hard to find what they were looking for so they gave up.

What Students Like Most. High school students were asked to specify what they like most about the Web site. Watching video clips and learning/useful information were foremost in their thoughts. Their frequently overlapping comments are presented in the report unsorted to convey the full range of their thinking.

What Students Like Least. Students were asked to specify what they like least about *Teachers' Domain: Physical Science*. Responses were sorted into the categories that emerged from a review of students' comments. For example, a total of 12 students simply wrote the word "nothing" to indicate there is nothing about the site that they didn't like. This is corroborated by eight similar but more descriptive remarks. Students' actual remarks are included in the report, from which it can be discerned that "Technical challenges" bothered 11.8% of the respondents to this inquiry and 10.9% indicated that "difficulty navigating and finding information" are the aspects they liked least about the Web site. Another 10.0% disliked "the login process" and 9.1% think there is "too much information," reflecting a desire for shorter readings and videos.

Did Students Print Pages? When asked if they had printed any pages contained on the Web site, 17.7% of the high school sample reported that they had. In contrast, 82.3% said that they hadn't.

What's Confusing or Too Challenging. Asked to describe anything about the Web site that they think is confusing or too challenging, 33.3% of the high school respondents simply wrote the words "Nothing" or "None." Another 18.8% offered similarly positive but more descriptive comments. In contrast, 47.9% of the sample offered broad ranging remarks contained in the report describing what they found confusing or too challenging about the Web site.

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, 59.7% of the respondents simply wrote words such as "Nothing" or "None," and 27.8% offered similarly positive but more descriptive remarks. In contrast, eight students offered comments contained in the report questioning information contained on the Web site.

Comparison With Other Web Sites. When high school students were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, 25.2% rated it as "Very Good." Another 4.2% rated the site as "Good" and 19.3% rated it as "Average." Approximately half (51.3%) rated it as "Poor" and nobody gave it a "Very Poor" rating. These bipolar results suggest that students did not constrain their comparison to "educational" Web sites.

Rating Features. To help determine which components were most useful to students, the high school sample was asked to rate the following *Teachers' Domain: Physical Science* features and resources:

Features	*Resource*
Lesson Plans	Videos
Resource Highlights	Still Images
Background Information	Documents
Questions for Discussion	Interactive Activities
Related Links	Audio Resources
Search	
Help	
Resource Bins	

On average, these components of the Web site received ratings between 3.6 and 4.7 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). The 4 features/resources that were most appreciated by the students are *Videos*, *Interactive Activities*, *Still Images*, and *Audio Resources*. All of the other features and resources were also very well rated.

Probing for information about the usability of the site's previously specified features and resources, when high school students were asked if the its features and resources perform the way they expect them to, 95.8% of the high school sample reported that they do.

Students' Suggestions for Improving the Site. When asked what suggestions they have for improving *Teachers' Domain: Physical Science*, 14.6% of the high school respondents simply wrote the word "None" or "Nothing," suggesting that they may think the site is fine as-is. Another 8.2% responded with similarly positive but more descriptive remarks. An additional 77.2% students offered the suggestions which fell within the following categories (Note that numbers in parenthesis indicate the number of responses that fall within each category):

- Make Site More Attractive/Inviting (18)
- Include More Videos/Movies (11)
- Information Architecture/Ease of Navigation (12)
- Include Additional Interactive Activities (9)
- Include More Information/Topics (4)
- Link Related Issues (4)
- Make Site More Interesting (4)
- Technological Stability (3)
- Enhance Grade Information (2)
- Miscellaneous (20)

High School Teacher Feedback

Teacher feedback collected over the course of this study is presented in the body of the report in a concise manner that does not lend itself to being abridged for this executive summary, other than the deletion of tables that are summarized in text. Consequently, teacher feedback sections of the report are included here, without tables, to enable an easy and complete review of the evaluation results.

The following is a summary of responses to the pre- and post-use high school teacher surveys. Note that written responses and multiple-choice selections are highlighted in mauve (Doug Gilliland) and blue (Claire Guse). Questions and multiple-choice options are included in their entirety for the reader to gain a clear understanding of the actual range of ratings, statements, and sentence stem-completion wording available.

Expectations. Prior to using the *Teachers' Domain* Web site participating teachers were asked to describe the types of information, activities, and other resources/content related to genetics, evolution, and ecology they would expect to be contained on the site. The following are high school teachers' written responses to this inquiry:

- "(1) More chemistry resources; (2) Student program sheets they fill out as they go through the programs." [Gilliland]
- "Interactive instruction; Simulators; Streaming video; Topic information with pictures and graphics; additional topics – energy (mechanical) momentum." [Guse]

After using the Web site for one school term, teachers were asked if the site had met their expectations. Both of the high school teachers reported that their expectations had indeed been met. When asked what word best describes the *Teachers' Domain: Physical Science* Web site, participating high school teachers offered the following responses:

- "Excellent!" [Gilliland]
- "Terrific" [Guse]

Web Site Use. At the end of the term, teachers were asked to estimate the percentage of their own *Teachers' Domain* use they had given to performing classroom presentations. On average, they reported that 15% of their use had been directed at this activity. Asked to describe the ways that they have used *Teachers' Domain*, teachers offered the following written responses:

- "After we covered a topic students would view movies and answer questions I had printed out for them." [Gilliland]
- "My own research for class prep.; Showed QuickTime video to class; Assigned interactive site; Extra credit assignments to supplement course." [Guse]

At the end of the term teachers also estimated that 60.0% of students' class or computer lab Internet use had been given to using the *Teachers' Domain: Physical Science* Web site, on average.

Teachers were asked if they personally printed any of the pages contained on the Web site. Neither of them reported that they had. They were also asked what length of video best meets their needs (short, medium, or long). Both of the teachers indicated that they prefer short videos. They also reported placing an average of 12 items in their Personal Resource Bin. Additionally, one teacher (Gilliland) indicated that his students were most likely to be in the classroom when they visited *Teachers' Domain*. The other teacher (Guse) identified the computer lab as the location where her students would make use of the Web site."

Overall Rating of Web Site. After using the *Teachers' Domain: Physical Science* Web site over the course of one school term, participating high school teachers were asked to rate the site, overall. Both of them gave the site a 5 rating on a five-point Likert scale ranging from 1 (Very Poor) to 5 (Very Good).

Rating Usefulness and Informative Value. When the high school teachers were asked to rate how useful *Teachers' Domain: Physical Science* is to obtain resources and information that support their teaching, both of them rated the site's usefulness as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful). When asked to indicate how informative they think the site is for their students, they both rated its informative value as "Very Informative" on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative).

Navigation and Finding Information. Teachers were asked to specify how easy or difficult it is for them to find information they are looking for on the Web site. Both of the high school teachers reported that it is "easy to find" what they are looking for. Similarly, probing for an understanding about what, if anything, may have caused finding information to be challenging, the teachers reportedly concluded that the information that could not be found "is not available on the site" rather than it is too difficult to find.

What Teachers Like Most. When asked to specify what they like most about *Teachers' Domain: Physical Science*, participating high school teachers offered the following written comments:

- "Movies – short, to the point, well done. Students found them very interesting and easy to understand." [Gilliland]
- "Organization because it's easy to find info. Speed – downloads are fairly fast." [Guse]

What Teachers Like Least. When asked to specify what they like least about *Teachers' Domain: Physical Science*, the teachers offered the following written comments:

- "Straight text sites. Were not very attractive to the students. They were much more interested in multimedia – movies and interactive sites." [Gilliland]
- "Registration, login – It took me quite awhile to figure out I could register once for the school and have multiple users login with the same name at the same time. Consequently, I found the info. on Teachers' Domain then sent students directly to the NOVA site instead of Teacher's Domain, which is why not all students were able to fill out follow up survey" [Guse]

What's Confusing or Challenging. Asked to describe anything about *Teachers' Domain: Physical Science* that they think is confusing or too challenging, one teacher (Guse) indicated that there isn't. The other teacher (Gilliland) offered the following written comment:

- "When the students would get to a folder and click on view it would sometimes cause the browser to quit. We found that if we clicked on the name of the resource, opened that resource page, then clicked on view it would work." [Gilliland]

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, both of the high school teachers reported that there isn't.

Comparison With Other Web Sites. When the high school teachers were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, both of them rated it as "Very Good" on a five-point scale ranging from 1 (Poor) to 5 (Very Good).

Rating Features and Resources. Teachers were asked to rate the *Teachers' Domain: Physical Science* features and resources previously specified. The site components used by high school teachers are highly appreciated items, typically receiving either a "Very Good" or "Good" rating. The videos, interactive activities, and background information (i.e., backgrounders) are the most valued features/resources for these teachers.

Probing for information about the usability of the features listed above, teachers were asked if the features perform the way they expect them to.   Both of the participating high school teachers reported that they do. Similarly, when asked if the resources contained on the *Teachers' Domain: Physical Science* Web site support their teaching needs, the teachers once again responded "Yes."

Changes in Instructional Strategies. Teachers were asked to describe how, if at all, their instructional strategies had changed over the course of using *Teachers' Domain: Physical Science*. High school teachers offered the following written remarks:

- "The use of your site, especially the movies, gave the students real life experiences. I write my own programs (The Physical Science Series) and your site is now part of my curriculum." [Gilliland]
- "I incorporate more video." [Guse]

Helpfulness of Contextualized Information & Resources. Asked how helpful it is to have information and resources on the Web site contextualized and if they are organized in a useful manner, high school teachers offered the following written remarks:

- "The information is contextualized well – no problems. I wish there were more topics – most are physics topics – I'd like to see more chemistry." [Gilliland]
- "Organization and topic choice is good. However, most info. is supplemental for enrichment, which I don't have a lot of time for in the curriculum. I need to cover the basics. I found the interactive site on Redshift from NOVA particularly useful. Most other information was great additional info., but not useful for getting the basic content across. Some lesson plans did provide good ideas for adapting my own." [Guse]

Perceived Value of Support Elements. In addition to the videos contained on the *Teachers' Domain: Physical Science* Web site, WGBH has made an effort to include supplemental features, resources, and organization for both teachers and their students. When asked if these elements of the site provide the intended support, both of the participating high school teachers responded by saying "Yes" it's worth the effort.

Usefulness of Text Information. Teachers were asked to rate the usefulness of the Web site's text information presented in the form of Backgrounders (i.e., educational text accompanying videos, still images, documents, interactive activities, and audio resources). One of the high school teachers (Guse) indicated that the Backgrounders are "Very Useful" and the other teacher (Gilliland) found them to be "Okay."

Probing for an understanding of how teachers used the Backgrounders, they were asked to describe how they and/or their students made use of this text feature. One of the high school teachers offered the following response to this inquiry:

- "Generally, to improve my own understanding and/or preview the video. I often do my prep work at home from a dial-up connection, so downloads were too slow to preview many of the video clips" [Guse]

Usefulness of Lesson Plans. When asked to rate how useful the Lesson Plans contained on the Web site are for their teaching, one high school teacher (Guse) rated them as "Moderately Useful" and the other (Gilliland) gave them a "Slightly Useful" rating.

Usefulness of Questions for Discussion. There are a set of "Questions for Discussion" that accompany each of the Web site's Backgrounders (i.e., educational text accompanying *Teachers' Domain* resources). When asked how useful these question prompts are, one high school teacher (Guse) rated their inclusion as "Okay" and the other (Gilliland) reported that he developed his own set of discussion questions.

Usefulness of Links to Curriculum Standards/Frameworks. Teachers were asked if the links to state and national curriculum standards are helpful for their teaching. One of the high school teachers (Guse) rated the links as "Moderately Useful" and the other teacher (Gilliland) gave them a lesser "Okay" rating.

Constraints On Using Teachers' Domain. Asked if they encountered any constraints to their use of *Teachers' Domain: Physical Science* and, if so, what can WGBH do to address these hurdles, high school teachers offered the following comments:

- "Your site was down on Friday May 14 to install the Civil Rights section. My morning classes were not able to access the site. If warning had been given I would have had the students work on the site Thursday and do another assignment on Friday. No warning was given. Why couldn't this have been done after 3:00 p.m.?" [Gilliland]
- "Time to extend classroom content to include the enrichment you provide. Try to include material that clearly covers the basic laws and principles of science. The Redshift interactive site was great. That's an example of a site that can teach a basic principle better than I can." [Guse]

Information WGBH Needs To Provide. Teachers were also asked for feedback about what additional information, if any, WGBH needs to provide for teachers so they can get the most out of *Teachers' Domain*. The following is a response from one of the high school teachers:

- "None. You just need to publicize that the site is there for teachers to use." [Gilliland]

Teachers' Suggestions For Improving the Site. Teachers offered the following written responses when asked to offer suggestions for improving *Teachers' Domain*:

- "More chemistry topics. Other than that I can't think of any way to improve the site. I want to thank WGBH for an outstanding resource. I plan on using it every year – my students found it very informative and interesting." [Gilliland]
- "Continue to add more info, particularly interactive sites that provide instruction in basic concepts. Including resources from Scientific American Frontiers would be great." [Guse]

Middle School Results
Student Feedback

Background Variables. Prior to use of the *Teachers' Domain: Physical Science* Web site 60.0% of the participating middle school students described their ability to use a computer as being either "advanced" or "above average." Similarly, 69.8% of the them indicated that they have either "advanced" or "above average" experience with exploring the Internet.

Expectations. Prior to using the site a total of 313 of the 325 students in the middle school sample described the things they would like to see or do when they visit a Web site that contains information about physical science. Their broad ranging written responses to this inquiry are presented in the report unsorted to convey the large variety of expectations.

Ways Students Used Teachers' Domain. Middle school students indicated that they used information contained on the Web site primarily for completing class assignments, preparing for exams, and enhancing learning. Their often overlapping remarks are again presented unsorted to convey the full nature of their thoughts.

Overall Rating of Web Site. After using the Web site over the course of one school term, middle school students gave the site an overall rating of 3.93 rating on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good) with 75.7% of the sample rating the site as either "Very Good" or "Good" and 19.4% rating it as "Average." When asked what word best describes *Teachers' Domain: Physical Science*, 10.8% of the middle school students described it as "Good," 8.6% "Informative/Informational," 8.3% "Okay," 6.5% "Fun," 5.8% "Cool," and 5.0% described it as "Helpful." In contrast, 3.6% described it as "Boring," and 0.7% described it as "Not Interesting."

Learning Outcomes. Both the pre-use and post-use student surveys included a 12-point knowledge test to assess understanding of content associated with the *Teachers' Domain: Physical Science* use goals. The post-use mean achievement score for the middle school sample is 6.65, significantly higher than the pre-use mean score of 3.10, as tested by a paired t-test. Thus, the learning outcomes resulting from middle school students' use of *Teachers' Domain: Physical Science* is statistically significant.

Rating Informative Value. When high school students were asked to indicate how informative they think the Web site is, 77.0% rated it as either "Very Informative" or "Moderately Informative." Another 20.9% of the sample rated its informative value as "Okay." A fewer 2.2% of these students perceived the site to be either "Slightly Informative" or "Not Informative."

Overall Appearance. When asked to rate the look of the Web site, 56.6% of the middle school respondents rated its overall appearance as either "Very Attractive" or "Attractive" and 35.1% rated it as "Somewhat Attractive."

Overall Readability. Asked to rate the overall readability of text contained on the Web site, 82.8% of the middle school sample rated its readability as either "Very easy to read" or "Easy to read." Another 15.1% rated it as "Somewhat difficult to read."

Rating the Homepage. When middle school students were asked to rate the Web site's homepage, 62.5% of the respondents rated its appeal as either "Very Inviting to read" or "Inviting." Another 29.9% rated it as "Somewhat Inviting." As a follow-up question, when students were asked if the homepage gives them a good sense of the content on the site 66.8% responded by specifying that it gives either a "very good sense" or "good sense" of the site's content. Another 30.2% reported that the homepage gives an "okay sense" of the site's content. In contrast, 3.1% indicated that the homepage gives them no sense of the site's content.

Changes of Interest in Related Topics. Both prior to and after using the Web site, middle school students were asked to rate their interest level in learning about the eight physical science topics specified below.

- Properties of Objects and Materials
- Sinking and Floating
- Air Is Matter
- Heat
- Gravity
- Describing Motion
- Pushing and Pulling Objects
- Sound

On average, the students' ratings of interest in each of these topics increased over the course of the study. When asked directly if their use of the site had increased their interest in physical science, 72.9% of the middle school sample reported that it had.

Navigation and Finding Information. When asked if they experienced any problem(s) navigating/moving around in the Web site, 91.1% of the middle school sample reported having no difficulty. Eight of the other students did not report having any navigation problem, but did comment that they experienced technical difficulties at the school that resulted in slow Internet access to Web site. One student indicated that navigating or finding information was difficult. Another student indicated that use of the captions was problematic.

Asked to specify how easy or difficult it was for them to find information they were looking for on the site, 57.9% of the middle school sample reported that information was "easy" to find. Another 35.4% thought that it "took a little searching" to find what they were looking for. Reportedly, 6.2% felt that finding specific information was "somewhat difficult" and 2 students reported it to be "impossible."

Probing further, when students were asked to specify what, if anything, they looked for on the site but were unable to find, 14.8% indicated that there was "nothing" on the site that they looked for but were unable to find. Another 72.6% concluded that they were unable to locate specific information because it is not available on the site. An additional 12.6% reported that it was hard to find what they were looking for so they gave up.

What Students Like Most. Middle school students were asked to specify what they like most about the Web site. Watching video clips and learning/useful information were foremost in their thoughts. Their frequently overlapping comments are presented in the report unsorted to convey the full range of their thinking. Many students commented that what they like most is either the "Information" or "Learning." "Videos" and "Interactive Games" were foremost in the thoughts of other middle school students in our sample reportedly because of their information content. The report contains additional broad ranging feedback identifying miscellaneous aspects of the Web site that other middle students in our sample reportedly found particularly appealing.

What Students Like Least. Students were asked to specify what they like least about *Teachers' Domain: Physical Science.* Responses were sorted into the categories that emerged from a review of students' comments. A total of 20.7% indicated there is nothing about the site that they didn't like. In contrast, "too much reading" bothered 12.6% of the middle school respondents to this inquiry. The entire set of their comments is presented in the report.

Did Students Print Pages? When asked if they had printed any pages contained on the Web site, 3.4% of the middle school sample reported that they had. In contrast, 96.6% said that they hadn't.

What's Confusing or Too Challenging. Asked to describe anything about the Web site that they think is confusing or too challenging, 26.1% of the middle school respondents simply wrote the words "Nothing" or "None." Another 15.4% offered similarly positive but more descriptive comments. In contrast, 58.5% of this sample offered broad ranging remarks contained in the report describing what they found confusing or too challenging about the Web site.

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, 45.3% of the middle school respondents simply wrote words such as "Nothing" or "None," and 30.1% offered similarly positive but more descriptive remarks. Another 4 students expressed complimentary opinions. In contrast, 22.9% of the middle school respondents to this inquiry offered comments contained in the report questioning information contained on the Web site.

Comparison With Other Web Sites. When middle school students were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, 11.4% rated it as "Very Good." Another 32.9% rated the site as "Good" and 37.2% rated it as "Average." An additional 9.5% rated it as "Poor" and 8.9% gave it a "Very Poor" rating in comparison to other well liked Web site.

Rating Features. To help determine which components were most useful to students, the middle school sample was asked to rate the thirteen previously specified *Teachers' Domain: Physical Science* features and resources. On average, these components of the Web site received ratings between 3.3 and 4.6 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). The 4 features/resources that were most appreciated by the students are *Videos*, *Interactive Activities*, *Still Images*, and *Audio Resources*. All of the other features and resources were also very well rated.

Probing for information about the usability of the site's features and resources, when middle school students were asked if they perform the way they expect them to, 91.7% of the high school sample reported that they do.

Students' Suggestions for Improving the Site. When asked what suggestions they have for improving *Teachers' Domain: Physical Science*, 8.7% of the middle school respondents simply wrote the word "None" or "Nothing," suggesting that they may think the site is fine as-is. Another 5.3% responded with similarly positive but more descriptive remarks. An additional 86.0% students offered the suggestions which fell within the following categories (Note that numbers in parenthesis indicate the number of responses that fall within each category):

- More Videos (37)
- More Games/Interactivity (38)
- Make Text Easier to Read/Understand (29)
- Make Site More Interesting/Entertaining for Students (27)
- Make Site More Colorful (19)
- Make Downloads Quicker (9)
- Enhance the Homepage (8)
- Enhance Navigation/Searching (8)
- Edit Quizzes/questions (23)
- More pictures (9)
- Include More Information/Topics (8)
- Make Site More Visually Appealing (8)
- Enhance Font(s) for Clarity (7)
- Include Additional Educational Activities (5)
- Longer videos (4)
- Revise Login Process (4)
- Add Music/Sound Effects (3)
- Miscellaneous Suggestions (12)

Middle School Teacher Feedback

The following is a summary of responses to the pre- and post-use middle school teacher surveys. Note that written responses and multiple-choice selections are highlighted in mauve (Cynthia Brogan), blue (Shalini Rao) green (Deb Roussell). Rich Marcou did not submit a completed teacher survey. Questions and multiple-choice options are included in their entirety for the reader to gain a clear understanding of the actual range of ratings, statements, and sentence stem-completion wording available.

Expectations. Prior to using the *Teachers' Domain* Web site participating middle school teachers were asked to describe the types of information, activities, and other resources/content related to genetics, evolution, and ecology they would expect to be contained on the site. The following are their written responses to this inquiry:

- "Webquests; mini movies; scientists in the field." [Brogan]
- "Safety; scientific method; chemical reactions; energy." [Marcou]
- "(1) Clearly outlined activities for students to try at home about Earth, Earth's processes, weather, rocks ad minerals; (2) Activities and lesson plans for topics mentioned above, which peak student creativity and curiosity; and (3) Hands-on ideas using everyday materials for topics mentioned above (with minimal preparation time)." [Rao]

After using the Web site for one school term, middle school teachers were asked if the site had met their expectations. All three respondents reported that their expectations had indeed been met. When asked what word best describes the *Teachers' Domain* Web site, respondents offered the following remarks:

- "Online file cabinet" [Brogan]
- "Informative" [Rao]
- "Motivating" [Roussell]

Web Site Use. At the end of the term, teachers were asked to estimate the percentage of their own *Teachers' Domain* use they had given to performing classroom presentations. On average, they reported that 63.3% of their use had been directed at this activity. Asked to describe the ways that they have used *Teachers' Domain*, teachers offered the following written responses:

- "Direct instruction supplement ; Research for presentation." [Brogan]
- "As a resource of background information for myself and teaching resource in the class (e.g., interactive activities)." [Rao]
- "I have had my students view, read, and answer the questions." [Roussell]

At the end of the term middle school teachers also estimated that 60.0% of students' class or computer lab Internet use had been given to using the *Teachers' Domain* Web site, on average.

Teachers were asked if they personally printed any of the pages contained on the Web site. One of them reported that they had and the two other had not. They were also asked what length of video best meets their needs (short, medium, or long). Each of the teachers indicated that they prefer medium length videos. They also reported placing an average of 8 items in their Personal Resource Bin. Additionally, one teacher indicated that her students were most likely to be in the classroom when they visited the *Teachers' Domain*. Two teachers reported that their students only used the site on computers located in the computer lab.

Overall Rating of Web Site. After using the *Teachers' Domain* Web site over the course of one school term, participating middle school teachers were asked to rate the site, overall. Two of them gave the site a 5 rating (Very Good) on a five-point Likert scale ranging from 1 (Very Poor) to 5 (Very Good) and one gave it a 4 rating (Good), resulting in an average rating of 4.7.

Rating Usefulness and Informative Value. When middle school teachers were asked to rate how useful *Teachers' Domain* is to obtain resources and information that support their teaching, 2 of them rated the site's usefulness as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful) and one teacher rated its usefulness as 4 (Moderately

Useful), resulting in an average rating of 4.7. When asked to indicate how informative they think the site is for their students, 2 of the teachers rated its informative value as "Very Informative" on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative) and 1 teacher rated it's value as "Okay, resulting in an average rating of 4.3.

Navigation and Finding Information. Middle school teachers were asked to specify how easy or difficult it is for them to find information they are looking for on the Web site. One of the teachers reported that it is "easy to find" what they are looking for and the other two indicated that it "took a little searching." Similarly, probing for an understanding about what may have caused finding information to be challenging, two of the respondents reportedly concluded that the information they were looking for "is not available on the site."

What Teachers Like Most. When asked to specify what they like most about *Teachers' Domain*, participating teachers offered the following written comments:

- "Pulling resources from many different places into one site." [Brogan]
- "The site has great interesting video clips for students to watch and use." [Rao]
- "Information in text and video were very helpful. It worked to help all abilities." [Roussell]

What Teachers Like Least. When asked to specify what they like least about *Teachers' Domain*, respondents offered the following written comments:

- "Not enough interactive programs – heavy on videos." [Brogan]
- "Some information was difficult to find. For example, ideas to teach/review rocks and minerals were difficult to find." [Rao]
- "For me, it would have been great to have state frameworks alongside the topics." [Roussell]

What's Confusing or Challenging. Asked to describe anything about *Teachers' Domain* that they think is confusing or challenging, teachers offered the following two written comments:

- "Finding my resources first time." [Brogan]
- "Obtaining general ideas first without having to select a grade level made it difficult to find useful material quickly." [Rao]
- "Some topics were advanced for my students." [Roussell]

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, two of the teachers simply wrote the word "Nothing." The following similarly positive comment was offered by the other responding middle school teacher:

- "I did not find anything on the site that I feel was inaccurate." [Roussell]

Comparison With Other Web Sites. When middle school teachers were asked to rate how well *Teachers' Domain* compares with other Web sites they like, one rated it as 5 (Very Good) and two rated it as 4 (Good), on a five-point scale ranging from 1 (Poor) to 5 (Very Good), resulting in an average rating of 4.3.

Rating Features and Resources. Teachers were asked to rate the *Teachers' Domain* features and resources previously specified. On average, these site components received ratings ranging from 4.0 to 5.0. The five most appreciated items are videos, documents, personal resource bins, and related links, each receiving an average rating of 5.0 on a on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). Other highly appreciated item, receiving a rating average of 4.7, are the interactive activities. Lesson plans and questions for discussion both received average ratings of 4.5.

Probing for information about the usability of the features listed above, teachers were asked if the features perform the way they expect them to. All three of the responding middle school teachers reported that they do. One teacher explained that "I was able to retrieve the information when needed." Similarly, when asked if the resources contained on the *Teachers' Domain* Web site support their teaching needs, all three of these teachers responded "Yes."

Changes in Instructional Strategies. Teachers were asked to describe how, if at all, their instructional strategies had changed over the course of using the *Teachers' Domain*. Respondents offered the following written remarks:

- "More inquiry based lessons using simulations." [Brogan]
- "It has been extremely helpful to have interactive activities and video clips as a supplement to my instructional strategies." [Rao]
- "When using the Web site, there is less instruction and more self-guided." [Roussell]

Helpfulness of Contextualized Information & Resources. Asked how helpful it is to have information and resources on the Web site contextualized and if they are organized in a useful manner, respondents offered the following written remarks:

- "Good organization; doesn't cover all main topics in textbook." [Brogan]
- "The topics and subtopics do not match our 6th grade curriculum, therefore were difficult to find. Much of the material online is unfamiliar to students who have not yet been given background information." [Rao]
- "Topics were very good. We might not have studied something yet when the students first viewed the site, but it helped when studying it later in class." [Roussell]

Usefulness of Backgrounders. Table 34 summarizes teachers' attitudes about the usefulness of Backgrounders (i.e., educational text accompanying videos, still images, documents, interactive activities, and audio resources). Note that all three of the middle school teachers who responded to this inquiry indicated that the Backgrounders are "Very Useful." Probing for an understanding of how the middle school teachers used the Backgrounders, they were asked to describe how they and/or their students made use of this text feature. The following are the responses to this inquiry:

- "It was a learning tool for me so I can mentally set up the activity for the students." [Brogan]
- "To enhance my own understanding of material." [Rao]

Usefulness of Lesson Plans. When asked to rate how useful the Lesson Plans contained on the *Teachers' Domain: Physical Science* Web site are for their teaching, two of the middle school teachers rated them as "Very Useful" and the other respondent gave them an "Okay" rating, resulting in an average rating of 4.3 on a 5-point scale ranging from 1 = "Not Useful" to 5 = "Very Useful.".

Perceived Value of Support Elements. In addition to the videos contained on the *Teachers' Domain* Web site, WGBH has made an effort to include supplemental features, resources, and organization for both teachers and their students. When asked if these elements of the site provide the intended support, all three of the middle school teachers responded by saying "Yes" it's worth the effort.

Usefulness of Questions for Discussion. There are a set of Questions for Discussion that accompany each of the Web site's Backgrounders (i.e., educational text accompanying *Teachers' Domain* resources). When asked how useful these question prompts are, one of the of the participating teachers rated their inclusion as "Very Useful," another teacher rated then and "Moderately Useful" and a third teacher rated them as "Okay" on a 5-point scale ranging from 1 = "Not Useful" to 5 = "Very Useful," resulting in an average rating of 4.0.

Usefulness of Links to Curriculum Standards/Frameworks. Teachers were asked if the links to state and national curriculum standards are helpful for their teaching. Two teachers rated the links as "Very Useful," two teachers rated them as "Very Useful," and 1 gave them a "Moderately Useful" rating on a 5-point scale ranging from 1 = "Not Useful" to 5 = "Very Useful," resulting in an average rating of 4.7.

Constraints On Using Teachers' Domain. Asked if they encountered any constraints to their use of *Teachers' Domain* and, if so, what can WGBH do to address these hurdles, respondents offered the following comments:

- "Not enough diversity of resources. Lots of NOVA and ZOOM video clips." [Brogan]
- "Having the option of viewing all available sources about a given topic at once would be helpful." [Rao]
- "The constraints were more to do with downloading the videos at our school site. They took too much time for the first person using the computer and once the video was in our cache it loaded right away." [Roussell]

Information WGBH Needs To Provide. Teachers were also asked for feedback about what additional information, if any, WGBH needs to provide for teachers so they can get the most out of *Teachers' Domain: Physical Science*. The following is the response offered by a middle school teacher:

- "Possibly a written guide to the site." [Roussell]

Teachers' Suggestions For Improving the Site. Teachers offered the following written responses when asked to offer suggestions for improving *Teachers' Domain*:

- "Add more diverse resources." [Brogan]
- "Teachers should be able to search for materials without specifying grade levels." [Rao]
- "(1) Workshop to introduce the site to teachers could be helpful; (2) Workshop with teachers who have already used the site; and (3) Frameworks along with each topic and how it could be used." [Roussell]

Elementary School Results
Student Feedback

Background Variables. Prior to use of the *Teachers' Domain: Physical Science* Web site 61.6% of the elementary school students who participated in this study describe their ability to use a computer as being either "advanced" or "above average." Similarly, 59.0% of these students indicated that they have either "advanced" or "above average" experience with exploring the Internet.

Expectations. Prior to using the site 37 of the students in the 39 member elementary school sample described the things they would like to see or do when they visit a Web site that contains information about physical science. Their broad ranging written responses to this inquiry are presented in the report unsorted to convey the large variety of expectations.

Ways Students Used Teachers' Domain. Elementary school students indicated that they used information contained on the Web site primarily for completing class assignments, preparing for exams, and enhancing learning. Their often overlapping remarks are again presented unsorted to convey the full nature of their thoughts.

Overall Rating of Web Site. After using the Web site over the course of one school term, elementary school students gave the site an overall rating of 4.41 rating on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good) with 79.5% of the sample rating the site as either "Very Good" or "Good." Another 18.0% rated it as "Average," one student rated it as "Poor," and no student rated it as "Very Poor." When asked what word best describes *Teachers' Domain: Physical Science*, one participating elementary school student described it as "Poor" and another as "Bad." All of the other respondents to this inquiry described it as either "Useful," "Awesome!," "Very good," "Cool!!!," "Good," "Interesting," "Fun," or "Okay."

Learning Outcomes. Given the that the content of the *Teachers' Domain: Physical Science* Web site was designed for middle and high school students, learning outcomes were not assessed for elementary school students.

Rating Informative Value. When elementary school students were asked to indicate how informative they think the Web site is, 23.1% rated it as either "Very Informative" or "Moderately Informative." Another 71.8% of the sample rated its informative value as "Okay," two students rated it as "Slightly Informative, and none of the students perceived the site to be either "Slightly Informative" or "Not Informative."

Overall Appearance. When asked to rate the overall look of the Web site, 12.9% of the elementary school sample rated it as either "Very Attractive" or "Attractive" and 82.0% rated it as "Somewhat Attractive."

Overall Readability. Asked to rate the overall readability of text contained on the Web site, 33.3% of the elementary school sample rated its readability as either "Very easy to read" or "Easy to read" and another 64.1% indicated that the site is "Somewhat difficult to read."

Changes of Interest in Related Topics. Both prior to and after using the Web site, elementary school students were asked to rate their interest level in learning about the site's previously specified eight physical science topics. On average, the students' ratings of interest in each of these topics increased over the course of the study. When asked directly if their use of the site had increased their interest in physical science, 82.0% of the elementary school sample reported that it had.

Navigation and Finding Information. When asked if they experienced any problem(s) navigating/moving around in the Web site, 84.6% of the elementary school sample reported having no difficulty. Asked to specify how easy or difficult it was for them to find information they were looking for on the site, 18.0% of the elementary school sample reported that information was "easy" to find. Another 12.8% thought that it "took a little searching" to find what they were looking for. An additional 66.7% felt that finding specific information was "somewhat difficult" and one of the students reported it to be "impossible."

What Students Like <u>Most</u>. Elementary school students were asked to specify what they like most about the Web site. Similar to the high school and middle school samples, watching video clips and learning/useful information were foremost in their thoughts. Their frequently overlapping comments are presented in the report.

What Students Like <u>Least</u>. Students were asked to specify what they like least about *Teachers' Domain: Physical Science*. Their broad ranging comments are presented in the report.

Did Students Print Pages? When asked if they had printed any pages contained on the Web site, 59.0% of the elementary school sample reported that they had. In contrast, 41.0% said that they hadn't.

What's Confusing or Too Challenging. Asked to describe anything about the Web site that they think is confusing or too challenging, 20.0% of the elementary school respondents simply wrote the words "Nothing" or "None." Another 56.0% offered similarly positive but more descriptive comments. In contrast, 6 students offered the following remarks describing what they found confusing or too challenging about the site:

- "Searching."
- "Hearing what the people were saying."
- "I couldn't hear some things they said in the video."
- "Reading the captions."
- "Reading captions."
- "Too many words."

Comparison With Other Web Sites. When elementary school students were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, 7.7% rated it as "Very Good." Another 69.2% rated the site as "Good" and 12.8% rated it as "Average." An additional 7.7% rated it as "Poor" and none of these students gave it a "Very Poor" rating.

Rating Features. To help determine which components were most useful to students, the elementary school sample was asked to rate the Web site's thirteen features and resources. On average, these components of the Web site received ratings between 3.2 and 4.1 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). The 4 features/resources that were most appreciated by the students are *Videos*, *Documents*, *Resource Highlights*, and *Still Images*. All of the other features and resources were also very well rated.

Students' Suggestions for Improving the Site. When asked what suggestions they have for improving *Teachers' Domain: Physical Science*, 13 elementary school students responded with the following written feedback:

- "Make it have more fun games and activities."
- "Have more games."
- "Games should be put in the Web site."
- "More games that teach and are fun."
- "Make more games."
- "More games."
- "Have games."
- "Make it funny! (some of them)."
- "Make some funny."
- "Stop the gray and too much ZOOM."
- "Add more colors to the site."
- "I think they should redo the captions."
- "Easier to read. Pictures for all subjects."

Elementary School Teacher Feedback

The following is a summary of responses to the pre- and post-use elementary school teacher surveys. Note that written responses and multiple-choice selections are highlighted in mauve (Carol Colgate – second grade teacher) and blue (Cheryl Klausner – fifth grade teacher). Questions and multiple-choice options are included in their entirety for the reader to gain a clear understanding of the actual range of ratings, statements, and sentence stem-completion wording available.

Expectations. Prior to using the *Teachers' Domain* Web site participating teachers were asked to describe the types of information, activities, and other resources/content related to genetics, evolution, and ecology they would expect to be contained on the site. The following are teachers' written responses to this inquiry:

- "Lesson plans; neat activities; correlation to national standards; related literature; resource books, places and addresses; local or national resource people or organizations like ICE, ACS, NSTA; pictures; video clips; interactive Web sites; worksheets and home links." [Colgate]
- "Interactive age-appropriate explorations which will enhance student learning. I am particularly interested in optics and sound content related materials. I would welcome some materials to provide extensions for some students." [Klausner]

After using the Web site for one school term, teachers were asked if the site had met their expectations. Both of the elementary school teachers reported that their expectations had indeed been met. When asked what word best describes the *Teachers' Domain: Physical Science* Web site, participating elementary school teachers offered the following responses:

- "Useful" [Colgate]
- "Inviting" [Klausner]

Web Site Use. At the end of the term, teachers were asked to estimate the percentage of their own *Teachers' Domain: Physical* use they had given to performing classroom presentations. On average, they reported that 52.5% of their use had been directed at this activity. Asked to describe the ways that they have used the site, teachers offered the following written responses:

- "Classroom, demo material, personal info for lessons." [Colgate]

- "I used to light sites when I was teaching optics for a sound unit. I revamped my plans to use the 15 related sites." [Klausner]

At the end of the term teachers also estimated that 15.0% of students' class or computer lab Internet use had been given to using the *Teachers' Domain: Physical Science* Web site, on average.

Elementary school teachers were asked if they personally printed any of the pages contained on the Web site. Both of them reported that they had. They were also asked what length of video best meets their needs (short, medium, or long). The second grade teacher indicated that she prefers medium length videos and the fifth grade teachers prefers short videos. They also reported placing an average of 15 items in their Personal Resource Bin. Additionally, second grade students were most likely to be in the classroom when they visited *Teachers' Domain: Physical Science* and fifth graders made use of the site in the school's computer lab.

Overall Rating of Web Site. After using the *Teachers' Domain: Physical Science* Web site over the course of one school term, participating elementary school teachers were asked to rate the site, overall. The second grade teacher gave it a 4 (Good) rating and the fifth grade teacher gave it a 5 (Very Good) rating on a five-point Likert scale ranging from 1 (Very Poor) to 5 (Very Good).

Rating Usefulness and Informative Value. When the elementary school teachers were asked to rate how useful *Teachers' Domain: Physical Science* is to obtain resources and information that support their teaching, the second grade teacher rated the site's usefulness as 4 (Moderately Useful) and the fifth grade teacher rated it as 5 (Very Useful) on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful). Similarly, when asked to indicate how informative they think the site is for their students, the second grade teacher rated its informative value as 4 (Very Informative) and the fifth grade teacher rated it as 5 (Very Informative) on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative).

Navigation and Finding Information. Teachers were asked to specify how easy or difficult it is for them to find information they are looking for on the Web site. The second grade teachers reported that locating desired information "took a little searching" and the fifth grade teacher indicted that it is "easy" to find what she was looking for. Similarly, probing for an understanding about what, if anything, may have caused finding information to be challenging, the second grade teacher reportedly concluded that the information that could not be found was too hard to find so she gave up. The fifth grade teacher concluded that the information she could not find is not available on the site rather than being too difficult to find.

What Teachers Like Most. When asked to specify what they like most about *Teachers' Domain: Physical Science*, participating elementary school teachers offered the following written comments:

- "Interesting graphics. Easy to print out material. Easy reference sites." [Colgate]
- "I liked the ZOOM episode in conjunction with the hands-on activities." [Klausner]

What Teachers Like Least. When asked to specify what they like least about *Teachers' Domain: Physical Science*, the teachers offered the following written comments:

- "The time it takes to find what I need." [Colgate]
- "(1) Until last week my students all had to access the site through my username and password. Then Eric Friedman set up user groups. It would have been better to set this up to begin with. (2) One site I wanted to use (Tunes and Spoons) was not functioning." [Klausner]

What's Confusing or Challenging. Asked to describe anything about *Teachers' Domain: Physical Science* that they think is confusing or too challenging, elementary school teachers offered the following written comments:

- "Sometimes the subjects you are looking for are not cross referenced." [Colgate]

- "(1) The access to students until the user groups were set up. (2) I didn't realize I would need separate speakers to show video clips. (3) I had trouble downloading a few things. People at WGBH were very helpful." [Klausner]

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, both of the elementary school teachers reported that there isn't.

- "I didn't see any." [Colgate]
- "I didn't find any." [Klausner]

Comparison With Other Web Sites. When the elementary school teachers were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, both of them rated it as "Very Good" on a five-point scale ranging from 1 (Poor) to 5 (Very Good).

Rating Features and Resources. Teachers were asked to rate the *Teachers' Domain: Physical Science* features and resources previously specified. The site components used by elementary school teachers are highly appreciated items, typically receiving either a "Very Good" or "Good" rating. The questions for discussion and personal bins for resources are reportedly the most valued features/resources for these teachers.

Probing for information about the usability of the features listed above, teachers were asked if the features perform the way they expect them to. Both of the participating elementary school teachers reported that they do. Similarly, when asked if the resources contained on the *Teachers' Domain: Physical Science* Web site support their teaching needs, the teachers once again responded "Yes."

Changes in Instructional Strategies. Teachers were asked to describe how, if at all, their instructional strategies had changed over the course of using *Teachers' Domain: Physical Science*. Elementary school teachers offered the following written remarks:

- "I now have more resources and places to look for information. I also can have students use this site at home." [Colgate]
- "I used video clips more." [Klausner]

Helpfulness of Contextualized Information & Resources. Asked how helpful it is to have information and resources on the Web site contextualized and if they are organized in a useful manner, the fifth grade teacher offered the following written remarks:

- "I would have liked more resources for optics. The only topics that fit with my curriculum were sound and optics." [Klausner]

Perceived Value of Support Elements. In addition to the videos contained on the *Teachers' Domain: Physical Science* Web site, WGBH has made an effort to include supplemental features, resources, and organization for both teachers and their students. When asked if these elements of the site provide the intended support, both of the participating elementary school teachers responded by saying "Yes" it is worth the effort.

Usefulness of Text Information. Teachers were asked to rate the usefulness of the Web site's text information presented in the form of Backgrounders (i.e., educational text accompanying videos, still images, documents, interactive activities, and audio resources). The second grade teacher rated the Backgrounders as 4 (Moderately Useful) and the fifth grade teacher rated them to be 5 (Very Useful) on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful).

Probing for an understanding of how teachers used the Backgrounders, they were asked to describe how they and/or their students made use of this text feature. The second grade teacher wrote: "To help me learn more about a topic response to this inquiry." No feedback to this inquiry was provided by the fifth grade teacher.

Usefulness of Lesson Plans. When asked to rate how useful the Lesson Plans contained on the Web site are for their teaching, both of the elementary school teachers rated them as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful).

Usefulness of Questions for Discussion. There are a set of "Questions for Discussion" that accompany each of the Web site's Backgrounders (i.e., educational text accompanying *Teachers' Domain* resources). When asked how useful these question prompts are, both of the elementary school teachers rated them as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful)..

Usefulness of Links to Curriculum Standards/Frameworks. Teachers were asked if the links to state and national curriculum standards are helpful for their teaching. Both of the elementary school teachers rated the links as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful).

Constraints On Using Teachers' Domain. Asked if they encountered any constraints to their use of *Teachers' Domain: Physical Science* and, if so, what can WGBH do to address these hurdles, the second grade teacher reportedly encountered no constraints and the fifth grade teacher offered the following description and suggestion:

- "The usual technological obstacles. The Internet was down one day. The students couldn't hear the video clips until I bought speakers. The one thing I would suggest is setting up the user group for students right at the beginning." [Klausner]

Information WGBH Needs To Provide. Teachers were also asked for feedback about what additional information, if any, WGBH needs to provide for teachers so they can get the most out of *Teachers' Domain*. The following is are responses from the elementary school teachers:

- "Help more teachers discover your Web site." [Colgate]
- "I thought, for the most part, it was set up in quite a user-friendly way." [Klausner]

Teachers' Suggestions For Improving the Site. The fifth grade teacher offered the following written response when the elementary school teachers were asked to offer suggestions for improving *Teachers' Domain*:

- "Making sure all the links are working or removed (e.g., virtual glass Xylophone – from Tunes & Spoons)." [Klausner]

Summative Evaluation
Teachers' Domain: Physical Science
A Web Site Containing a Digital Library/Repository
of Contextualized Teaching and Learning Resources

September 24, 2004

INTRODUCTION

Project Description

The summative evaluation reported here focuses on a digital library/repository of contextualized teaching and learning resources, collectively titled *Teachers' Domain: Physical Science*, that are intended for K-12 teachers to easily, immediately, and productively access via a Web site for their own professional development, as well as to enrich classroom activities with students. The Web site, for the purposes of this evaluation, includes WGBH's extensive collection of videos, still images, backgrounders (educational text accompanying Web site resources), documents, audio, lesson plans, and interactive activities that span across the life science topics of genetics, evolution, and ecology. These resources are organized to reflect alignment with commonly taught physical science units as well as with age-appropriate national and state-level curriculum standards/frameworks. Findings reported in the project's life science implementation evaluation studies provided a bridge to this summative evaluation research involving high school classrooms located in Orland, ME and Sarasota, FL; middle school classrooms located in Hyde Park, MA, Maynard, MA, Keene, NH, and Waynesboro, GA; and elementary school classrooms situated in Brookline, MA and Hamilton, OH.

Evaluation Goals

The general goals for this summative evaluation study are twofold. One goal is to inform our understanding about the impact that use of project support materials (e.g., lesson plans) has on teaching. Consequently, research efforts were made to assess teachers' use of the site and changes in their instructional strategies, if any, as the result of having the project support materials available for lesson planning and instruction.

A second goal is to determine the impact of the *Teachers' Domain: Physical Science* resource material on student learning of science as described in the National Science Education Standards in the areas of physical science content and process. Toward this end, evaluation activities assessed the degree to which students' knowledge of project related concepts change as the result of using the Web site. Such information will be considered by the designers and producers along with other data in order to make decisions about further additions and/or revisions of the Web site and its success at reaching intended project goals.

The impact of student and teacher use of Web site content on learning and teaching were systematically evaluated to provide information about each of the following questions:

- Impact on Teaching – Do the instructional strategies of educators' change as the result of using *Teachers' Domain: Physical Science* resources? Do these resources support teaching needs?

- Impact on Student Learning – Do middle and high school students acquire knowledge and information about properties of objects and matter, sinking and floating, air is matter, heat, gravity, describing motion, pushing and pulling objects, and sound from use of *Teachers' Domain: Physical Science* resources?   What impact does use of these resources have on elementary, middle, and high school students' interest in these eight areas of physical science?
- Perceived Educational Value – Which Web site components do teachers and students find to be most and least useful? How do teachers and students rate the value of each of the site's features and resources?
- Ease of Use – Are the Web site's features and interface accessible, responsive, and accommodating to different learning, usage, and navigation styles?
- Design Specifics – Do users find the Web site's design elements to be interesting, comprehensible, informative, and entertaining?
- Functionality Specifics – Do Web site features perform as anticipated? Do teachers and students perceive the site to be a useful resource for obtaining information and instruction about physical science? Does the site provide content that they consider to be important and informative? Do they understand the information presented and its implications?
- Content Specifics – Do Web site content and features meet teachers' and students' interests and learning needs? Do they see the site's content as believable and accurate?

Toward these ends, both descriptive and explanatory findings are reported. The researcher looked for patterns in the quantitative and qualitative data specified in the following section of this report to explain the effective and ineffective aspects of the Web site. As specified, credibility of findings were established through triangulation of methods. Communication between the evaluator and project staff took place at the outset of research in order to review developments and agree upon specific evaluation issues.

GENERAL EVALUATION DESIGN

Implementation research involved placing *Teachers' Domain: Physical Science* in its designated Internet context with appropriate high school, middle school, and elementary school level target groups to discern the usability of the Web site and the impact its use has on its intended educator and student audiences. Such information will be considered by the designers and producers along with other data in order to inform their understanding of the site's success at reaching intended project goals and to make decisions about further development/revision of the site. The purpose for this evaluation effort is to examine the effectiveness of the Web site under normal use conditions with the intention of implementing changes to the project that will better serve the teaching and learning needs of its users.

Toward this end, evaluation activities were performed over the course of one school term (beginning January, 2004) to obtain both a depth and breadth of information about *Teachers' Domain: Physical Science* implementation. Evaluation efforts included naturalistic studies that were carried out in schools located in different geographical settings. Pre- and post-use questionnaires were administered to assess

teachers' use of the site and changes in their instructional strategies as the result of using these resources. Research efforts were also made to assess *Teachers' Domain: Physical Science* usability and changes in students' interests, attitudes, and knowledge regarding physical sciences (specifically, properties of objects and matter, sinking and floating, air is matter, heat, gravity, describing motion, pushing and pulling objects, and sound) as a consequence of using the Web site and its resources. To achieve these ends, three methods were employed to obtain feedback from Web site users:

1. Teacher Questionnaires – Teachers who participated in this study were asked to respond to printed pre- and post-use questionnaire that were mailed to them with an accompanying pre-addressed, stamped envelope. The questionnaires probed for information about instructional needs and use of project resources in the classroom. The information obtained informs our understanding about the efficacy of Web site resources and activities for diverse learning environments.

2. Student Questionnaires – Pre- and post-usage questionnaires probed for feedback about students' interests and attitudes toward Web site features and resources, in addition to their learning outcomes. Data was also collected to inform our knowledge about audience demographics.

3. Field Testing – Two key intents of this evaluation study are to discern if *Teachers' Domain* features enable high school, middle school, and elementary school students to easily employ the capabilities of the Web site, and if the capabilities of these resources provide significant support for their development of knowledge about physical sciences. Examining students' use of these resources from the context of naturalistic settings and social interaction (e.g., school classrooms) provides the lens through which the research methodology used in the evaluation obtained a focus. Consequently, findings obtained by this study are meant to inform our understanding about teachers' and students' use of *Teachers' Domain: Physical Science* resources in the manner and learning context in which they are intended to be used. In addition to the insights this information will provide for project staff, educators will also benefit by obtaining guidance about ways to use *Teachers' Domain: Physical Science* efficaciously while avoiding hurdles to learning and maintaining ease of use.

The basis for this methodology is derived from findings reported by researchers such as Hannafin & Garhart (1985) who indicate that research focusing only on resource features, like those contained on a Web site, often diverts considerations away from students' cognitive processing strengths and limitations. It is also based on the work of Daiute (1985) and Andrea Herrmann (1987), for example, who advocate performing evaluation in the social and cultural context of the student. Therefore, learning context and cognition perspectives are systematically integrated into the implementation evaluation of the project's Web site to discern if its features and resources are usable and informative.

Toward these ends, implementation evaluation involving school classes situated in a total of eight different geographical locations were carried out with students in grades 9-12, 6-8, and 2-5. Efforts were made to select naturally assembled collectives that have pre-experimental sampling equivalence with respect to experience with using computers and Web sites

and with knowledge of the project's previously specified physical science topics.

Teachers at each of the participating schools were provided with a set of written instructions for administering student questionnaires prior to using the *Teachers' Domain: Physical Science* Web site. All participating teachers and students responded to pre-use questionnaires. Students in the three samples (i.e., high school, middle school, and elementary school) completed the questionnaire as part of their regular classroom activity. Teachers did not mention that it was associated with WGBH or *Teachers' Domain*.

Questions on the pre-use student questionnaire focused on demographic and background classification variables as well as pre-use self-reported knowledge about and interest in Web site physical science topics. In addition, the questionnaire included twelve open-ended content questions. Approximately two weeks after students responded to the pre-use questionnaire, participating teachers began integrating use of Web site resources and activities into classroom study for a period of one school term. Administration of questionnaires and use of the Web site were separated in time by at least two weeks to assure that pre-use questionnaire/testing effects are minimal.

At the end of the school term, all teachers and students completed post-use questionnaires. In addition to content questions, the student questionnaire included attitude measures to compare with the pre-use questionnaire results and open-ended questions which allowed for exploration of usability and unintended effects. The post-use teacher questionnaire probed for information about the perceived ease of use and educational value of *Teachers' Domain: Physical Science* features and resources as well as reported changes in their instructional strategies as the result of using the Web site. It also requested feedback that would enhance the project's ability to provide information for educators that would enable them to get the most out of using the site.

DEMOGRAPHICS

As previously specified, evaluation research focused on three academic levels: (1) high school, (2) middle school, and (3) elementary school. As indicated in Table 1, on the following page, two high schools participated in this evaluation: Searsport, District High School (Orland, ME) and Sarasota High School (Sarasota, FL). Four middle school classrooms located in Hyde Park, MA, Maynard, MA, Keene, NH, and Waynesboro, GA also participated. In addition, two elementary school classrooms located in Brookline, MA and Hamilton, OH were also research participants.

Table 1. Participating Schools and Teachers

Level/Teacher	School	Subject Taught
High School		
Douglas Gilliland	Sarasota High School (Sarasota, FL)	Honors Physical Science
Claire Guse	Searsport District High School (Orland, ME)	Intro. Physical Science
Middle School		
Cynthia Brogan	Burke Middle School (Waynesboro, GA)	Science
Rich Marcou	Keene Middle School (Keene, NH)	Physical Science
Shalini Rao	Academy of the Pacific Rim (Hyde Park, MA)	Science
Deb Roussell	Fowler School (Maynard, MA)	Physical Science
Elementary School		
Carol Colgate	Morgan Elementary School (Hamilton, OH)	All subjects
Cheryl Klausner	Pierce School (Brookline, MA)	All subjects

Table 2 shows that the high schools provided a total of 2 teachers and 119 students (59 male, 60 female). The middle schools provided a total of 4 teachers and 325 students (167 male, 158 female). The elementary schools provided a total of 2 teachers and 39 students (17 male, 22 female). Note that only data from students who completed both the pre- and post-use questionnaires were analyzed. Consequently, findings presented in the following sections of this report reflect feedback received from a total of 8 teachers and 483 students (243 male, 240 female) who used *Teachers' Domain: Physical Science* for one school term and responded to both pre- and post-use questionnaires. There is an approximately equal percentage of males and females participating in each of the three school audiences represented in this report.

Table 2. Student Gender and Grade-Level Demographics

Level/Teacher	Gender/Total Students			Grade					
	Males	Females	Total	2nd	5th	6th	8th	9th	10th
High School									
Douglas Gilliland	56	51	107	–	–	–	–	98	9
Claire Guse	3	9	12	–	–	–	–	–	12
Subtotal	59	60	119	–	–	–	–	98	21
Middle School									
Cynthia Brogan	35	38	73	–	–	73	–	–	–
Rich Marcou	42	40	82	–	–	–	82	–	–
Shalini Rao	31	24	55	–	–	55	–	–	–
Deb Roussell	59	56	115	–	–	115	–	–	–
Subtotal	167	158	325	–	–	243	82	–	–
Elementary School									
Carol Colgate	9	12	21	21	–	–	–	–	–
Cheryl Klausner	8	10	18	–	18	–	–	–	–
Subtotal	17	22	39	21	18	–	–	–	–
Total	243	240	483	21	18	240	82	98	21

The distribution of the student sample on the demographic classification variable "Ethnicity" is presented in Table 3, on the following page. Approximately 62.7% of the entire student sample is white/Caucasian. Comparison between pre- and post-use variables, such as learning outcomes and interests in learning about the project's physical science topics, are presented later in this evaluation report.

Table 3. Student Ethnicity Summary

Academic Level	N	Categories	Students Number (%)*
High School	119	Native American	1 (0.8%)
		Asian American	7 (5.9%)
		Black/African American	2 (1.7%)
		Latino/Hispanic	4 (3.4%)
		White	103 (86.5%)
		Not Specified	*2 (1.7%)*
Middle School	325	Native American	7 (2.2%)
		Asian American	18 (5.5%)
		Black/African American	91 (28.0%)
		Latino/Hispanic	26 (8.0%)
		White	178 (54.8%)
		Not Specified	*5 (1.5%)*
Elementary School	39	Native American	–
		Asian American	7 (18.0%)
		Black/African American	8 (20.5%)
		Latino/Hispanic	2 (5.1%)
		White	22 (56.4%)
		Not Specified	–

HIGH SCHOOL RESULTS

HIGH SCHOOL STUDENT FEEDBACK

Background Variables. Background classification variables (self-reported ability to use a computer and experience with exploring the Internet prior to use of *Teachers' Domain: Physical Science* were examined. Table 5 shows that 70.6% of the high school students who participated in this study describe their ability to use a computer as being either "advanced" (25.2%) or "above average" (45.4%). Similarly, 73.1% of the students indicated that they have either "advanced" (31.9%) or "above average" experience(41.2%) with exploring the Internet/World Wide Web.

Table 5. Background Variables

Variable	N	Categories	Responses Number (%)
Ability to use a computer	119	Advanced	30 (25.2%)
		Above average	54 (45.4%)
		Average	34 (28.6%)
		Just beginning	1 (0.8%)
Experience with exploring the Internet/World Wide Web	119	Advanced	38 (31.9%)
		Above average	49 (41.2%)
		Average	31 (26.1%)
		Just beginning	1 (0.8%)

Expectations. Prior to using *Teachers' Domain: Physical Science*, students were asked to describe the things they would like to see or do when they visit a Web site that contains information about physical science. A total of 107 high school students provided a written response to this inquiry describing a broad range of expectations. The following are their comments, presented unsorted to convey the nature of their thoughts:

- "Interactive activities."
- "I would like to see pictures of the things people would be interested in and advanced information on things students would like to do."
- "Activities to use your knowledge or mini fun quizzes to review what you learned."
- "I want it to be colorful and look like it would be a lot of fun. I would also want to see games."
- "I want to know more about space, sound and other objects."
- "Some good macromedia (flash) design. Ease of use."
- "Interactive type things."
- "Interactive manuals and games explaining main points and ideas about physical science in an easy to read and easy to use format."
- "I would like to be able to type in a question and get an answer instead of just sites to refer to. I'd also like a visual demonstration because I learn better that way, rather than reading."
- "You don't have to like search through everything to find what you are looking for. If it's right there it's easier access and more people would probably go to that site."
- "Movies of the stuff so you get a better view of what you are learning."
- "Examples, information, explaining step by step description of how to do something."
- "I would like to see graphics or visual aids."
- "Do the work."
- "See if there is anything relevant to what I am studying."
- "I like Mr. G's site because it has step by step information. I also like the message board because we can get help when we need it."
- "Interactive things, not just reading. Games, movies and sounds."
- "Movies on experiments, pictures."
- "Little games or cartoon figures so it's not all serious and boring."
- "Activities and demonstrations."
- "Experiments, test things, links."
- "Easy to read, organized manner, demonstrations, pictures."
- "Watch movies about experiments."
- "I would like lots of visual effects and demonstrations."
- "Experiments."
- "Help on subjects hard to grasp."
- "Something that would keep my attention. Like matching games or something like that."
- "Games and movies about various topics."
- "Maybe have a few games that have to do with science."
- "Explanations and examples on the different topics."
- "I would like to see examples and easy to understand information or instructions."
- "I would like to see attention grabbing details such as colors and sound. I also like interactive material in which you, in a way, teach yourself at your own pace."
- "I like to play games or do quizzes on them if any are there. If not, I usually read some of the topics."
- "If you have a question, type in the search box and the site will give you other sites to find the answer."
- "I would like to see more examples."
- "Some things about the scientists, chemical equation and lots of stuff that involves physical science. Pictures, animations, links, links to help you, all might help the website and catch your viewers attention."
- "I would like to see movies of experiments, such as how things react."
- "Examples of labs."
- "See demos of experiments and learn to do cool experiments."
- "Something that is catchy, not boring."
- "Examples and demos."
- "See experiments on nuclear physics and really cool chemical reactions. Also help with homework."

- "Demos and movies."
- "Movies, control experiments."
- "Watch experiments."
- "Not a white background – not plain pictures with links and animations."
- "I would like to see games and information on how to do physical science things. Also, I would like to see demonstration."
- "Movies that explain the information using examples."
- "Demos or things we could do at home. Not boring!"
- "Experiments, educational games, movies because reading doesn't always help me learn."
- "Videos of actual experiments and games involving something related to what you're teaching."
- "Games and such concerning physical science."
- "Topics to help with homework, Practice quizzes for practice."
- "Have it interesting so we don't get bored."
- "See experiments."
- "Many movies showing experiments."
- "Anything that has to do with Chemistry."
- "Click out of it."
- "Get basic facts that aren't confusing and look for diagrams or pictures that might help me to better understand that topic."
- "Things on sound and motion and waves."
- "I like to look at what things are made of and how they're broken down."
- "Definition of common terms, fun and educational activities, equations, laws."
- "Interactive site, learning games, colorful."
- "Demonstrations of experiments."
- "I would like to see demos."
- "Useful information, pictures, videos."
- "View information about chemical properties."
- "Hands on, animations, and interesting things."
- "Games about science and things that will help me understand science more."
- "Reactions."
- "Demos, step by step explanations, pictures to go along with words."
- "Easy to follow instructions, tutorials with good clear examples, broken down material, calendar of assignments, message board."
- "I would like to be shown examples and then be able to figure out my own problems with help."
- "Information about atoms and subatomic particles. Anything dealing with space and cosmos."
- "Pictures and video demos."
- "Activities or programs that include what we're studying but are fairly interesting"
- "Animation."
- "Text and videos and interactive links and of course easy t use for help with schoolwork."
- "I would like to see a lot of pictures describing the information given."
- "Demonstrations and help links."
- "Things exploding."
- "Movies or pictures."
- "Experiments that make cool stuff."
- "I would like to see videos and diagrams that visually describe to me what they are trying to say."
- "Interactive activities."
- "Watch demos, interactive guides, games, interactive demos (on screen)."
- "Interactive labs on the computer, something will help me if I don't understand something."

- "Extra credit, tutoring, fun activities, our assignments, things we are doing during the day."
- "Look up stuff that will help me with homework and to study."
- "Watch movies about experiments."
- "I would like to be able to participate in labs, and experiments."
- "Colorful pages, a pleasing and fun font, activities, demos and movies, that will help me to understand concepts better and a good layout that will help me to find things faster."
- "Animations, things appealing to the human eye."
- "Explore and research to learn something new."
- "Stuff that helps with the work that I am doing in class."
- "Look at how chemicals react with each other."
- "Games, movies."
- "Practice quizzes, interactive lessons."
- "Play games that will teach different lessons, such as gravity."
- "Experiments and demos."
- "Movies, games, stuff to catch your attention."
- "A lot of hands on experiments, where I can see it happening or someone showing me what's happening."
- "Help me with science and understand it more."
- "Pictures, examples."
- "Movies, experiments, good information, games about science"
- "stuff blowing up."
- "Video demonstrations with explanations of events. Possibly freeze frames while the event is taking place."

Ways Students Used Teachers' Domain. Students were asked to describe the way(s) that they used information contained on the *Teachers' Domain: Physical Science* Web site. As the following student written comments explain, the site was used for completing class assignments, preparing for exams, and enhancing learning. The often overlapping remarks are presented unsorted to convey the full nature of their feedback.

- "Learn things I didn't know and researched more about stuff. It made me want to know more."
- "On tests in my science class and after some movies I understand the science better. I also know more cool things."
- "I have used the information for just gaining knowledge, for elaborating on topics we learned in class and as a review/study aid before chapter exams."
- "To write articles for extra credit."
- "Did some of the lessons."
- "I have used this info. for my science classes and this packet."
- "I have used them in science papers."
- "I found the fireworks color video very informative. Now when I go to watch fireworks on the 4th of July, I will know how the colors are created."
- "I wrote a paper."
- "I used it to summarize a paragraph on what I learned on the Web site."
- "Teacher gave us an extra credit assignment. We had to research one of the topics and write a paragraph on what we learned."
- "I used it so I could get extra credit on my homework."
- "For an extra credit project."
- "I watched three videos and wrote summaries about them."
- "Study materials, notes, assignment references."
- "I answered worksheets from Mr. Gilliland."
- "In science class to get better information on what we're studying."
- "I have got good examples that help me with my studying."
- "To study for my science test."

- "School work."
- "I used it on homework in Physical Science."
- "To do computer programs and collect information."
- "To study different subjects."
- "Mr. G's tests!"
- "Movies, research."
- "On tests we have taken and in my everyday life."
- "To research engineering."
- "For worksheets on the movies."
- "Class work."
- "In worksheets."
- "To help me with Physical Science class."
- "For class."
- "If there was a subject I really didn't understand, it was very easy to find help."
- "I used it to work on my worksheets."
- "Used it as a tutor."
- "I have used the information on the Web site to help me understand things, and study."
- "In my Physical Science class."
- "I used the info on the web site to answer questions on my teacher's movie worksheets."
- "I have used it to help me understand concepts that we were studying in Physical Science."
- "I used some of the info. about motion to help study for our quiz."
- "It has helped me in my science class very much it helps me understand what I am doing in class."
- "It helped me on my tests."
- "For homework, extra knowledge, to take quizzes, and to check assignments, and upcoming assignments."
- "Homework and extra credit."
- "To do my teacher's movie questions."
- "School assignment."
- "On worksheet and tests."
- "In conversations with adults."
- "Found out my hair conditioner was non-radioactive."
- "On my science test."
- "Tests/school."
- "Print-outs."
- "To answer questions on worksheets."
- "For my Physical Science class."
- "To answer Gilliland's questions."
- "For worksheets my teacher has given us. To find an answer in the movies usually about 5 questions per movies, 10 movies."
- "Class work that was assigned."
- "For school research and homework."
- "I used information on my web assignment."
- "To answer problems."
- "I have used the information on the site for help on homework."
- "For class and helps on tests."
- "For reports and program worksheets in Mr. G's class."
- "I have been able to study for exams, find out when things are due, and gotten extra help on things I didn't understand."
- "I have used it to study for exams."
- "For educational purposes; worksheets."
- "I have been able to watch the movies and find answers to questions."
- "I used them for school assignments and telling my friends and family the things I learned."

- "Print out worksheets, find my grade, do extra credit."
- "To get a good grade in class."
- "I used the information on the Web site to do my science worksheets."
- "I have used information to study for physical science test."
- "I have used the info to further my knowledge about physical science and its relation to real life situations."
- "Homework, studying."
- "I have used it to study, get help with certain subjects and to find the schedule for science."
- "On worksheets for school."
- "For questions and worksheets."
- "To increase my knowledge on physical science subjects."
- "To study for Physical Science."
- "I used them to complete worksheets."
- "I used some of the periodic tables and searched for answers to some other things."
- "Science class, proving my dad wrong about the Segway scooter."
- "To understand certain topics."
- "I answered questioned about movies I watched."
- "Worksheets from teacher."
- "I used the Web site to study for a few tests."
- "I have used them in life."
- "For homework."
- "Movies and documents."
- "For work in class."
- "We did program sheets and experiments."
- "I've used it to study for my tests."
- "For programs my teacher has assigned to us."
- "I have used this information to help study for science tests and do work in science."
- "On tests and to help someone in my class."
- "For worksheets from our teacher, answering ? about movies we watched."
- "I have used the movies and documents for my science class."
- "I have used the information to prepare for my tests."
- "Used questions about the videos to enhance our learning."
- "For answering questions on study guides."
- "I have used it to do the movies and worksheets."
- "We've sued the information form the movies to answer questions about the movies and on tests."
- "I have used this site for school worksheets."
- "In school assignments."
- "Printing out work, looking at the calendar for reminders, extra credit, message board to receive teacher assistance, extra help!"
- "To do the worksheets"
- "Everyday problems and tests."
- "It informs you of the ways of science."
- "For future tests and to elaborate on the learning in class"
- "Through answers on questions"
- "Homework tests, studying"
- "I have used the information to study for tests and get better grades on other things."
- "In completing internet programs for science class."

Overall Rating of Web Site. After using *Teachers' Domain: Physical Science* over the course of one school term, high school students were asked to rate the site, overall. On average, respondents to this inquiry gave the site a 4.21 rating on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). As shown in Table 6, approximately

93.3% of the sample rated the site as either "Very Good" or "Good," 6.7% rated it as "Average," and none of the student rated it as either "Poor" or "Very Poor."

Table 6. Students' Overall Rating of Commanding Heights Online

Variable	*N*	*Categories*	*Responses* Number (%)
Overall Rating	119	Very Good	33 (27.7%)
		Good	78 (65.6%)
		Average	8 (6.7%)
		Poor	–
		Very Poor	–

When asked what word best describes *Teachers' Domain: Physical Science*, 34 of the participating high school students described it as "Educational/Informative" and 28 described it as "Interesting." Other students described it as "Helpful/Useful" (19), and "Good" (4). These and other similarly positive responses are listed below (Note that numbers in parenthesis indicate the number of times the word was cited, if more than once.).

- "Educational/Informative" (34)
- "Interesting" (28)
- "Helpful/Useful" (19)
- "Good" (4)
- "Alright" (3)
- "Cool" (3)
- "Easy" (3)
- "Excellent"
- "Fantastic"
- "Awesome"
- "The best"
- "Great"
- "Factual"
- "Investigative"
- "Very technological"
- "Captivating"
- "Creative"
- "Descriptive, detailed"

Learning Outcomes. Both the pre-use and post-use surveys included a knowledge test to assess understanding of content associated with the *Teachers' Domain: Physical Science* use goals. Toward this end, students were asked to provide responses to a combination of 12 open-ended and multiple-choice content questions drawn directly from questions contained on the Web site. Correct answers received one point. Thus, there is a total of 12 points possible for each survey. The criteria for question selection was based upon (1) relevance of their content to standard physical science learning objectives and (2) correspondence with Web site content. The questions appear below (Note that correct multiple-choice responses are highlighted in red.).

> 1. *What are the advantages of using wood to build a house?*
> 2. *Explain what effect salt has on frozen water.*
> 3. *Which of the following statements is true?*
>> (a) Warm water floats on top of cold water.
>> (b) Cold water floats on top of warm water.
>> (c) Neither warm or cold water would float on top of the other.

4. *Explain why you think your answer to Question 3 is true.*

5. *What is the difference between gliding and flying?*

6. *If you were to rise straight up until you were 200 miles above the Earth, how much would you weigh when you got there?*
    (a) About 10 percent more than I do standing on Earth.
    (b) The same as I do when I'm standing on Earth.
    (c) About 90 percent of what I do standing on Earth.
    (d) I would weigh nothing if I were 200 miles above the Earth.

7. *Explain the meaning of the term "Kinetic energy."*

8. *Explain the meaning of the term "potential energy."*

9. *Explain the meaning of the term "compression."*

10. *Explain the meaning of the term "tension."*

11. *If there is a single most important shape in engineering (such as building a bridge), which of the following would it be?*
    (a) Circle
    (b) Square
    (c) Triangle
    (d) Cylinder

12. *Does sound travel faster or slower through solids than through air?*
    (a) Faster
    (b) The same
    (c) Slower

The post-use mean achievement score for the high school sample is 8.25 [SD (standard deviation) = 1.75], significantly higher than the pre-use mean score of 4.95 [SD = 2.01], as tested by a paired t-test, t (1,118) = 16.29, $p \leq 0.0001$. Thus, the learning outcomes resulting from high school students' use of *Teachers' Domain: Physical Science* is statistically significant. Figure 1 presents the mean scores for the sample's pre- and post-use content questions.

Figure 1. Distribution of High School Mean Achievement
Scores for Pre- and Post-Use Content Questions
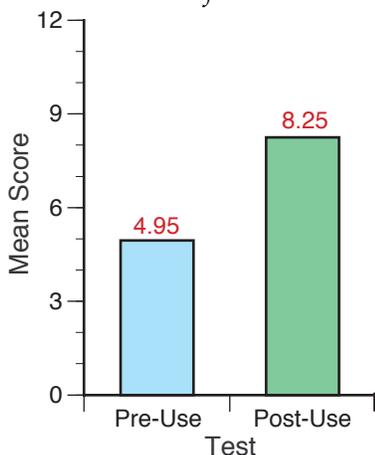
As previously specified, high school students had significantly improved scores on the post-use test, compared to their pre-use results, overall. Table 7, on the following page, reveals that, more specifically, there was statistically significant improvement on all of the content questions except for Questions 3, 6, and 11 (i.e., Warm water floats on cold water; our weight 200 miles above Earth is about 90% of what it is on Earth; and a triangle is the most important shape in engineering.).

Table 7. Pre- and Post-Use Test Data Summary (N = 119)

Question	Points Possible	Pre-Use Mean (sd*)	Post-Use Mean (sd*)	Mean Difference	Statistical Significance**
1	1	.14 (.35)	.82 (.39)	+ .68	$p \leq .0001$***
2	1	.55 (.50)	.82 (.38)	+ .27	$p \leq .0001$***
3	1	.50 (.50)	.56 (.49)	+ .06	$p = .0936$
4	1	.13 (.33)	.44 (.50)	+ .31	$p \leq .0001$***
5	1	.40 (.49)	.73 (.45)	+ .33	$p \leq .0001$***
6	1	.49 (.65)	.53 (.50)	+ .04	$p = .5435$
7	1	.56 (.50)	.90 (.30)	+ .34	$p \leq .0001$***
8	1	.78 (.42)	.94 (.24)	+ .16	$p \leq .0001$***
9	1	.40 (.49)	.82 (.39)	+ .42	$p \leq .0001$***
10	1	.29 (.46)	.81 (.40)	+ .52	$p \leq .0001$***
11	1	.46 (.50)	.50 (.50)	+ .04	$p = .4675$
12	1	.24 (.43)	.38 (.49)	+ .14	$p = .0056$***

   * Standard Deviation
  ** Paired t-Test
 *** Statistically significant at the .05 p level (i.e., 95% confidence level)
     A p level $\leq$.05 indicates a treatment affect occurred (i.e., post-use score is significantly higher or lower than pre-use score. See sign in difference column for direction.)

Figure 2 presents a chart showing the differences between pre- and post-use mean/average scores for each of the 12 content questions.

Figure 2. Distribution of High School Pre- and Post-Use Mean Scores
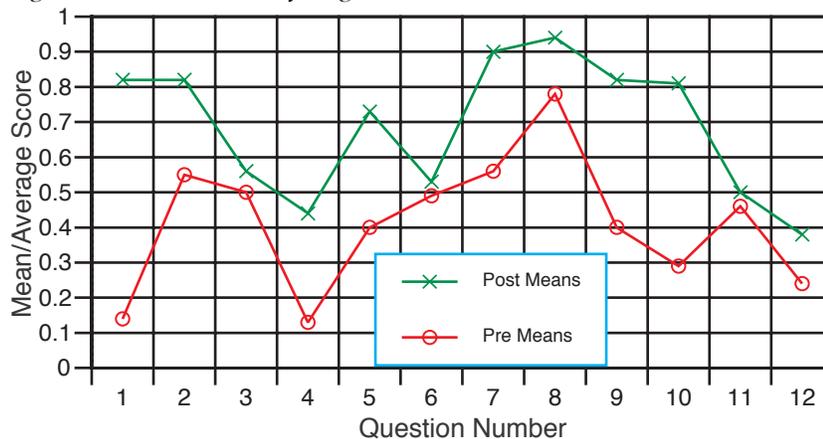
To sum up, the high school sample taken as a whole did show statistically significant learning gains as measured against its starting baseline knowledge by our pre- and post-use surveys.

Rating Informative Value. Moving from learning outcomes to subjective assessment of the site, high school students were asked to indicate how informative they think *Teachers' Domain: Physical Science* is. Approximately 93.3% of the high school sample rated the site as either "Very Informative" or "Moderately Informative" (see Table 8 on the following page); another 6.7% of the sample rated the site's informative value as "Okay." None of the students perceived the site to be either "Slightly Informative" or "Not Informative." The mean rating is 4.64 on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative).

Table 8. Perceived Informative Value of Commanding Heights Online

Variable	N	Categories	Responses Number (%)
Informative Value	119	Very Informative	33 (27.7%)
		Moderately Informative	78 (65.6%)
		Okay	8 (6.7%)
		Slightly Informative	–
		Not Informative	–

Overall Appearance. Students were asked to rate the overall look of *Teachers' Domain: Physical Science*. Table 9 shows that 68.1% of the respondents rated its overall appearance as either "Very Attractive" or "Attractive." The mean rating is 2.77 on a four-point scale ranging from 1 (Unattractive) to 4 (Very Attractive).

Table 9. Overall Look of Teachers' Domain: Physical Science

Variable	N	Categories	Responses Number (%)
Overall Look of the Web Site	119	Very Attractive	13 (10.9%)
		Attractive	68 (57.2%)
		Somewhat Attractive	35 (29.4%)
		Unattractive	3 (2.5%)

Overall Readability. Asked to rate the overall readability of text contained on the Web site, Table 10 shows that 95.8% of the respondents rated its readability as either "Very easy to read" or "Easy to read." The mean rating is 3.34 on a four-point scale ranging from 1 (Very difficult to read) to 4 (Very easy to read).

Table 10. Overall Readability of Teachers' Domain: Physical Science

Variable	N	Categories	Responses Number (%)
Overall Readability of the Web Site	119	Very easy to read	45 (37.8%)
		Easy to read	69 (58.0%)
		Somewhat difficult to read	5 (4.2%)
		Very difficult to read	–

Rating the Homepage. When high school students were asked to rate the Web site's homepage, Table 11 shows that 64.7% of the respondents rated its appeal as either "Very Inviting to read" or "Inviting." Another 30.3 rated it as "Somewhat Inviting." The mean rating is 2.71 on a four-point scale ranging from 1 (Not Inviting) to 4 (Very Inviting).

Table 11. Rating the Homepage

Variable	N	Categories	Responses Number (%)
Overall Appeal of the Homepage	119	Very Inviting	14 (11.8%)
		Inviting	63 (52.9%)
		Somewhat Inviting	36 (30.3%)
		Not Inviting	6 (5.0%)

As a follow-up question, students were asked if the homepage gives them a good sense of the content on the site. As indicated in Table 12, on the following page, 68.1% responded by specifying that it gives either a "very good sense" or "good sense" of the Web site's content. A little over a quarter of the students (29.4%) reported that the homepage gives an "okay sense" of the site's content. In contrast, 2.5% indicated that

the homepage gives them no sense of the site's content. The mean rating is 2.82 on a four-point scale ranging from 1 (Very good sense) to 4 (No sense at all).

Table 12. Sense of Site Content Conveyed by Homepage

Variable	N	Categories	Responses Number (%)
Homepage depiction of site content	119	Very good sense	20 (16.8%)
		Good sense	61 (51.3%)
		Okay sense	35 (29.4%)
		No sense at all	3 (2.5%)

Changes of Interest in Related Topics. Both prior to and after using *Teachers' Domain: Physical Science*, high school students were asked to rate their interest level in learning about the eight physical science topics specified in Table 13 below and continued on the following page. The table presents a summary of students' ratings on a five-point Likert scale ranging from 1 (Not interested at all) to 5 (Very interested). Paired pre- and post-use responses were analyzed and changes in attitudes are indicated in the rightmost column. On average, the students' ratings of interest in each of these topics increased over the course of the study. When asked directly if their use of *Teachers' Domain: Physical Science* had increased their interest in physical science in general, 85 (71.4%) of the 119 participating high school students reported that it had.

Table 13. Pre- and Post-Use Interest in Learning About Topics* (N=119)

Variable	Categories	Pre-Use Responses	Pre Mean	Post-Use Responses	Post Mean	Mean Change
Properties of Objects and Materials	Very interested	4 (3.4%)		5 (4.2%)		
	Moderately interested	15 (12.6%)		26 (21.9%)		
	Medium interest	53 (44.5%)	2.72	55 (46.2%)	2.96	+ 0.24
	A little interested	32 (26.9%)		25 (21.0%)		
	Not interested at all	15 (12.6%)		8 (6.7%)		
Sinking and Floating	Very interested	4 (3.4%)		8 (6.7%)		
	Moderately interested	37 (31.1%)		44 (37.0%)		
	Medium interest	32 (26.9%)	2.87	43 (36.1%)	3.25	+ 0.38
	A little interested	31 (26.1%)		18 (15.1%)		
	Not interested at all	15 (12.6%)		6 (5.0%)		
Air Is Matter	Very interested	3 (2.5%)		5 (4.2%)		
	Moderately interested	13 (10.9%)		22 (18.5%)		
	Medium interest	36 (30.3%)	2.43	47 (39.5%)	2.81	+ 0.38
	A little interested	47 (39.5%)		35 (29.4%)		
	Not interested at all	20 (16.8%)		10 (8.4%)		
Heat	Very interested	12 (10.1%)		16 (13.5%)		
	Moderately interested	37 (31.1%)		42 (35.3%)		
	Medium interest	44 (37.0%)	3.25	40 (33.6%)	3.42	+ 0.17
	A little interested	21 (17.1%)		18 (15.1%)		
	Not interested at all	5 (4.2%)		3 (2.5%)		
Gravity	Very interested	24 (20.2%)		24 (20.2%)		
	Moderately interested	39 (32.8%)		44 (37.0%)		
	Medium interest	37 (31.1%)	3.54	32 (26.9%)	3.61	+ 0.07
	A little interested	15 (12.6%)		15 (12.6%)		
	Not interested at all	4 (3.4%)		4 (3.4%)		

*Totals may not equal exactly 100.0% due to rounding.

Table 13 (continued). Pre- and Post-Use Interest in Learning About Topics* (N=119)

Variable	Categories	Pre-Use Responses	Pre Mean	Post-Use Responses	Post Mean	Mean Change
Describing Motion	Very interested	13 (10.9%)		18 (15.1%)		
	Moderately interested	22 (18.5%)		35 (29.4%)		
	Medium interest	41 (34.5%)	2.95	34 (28.6%)	3.25	+ 0.30
	A little interested	32 (26.9%)		23 (19.3%)		
	Not interested at all	11 (9.2%)		9 (7.6%)		
Pushing and Pulling Objects	Very interested	9 (7.6%)		14 (11.8%)		
	Moderately interested	20 (16.8%)		34 (28.6%)		
	Medium interest	46 (38.7%)	2.82	42 (35.3%)	3.22	+ 0.40
	A little interested	29 (24.4%)		22 (18.5%)		
	Not interested at all	15 (12.6%)		7 (5.9%)		
Sound	Very interested	26 (21.9%)		27 (22.7%)		
	Moderately interested	36 (30.3%)		53 (44.5%)		
	Medium interest	35 (29.4%)	3.50	24 (20.2%)	3.73	+ 0.23
	A little interested	16 (13.5%)		10 (8.4%)		
	Not interested at all	6 (5.0%)		5 (4.2%)		

*Totals may not equal exactly 100.0% due to rounding.

Navigation and Finding Information. When asked if they experienced any problem(s) navigating/moving around in the Web site, 99 (83.2%) of the 119 high school students reported having no difficulty. Some of the other students did not report having any navigation problem, but did comment that they experienced technical difficulties at the school that resulted in slow Internet access to Web site, as expressed in their following remarks:

- "The computer would sometimes not allow us to connect to the movies."
- "Sometimes the movies just stop and exit out."
- "Some links to watch movie were not able to be used - didn't show movie."
- "Just link problems, but they are usually fixed within the day that they are reported."
- "Only simple problems with getting some printouts, my screen goes black and freezes."
- "If you clicked on the picture to view the movie, it didn't work."
- "When trying to view a movie the first 'view' link crashes the Internet application."

Still other students offered the following feedback reporting that navigating or finding information was sometimes confusing:

- "Getting around was confusing."
- "Sometimes in could be confusing"
- "There was so much stuff on there it was hard to find where to go."
- "Sometimes we couldn't find where some movies were located. They seemed to be out of place."

Four students indicated that use of the links was problematic.

- "Sometimes, clicking on the link didn't correctly go to the next page. Also, captions didn't always work."
- "Couldn't click view on the list of movies. Had to go into the individual page to view it."
- "Certain links wouldn't work, it was hard to find folders if the teacher didn't tell us where to go."
- "Clicking on the wrong buttons."

Students were also asked to specify how easy or difficult it was for them to find information they were looking for on *Teachers' Domain: Physical Science*. As indicated in Table 14, on the following page, 68 (57.1%) of the high school students reported that information was "easy" to find. Another 39 (41.2%) thought that it "took a little

searching" to find what they were looking for. Reportedly, 2 students felt that finding specific information was "somewhat difficult" and none of the students reported it to be "impossible." The mean rating is 3.56 on a four-point scale ranging from 1 (Impossible to find what you're looking for) to 4 (Easy).

Table 14. Ability to Find Information

Variable	N	Categories	Responses Number (%)
Ability to Find Information	119	Easy	68 (57.1%)
		Took a little searching	49 (41.2%)
		Somewhat difficult	2 (1.7%)
		Impossible	–

Probing further, students were asked to specify what, if anything, they looked for on the site but were unable to find. Of the 119 students in the high school sample, 41 (34.5%) indicated that there was "nothing" on the site that they looked for but were unable to find. Another 55 students (46.2%) concluded that they were unable to locate specific information because it is not available on the site. An additional 23 students (19.3%) reported that it was hard to find what they were looking for so they gave up.

What Students Like Most. High school students were asked to specify what they like most about *Teachers' Domain: Physical Science*. As you will note from respondent's feedback, videos/movies and learning/useful information were foremost in their thoughts. Their frequently overlapping comments are presented unsorted to convey the full nature of their thoughts.

- "Actual activities – they explained information."
- "I liked how easy & simple it was to find the topic I was looking for. It made me search less & enjoy the site more."
- "I like the videos, rather than reading information, which gets boring. The videos were interesting and I feel I can learn better from those."
- "How easy to read it was."
- "That it has videos."
- "The QuickTime videos and other different resources you can choose."
- "The interactive visuals, fun, easy way to learn."
- "That I found exactly what I needed."
- "The interactive things."
- "I liked the videos. They were much more interesting to watch than to read."
- "The movies were easy to understand and informative. They helped me understand science better."
- "It helps learner's through visual and audible presentation."
- "What it offers. The movies make it very interesting."
- "Watching movies because it helped you learn better."
- "It is very informing, because its an easy way to get information."
- "The movies were cool, because of all the information, it was fun to watch. I learned a lot."
- "It has movies."
- "The movies, they are a nice way to learn."
- "The movies. I find science very interesting and when historical facts are represented in movies it is easier for me to learn."
- "It is easy to listen to and has many interesting topics."
- "The movies gave real life, and unique, examples of things we were learning about (ex. Newton's Laws of Motion). It was something different."
- "It is very important and it didn't take long to find answers."
- "The topics. It has a lot of interesting topics to look at."

- "The videos because they are interesting."
- "The movies cause they interest me more."
- "It has many movies, large choice."
- "The movies make things more interesting."
- "The interesting movies because you learn from them and its not boring."
- "The movies, very explanatory."
- "The information is great, and easy to get to if you don't quite understand a subject."
- "The captions on the movies, it helps you write down your answers easier."
- "The message board because I can ask questions."
- "The calendar and online quizzes, because the calendar helps you know when everything is due, and the online quizzes give study help and extra credits."
- "The captions on the movies. Because if I read it I understand it better."
- "I liked that the movies were simple to understand and that you can rewind easily if the information was missed. This was good because I missed a bit of info and I could just go back."
- "It is very helpful because it explains certain areas with much detail."
- "The videos because they are funny and educational at the same time."
- "Very interesting because it isn't just boring writing you have to read it has really good movies."
- "There are movies with captions."
- "It is very easy to use, I never have any problem using the website, or opening links."
- "All the assignments were on clearly able to read."
- "The movies because it's a lot better than just reading it."
- "The movies. I thought they were very interesting."
- "The informative movies I've learned a lot about some stuff I didn't know."
- "The movies, they are not monotonous."
- "The actual movies, makes it easier to pay attention to the information."
- "The movies, because you actually see things that you are leaning about applied to the real world."
- "The movies, they are interesting."
- "Movies."
- "How you don't have to write down your homework fro the day, you just go to HPS.com."
- "When you play the movies you can pause and search through them. It makes it easier to find information."
- "The movies because they are fun to watch."
- "Being able to fast forward through movies, because it makes it easier to find the answer."
- "Captions on the movies, so that if you misunderstood an interview with a professor or someone of that nature, you could read it."
- "The movies present it in an informative way and they're entertaining."
- "Movies… its better than reading a ton of pages on boring topics."
- "Things were pretty easy to find."
- "Movies, interesting."
- "The calendar because it states the content of what we do each day and when tests are planned."
- "The movies; were interesting."
- "The information in the movies because they were interesting to me."
- "I like reading the calendar, so I can be reminded about what is due and when. I also like being able to ask questions on the message board."
- "The computer animations used to represent examples because the help me better understand."
- "The interesting facts."
- "The captions and pause button, so you can read instead of trying to listen."
- "It allows you to read what the people are saying in the movies."

- "How easy it was to find information."
- "It keeps you up to date."
- "That it is easy to accomplish, because if you didn't finish answering the questions, you can go home and finish."
- "I liked that the movies made the different parts of science very interesting."
- "I liked the fact that we got to watch movies instead of read because I am a visual person."
- "I liked that it used concepts and showed how they were used in inventions and history."
- "It is helpful."
- "Topics."
- "The calendar, it shows what is dues and can go to links from it."
- "It gives us a good amount of information."
- "Movies, movies are better than reading."
- "The movies because they were insightful."
- "The various movies and reviews they were very useful."
- "I like the movies with captions because you can watch and read rather than just one or the other."
- "I like how we can always view grades and see what's due on calendar."
- "Movies, better than reading."
- "Movies, more interesting than just reading articles."
- "The captions, because it is a lot easier to understand."
- "The movies complicated things in an easy to understand format."
- "A lot of good movies with a caption, the caption really helped a lot."
- "The calendar, in case I forget the homework assignments."
- "The movie because they're informative."
- "The driving velocity car, it was fun."
- "It shows you what you need how you want to see it."
- "Information."
- "That the videos have captions because then I can get call of the information."
- "It gave the researchers' opinions, the captions for the movies."
- "It had movies on the information I liked it because it made it more interesting."
- "The movies because they told you a lot and had the captions to read along."
- "The video because it was a lot easier to pay attention."
- "The movies the site offers, they are filled with lots of information and give you good idea of the subject they are about."
- "I like the movies because they were easily accessible, easy to follow and had optional subtitles."
- "I like the captions on the videos."
- "I liked the movies that we viewed because they were very informative. The captions were very helpful with answering questions. The moves were also fairly interesting and they were a good length."
- "The videos give real examples of our subjects."
- "The movies are pretty neat."
- "I like how the movies give you captions because it makes it easier to understand."
- "Net tutor, it gives you a second lesson on what you have learned."
- "The movies gave a lot of info in a little time."
- "The movies because they were well put together."
- "The movies, they show demonstrations better than models."
- "Helpful movies, they gave good visuals."
- "The movies give me a more interactive way to view the events."
- "I like the message board and calendar because finding / receiving answers for my questions are easy to attain."
- "It's easy."
- "The detailed movies. They give you the information as well as showing some illustrations. Catches my attention."

- "It helps you learn from the movies which are somewhat exciting."
- "The movies, because its not like words its entertaining."
- "The movies because they are interesting and they have captions."
- "Movies."
- "The message board, because you can ask the teacher questions and not have to wait till the next day."
- "The movie approach to teaching new subjects. You don't have to be in the classroom to continue your work."

What Students Like Least. Students were asked to specify what they like least about *Teachers' Domain: Physical Science.* Of the 119 high school students in this study, 110 (92.4%) provided an answer. Responses were sorted into the categories that emerged from a review of students' comments. For example, a total of 12 students simply wrote the word "nothing" to indicate there is nothing about the site that they didn't like. This is corroborated by the following 8 similar but more descriptive remarks:

- "I cannot think of anything wrong with it."
- "I haven't found anything yet that I don't like."
- "I haven't found a dislike."
- "I didn't find anything wrong with it."
- "Nothing really……..it was a good site."
- "I think the site is fine the way it is."
- "It's supply of movies because you grow interested in a subject and want to know more."
- "Wasn't bad."

A summary of other responses is presented and summarized in Table 15. Students' actual remarks are included following the table. Note that "technical challenges" bothered 13 (11.8%) of the respondents and 12 (10.9%) indicated that "difficulty navigating and finding information" are the aspects they liked least about *Teachers' Domain: Physical Science.* Another 11 (10.0%) disliked "the login process" and 10 (9.1%) think there is "too much information," reflecting a desire for shorter readings and videos.

Table 15. What Students Like Least (N = 110 respondents)

Category	Responses Number (%)
Nothing was disliked	20 (18.2%)
Technical challenges	13 (11.8%)
Difficulty navigating/searching	12 (10.9%)
Login process	11 (10.0%)
Too much information	10 (9.1%)
Design appearance	9 (8.2%)
Content not interesting	7 (6.4%)
"View" button	5 (4.6%)
Confusing content	3 (2.7%)
Problematic links	2 (1.8%)
Inaccurate or misleading	2 (1.8%)
Grade posting	2 (1.8%)
Uninteresting class assignments	2 (1.8%)
Miscellaneous remarks	12 (10.9%)
No feedback offered	*9*

The following are students' descriptions of what they like least about *Teachers' Domain: Physical Science*, subdivided into the categories specified in Table 15, above:

Technical Challenges (13)
- "That it takes so long to load things."
- "Not being able to enter all the time. Couldn't get the work done."
- "Sometimes I can't get it to work on my home computer, so I get behind."
- "The fact that some links/parts of the site take a long time for dial-up (AOL users) to load."
- "Too many buttons to press because it causes computer problems."
- "The movies need a high speed internet or they take 20–30 minutes to load."
- "That dial-up can't connect."
- "How sometimes it is not up and running."
- "Movies only available to cable Internet."
- "The movies can be static looking once in a while."
- "At times it is sluggish on things and tests people."
- "That you have to have QuickTime to watch the movies."
- "Had to download a thing for the videos."

Difficulty Navigating/Searching (12)
- "It was sort of hard to get around. All of the drop down menus confused me."
- "You have to go through a lot of screens to get where you want to go."
- "Hard to find information."
- "The searching to find the movies, you had to click on different things to get to one chapter."
- "All of the steps to get to where you want to be."
- "Some things were hard to find at first"
- "The html documentation because it is hard to find information."
- "It is hard to find stuff."
- "Too many links on the edges of the page. It makes it harder to find what I'm looking for."
- "Finding certain movies, it was hard to find some movies."
- "Accessing folders, I would have liked having buttons available on the homepage."
- "Trying to get through the check-in for a group folder."

Login Process (11)
- "Logging in was a little difficult."
- "Logging in, sometimes I forget my name."
- "Signing in process, well for my computer it takes long to load."
- "The sign in, pain to type in password."
- "Having to sign in every time."
- "Long-in names."
- "The signing in process because it got confusing."
- "The screen name and password you have to sign in with – I always forget it."
- "Password and user name easy to forget them."
- "Sign-up process."
- "Login screen because it takes time."

Too Much Information (10)
- "That there was too much information."
- "A little too much info."
- "The movies, because they can be a little extensive."
- "It got overwhelming at times with all of the topics I could choose from."
- "There are so many different things (topics) there is a wide variety, so it's hard to narrow down what you're looking for."
- "Some of the movies were long and not to the point."
- "The articles, had too much information."

- "Reading the long information, it's boring."
- "The length of the movies. Sometimes they are incredibly long and the info you need for a question might not be until towards the end."
- "Length of movies, some went on for 8 minutes or more, I lost interest in what I was seeing."

Design/Appearance (9)
- "The visual presentation because it is kind of dull and not very interesting."
- "The graphics, because its kinda plain."
- "Not very colorful."
- "It needs to be more inviting to attract new people."
- "Just the front page because it's a little bland."
- "The small fonts, can't be read with extreme ease."
- "It's appearance, it doesn't look fund and interesting."
- "How the content was set up. It wasn't the easiest layout for viewers."
- "The way it is set up."

Content Not Interesting (7)
- "I least liked files that were just documents because they didn't appeal to me and I lost interest in them quickly. More pictures/graphics and more colors would make the documents have better appeal."
- "A little boring."
- "Lack of interesting pictures."
- "The information was kind of boring."
- "It's boring."
- "It's not as fun as it could be… It was interesting but kind of boring at the same time."
- "The flash games, kind of boring."

"View" Button (5)
- "That the first 'View' link did not work. It was a hassle to have to restart the application if it closed."
- "When you open a folder and have the content in front of you, you have to select the item then 'View,' you can't just view it."
- "When you click the first 'View' button it never loads the page."
- "I didn't like that on the first screen you couldn't just click 'View' because it didn't work so I had to click on the link then 'View.' This is because it was inconvenient."
- "That you can't just click the 'View' button."

Confusing Content (3)
- "Confusing."
- "The summary because it was confusing."
- "Movies hard to understand."

Problematic Links (2)
- "Link problems."
- "The Net tutor, some of the Web sites it is linked to don't work."

Inaccurate or Misleading (2)
- "In very few instances, the video may be misleading."
- "Sometimes the info. was not correct."

Grade Posting (2)
- "The grade posting because it doesn't list the assignment grades as well."
- "The grades aren't updated that often, but we get them in class anyways."

Uninteresting Class Assignments (2)
- "Looking up answers, boring."
- "Worksheet, boring."

- "I like that you can view the pictures because it gives you a sense of what you're learning."
- "The speaking was a little fast on the videos."
- "The boxes to view the movie were too small."
- "I would've liked the online quizzes to have been longer."
- "The Tim and Moby movies, because they seem to be made for younger kids."
- "I didn't like have to keep going back after I watched a movie."
- "It was just a repeat of what we learned in the programs."
- "How the sequence of events and information given, in the videos is different from the worksheets."
- "I dislike how the movies are stories and don't just give you the information."
- "They had actual people talking in the movie – I didn't like the changes in voices."
- "The movies often repeated themselves."
- "What I like least about the site was that the interactive activities were limited."

Did Students Print Pages? When asked if they had printed any pages contained on *Teachers' Domain: Physical Science*, 21 (17.7%) of the 119 students in the high school sample reported that they had. In contrast, 98 (82.3%) said that they hadn't.

What's Confusing or Too Challenging. Asked to describe anything about *Teachers' Domain: Physical Science* that they think is confusing or too challenging, 32 high school respondents simply wrote the words "Nothing" or "None." Another 18 students offered the following similarly positive comments:
- "I didn't [think] that the Web site was too confusing or challenging."
- "There are none. It is all pretty basic."
- "Nothing really, you just click and go."
- "Nothing at all. It is easy to access and use."
- "I don't think anything was confusing about it."
- "Nothing was confusing or challenging."
- "Nothing is confusing on the Web site just some of the movies can be a little confusing."
- "I thought that the Web site was very explanatory, there was nothing confusing."
- "There's nothing. Everything is right there and east to get to."
- "Nothing, the site is pretty easy to understand."
- "Nothing is confusing or challenging."
- "I don't think anything is difficult."
- "Nothing – it is all pretty explanatory."
- "I had no major problems."
- "I can't think of anything."
- "I thought the Web site was clear and overall very easy to follow."
- "I don't think anything about the site is confusing or challenging."
- "Nothing really was confusing."

Another 46 students offered the following additional broad ranging remarks describing what they found confusing or too challenging about *Teachers' Domain: Physical Science*:
- "I wasn't sure where to go after I read directions."
- "It got overwhelming at times with all of the topics I could choose from."
- "I had to keep pausing the videos to write things down, it's hard to remember every little fact if you are just listening to a video."
- "Finding exact things I need."
- "There were some big words."
- "Getting around."
- "It is hard to remember your password, but that's about it."

- "Trying to find stuff."
- "I think all the links and places in the site that you can go are confusing."
- "Sometimes I'm not clear on where to find the movies, but I usually figure it out pretty fast."
- "The questions make you think about what happened and why that happened."
- "Signing in there shouldn't be so many steps."
- "Getting to the movies."
- "Folder names and login process – not convenient."
- "Navigating around."
- "You can't just view the movie you must first click on the title then view."
- "Making a group."
- "Sometimes the calendar is off."
- "You have to click on the title of the movies before clicking on view."
- "Narrator speaks fast, but you can add captions or stop and rewind."
- "Having to open so many folders."
- "Sometimes, trying to find certain information."
- "Sometimes the way things are explained."
- "Why do we need a username and password, it's be quicker without it."
- "Getting into the Physical Science site."
- "Finding the topics at first."
- "How to watch the movies."
- "The games."
- "How the stealth is built."
- "The checking in process."
- "Too many places to go before you get to where you want."
- "It is hard to find some things."
- "How to find the things you are looking for."
- "The way the 'groups' are set up confuses me a little because of so many."
- "The work you print and do for homework."
- "Make the first "View" link work for movies."
- "Why can't you click on view the first time it is available."
- "The summaries."
- "Hard understand to voices in the movies."
- "The check in and finding the right folders."
- "The method of finding a certain category of movie."
- "At first the navigation was difficult, but I got used to it."
- "The amount of reading."
- "Getting the movies to play."
- "Describing motion."
- "The filing system is hard to notice, but once you find it is easy to use."

Inaccurate or Unbelievable Content. Asked to describe any information contained on *Commanding Heights Online* that they feel is either inaccurate or unbelievable, 43 respondents simply wrote words such as "Nothing" or "None," and 20 others offered the following similarly positive remarks:
- "I thought it was all accurate."
- "I don't think there was any"
- "I do not feel any information was inaccurate."
- "I didn't think that any of the information was inaccurate."
- "Everything seemed credible."
- "I didn't find any."
- "Not really anything"
- "No information that I received was inaccurate."
- "I don't believe there is any."

- "None that I know of."
- "I don't think I came across anything inaccurate."
- "Nothing. The site is very accurate."
- "Nothing that I viewed."
- "I didn't find anything false."
- "It all looked good."
- "None that I have found."
- "I believe it is all true."
- "Most of it is believable because of the fact that most of science is strange."
- "I feel that the information was accurate and believable."
- "All of the information on the site, to the best of my knowledge is accurate and believable."

Another student offered the following complimentary opinion:

- "The Segway was cool."

In contrast, eight students offered the following comments questioning information contained on the Web site:

- "How fast sound travels."
- "The Segway information was unbelievable, but it was amazing."
- "On the moon how they dropped a hammer and a falcons feather and they landed at the same time."
- "When the astronaut dropped a hammer and a feather on the moon and they landed at the same time."
- "The most unbelievable thing I saw is how radioactive that guy was from working with Radon."
- "Sometimes the calendar information is off, but it is easy to check due dates on the message board."
- "Sometimes the due dates are incorrect."
- "Some of the movies need more impartial contents of items."

Comparison With Other Web Sites. When students were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, a quarter (25.2%) rated it as "Very Good" (see Table 16). Another 4.2% rated it as "Good" and 19.3% rated the site as "Average." Approximately 51.3% rated it as "Poor" and nobody gave it a "Very Poor" rating. These bipolar results suggest that students did not constrain their comparison to educational Web sites. The mean comparison rating is 2.91 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good).

Table 16. Comparison with Other Web Sites

Variable	*N*	*Categories*	*Responses* Number (%)
Comparison	119	Very Good	30 (25.2%)
		Good	5 (4.2%)
		Average	23 (19.3%)
		Poor	61 (51.3%)
		Very Poor	–

Rating Features and Resources. To help determine which components were most useful to students, all respondents in the high school sample were asked to rate the *Teachers' Domain: Physical Science* features and resources listed in Table 17, on the following page. On average, the features received ratings between 3.6 and 4.7 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). The 4 features that were most appreciated by the students are *Videos*, *Interactive Activities*, *Still Images*, and *Audio Resources*. All of the other features and resources were also very well rated.

Table 17. Rating Teachers' Domain Features and Resources (N = 119)

Features	Haven't Used	Very Poor	Poor	Fair	Good	Very Good	Average
Lesson Plans	47	1	1	11	42	17	4.0
Resource Highlights	45	–	3	18	36	17	3.9
Background Information	44	–	2	16	38	19	4.0
Questions for Discussion	48	1	2	23	30	15	3.8
Related Links	49	–	6	21	33	10	3.7
Search	49	1	5	29	24	11	3.6
Help	60	1	5	18	22	13	3.7
Resource Bins	60	2	3	20	19	15	3.7
Resources							
Videos	1	–	3	3	28	84	4.7
Still Images	25	–	1	9	55	29	4.2
Documents	22	–	5	17	58	17	3.9
Interactive Activities	23	–	2	15	35	44	4.3
Audio Resources	33	–	5	9	32	40	4.2

Probing for information about the usability of the features and resources listed above, students were asked if these components perform the way they expect them to. Of the 119 high school students in this sample, 114 (95.8%) reported that they do. In contrast, 5 students indicated that they don't.

Students' Suggestions for Improving the Web Site. When asked what suggestions they have for improving *Teachers' Domain: Physical Science,* 16 respondents simply wrote the word "None" or "Nothing," suggesting that they may think the site is fine as-is. Another 9 students responded with the following positive remarks:

- "Keep up the good work."
- "None. The Web site was very helpful."
- "I feel it's a good site and the movies were easy to watch."
- "It seems fine at it is."
- "It seems fine to me."
- "It seems fine."
- "I think it's good the way it is."
- "Nothing really I think the site is very good!"
- "Keep up the good work."

An additional 85 students offered the following suggestions, which have been organized into categories (Note that numbers in parenthesis indicate the number of responses that fall within each category.):

Make Site More Attractive/Inviting (18)
- "More attractive design."
- "Make it look more inviting."
- "Make the site a little more lively."
- "Improve Web site design."
- "Better appearance."
- "More teen friendly."
- "A little more inviting."
- "Make it more inviting to students."
- "Make pages more colorful and attractive to the eye."
- "Make it have more color, instead of just green for the border."
- "Make more attracting and more colorful."
- "Maybe have the Web site more appealing. More color"

- "Colorful."
- "More color."
- "A different color."
- "The site could possibly be more colorful and have more graphics because then it would appeal to more people and seem more inviting."
- "Have a little more exciting entrance page."
- "More colorful on the home page."

Include More Videos/Movies (11)
- "Add more movies"
- "Adding more movies."
- "Include more movies."
- "Have more movies."
- "More movies."
- "More movies, they are cool."
- "More movies on same topic."
- "Adding more videos on some of the topics."
- "Add more movies and interactive material to your sections."
- "Keep making more movies."
- "Add more videos."

Information Architecture/Ease of Navigation (12)
- "Make a more convenient way of getting around the site."
- "Make everything more accessible."
- "Make it easier to navigate."
- "Easier to navigate."
- "Make it easier to get to the movies."
- "The setup is boring and hard to find things."
- "Have easier ways to reach certain things."
- "Make finding the information on what you need easier."
- "Easier access to learning station."
- "None really other than making the search easier, like listing the categories the site has."
- "Have more directions, easier to guide through the site."
- "When I was on the homepage I didn't even know it had information on it concerning science or anything else."

Include Additional Interactive Activities (9)
- "More interactive games, experiments and other activities."
- "Have more interactive activities for a subject."
- "Add more interactive educational activities."
- "Add more interactive activities."
- "To have more interactivities."
- "More interactive learning."
- "More interactive things."
- "Add more interactive learning games."
- "Interactive games."

Include More Information/Topics (4)
- "Add more information."
- "To have just a few more facts and stuff."
- "Include a wider variety of topics."
- "More topics."

Link Related Issues (4)
- "Make sure the links work."
- "Fix broken/non-working links."
- "You should improve the links to the brain pop movies."

- "Add more links to sites."

Make Site More Interesting (4)
- "Make it more interesting."
- "Make the site more interesting."
- "Have the documents a little more interesting."

Technological Stability (3)
- "Try to stop from crashing."
- "Try to improve keeping the server up."
- "More compatible for dial-up internet users."

Enhance Grade Information (2)
- "Maybe add a tests grade link to find out what you got."
- "A more detailed section for grades."

Miscellaneous (20)
- "Label things more clearly."
- "Making the viewing screen bigger."
- "Get more Media Players for the movies."
- "Make it available for all speeds of Internet connection; no need to login."
- "You could make some of the documents clearer and easier to understand."
- "Maybe add quizzes to each video so users can test their knowledge on that information."
- "Not have so many windows."
- "Putting a cool picture on the front page."
- "Enlarge smaller fonts."
- "Better acceleration car game, that car barely did anything!"
- "The case sensitive password; you can't just click on the movies you have to go into the folder then click."
- "Answer questions to the message board faster."
- "Make flash games a little more interesting."
- "Make the checking in process easier."
- "I think the videos should be more factual instead of story like."
- "Just try to make groups less confusing."
- "Newer movies."
- "Make sure the movies don't repeat themselves."
- "Better narratives, less boring voices."
- "For passages on a topic just have important highlights."

HIGH SCHOOL TEACHER FEEDBACK

The following is a summary of responses to the pre- and post-use high school teacher surveys. Note that written responses and multiple-choice selections are highlighted in mauve (Doug Gilliland) and blue (Claire Guse). Questions and multiple-choice options are included in their entirety for the reader to gain a clear understanding of the actual range of ratings, statements, and sentence stem-completion wording available.

Expectations. Prior to using the *Teachers' Domain* Web site participating teachers were asked to describe the types of information, activities, and other resources/content related to genetics, evolution, and ecology they would expect to be contained on the site. The following are teachers' written responses to this inquiry:

- "(1) More chemistry resources; (2) Student program sheets they fill out as they go through the programs." [Gilliland]
- "Interactive instruction; Simulators; Streaming video; Topic information with pictures and graphics; additional topics – energy (mechanical) momentum." [Guse]

After using the Web site for one school term, teachers were asked if the site had met their expectations. Both of the high school teachers reported that their expectations had indeed been met.

When asked what word best describes the *Teachers' Domain: Physical Science* Web site, participating high school teachers offered the following responses:
- "Excellent!" [Gilliland]
- "Terrific" [Guse]

Web Site Use. At the end of the term, teachers were asked to estimate the percentage of their own *Teachers' Domain* use they had given to performing classroom presentations. On average, they reported that 15% of their use had been directed at this activity. Asked to describe the ways that they have used *Teachers' Domain*, teachers offered the following written responses:
- "After we covered a topic students would view movies and answer questions I had printed out for them." [Gilliland]
- "My own research for class prep.; Showed QuickTime video to class; Assigned interactive site; Extra credit assignments to supplement course." [Guse]

At the end of the term teachers also estimated that 60.0% of students' class or computer lab Internet use had been given to using the *Teachers' Domain: Physical Science* Web site, on average.

Teachers were asked if they personally printed any of the pages contained on the Web site. Neither of them reported that they had. They were also asked what length of video best meets their needs (short, medium, or long). Both of the teachers indicated that they prefer short videos. They also reported placing an average of 12 items in their Personal Resource Bin. Additionally, one teacher (Gilliland) indicated that his students were most likely to be in the classroom when they visited *Teachers' Domain*. The other teacher (Guse) identified the computer lab as the location where her students would make use of the Web site."

Overall Rating of Web Site. After using the *Teachers' Domain: Physical Science* Web site over the course of one school term, participating high school teachers were asked to rate the site, overall. Both of them gave the site a 5 rating on a five-point Likert scale ranging from 1 (Very Poor) to 5 (Very Good).

Rating Usefulness and Informative Value. When the high school teachers were asked to rate how useful *Teachers' Domain: Physical Science* is to obtain resources and information that support their teaching, both of them rated the site's usefulness as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful). When asked to indicate how informative they think the site is for their students, they both rated its informative value as "Very Informative" on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative).

Navigation and Finding Information. Teachers were asked to specify how easy or difficult it is for them to find information they are looking for on the Web site. Both of the high school teachers reported that it is "easy to find" what they are looking for. Similarly, probing for an understanding about what, if anything, may have caused finding information to be challenging, the teachers reportedly concluded that the information that could not be found "is not available on the site" rather than it is too difficult to find.

What Teachers Like Most. When asked to specify what they like most about *Teachers' Domain: Physical Science,* participating high school teachers offered the following written comments:

- "Movies – short, to the point, well done. Students found them very interesting and easy to understand." [Gilliland]
- "Organization because it's easy to find info. Speed – downloads are fairly fast." [Guse]

What Teachers Like Least. When asked to specify what they like least about *Teachers' Domain: Physical Science,* the teachers offered the following written comments:

- "Straight text sites. Were not very attractive to the students. They were much more interested in multimedia – movies and interactive sites." [Gilliland]
- "Registration, login – It took me quite awhile to figure out I could register once for the school and have multiple users login with the same name at the same time. Consequently, I found the info. on Teachers' Domain then sent students directly to the NOVA site instead of Teacher's Domain, which is why not all students were able to fill out follow up survey" [Guse]

What's Confusing or Too Challenging. Asked to describe anything about *Teachers' Domain: Physical Science* that they think is confusing or too challenging, one teacher (Guse) indicated that there isn't. The other teacher (Gilliland) offered the following written comment:

- "When the students would get to a folder and click on view it would sometimes cause the browser to quit. We found that if we clicked on the name of the resource, opened that resource page, then clicked on view it would work." [Gilliland]

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, both of the high school teachers reported that there isn't.

Comparison With Other Web Sites. When the high school teachers were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, both of them rated it as "Very Good" on a five-point scale ranging from 1 (Poor) to 5 (Very Good).

Rating Features and Resources. Teachers were asked to rate the *Teachers' Domain: Physical Science* features and resources listed in Table 18 below and continued on the next page. The site components used by high school teachers are highly appreciated items, typically receiving either a "Very Good" or "Good" rating. The *videos, interactive activities,* and *background information* (i.e., backgrounders) are the most valued features/resources for these teachers.

Table 18. Rating Teachers' Domain Features and Resources

Features	Haven't Used	*Very Poor*	*Poor*	*Fair*	*Good*	*Very Good*
Lesson Plans	1	–	–	–	1	–
Resource Highlights	1	–	–	–	1	–
Background Information	–	–	–	–	1	1
Questions for Discussion	1	–	–	1	–	–
Related Links	–	–	–	–	2	–
Search	1	–	–	–	–	1
Help	1	–	–	1	–	–
Personal Bins for Resources	1	–	–	–	–	1

Table 18 (continued). Rating Teachers' Domain Features and Resources

Features	Haven't Used	Very Poor	Poor	Fair	Good	Very Good
Resources						
Videos	–	–	–	–	–	2
Still Images	1	–	–	–	–	1
Documents	–	–	–	–	2	–
Interactive Activities	–	–	–	–	1	1
Audio Resources	1	–	–	–	–	1

Probing for information about the usability of the features and resources listed above, teachers were asked if these components perform the way they expect them to. Both of the participating high school teachers reported that they do. Similarly, when asked if the resources contained on the *Teachers' Domain: Physical Science* Web site support their teaching needs, the teachers once again responded "Yes."

Changes in Instructional Strategies. Teachers were asked to describe how, if at all, their instructional strategies had changed over the course of using *Teachers' Domain: Physical Science*. High school teachers offered the following written remarks:

- "The use of your site, especially the movies, gave the students real life experiences. I write my own programs (The Physical Science Series) and your site is now part of my curriculum." [Gilliland]
- "I incorporate more video." [Guse]

Helpfulness of Contextualized Information & Resources. Asked how helpful it is to have information and resources on the Web site contextualized and if they are organized in a useful manner, high school teachers offered the following written remarks:

- "The information is contextualized well – no problems. I wish there were more topics – most are physics topics – I'd like to see more chemistry." [Gilliland]
- "Organization and topic choice is good. However, most info. is supplemental for enrichment, which I don't have a lot of time for in the curriculum. I need to cover the basics. I found the interactive site on Redshift from NOVA particularly useful. Most other information was great additional info., but not useful for getting the basic content across. Some lesson plans did provide good ideas for adapting my own." [Guse]

Perceived Value of Support Elements. In addition to the videos contained on the *Teachers' Domain: Physical Science* Web site, WGBH has made an effort to include supplemental features, resources, and organization for both teachers and their students. When asked if these elements of the site provide the intended support, both of the participating high school teachers responded by saying "Yes" it's worth the effort.

Usefulness of Backgrounders. Teachers were asked to rate the usefulness of the Web site's text information presented in the form of Backgrounders (i.e., educational text accompanying videos, still images, documents, interactive activities, and audio resources). One of the high school teachers (Guse) indicated that the Backgrounders are "Very Useful" and the other teacher (Gilliland) found them to be "Okay."

Probing for an understanding of how teachers used the Backgrounders, they were asked to describe how they and/or their students made use of this text feature. One of the high school teachers offered the following response to this inquiry:

- "Generally, to improve my own understanding and/or preview the video. I often do my prep work at home from a dial-up connection, so downloads were too slow to preview many of the video clips" [Guse]

Usefulness of Lesson Plans. When asked to rate how useful the Lesson Plans contained on the Web site are for their teaching, one high school teacher (Guse) rated them as "Moderately Useful" and the other (Gilliland) gave them a "Slightly Useful" rating.

Usefulness of Questions for Discussion. There are a set of "Questions for Discussion" that accompany each of the Web site's Backgrounders (i.e., educational text accompanying *Teachers' Domain* resources). When asked how useful these question prompts are, one high school teacher (Guse) rated their inclusion as "Okay" and the other (Gilliland) reported that he developed his own set of discussion questions.

Usefulness of Links to Curriculum Standards/Frameworks. Teachers were asked if the links to state and national curriculum standards are helpful for their teaching. One of the high school teachers (Guse) rated the links as "Moderately Useful" and the other teacher (Gilliland) gave them a lesser "Okay" rating.

Constraints On Using Teachers' Domain. Asked if they encountered any constraints to their use of *Teachers' Domain: Physical Science* and, if so, what can WGBH do to address these hurdles, high school teachers offered the following comments:
- "Your site was down on Friday May 14 to install the Civil Rights section. My morning classes were not able to access the site. If warning had been given I would have had the students work on the site Thursday and do another assignment on Friday. No warning was given. Why couldn't this have been done after 3:00 p.m.?" [Gilliland]
- "Time to extend classroom content to include the enrichment you provide. Try to include material that clearly covers the basic laws and principles of science. The Redshift interactive site was great. That's an example of a site that can teach a basic principle better than I can." [Guse]

Information WGBH Needs To Provide. Teachers were also asked for feedback about what additional information, if any, WGBH needs to provide for teachers so they can get the most out of *Teachers' Domain*. The following is a response from one of the high school teachers:
- "None. You just need to publicize that the site is there for teachers to use." [Gilliland]

Teachers' Suggestions For Improving the Site. Teachers offered the following written responses when asked to offer suggestions for improving *Teachers' Domain*:
- "More chemistry topics. Other than that I can't think of any way to improve the site. I want to thank WGBH for an outstanding resource. I plan on using it every year – my students found it very informative and interesting." [Gilliland]
- "Continue to add more info, particularly interactive sites that provide instruction in basic concepts. Including resources from Scientific American Frontiers would be great." [Guse]

MIDDLE SCHOOL RESULTS

MIDDLE SCHOOL STUDENT FEEDBACK

Background Variables. Background classification variables (self-reported ability to use a computer and experience with exploring the Internet prior to use of *Teachers' Domain: Physical Science*) were examined. Table 19 shows that 60.0% of the middle school students who participated in this study describe their ability to use a computer as being

either "advanced" (27.7%) or "above average" (32.3%). Similarly, approximately 69.8% of the students indicated that they have either "advanced" (36.6%) or "above average" experience(33.2%) with exploring the Internet/World Wide Web.

Table 19. Background Variables

Variable	*N*	*Categories*	*Responses* Number (%)
Ability to use a computer	325	Advanced	90 (27.7%)
		Above average	105 (32.3%)
		Average	119 (36.6%)
		Just beginning	11 (3.4%)
Experience with exploring the Internet/World Wide Web	325	Advanced	119 (36.6%)
		Above average	108 (33.2%)
		Average	86 (26.5%)
		Just beginning	12 (3.7%)

Expectations. Prior to using *Teachers' Domain: Physical Science,* students were asked to describe the things they would like to see or do when they visit a Web site that contains information about physical science. A total of 313 middle school students provided a written response to this inquiry describing a broad range of expectations. Two of these students indicated that they had no pre-use expectations. The following are the other students' comments, presented unsorted to convey the nature of their thoughts:

- "Learn about air is matter."
- "Experiments that you could do. Things that are fun to do about science; games about science."
- "Stuff I do not know about."
- "Play games."
- "Another rollercoaster Web site."
- "Stuff like sound waves and gravity and stuff."
- "Play games."
- "About sinking and floating."
- "Newton's Law of motion."
- "Stuff on chemicals and mixing them."
- "When did the beginning of Physical Science start."
- "Nice people."
- "play games or do quizzes."
- "Learn different things I don't know much about yet."
- "Play games."
- "I would like to do and play games, so I can learn as well as have fun while on your Web site."
- "I will like to go to heat."
- "How waves can really travel with such little sound and how water makes such bigger wave thing when you touch it."
- "I get it."
- "Play a trivia game about science."
- "Sound – music, speakers."
- "I like to go to science, in gravity."
- "I would like to play a game like a game dealing with science."
- "To work on sound."
- "Heat, gravity, properties of objects and more."
- "I would like to see stuff about properties of objects and materials and sound mostly."
- "Good stuff that you need to know, not know unfit stuff."
- "See most of the scientific matter."

- "Just stuff that looks fun to do."
- "Everything, but mostly the wild life (outside) and me (bodies)."
- "I like to go to google.com Web site. I would like to look at more roller coasters and play science games."
- "See things about planetary motion and about the human body, cures for sickness and all that."
- "Gravity, heat, sinking and floating."
- "I like to see a car moving up and down."
- "Heat, gravity and matter."
- "I like to play the games and do the pop quizzes."
- "On like a science Web site, I like to go to the space things."
- "I would like to do experiments / labs."
- "See roller coaster."
- "Play games, study and read about physical science, and take quiz."
- "I would like to know more about echolocation."
- "Everything."
- "Sound waves."
- "Movies, games on the subject."
- "Talk about heat and other science topics."
- "Make power points."
- "Atoms."
- "Play scientific games."
- "I like to go to the fan people Web site and talk to Bow Wow or play games."
- "Anything you show like cars, heat radiation."
- "Go on web pages and chatting."
- "I will like that a lot."
- "I would like to see experiments and funny things but still educating."
- "To study gravity."
- "Energy."
- "Play games."
- "I would like to know about things in science that I haven't learned before."
- "Play a game."
- "Learn more about it."
- "More information."
- "Play science games."
- "A lot."
- "Work with computers, learn more about motion, learn more about air of matter, more about heat, more about objects and materials."
- "To learn more than I already know."
- "How can we use physical science in our life."
- "Rollercoaster."
- "Play games to make me learn."
- "I would like to play games and read essays so people who read can learn and people that visualize can learn to."
- "See pictures of the items listed."
- "The types of things I would like to see and do on the web is like building a go-cart or a mini-vehicle."
- "What I would like to do is answer some questions and do some science games."
- "I would like to see facts and information so that I can understand about what I don't know."
- "To learn from a web site, I learn better if I see shows of what I am trying to learn."
- "I would like to see about gravity and acceleration because those are what I am most interested in and also hydrogen too. I would like to know more because I find those subjects in my everyday life."
- "I see a home page with all the information there."

- "The thing I would like to see or do is…..find more information about physical science."
- "I would like to see some examples of the things that you would learn about in physical science."
- "Check if the information is accurate."
- "Maybe on-line experiment would be fun."
- "I would like to see information on space, motion, sound, and friction."
- "I would like to see things that are about gravity."
- "I would want to see how we (people) aren't able to go to Mars if we can go to the moon."
- "I would like to see little cartoons giving examples of what the web site is talking about with a caption underneath."
- "I would like to see reactions."
- "Play a little side game where you are a doctor."
- "I would like to see cool pictures and graphics on a web site."
- "Air is matter."
- "I would like to find out how an airplane can fly."
- "Information on that topic and easy at home experiments."
- "Mostly I would like to see how the human body works and where other important body parts are."
- "I would like to see information by using words and pictures to help me understand what they are talking about."
- "I would like to see good information. The information should be easy to find."
- "I would like to see the information said in a kid friendly way, not 12th grade science talk."
- "I would like to search through the web site to see what would interest me."
- "I would like to see information, but I like games that are about physical science, so people can make learning fun."
- "On a web site I would like to see examples of labs."
- "A thing I would like to see on a web site that contains physical science is motion and force."
- "I would like to see heat."
- "I would like to see a list of fun facts (amazing but true facts) on your web page."
- "I guess what's on the web site, don't really know because I am really never on that kind of web site."
- "If I saw a web page that contains information about physical science, I would want to see information about gravity and sound."
- "If I was on a web site containing physical science, I would like to see ideas for cool experiments."
- "Things that I would like to see is parts of space."
- "I like to go through the web site and find information that I would be looking for."
- "Find out more about the 3 of Newton's."
- "I would like to see more about force."
- "I would like to see some interesting facts that I hopefully haven't known."
- "I would like to see good information and well drawn and labeled diagrams."
- "I would like to see cool graphics and I would like to be able to understand the information."
- "I would like to see funny, yet educational video clips and games."
- "I'd like to see what I'm looking at (a lot of tings)."
- "I would like to learn hands on labs that we can do at home or at school. I would also like to see funny moving graphics."
- "I would like to see some games about physical science and a lot of information."
- "I would like to learn by demonstration or pictures about all that I circled 5 on in page one."
- "I would like to see an eye-catching web site with helpful information, and in words so kids can understand."

- "I would probably go and try to find some cool information, maybe learn something. If I was in school I would definitely try to learn something, but at home just mostly have fun and some learning."
- "I would like to see directions on how to do the experiments on your own."
- "I would like to see stuff that would help me understand more about the things we do in science."
- "I would like to see fun ways to learn about physical science and maybe do a learning game."
- "Introduction, beginning, middle, ending, info, conclusion."
- "When I visit a physical science web site, I would like to see more learning games and cool facts that you can go home and tell your family about."
- "I would like to see interesting facts or cool pictures."
- "On-line labs."
- "I would like to see all different topics and information I can use."
- "Maybe pictures to describe each paragraph."
- "I would like to see something about how science can be fun."
- "I would like to see lots of interactive activities."
- "I would like visual things (ex graphics and pictures) and sound and interactive things."
- "I would like to see short movie of experiments or games that help you learn."
- "I would like to see how the human body works and the different brain cells."
- "I would like to see things on motion such as velocity, force, acceleration, etc."
- "Some things I would like to do are play games about physical science that get me interested."
- "I would like to play games and see pictures of some physical science and information."
- "I'd like to see information about physical science in a way that is easier to understand, or a way that's more fun to read than paragraphs."
- "Play a game that has something to do with science."
- "I like to look at interesting facts about it."
- "I would like to see pictures and good detailed information."
- "I would like to surf that Web site and research topics I do not know about."
- "I like to see information about matter and motion when I view a web page about physical science."
- "I would like to find out information on electricity and heat."
- "Some things I would like to see are the periodic table, and pictures of physical science."
- "Some things I would like to see are not just boring information in paragraphs that go on and on."
- "I would like to play interesting game that teach me about what you chose to put on the Web site."
- "Examples of what they are talking about like put objects that demonstrate physical science."
- "Experiments of all kinds, info, help page."
- "I would like to see very interesting facts on physical science about new things I haven't learned and to see images of what things look like."
- "I would like to see how sports are related to science because I love sports."
- "I would like to see what kinds of experiments there are and learn lots of new things."
- "I like to see amazing but true facts for my abt cards."
- "I would like to see how that object works and know about it before I can do any experiments with it."
- "I would like to visit NASA web site."
- "How to control fire and matter in certain objects."
- "Something that grabs attention like a lot of pictures and something to make everything make sense."
- "I would like to learn more about science."
- "Types of thing I like to do is find the subject and do an activity while learning about it."
- "I would like to play a game or watch a video."

- "It would be cool to watch a video of the person doing an experiment with the subject."
- "I would like to do fun activities and see educational, interesting pictures."
- "I like games that would have the science in them."
- "I like to go on a web site and find sinking or floating objects."
- "I would like to see some interesting information that helps me get more into the Web site."
- "I would like to see people doing things."
- "I would like to see science games."
- "I would like to learn about properties and materials of an object."
- "Like play a game that would teach you about something to do with Physical Science, like it could ask you PS."
- "The types of things I would like to see is color, animations and interesting facts."
- "I would like to see new things, some things I have not learned in science yet."
- "I would like to see experiments and know how to do them."
- "I would like to see information about the 4 elements."
- "I would like to see good information along with some pictures."
- "I would read all the information that I find interesting."
- "If the web site had some pictures of the heart."
- "I would like to see definitions."
- "When I go to a science web page I like to learn things I don't know."
- "I would like to see forever."
- "When I go to a site on the internet about Physical Science, I want the page to be eye catching, informative, and interesting."
- "I will like to experiment a couple of exercises about physical science and explore new things."
- "Umm….I think it would be cool to be learning while playing a game."
- "Fun stuff like educational games."
- "When I visit a web site about Physical Science I would like to see someone pushing another person in a chair with wheels on the bottom."
- "I will like to look at something I never knew, I like to see pictures."
- "Watch video clips or reading."
- "Interactive questioning."
- "Interactive demonstrations."
- "Look around & see what's there and looking at picture."
- "Interactive demonstrations."
- "Interactive demonstrations and questions, watching clips."
- "Color, movement, click on's."
- "Interactive demonstrations and questioning."
- "Interactive questioning and video clips."
- "Watch video clips."
- "Video clips, audio clips, questions."
- "Interactive questions and demonstrations."
- "Diagrams, interactive, watch video clips."
- "Interactive demonstrations and questions."
- "Watch video clips."
- "Video clips and pictures."
- "Read/look documents, interactive questions."
- "Interactive demonstration."
- "Watch video clips, interactive demonstrations, interactive questions."
- "Watch video clips."
- "Watch video clips."
- "Watch video clips, interactive demonstration & questioning."
- "Watch video clips."
- "Pictures and games."
- "Interactive demonstrations."

- "To get straight answers to questions first then directed to links later."
- "Watch video clips, interactive questioning and demonstrations."
- "Interactive demonstrations."
- "Interactive demonstrations."
- "Interactive questions."
- "Interactive questions."
- "Interactive documents."
- "Diagrams, experiments, interactivity."
- "Read/look at documents, video clips, interactive questions."
- "Writing that is to the point, interactive demonstrations."
- "Watch video clips."
- "Watch movies."
- "Watch video clips."
- "Interactive demonstrations."
- "Watch video clips."
- "Watch video clips."
- "Diagrams, videos."
- "Interactive demonstrations."
- "Interactive."
- "Interactive questions."
- " Watch video clips, interactive demonstrations."
- "Interactive demonstrations."
- "Games."
- "Watch video clips."
- "Quizzes, pictures, watch video clips, interactive demonstrations."
- "Watch video clips, interactive questions and demonstrations."
- "Interactive questions."
- "Interactive questions."
- "Watch video clips, interactive demonstrations."
- "Watch video clips, interactive demonstrations."
- "View documents, interactive demonstrations."
- "Watch animated video clips."
- "Video clips, interactive demonstrations and questioning."
- "Interactive questioning and demonstrations."
- "Video clips, diagrams, interactive questioning and demonstrations, fun, attractive, designed well."
- "Interactive questions, pretty pictures."
- "Motion, interactive, video clips."
- "Play games."
- "Interactive video clips."
- "Watching video, picture, interactive picture and questions."
- "Interactive demonstrations, video clips that sound interesting."
- "Watch video clips."
- "Interactive, interesting facts, watch video clips."
- "I would like to leave the web site."
- "Interactive demonstrations, read bullets."
- "Read/look at documents, video clips, interactive demonstrations."
- "Watch video clips."
- "Watch video clips."
- "Pictures, color, watching videos."
- "Interactive demos and video clips."
- "Watch clips, interactive demonstrations."
- "Games, pictures, research."
- "Interactive, watch animations, music."
- "Read documents with thorough demonstrations/examples, small quizzes."

- "I would like to see activities and different games that make it fun. Also places that let you talk to other science fans."
- "I like to know about Mars."
- "I would like to hear music and pictures."
- "The types of things I like to do are playing games, chatting and researching things."
- "Well a lot about planets and a lot about earth."
- "I would like to try out some fun experiments and do projects."
- "I would like to see things like minerals, gravity, inertia and/or gas."
- "Physical things about whale sharks."
- "I would like to see science games and facts."
- "I would like to see experiments."
- "I would like to see experiments that is fast and easy to do as a project."
- "I would like to know more about the solar system."
- "Not much."
- "I would like to see how they make robots and how they do the experiment with exciting pictures."
- "Gravity."
- "The science projects."
- "I would like to see the planets."
- "More about planets."
- "I would like to see information about rocks and minerals."
- "I would like to be able to play games."
- "Gravity activities."
- "What kids are doing at home like experiment and that kind of thing."
- "Explore about bones."
- "I want to see more things about the rain forests. I would like to be quizzed on some of this stuff on the web site too."
- "A game that teaches."
- "I would like to see games."
- "Probably arachnids, bugs, insects, space and geography."
- "The pictures of the planets."
- "I would like to see."
- "I would like to see planets and hear sounds."
- "What I would like to see or do when I visit the Web site is I would like to see is gravity using things down on the ground."
- "I would like to see what other kids my age with a project."
- "Floating things."
- "I would like to see some mini-games and some of the pictures or mini-movies of things."
- "I would like to see a game so if you have a test the next day you could study with a game."
- "I would like to see games and more about the planets."
- "I don't know."
- "I see the phases of the moon."
- "Fun games are what I would like to see."
- "Experiments."
- "I would like to see the birth of animals such as elephants."
- "The core."
- "I would like to play science games and learn more about science and planets and the world."
- "I would like to pictures, things about animals etc."
- "I would like to see how motions moves. I would like to see how peoples bodies are connected."
- "I would like to study the universe."
- "I would like to see demonstrations of what I'm explaining."
- "Gravity and heat."

- "I would like to play science game on gravity to make me understand better"
- "Learn more about animal facts."
- "The type of things that I would like to see are science activities and games."

Ways Students Used Teachers' Domain. Middle school students were asked to describe the way(s) that they used information contained on the *Teachers' Domain: Physical Science* Web site. As the following student written comments explain, the site was used for completing class assignments, preparing for exams, and enhancing learning. The often overlapping remarks are presented unsorted to convey the full nature of their feedback.

- "Studied physical and prepared for test."
- "Learned from it and tested from it."
- "Science."
- "Learn, quiz/ test understanding."
- "Learn or check learning."
- "Learn, quiz, check learning."
- "I learned from it and I was able to test what I learned."
- "Quiz or exam."
- "Learning."
- "For projects."
- "Learn, check learning."
- "To learn and have quizzes."
- "To learn to take the quiz."
- "To help us on the quiz that we took and to learn."
- "Learned and made science more interesting."
- "For quiz, reach."
- "To learn more about science."
- "Learn, quiz."
- "Games and movie."
- "Learning and help us at pop quiz."
- "Take pop quiz, learning."
- "Science."
- "Learn, took quiz, watching."
- "Videos, games, learned, quizzes. Able to test what I have learned."
- "Learned and accessed what I learned."
- "Learned about science."
- "Knowledge, science, education."
- "To learn and take the quiz after the video."
- "Videos – you learn from it and was able to pass a test on it."
- "Learn about stuff and it gave us a pop quiz."
- "Helps on learning and quizzes, researching."
- "By learning and fun."
- "Learn, brain, pop."
- "On brain pop to help, science."
- "Learn, research, quizzes and writing."
- "After we watched the video with Ken and Moby, we did the little quiz."
- "Learn, check learning."
- "Learn and check your learning."
- "To help learn better."
- "Learned about science and was quizzed about what was learned."
- "I've learned from it and test what I learned."
- "Learn, took quiz, pop quiz."
- "To learn more about physical science and was able to see how much you learned."
- "By looking up brain pop and have learned stuff, and able to excess what I learned."

- "To learn, take quiz."
- "Learn, understand."
- "Grades."
- "Learn."
- "Learn about science, learn about it."
- "To help me learn about science."
- "To help us study."
- "Learn from it, test what we learn."
- "For class work and learn."
- "To help us."
- "Learn."
- "Just to take test."
- "Learn, quiz, check learning."
- "Learning, pop quiz."
- "When we did brain pop."
- "Learning and quizzing."
- "To learn."
- "We have learned from it and access what we learn."
- "I have learned from it and was able to test what I learned."
- "To help us understand better in science."
- "To learn, taking quizzes."
- "I have used it on tests and projects."
- "I used them on sum what of a basis but not a lot."
- "To answer the questions."
- "Projects and labs."
- "The only way is I used this info to answer questions."
- "Some ways that I use this information on this site is the notes I always need the notes and the site is really helpful."
- "I went on many different ways to learn."
- "I have used the information I learned to do worksheets."
- "I have used the web site to get information on Newton and my search was successful."
- "I have answered questions for my teacher with the movies."
- "To learn."
- "I used the information jut to help me understand things a little better."
- "I have used the information to answer the questions at the bottom of the pages."
- "I used the info for questions I need to answer."
- "By answering questions with it and seeing some movies."
- "We used the information on hovercrafts to do a lab in science class where we created our own hovercraft."
- "I used info to answer the questions."
- "I used one thing from the Web site for my project."
- "I have used the information to help me on tests."
- "I have used information on the web site to learn about people like Galileo, Newton, and the simple forces of gravity."
- "I used info for questions and projects."
- "I used info from the site when I did my lab report."
- "I used it to help me understand science classes better."
- "I use the info. in some projects."
- "I mostly have told all my 5th and 4th grade friends. Now they are into it."
- "Have the videos go faster than usual."
- "I have used it to find info on NASA."
- "I used it to build my own hovercraft."
- "I have used the info to answer the questions at the bottom of each section."
- "I answered important questions."
- "I looked at the little movies on the web site."

- "To help me with science projects."
- "The videos and questions let me learn some things."
- "I used the info to learn about certain things."
- "I used some information on a class project."
- "1. answering questions; 2. making projects; and 3. lab reports."
- "To answer questions and know more."
- "I used them as notes and some of them helped me to study."
- "To do classroom experiments."
- "I've answered questions with them."
- "As a class we looked at different videos under motion and then answered the questions."
- "We had tests and the website helped me remember the answer."
- "We have made our own pendulums and tried making hovercrafts."
- "One way I used it was to do experiments like make a hovercraft, and learning and using pendulums."
- "I have used the info by telling my parents about it."
- "I didn't use any information on the web site. I never through about that."
- "I used the information for examples on projects and papers in my own words."
- "I've used the information in many ways such as I've got information for a project."
- "To write papers and pass test / quizzes."
- "Videos and questions."
- "The experiments."
- "I have used it to do experiments with them."
- "By using it in everyday life."
- "I use this information when I talk to people or when I take a test."
- "We have used it to answer questions."
- "We tried the balloon experiment (the one with the straw bent and straight)."
- "I haven't used any of the information from the website other than school work."
- "I haven't used them."
- "I have used the info from the site to work on tests and to try out the experiments."
- "I have used some information on the website to help when learning about it. Also we have done the hover craft activity."
- "Looked up things."
- "I have used the pendulum information when assembling the swing my brother got for his birthday."
- "We did experiments about the movies."
- "I used the information to study in increase my grade in science."
- "I used it to learn about defying gravity."
- "I have used information for science class, for myself."
- "I have used information on the site to help me in science class."
- "I used the information to answer questions."
- "We did experiments on what we learned."
- "It helped me in class."
- "In school; on tests."
- "I use it in my school work."
- "To answered questions."
- "I have used their information to help me answer questions easily."
- "I have used it mostly to help me with better understanding and helping to make WGBH a better Web site."
- "I was writing it down on a piece of paper and took notes on it too."
- "I used it for a class project."
- "I have used the information / stuff against projects. The hovercraft one I really liked. I used that information and tried it out!"
- "After the videos the reading part is really information."
- "On tests and quizzes in science class."

- "To find out about the gravitational pull of objects, and how they work."
- "We have used information to do labs in science."
- "The experiment with the balloons and the straws letting air out enabled my class to do our own experiment."
- "I have used the information on the air craft and made my own."
- "The high velocity clip gave me new knowledge of car racing."
- "In class we did a pendulum lab."
- "We clicked on a topic and watched the movie then read the article and answered the questions."
- "I have used it to help me on tests and quizzes."
- "I have used the notes to help me study online."
- "I've used it to prepare myself for the science tests we take."
- "We did labs in school."
- "Just to answer questions."
- "In tests and quizzes."
- "I used it to learn about physical science."
- "We used the website to learn about the subjects we were studying in school."
- "To learn about something and to study."
- "I have used it for projects and to answer things."
- "The info. helps with reports."
- "When I look at things in the world I see them in a more scientific way, like the pinwheels and race cars."
- "They went back to find any missing information."
- "I used the information about the handicapped scooters for something cool to talk about at dinner."
- "Doing a project."
- "I used the hover craft experiment and I found it on the Web site."
- "We watch the videos and then answer the questions."
- "For class discussions and research."
- "Educational research."
- "Sinking and floating, protons, neutrons, Zoom."
- "By what unit we were doing we looked and read information."
- "To learn ; educational purposes."
- "Science class."
- "Lab reports, labs, class work."
- "Element project (the research)." [Note: There were many variations of this answer]
- "Class lecture."
- "Element project."
- "For teaching us stuff. Elements, class lecture, educational resources."
- "Research."
- "Resource on the elements."
- "Mr. Marcou did class things with the site."
- "We used it in class to show examples of different things. Class lectures, educational resources, etc."
- "For projects."
- "Used it for entertainment, classroom discussion, and on a project."
- "Learning."
- "Class lectures."
- "The balloon and car."
- "Learn and class lecture."
- "Personal interest."
- "For projects, on element projects, class room lectures / discussions."
- "On science homework."
- "With the periodic table."
- "The table of elements helped on a pamphlet."

- "I used some information for school work and it helped increase my learning."
- "I looked up info for a project."
- "Research papers."
- "Homework and research projects."
- "By looking at different things."
- "The moving of things let me understand the way we move."
- "To learn about school topics."
- "To watch stuff and learn."
- "I search I watch videos and read information."
- "I watched the videos and seen information about cancer."
- "I copied them down."
- "I used the scavenger hunt for elements to find about more elements."
- "I learned it."
- "Typed in what I was looking for and got search."
- "I just clicked and then I was there but I had to let it load."
- "The movie info."
- "In my science class."
- "I tell people about it."
- "Watched movies."
- "On test and projects."
- "People, videos, games."
- "I looked for arachnids."
- "I used it for my homework."
- "I used solar power."
- "I used information from the periodic table."
- "I used some stuff like planets and other stuff like that."
- "The periodic tables."
- "For projects."
- "Someone asked me a question about it."
- "I used it in science class and at home."
- "Project I can do at home."

Overall Rating of Web Site. After using *Teachers' Domain: Physical Science* over the course of one school term, middle school students were asked to rate the site, overall. On average, respondents to this inquiry gave the site a 3.93 rating on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). As shown in Table 20, approximately 75.7% of the sample rated the site as either "Very Good" or "Good," 19.4% rated it as "Average," 4.0% rated it as "Poor," and 3 students rated it as "Very Poor."

Table 20. Students' Overall Rating of Commanding Heights Online

Variable	*N*	*Categories*	*Responses Number (%)*
Overall Rating	325	Very Good	74 (22.8%)
		Good	172 (52.9%)
		Average	63 (19.4%)
		Poor	13 (4.0%)
		Very Poor	3 (0.9%)

When asked what word best describes *Teachers' Domain: Physical Science*, 36 of the participating middle school students described it as "Interesting," another 30 described it as "Good," 27 found it to be "Educational," and 24 described the site as being "Informative/Informational." Other students described it as "Okay" (23), "Fun" (18), "Cool," (16), and "Helpful," (14). These and other similarly positive responses are listed on the following page (Note that numbers in parenthesis indicate the number of times the word was cited, if more than once.).

- "Interesting" (36)
- "Good" (30)
- "Educational" (27)
- "Informative/Informational" (24)
- "Okay" (23)
- "Fun" (18)
- "Cool" (16)
- "Helpful" (14)
- "Great" (9)
- "Excellent" (7)
- "Awesome" (7)
- "Scientific" (6)
- "Alright" (6)
- "Exciting" (5)
- "Fantastic" (4)
- "Very good" (4)
- "Interactive" (3)
- "Amazing" (2)
- "Very intelligent" (2)
- "Factual" (2)
- "Adventurous"
- "Colorful"
- "Convenient"
- "Creative"
- "Fair"
- "Genius"
- "Groovy"
- "Mature"
- "Not that bad"
- "So-so"
- "Splendid"
- "Sweet"
- "Terrific"
- "Useful"
- "Wow domain"

In contrast, to the 260 positive descriptions listed above, 18 students offered the following negative descriptions of the Web site:

- "Boring" (10)
- "Uninteresting" (2)
- "Bad"
- "Badly named"
- "Not that good"
- "Plain"
- "Poor"
- "Slow"

Learning Outcomes. As previously specified, both the pre-use and post-use surveys included a knowledge test to assess understanding of content associated with the *Teachers' Domain: Physical Science* use goals. Toward this end, students were asked to provide responses to the combination of 12 open-ended and multiple-choice content questions described earlier in the Learning Outcomes section of the High School Results. Correct answers received one point. Thus, there is a total of 12 points possible for each survey.

The post-use mean achievement score for the middle school sample is 6.65 [SD (standard deviation) = 2.20], significantly higher than the pre-use mean score of 3.10 [SD = 1.93], as tested by a paired t-test, t (1,324) = 29.77, $p \leq 0.0001$. Thus, the learning outcomes resulting from middle school students' use of *Teachers' Domain: Physical Science* is statistically significant. Figure 3 presents the mean scores for the sample's pre- and post-use content questions.

Figure 3. Distribution of Middle School Mean Achievement Scores for Pre- and Post-Use Content Questions
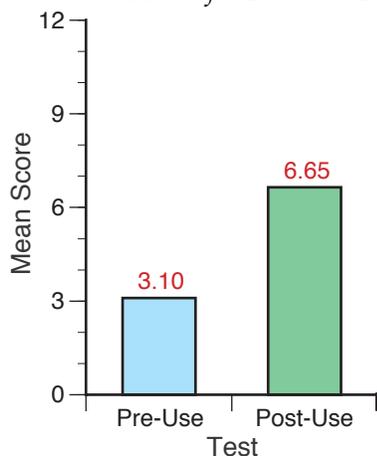
As previously specified, middle school students had significantly improved scores on the post-use test, compared to their pre-use results, overall. Table 21 reveals that, more specifically, there was statistically significant improvement on all of the content questions except for Questions 6 (i.e., Our weight 200 miles above Earth is about 90% of what it is on Earth.).

Table 21. Pre- and Post-Use Test Data Summary (N = 325)

Question	Points Possible	Pre-Use Mean (sd*)	Post-Use Mean (sd*)	Mean Difference	Statistical Significance**
1	1	.21 (.41)	.62 (.49)	+ .68	$p \leq$ .0001***
2	1	.52 (.50)	.70 (.46)	+ .27	$p \leq$ .0001***
3	1	.40 (.49)	.55 (.50)	+ .06	$p \leq$ .0001***
4	1	.15 (.36)	.37 (.48)	+ .31	$p \leq$ .0001***
5	1	.21 (.41)	.43 (.50)	+ .33	$p \leq$ .0001***
6	1	.35 (.48)	.36 (.48)	+ .04	$p =$ .5783
7	1	.16 (.36)	.81 (.40)	+ .34	$p \leq$ .0001***
8	1	.13 (.34)	.77 (.42)	+ .16	$p \leq$ .0001***
9	1	.27 (.44)	.43 (.50)	+ .42	$p \leq$ .0001***
10	1	.11 (.32)	.28 (.46)	+ .52	$p \leq$ .0001***
11	1	.22 (.41)	.46 (.50)	+ .04	$p \leq$ .0001***
12	1	.38 (.49)	.59 (.49)	+ .14	$p \leq$ .0001***

  * Standard Deviation
  ** Paired t-Test
  *** Statistically significant at the .05 p level (i.e., 95% confidence level)
     A p level ≤.05 indicates a treatment affect occurred (i.e., post-use score is significantly higher or lower than pre-use score. See sign in difference column for direction.)

Figure 4 presents a chart showing the differences between pre- and post-use mean/average scores for each of the 12 content questions.

Figure 4. Distribution of Middle School Pre- and Post-Use Mean Scores
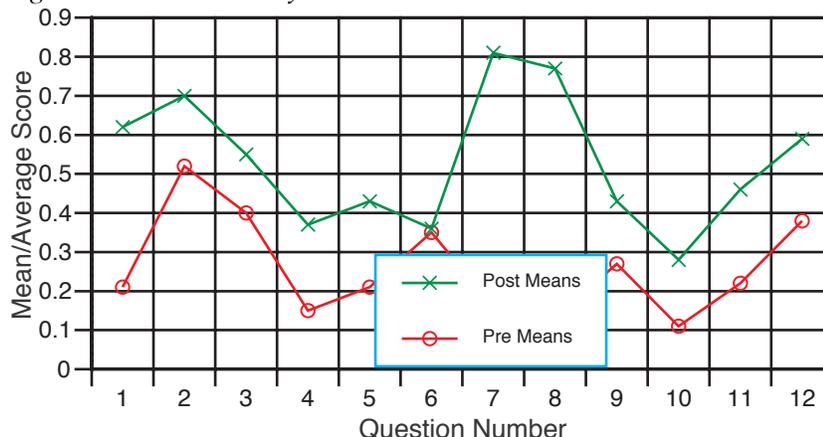
To sum up, the middle school sample taken as a whole did show statistically significant learning gains as measured against its starting baseline knowledge by our pre- and post-use surveys.

Rating Informative Value. Moving from learning outcomes to subjective assessment of the site, middle school students were asked to indicate how informative they think *Teachers' Domain: Physical Science* is. Approximately 77.0% of the middle school sample rated the site as either "Very Informative" or "Moderately Informative" (see Table 22); another 20.9% of the sample rated the site's informative value as "Okay." A fewer 2.2% of the students perceived the site to be either "Slightly Informative" or "Not Informative." The mean rating is 4.12 on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative).

Table 22. Perceived Informative Value of Commanding Heights Online

Variable	N	Categories	Responses Number (%)
Informative Value	325	Very Informative	123 (37.9%)
		Moderately Informative	127 (39.1%)
		Okay	68 (20.9%)
		Slightly Informative	6 (1.9%)
		Not Informative	1 (0.3%)

Overall Appearance. Students were asked to rate the overall look of *Teachers' Domain: Physical Science*. Table 23 shows that 56.6% of the respondents rated its overall appearance as either "Very Attractive" or "Moderately Attractive." Another 35.1% rated its appearance as "Somewhat Attractive." The mean rating is 2.57 on a four-point scale ranging from 1 (Unattractive) to 4 (Very Attractive).

Table 23. Overall Look of Teachers' Domain: Physical Science

Variable	N	Categories	Responses Number (%)
Overall Look of the Web Site	325	Very Attractive	29 (8.9%)
		Attractive	155 (47.7%)
		Somewhat Attractive	114 (35.1%)
		Unattractive	27 (8.3%)

Overall Readability. Asked to rate the overall readability of text contained on the Web site, Table 24 shows that 82.8% of the respondents rated its readability as either "Very easy to read" or "Easy to read." Another 15.1% rated it as "Somewhat difficult to read." The mean rating is 3.13 on a four-point scale ranging from 1 (Very difficult to read) to 4 (Very easy to read).

Table 24. Overall Readability of Teachers' Domain: Physical Science

Variable	*N*	*Categories*	*Responses* Number (%)
Overall Readability of the Web Site	325	Very easy to read Easy to read Somewhat difficult to read Very difficult to read	104 (32.0%) 165 (50.8%) 49 (15.1%) 7 (2.1%)

Rating the Homepage. When middle school students were asked to rate the Web site's homepage, Table 25 shows that 62.5% of the respondents rated its appeal as either "Very Inviting to read" or "Inviting." Another 29.9% rated it as "Somewhat Inviting." The mean rating is 2.71 on a four-point scale ranging from 1 (Not Inviting) to 4 (Very Inviting).

Table 25. Rating the Homepage

Variable	*N*	*Categories*	*Responses* Number (%)
Overall Appeal of the Homepage	325	Very Inviting Inviting Somewhat Inviting Not Inviting	52 (16.0%) 151 (46.5%) 97 (29.9%) 25 (7.6%)

As a follow-up question, students were asked if the homepage gives them a good sense of the content on the site. As indicated in Table 26, 66.8% responded by specifying that it gives either a "very good sense" or "good sense" of the Web site's content. Another 30.2% reported that the homepage gives an "okay sense" of the site's content. In contrast, 3.1% indicated that the homepage gives them no sense of the site's content. The mean rating is 2.87 on a four-point scale ranging from 1 (Very good sense) to 4 (No sense at all).

Table 26. Sense of Site Content Conveyed by Homepage

Variable	*N*	*Categories*	*Responses* Number (%)
Homepage depiction of site content	325	Very good sense Good sense Okay sense No sense at all	76 (23.4%) 141 (43.4%) 98 (30.2%) 10 (3.1%)

Changes of Interest in Related Topics. Both prior to and after using *Teachers' Domain: Physical Science*, middle school students were asked to rate their interest level in learning about the eight physical science topics specified in Table 27, on the following page. The table presents a summary of students' ratings on a five-point Likert scale ranging from 1 (Not interested at all) to 5 (Very interested). Paired pre- and post-use responses were analyzed and changes in attitudes are indicated in the rightmost column. On average, the students' ratings of interest in each of these topics increased over the course of the study. When asked directly if their use of *Teachers' Domain: Physical Science* had increased their interest in physical science in general, 237 (72.9%) of the 325 participating middle school students reported that it had.

Table 27. Pre- and Post-Use Interest in Learning About Topics* (N = 325)

Variable	Categories	Pre-Use Responses	Pre Mean	Post-Use Responses	Post Mean	Mean Change
Properties of Objects and Materials	Very interested	25 (7.7%)		33 (10.2%)		
	Moderately interested	45 (13.9%)		82 (25.2%)		
	Medium interest	133 (40.9%)	2.80	134 (41.2%)	3.13	+ 0.33
	A little interested	85 (26.2%)		45 (13.9%)		
	Not interested at all	37 (11.4%)		31 (9.5%)		
Sinking and Floating	Very interested	66 (20.3%)		76 (23.4%)		
	Moderately interested	107 (32.9%)		107 (32.9%)		
	Medium interest	83 (25.5%)	3.45	83 (25.5%)	3.54	+ 0.09
	A little interested	45 (13.9%)		35 (10.8%)		
	Not interested at all	24 (7.4%)		24 (7.4%)		
Air Is Matter	Very interested	38 (11.7%)		44 (13.5%)		
	Moderately interested	49 (15.1%)		81 (24.9%)		
	Medium interest	90 (27.7%)	2.79	97 (29.9%)	3.09	+ 0.30
	A little interested	101 (31.1%)		65 (20.0%)		
	Not interested at all	47 (14.5%)		38 (11.7%)		
Heat	Very interested	69 (21.2%)		73 (22.5%)		
	Moderately interested	98 (30.2%)		104 (32.0%)		
	Medium interest	74 (22,8%)	3.37	78 (24.0%)	3.48	+ 0.11
	A little interested	51 (15.7%)		45 (13.9%)		
	Not interested at all	33 (10.2%)		25 (7.7%)		
Gravity	Very interested	108 (33.2%)		122 (37.5%)		
	Moderately interested	90 (27.7%)		97 (29.9%)		
	Medium interest	80 (24.6%)	3.73	67 (20.6%)	3.87	+ 0.14
	A little interested	26 (8.0%)		21 (6.5%)		
	Not interested at all	21 (6.5%)		18 (5.5%)		
Describing Motion	Very interested	32 (9.9%)		50 (15.4%)		
	Moderately interested	68 (20.9%)		101 (31.1%)		
	Medium interest	87 (26.8%)	2.84	87 (26.8%)	3.22	+ 0.38
	A little interested	91 (28.0%)		44 (13.5%)		
	Not interested at all	47 (14.5%)		43 (13.2%)		
Pushing and Pulling Objects	Very interested	77 (23.7%)		80 (24.6%)		
	Moderately interested	70 (21.5%)		89 (27.4%)		
	Medium interest	79 (24.3%)	3.23	73 (22.5%)	3.42	+ 0.19
	A little interested	49 (15.1%)		52 (16.0%)		
	Not interested at all	50 (15.4%)		31 (9.5%)		
Sound	Very interested	112 (34.5%)		117 (36.0%)		
	Moderately interested	99 (30.5%)		98 (30.2%)		
	Medium interest	49 (15.1%)	3.71	55 (16.9%)	3.76	+ 0.05
	A little interested	37 (11.4%)		26 (8.0%)		
	Not interested at all	28 (8.6%)		28 (8.6%)		

*Totals may not equal exactly 100.0% due to rounding.

Navigation and Finding Information. When asked if they experienced any problem(s) navigating/moving around in the Web site, 296 (91.1%) of the 325 middle school students reported having no difficulty. Some of the other students did not report having any navigation problem, but did comment that they experienced technical difficulties at the school that resulted in slow Internet access to Web site, as expressed in their following remarks:

- "It kind of freezes."
- "The Web site is so slow."

- "Slow site."
- "It was slow."
- "Slow."
- "Took 10 minutes to get to 1 page."
- "The information wasn't coming."
- "The computer."

One student offered the following comment suggesting that navigating or finding information may have sometimes been confusing:

- "Hard to get what you want."

Another student indicated that use of the captions was problematic.

- "There were errors and the captions are unable to read."

Students were also asked to specify how easy or difficult it was for them to find information they were looking for on *Teachers' Domain: Physical Science*. As indicated in Table 28, 188 (57.9%) of the middle school students reported that information was "easy" to find. Another 115 (35.4%) thought that it "took a little searching" to find what they were looking for. Reportedly, 20 students felt that finding specific information was "somewhat difficult" and 2 students reported it to be "impossible." The mean rating is 3.51 on a four-point scale ranging from 1 (Impossible to find what I'm looking for) to 4 (Easy).

Table 28. Ability to Find Information

Variable	*N*	*Categories*	*Responses* Number (%)
Ability to Find Information	325	Easy	188 (57.9%)
		Took a little searching	115 (35.4%)
		Somewhat difficult	20 (6.2%)
		Impossible	2 (0.6%)

Probing further, students were asked to specify what, if anything, they looked for on the site but were unable to find. Of the 325 students in the middle school sample, 48 (14.8%) indicated that there was "nothing" on the site that they looked for but were unable to find. Another 236 students (72.6%) concluded that they were unable to locate specific information because it is not available on the site. An addition 41 students (12.6%) reported that it was hard to find what they were looking for so they gave up.

What Students Like Most. Middle school students were asked to specify what they like most about *Teachers' Domain: Physical Science*. Many students commented that what they like most is either the "Information" or "Learning." Information and learning are also cited with regards to the Web site's videos and interactive games in another set of remarks presented later.

- "I liked the information because it gave good detail."
- "I like how the site is very informative. I'm the kind of person that searches for knowledge."
- "The Web site tells you how to make stuff out of science. I like that the most because it's informative."
- "The thing I like most about this site is everything, because it has pretty much everything about science."
- "I like that there is a monthly project on it so I can get information."
- "What I liked most about this site was that it helped me have a better understanding of what I was learning."
- "I like how it gives you good information that I can understand."
- "I like it because it gives lots of information that I can remember."

- "I really liked that it had a lot of information."
- "It has a lot of information because I need information"
- "I like that the Web site teaches me things I've never known before."
- "I liked how I learned stuff from it. It was very informative."
- "It had a lot of information on gravity and had experiments."
- "I think it gave good information, because if you didn't find facts in the video there were paragraph you could read."
- "Easy to search information."
- "Easy to find information."
- "I like the site had usable content and taught me stuff I did not know."
- "The information I need and when."
- "I like that there is a lot of information and it is written so that kids can read it. It is not in grown up words."
- "I liked the information, because it helped me learn more things about science."
- "It was informative."
- "The information because it is easy to find."
- "It was a fun way to see science. It was also very informative."
- "I like that it gives information about important stuff."
- "It was educational, it helped us learn."
- "It is informative and very easy to understand."
- "Information, it was good."
- "It was very helpful because you could find things that you needed."
- "I liked how they did the experiments and showed us how it worked."
- "Density."
- "I most liked the experiments, because they showed you a movie of them and they were easy to do."
- "I like that they have a lot for every grade."
- "Gives good information and examples."
- "It was very inviting. It had a good homepage that drew me in. It was very educational."
- "It has a lot of information."
- "I like the information from the site like global warming."
- "I like how it states information."
- "The information."
- "Information."
- "Gives good information."
- "All because it is a helpful way to learn."

As you will discern from the following responses to this inquiry, "Videos" and "Interactive Games" were foremost in the thoughts of other middle school students in our sample. Note that many of them reportedly like the videos and interactive activities/games because of their information content.

- "I like how you can watch videos because it is easier for me to understand."
- "Videos because they were informative."
- "I liked the short clips. The reason for this is because I like the videos."
- "I like the videos that showed the picture and what they would look like in the past."
- "I like how you watch the videos."
- "I like the movies because you can learn a lot from them."
- "The small movies and examples because they help me to understand more."
- "I Liked the little movies, they were interesting and fun."
- "How you could watch the videos was very cool."
- "I liked how you got to watch a movie of information because I would rather watch a movie than read a book."
- "The short videos. They're so fun to watch."
- "The movies."
- "The visual graphics because they show you what you are learning.'"

- "The thing I like most about this site was the video clips. Mainly the. Ones from ZOOM because they are fun to watch and easy to learn from."
- "The movies were awesome."
- "Some of the short videos."
- "I like the information videos. They were fun to watch."
- "Videos, games, words, text."
- "Games."
- "Games because it's fun."
- "You play games."
- "Videos cause you don't have to read."
- "Games because I love to play games."
- "Game – they are fun to play."
- "Games because it's fun."
- "When I look on Web sites like ZOOM, and the videos."
- "Games because that is what most children like to play."
- "Games because you can enjoy and learn things at the same time."
- "Game, video, reading because they are for activities."
- "Interactive games because it is fun and we get to pick the answers."
- "Games because you can have fun and learn at the same time."
- "It had games, video, etc. I liked it because it had lots of information."
- "I liked how the video and the writing helps with the labs."
- "I like how they had to Zoom videos because they were easy to understand."
- "I like the video because they were fund to watch."
- "I like all the choices of videos. The reason why is because there is so many choices."
- "The videos because they were the most we did."
- "What I liked most was the videos because they were fun."
- "The videos because it had a lot of information."
- "Videos. They show you and explain it at the same time."
- "It gave videos so you can see what it is talking about."
- "I liked how you were able to watch QuickTime videos."
- "The video clips. They were interesting."
- "I liked the videos because it gives you a little break from working."
- "The videos all from technology and the interactive experiments."
- "I liked all the of the videos because I liked learning through videos."
- "I like the videos."
- "I liked watching the short videos about each lab."
- "I liked playing the interactive videos. I think it is a better way of learning to watch a video."
- "I like that you can watch little video clips but still learn stuff at the same time."
- "I like how you can watch a video on it about science. It makes science more fun than it already is."
- "You get to watch the video to understand to better."
- "I like the movies because it gives you a visual example of science."
- "I like how it has clips from NOVA."
- "I liked the movies because watching movies is more fun then reading."
- "I like the parts of the ZOOM show that show the ZOOM members doing experiments."
- "I liked watching the videos because they help me understand sometimes."
- "I like the ZOOM videos of different activities. They give information in a fun way."
- "The videos because it shows what and how something works."
- "I like how the site used ZOOM shows, where the kids were trying to find the same information as we were."
- "The movies, because they were fun to watch."
- "I liked the little ZOOM clips from the show. It was cool."
- "I liked the videos because it was much better than just looking at a book and reading it."
- "The video examples they have because I think they are more informative."

- "I liked the Quick Time videos because they were very informative and gave examples."
- "The ZOOM videos, they're interesting on experiments!"
- "It gives you videos to watch."
- "I liked best was that it explained everything with a movie."
- "The little clips because when it came to answering the question it made it easier."
- "The movies."
- "I like the video segments. I like them because its fun and informative at the same time."
- "I liked the videos because they are more interesting."
- "I liked the movie clips."
- "I like the video clips because it shows experiments like how you would do it."
- "I like the videos because you can see what they are talking about."
- "It has videos about the topic because it gives a better view for what you are learning."
- "I liked the part when we was the video because it's informative."
- "I liked the videos because it's easier to learn from something fun."
- "I like how they have videos. It's easy to just watch and not have to read."
- "I like that there were videos to explain the topic further, because it was informative and exciting at the same time."
- "How there's videos, because the videos make it a little easier to get what's going on."
- "I like the movie clips because I thought they were fun to watch and educative too."
- "I liked how there were clips of ZOOM."
- "They show movies so that you don't have to read."
- "I liked the videos because I could see experiments with a visual."
- "I liked the videos the most because they were interesting."
- "I liked watching the videos they showed."
- "The videos because they were fun and creative."
- "It shows you clips of what its talking about. It was fun to watch."
- "I liked watching the videos on the site."
- "The movies because it was a different {way} of learning."
- "I liked the videos because they told you a lot."
- "I like the movies because they're way cooler than reading."
- "I liked the movie sequence."
- "The most thing I liked was watching because you don't read everything."
- "I like the videos because they show how to do it by yourself."
- "The movie clips."
- "The ZOOM clip."
- "The ZOOM clips because it was fun."
- "I liked the ZOOM video clips. They were fun to watch and not long enough to bore you."
- "The ZOOM clips."
- "ZOOM videos."
- "The movies because it's the most interesting."
- "The ZOOM clips because it gave me a better understanding."
- "Videos – fun to watch."
- "The ZOOM clips."
- "Video clip."
- "The movies and car and balloon stuff."
- "The video clips because they were interesting to like."
- "The clear videos and diagrams."
- "Activities, it is the funniest part."
- "The ZOOM clips because they were cool."
- "Videos."
- "The videos because they showed us the real stuff how it works."
- "The ZOOM movies."
- "The video clips because I didn't have to read it."
- "It had lots of videos of the experiments and was easier for me to understand."
- "The video clips."

- "The videos."
- "The graphics/movies because I don't like to read."
- "Video clips because they weren't boring."
- "The movies – they are cool."
- "The cool videos because they were fun."
- "The activities."
- "The video because it was interesting."
- "I like that sometimes they show videos. That was interesting."
- "The videos because they are cool."
- "The videos."
- "I kind of like the video."
- "I like the videos. It is interesting."
- "The movies."
- "I like the movies because it is very interesting."
- "The movies because it's fun."
- "Movies about motors."
- "Videos."
- "I liked the movies."
- "The movies because you can learn something."
- "I like the videos because they're fun to watch."
- "The movies."
- "How you can go under Zoom."
- "I like all the videos you can find to make it fun to search for things."
- "The videos because they are interesting."
- "I like the movies because you don't have to read."
- "Watching video stuff."
- "The movies were interesting."
- "I like the videos. They are very describing."
- "All the movies and cool pictures."
- "I like the Zoom video."
- "I like the videos about Zoom."
- "Games because you learn more."
- "The movies and the games because they are most fun to play and look at."
- "Games because it's fun."
- "Videos because they show cool stuff."
- "Videos – they are fun."
- "Videos, because they are interesting."
- "Games, the games are fun to play."
- "The pictures and games because they were very creative."
- "Videos, pictures, games, tests. I like what they are showing, and telling you about."
- "Games, cause it was better than the others."
- "Videos, because they are educational, funny, and fun to watch."
- "The games because we can remember the games we played."
- "Video, pictures, games, text."
- "Interactive games because they were very fun to play."
- "Video, picture, game, text words."
- "I love videos and games!"
- "Videos and games."
- "The games because they're fun."
- "Videos."
- "Games, pictures and videos."
- "Games because they're fun."
- "I like the videos."
- "Games, it's fun."
- "Games because I learn while I have fun."

- "I like the videos because they make a subject seem easier to understand."
- "Videos because you don't have to read a lot."
- "Videos, games, pictures, why because I understand more better."
- "They had video, games, words, and text."
- "Videos because it's interesting."
- "Games."
- "Games because it is fun."
- "Videos."
- "Games, it's good to play together."
- "Pictures because the pictures look very interesting."
- "There was video and games because videos help you learn more."
- "Games because it's fun."
- "Games."
- "Picture because it shows you what they are."
- "Videos, pictures, games, text."
- "Games, it's fun.."
- "Games."
- "Videos, interactive games pictures, text."
- "Games."
- "Games, because I love playing any kind of game."
- "Videos so you can watch them."
- "It has video and games."
- "Videos because I like watching it."
- "The games because you can turn something boring into fun."
- "Interactive games."
- "Animation, games and it's fun."
- "Games."
- "I liked videos the ones about Ken and Moby because I was interested in learning about the different things."
- "Videos and games because they are fun."

The following is additional feedback identifying miscellaneous aspects of the *Teachers' Domain: Physical Science* Web site that other middle students in our sample reportedly found particularly appealing:

- "All the resources."
- "I liked all of it."
- "You go to a lot of things."
- "Demonstrations on physics."
- "Buoyancy stuff, because it explained stuff well."
- "Bonding – it was fun to learn about it."
- "I like how everything is categorized, like it has K-1, 2-3. 4-5, 6-8. That makes it a lot easier to find something you are looking for. You can also find something in your grade level."
- "I liked the way each section has written information and a video."
- "I liked Galileo's incline plane the most."
- "I like how you can watch the little movies then read about them too."
- "It gives us what we need to pass, so we do good on tests and quizzes."
- "The way it's neatly organized by alphabetical order."
- "It is easy to find what you're looking for."
- "I like the way its set up, so you can just look it up and the info is right there."
- "I like how organized it is."
- "The bonding animations."
- "You can interact with the stuff."
- "The diagrams that moved."
- "Looks."

- "I liked the Rube Goldberg device."
- "Rube Goldberg devise was awesome."
- "Rube Goldberg devise, it was interesting."
- "Buoyancy."
- "Buoyancy."
- "Building the atoms, because it was fun."
- "The animations."
- "All the science stuff, science is cool."
- "Periodic tables because it was interesting."
- "The pictures or diagrams that moved, it made it easy to understand."
- "Ionic bonding, the activity was fun."
- "The questions we tried to answer."
- "Atom bonding."
- "Diagrams, they were cool.
- "Pictures."
- "The visuals because there big and eye-catching."
- "I liked that atom demonstration because it was fun to make different elements."
- "Brain teasers."
- "The colors because they were bright."
- "It had diagrams that were helpful."
- "The pretty colors of the periodic table, because it was attractive to me."
- "The colors, they were attractive."
- "I loved the Rub Goldberg experiment, because it was interesting."
- "The homepage is attractive."
- "The colors."
- "The different experiments."
- "The diagrams with the writing/reading because it makes it easier to find."
- "The diagrams."
- "The pictures need to be bigger."
- "The ease of use."
- "Archimedes links."
- "The pictures of animals."
- "I liked all kinds of planets and their pictures."
- "The sites you have."
- "The slideshow with the fish."
- "It's not that difficult to get to because it's easy to remember."
- "It has kids testing science."
- "This stuff is great."
- "I like the homepage because it gives me a great view of the site."
- "I liked the scavenger hunt because I liked the way it was set up."
- "I liked the pictures the most because they showed a lot."
- "The periodic tables. It is interesting."
- "I liked the Periodic Table."
- "Elements table. That was cool."
- "It has engineering. That is my favorite section in science."
- "I like the astronomy."
- "Photographs."
- "Animal defenses."
- "The tour of the site."
- "It is easy."

What Students Like Least. Students were asked to specify what they like least about *Teachers' Domain: Physical Science.* Of the 325 middle school students in this study, 87 (21.9%) identified a least favorite aspect of the site and another 24 misunderstood the question and listed a most favorite aspect, which are included in the previous sub-

section. Responses were sorted into the categories that emerged from a review of students' comments. A summary of other responses is presented and summarized in Table 29. Students' actual remarks are included following the table. Note that "too much reading" bothered 41 (12.6%) of the middle school respondents to this inquiry and 18 (20.7%) indicated that there is nothing about the Web site that they dislike.

Table 29. What Students Like Least (N = 87 respondents)

Category	*Responses* Number (%)
Nothing was disliked	18 (20.7%)
Too much reading	41 (47.1%)
Misc. remarks about reading	6 (6.9%)
Content not interesting	7 (8.1%)
Not "kid friendly"	6 (6.9%)
Sound effects	3 (3.5%)
Design/appearance	2 (2.3%)
The videos	2 (2.3%)
"View" button	1 (1.2%)
Difficult class assignments	1 (1.2%)
No least favorite aspect identified	238

The following are students' descriptions of what they like least about *Teachers' Domain: Physical Science*, subdivided into the categories specified in Table 15, above:

Too Much Reading (41)
- "Too much reading." (12)
- "Reading." (3)
- "Too much reading, I hate it!"
- "Too much writing and reading."
- "A lot of reading."
- "Having to read."
- "To read, cause it is too long."
- "Document because it's too much to read."
- "Reading all the information."
- "Having to read all the information."
- "Too much reading because my throat will start to hurt."
- "Too much reading because I don't like reading that much."
- "There is too much information to read."
- "Text has a lot of words."
- "To read all of those little words."
- "Words because I don't like to read."
- "All the reading."
- "Having to read a lot of information."
- "Reading all the passage."
- "Reading, it's boring."
- "Not like to read."
- "Reading because I hated it."
- "The reading."
- "It has to my words."
- "Too many words."
- "All the words."
- "Reading long passages."
- "The words there are too many."

Miscellaneous Remarks About Reading (6)
- "Text." (2)
- "Just the reading part, sometimes it's okay, need more information."
- "Text because a lot of kids don't like reading for teachers."
- "The text because some of the words are complicated."
- "The text because some of it was hard to understand."

Content Not Interesting (7)
- "Document, not interesting."
- "The work because it's boring."
- "Documents because it is my least favorite."
- "It wasn't interesting."
- "Text, because it isn't interesting at all."
- "It does not interest me."
- "Text, words because it is not interesting to me."

Not "Kid Friendly" (6)
- "When they don't set it up for kids."
- "Kid unfriendly."
- "Didn't really interest me – more for teachers."
- "It's kind of like a teacher Web site."
- "Better for teachers."
- "It has to my words and is not kid friendly."

Sound Effects (3)
- "Sound effects because it is annoying."
- "Sound effects." (2)

Design/Appearance (2)
- "It looks too plain."
- "It looks lame. Show cool stuff."

The Videos (2)
- "Video because it's too much stuff."
- "Video because it's boring."

"View" Button
- "Some things didn't appear when in 'View'."

Difficult Class Assignments
- "To do work, kind of hard."

Did Students Print Pages? When asked if they had printed any pages contained on *Teachers' Domain: Physical Science*, 11 (3.4%) of the 325 students in the middle school sample reported that they had. In contrast, 314 (96.6%) said that they hadn't.

What's Confusing or Too Challenging. Asked to describe anything about *Teachers' Domain: Physical Science* that they think is confusing or too challenging, 63 middle school respondents simply wrote the word "Nothing" or "None." Another 37 students offered the following similarly positive comments:
- "Not anything is confusing or too challenging on this Web site."
- "Nothing, it's exclamatory."
- "I have nothing confusing, everything easy."
- "Nothing is confusing, everything is easy to me."
- "Nothing, everything is easy."
- "I had nothing confusing, it was easy."
- "Everything was easy."
- "Everything is easy."

- "Everything is easy."
- "Everything is easy"
- "It is easy."
- "Everything is always easy."
- "Nothing was difficult."
- "Nothing at all."
- "I haven't found anything confusing."
- "I do not think anything is confusing or too challenging."
- "I really don't think anything is too challenging."
- "I think it is all pretty straight forward and self explanatory."
- "I didn't think anything was confusing or too challenging."
- "There isn't anything I find confusing."
- "Nothing was really confusing or too challenging."
- "I don't think anything too confusing or too challenging."
- "I don't believe I've stumbled into a problem on the Web site."
- "Nothing was confusing."
- "There wasn't anything confusing or too challenging."
- "Nothing was confusing for me."
- "I don't think anything was really confusing of too challenging."
- "Nothing was confusing or challenging."
- "I do not think anything was confusing or too challenging."
- "Nothing is confusing or too challenging."
- "Nothing confuses me."
- "I don't think it is confusing or too challenging."
- "Nothing was confusing"
- "I do not remember anything too challenging."
- "Nothing was confusing."
- "I didn't really think there was really any confusing things."
- "I think nothing is confusing."

An additional 141 middle school students offered the following broad ranging remarks describing what they found confusing or too challenging about *Teachers' Domain: Physical Science*:

- "The Web site might say one thing the book might say another."
- "When you read too much of it and the other stuff lives in your head."
- "No, except having to go through all the links."
- "Writing."
- "All the words."
- "All the words."
- "All the words."
- "All the words."
- "All the words."
- "All words."
- "Words."
- "All of the big words."
- "Some of the words."
- "When it teaches about protons, neutrons and atoms."
- "Some of the readings."
- "Thing I thought was challenging at first was how to get into my name."
- "The challenging part was finding the stuff."
- "I think the pendulum is challenging."
- "The part that is challenging is reading the passage."
- "The reading."
- "One thing that is a little confusing is knowing how to get from one place to another."
- "It was confusing because if you did the wrong pass word you can't get in."

- "I think that the way some of the things were described threw me off track."
- "The categories of age, title, subjects, and it is kind of hard to keep up with it all."
- "Some of the questions."
- "I think that the reading was a little confusing because not everything in that kids are going got be able to understand."
- "How to get places."
- "The operation was a bit confusing because it involves so much clicking that sometimes you click the wrong link."
- "The questions were hard."
- "How there are so many web sites that look the same."
- "The questions to be answered."
- "The questions are confusing."
- "I think reading about Galileo is confusing."
- "Some of the things about Galileo were confusing, like pendulums."
- "Some of the questions are hard to understand."
- "The videos took a long time to figure out how, but it was loading."
- "Answering the questions were challenging."
- "I thought the Segways were hard to learn about."
- "I think the hardest thing was finding information under a certain category."
- "Some of the reading."
- "I think the questions at the end can be confusing."
- "After you watch a video you had to read the paragraph and some of the paragraphs were confusing."
- "The thing I liked the most was learning how to make a hovercraft."
- "Finding a specific paragraph about something."
- "I think that when I was logging in it was difficult."
- "Some of the words were hard to understand."
- "The questions at the end of the videos."
- "The questions."
- "I though the Galileo videos were confusing."
- "Reading the text."
- "I think some of the paragraphs were hard to understand."
- "Some of the questions were confusing."
- "Some of the questions were worded so I didn't understand some."
- "Finding what you're looking for is somewhat hard."
- "The after questions."
- "It was kind of challenging when scientists were talking."
- "It does not tell you how to do things."
- "Sometimes the questions were phrased confusingly."
- "How it describes the lesson is somewhat confusing."
- "I think some of the questions are confusing."
- "I thought that some of the questions pertaining to the Galileo movie were a little bit hard to understand."
- "The questions you had to answer about the movies."
- "Well, the questions confused me a little bit 'cause you had to go back to the clip then you forget what the question was."
- "I did find it hard to find what you were looking for."
- "I think the information is a little confusing for children."
- "Some of the information is so informative it is confusing."
- "The reading part because its so long you get confused sometimes, but nothing that much."
- "The questions."
- "The reading was a little confusing."
- "Some questions were a little difficult."

- "Something that is confusing is the questions we are given to answer. Some of them can be a bit confusing."
- "I think reading the article before and after the video is challenging because it was hard to understand."
- "What I think was challenging was the part of getting on the site which was also confusing."
- "The questions for the ZOOM experiments."
- "I think that the questions are challenging."
- "The Web site is a lot challenging."
- "How they do the questions."
- "Some of the questions."
- "The question you have to answer the questions after you read."
- "I think the questions after the context was challenging."
- "It was challenging for me to find some of the information needed in paragraphs to answer questions."
- "I think some of the questions are hard, but if you look back you will find the answers."
- "I thought the pendulum was confusing."
- "The questions were challenging."
- "The questions we had to answer."
- "I think the questions were confusing and challenging."
- "Finding the Web site. The address is too long to remember."
- "I think the confusing or challenging part is trying to learn about something and having to look for it."
- "Some of the questions listed."
- "The wording of the paragraphs."
- "The questions were hard to understand."
- "Reading the paragraphs."
- "Some of the big scientific words."
- "The wording that was in the paragraph."
- "The questions."
- "I think the questions you have to answer are challenging."
- "The password thing is very confusing."
- "The thing I found confusing was trying to answer some questions like is pendulum, and the incline plane."
- "The confusing than it was the questions."
- "That you have to read a lot."
- "Complicated vocabulary."
- "Sometimes trying to find information was a little confusing, but not bad at all. It was really good."
- "The big words."
- "Understanding the reading."
- "Usernames."
- "The passwords."
- "Funny games."
- "The puzzle was confusing."
- "How to log to different subjects."
- "The thing that's really challenging and I think is confusing is the words."
- "I think the scientists words are challenging."
- "There was some information that was too hard."
- "Reading the words."
- "Finding things."
- "Finding information."
- "I think it is confusing because you can't really see it."
- "The part that was confusing was finding where the places were."
- "Looking for things on the site."

- "Finding facts."
- "The words are so small that it's hard to read."
- "Some of the pictures."
- "The whole site."
- "Too much writing."
- "How to get something."
- "Finding information."
- "Make the searches easier."
- "What is confusing is how it works. Do you have to click on one social science to find stuff about it, as an example."
- "How to search sometimes."
- "The newspaper chair."
- "Scavenger hunt even tough it was fun."
- "I think trying to find different things and reading things are difficult, confusing, and too challenging."
- "Periodic element table."
- "To find one thing you have to open 10 files."
- "The video caption."
- "Trying to find what I am looking for."
- "It is difficult to read the captions."
- "The chain reaction."
- "The elements."
- "Finding the elements."
- "Four-wheelers."
- "I think it is hard to understand and hard. The writing is small."

Inaccurate or Unbelievable Content. Asked to describe any information contained on *Commanding Heights Online* that they feel is either inaccurate or unbelievable, 101 respondents simply wrote words such as "Nothing" or "None," and 67 others offered the following similarly positive remarks:

- "There isn't anything on this Web site that seems unbelievable to me."
- "I haven't found anything inaccurate or unbelievable."
- "Everything was cool."
- "Nothing is inaccurate. It's kind of fun."
- "Have learned from it and took test on what you learned."
- "Learned and took test."
- "All seemed accurate."
- "I didn't find anything that was inaccurate."
- "I cannot think of anything."
- "Everything is good and seemed accurate to me."
- "I think everything is understandable."
- "There is no information that is inaccurate."
- "The movies were good."
- "I think that everything was accurate and believable."
- "I did not find any information that was inaccurate or unbelievable."
- "I really believed everything that I looked at."
- "I think everything is OK."
- "I thought everything was accurate."
- "I don't think there is any inaccurate or unbelievable information on the Web site."
- "I didn't think there were any inaccurate information."
- "Nothing was inaccurate."
- "I didn't think any of it was wrong, but the wheelchair that could walk up stairs was cool."
- "There was no information I feel is inaccurate."

- "I believe all the site's information."
- "I don't find any information inaccurate."
- "No, I though it was all true."
- "I don't think any information is inaccurate or unbelievable."
- "I think all the info is true."
- "I did not find any."
- "I don't think anything was inaccurate or unbelievable."
- "I didn't find anything inaccurate."
- "Nothing was inaccurate but some of the info was amazing."
- "I think all the information is accurate."
- "There was no information I thought was inaccurate or unbelievable."
- "Nothing was inaccurate or unbelievable to me."
- "I think everything is mostly accurate."
- "I did not find any information on the site that appeared to be inaccurate."
- "I didn't think anything was inaccurate or unbelievable."
- "I think everything was accurate."
- "I did find the ball going around in the plastic pitcher was inaccurate because it's not really defying gravity."
- "There was nothing I felt to be unbelievable."
- "I don't remember anything unbelievable."
- "I think its unbelievable that objects of different sizes fall at the same time."
- "Nothing was inaccurate."
- "I did not disbelieve anything on this site."
- "I don't recall any unbelievable stuff."
- "I don't think anything is inaccurate."
- "I'm not sure I saw anything inaccurate or unbelievable."
- "I really think that everything was believable and I know this because you saw it on tape."
- "There wasn't any."
- "I didn't find any."
- "Nothing I could find was wrong."
- "No information was unbelievable."
- "I think it is all true."
- "I thought it was all believable."
- "Nothing is really inaccurate or unbelievable."
- "I didn't feel anything on this site was inaccurate. In some of the ZOOM experiments what they did was really cool and hard to believe, but they explained it."
- "Nothing, really, was inaccurate I thought."
- "I didn't see none of it OK it was good."
- "The site is accurate."
- "All of it's great."
- "I feel having any good games in incorrect."
- "I didn't find any."
- "Nothing was inaccurate."
- "There is nothing I can describe."
- "I don't think anything is wrong."
- "I haven't found any info. that's either inaccurate or too challenging."

Another 4 students offered the following complimentary opinions:
- "This Web site had a lot to do with what we learned in science."
- "I've learned from it and was tested on what I learned."
- "We have learned from it and test what we learned."
- "I did like the videos."

In contrast, 51 students offered the following comments questioning information contained on the Web site:

- "Some of the pictures look unbelievable because they look funny."
- "How the universe was born because the bible tells me God created the earth and all the things around it, Genesis 1, but I don't argue."
- "How the universe was formed."
- "About how the universe was formed – unbelievable."
- "I thought it was believable that you made learning fun."
- "I thought that the sound one was great and had lots of information."
- "The hover craft was unbelievable."
- "The information that is kind of inaccurate is the project info on the site that is given."
- "I thought it was 'Wow!' when we were experimenting with balloons."
- "The hover craft seems to amazing to believe."
- "I sometimes think the information in the videos are inaccurate."
- "I pretty much thought that everything was in between."
- "I think that the Segway movie was so cool."
- "A piece of information on the site that is unbelievable is the hovercrafts."
- "It was unbelievable how there are hovercrafts people can ride in."
- "Like how Galileo found that 2 things drop at the same time."
- "The videos."
- "One thing that was unbelievable was the wheelchairs that can walk down stairs."
- "I thought it was unbelievable when the spaceman dropped the hammer and the feather at the same time and they landed together."
- "What I thought was unbelievable was how a guy in space lost 10 pounds in 2 hours."
- "There were many unbelievable subjects but the site explained how it moved and worked"
- "Updates."
- "Probably that a ball could float in the air of a hair dryer."
- "I believed the straw one because we did it in class (experimenting with balloons)."
- "That a ball and a car fall at the same rate."
- "I think the Segway video was unbelievable because they have so much high-tech stuff this is the coolest one."
- "The information that was unbelievable was the hovercraft."
- "The one with the hairdryer and when the hairdryer goes on the ball to goes up. I don't believe that for some reason."
- "I think the hovercraft is unbelievable because people can use it in water or in land."
- "The videos and the little games from ZOOM."
- "The Galileo questions."
- "I think that the piece of paper and hammer falling at the same time was unbelievable."
- "The new wheelchair thing that's out."
- "Some of the stories about how to do stuff and stuff like that are inaccurate."
- "The unbelievable thing to me was the wheel chair and the two wheeled thing."
- "The helium balloon in the car."
- "Rocks do sink – unbelievable."
- "You have to wait too long to get there."
- "The face of the baby and then when it gets older."
- "I think the videos are unbelievable."
- "The zoom chair video."
- "I think it is when the cat killed the snake was unbelievable."
- "The pictures."
- "The movies."
- "The DNA."
- "The theories and since there's no games it's boring."
- "The color. Kids are looking at bright colors."

- "Can't understand some words."
- "You can make a chair."
- "Animals, plants."
- "The animal site."

Comparison With Other Web Sites. When middle school students were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, 11.4 % rated it as "Very Good" (see Table 30). Another 32.9% rated the site as "Good" and 37.2% rated the site as "Average." Approximately 9.5% rated it as "Poor" and 8.9% gave it a "Very Poor" rating, in comparison to other well liked sites. The mean comparison rating is 3.28 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good).

Table 30. Comparison with Other Web Sites

Variable	N	Categories	Responses Number (%)
Comparison	325	Very Good	37 (11.4%)
		Good	107 (32.9%)
		Average	121 (37.2%)
		Poor	31 (9.5%)
		Very Poor	29 (8.9%)

Rating Features and Resources. To help determine which components were most useful to students, all respondents in the middle school sample were asked to rate the *Teachers' Domain: Physical Science* features and resources listed in Table 31. On average, the features received ratings between 3.3 and 4.6 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). The 4 features that were most appreciated by the middle school students are *Videos*, *Interactive Activities*, *Still Images*, and *Audio Resources*. All of the other features and resources were also very well rated.

Table 31. Rating Teachers' Domain Features and Resources (N = 325)

Features	Haven't Used	Very Poor	Poor	Fair	Good	Very Good	Average
Lesson Plans	202	4	13	46	48	12	3.4
Resource Highlights	120	7	21	55	77	45	3.6
Background Information	106	8	23	54	77	57	3.7
Questions for Discussion	82	18	29	87	70	39	3.3
Related Links	183	5	12	46	61	18	3.5
Search	187	11	14	29	53	31	3.6
Help	211	10	12	33	32	27	3.5
Resource Bins	233	5	15	25	39	8	3.3
Resources							
Videos	5	4	16	20	68	212	4.6
Still Images	17	10	20	66	114	98	3.9
Documents	69	14	26	80	92	44	3.5
Interactive Activities	38	10	19	21	93	144	4.2
Audio Resources	66	12	21	45	86	95	3.9

Probing for information about the usability of the features and resources listed above, students were asked if these components perform the way they expect them to. Of the 325 middle school students in this sample, 298 (91.7%) reported that they do. One student wrote that "They are better than I expected!" In contrast, 27 (8.3%) of the middle school students indicated that they don't. Probing further, when these students

were asked to explain why they think features don't perform as expected, they offered the following remarks:

- "The SEARCH is too slow!!!!"
- "I thought there would be more information."
- "It is not good enough for my expectations of a good Web site."
- "It has no games."
- "My computer was slow."
- "I thought they would be more interesting."
- "I was expecting more stuff."
- "Too boring, everything."
- "Because you get sleepy."
- "Because they are boring. People just don't like reading."

Students' Suggestions for Improving the Site. When asked what suggestions they have for improving *Teachers' Domain: Physical Science*, 18 respondents simply wrote the word "None" or "Nothing," suggesting that they may think the site is fine as-is. Another 11 students responded with the following positive remarks:

- "Nothing, it's perfect like it is."
- "I think Teachers' Domain is a great site so I don't really think any changes."
- "I don't have any suggestions because I think the Web site is awesome."
- "I think it is a really good site, I don't think I have any suggestions."
- "Nothing to improve on."
- "I think the Web site is excellent as it is and I have no suggestions."
- "I don't have any suggestions for Teacher's Domain. I think it is good for everyone."
- "I don't have any suggestions because this Web site is fine the way it is."
- "None of them because you got everything is good."
- "Keep it like it is now."
- "It's cool."

An additional 179 students offered the following suggestions, which have been organized into categories (Note that numbers in parenthesis indicate the number of responses that fall within each category.):

More Videos (37)
- "More video." (35)
- "I think if you had more videos that would make it better."
- "More ZOOM videos."

More Games/Interactivity (38)
- "Add more interactive games." (31)
- "More interactive activities." (3)
- "Put more pictures or games so it will be more fun."
- "Put more games."
- "Add some more interactive stuff."
- "I suggest you put games so people can understand better."

Make Text Easier to Read/Understand (29)
- "Less reading." (4)
- "Making the articles easier to understand."
- "Don't make so many words to read."
- "Less words."
- "To make the reading a little more simple so kids can understand what the information is telling them."
- "More readable words for kids in the 6th grade on questions for discussion."
- "They could make some of the documents more understandable."
- "On some of the questions for discussion make some questions easier to understand."

- "You could explain the resource highlights in your own words to make it easier to understand."
- "I think that the questions for discussion could be more clear and I wouldn't wonder what it was asking me."
- "Use simpler terms."
- "Use simpler words in the text."
- "Make it more understandable for kids."
- "I would suggest to improve the wording on the questions for discussion."
- "I think you should make some of the questions and information more readable."
- "A suggestion is to word the questions easier."
- "Maybe you could try to make it easier for kids to understand."
- "You could make the content in an easier to read way."
- "Easier to understand information."
- "I think you should change the words so that kids can read the words."
- "Put some of the words in the paragraphs before the video in easier terms for kids."
- "Don't make you have to read as much."
- "You shouldn't write as much."
- "Be more descriptive and use less words."
- "Brief blurbs."

Make Site More Interesting/Entertaining for Students (27)
- "You should make it more appealing to children. There should be brighter colors and less "scientific" language. Put the information in simpler terms."
- "Make the site more fun"
- "Making it fun."
- "Make it more inviting."
- "Make it interest people."
- "You can put out more interesting features."
- "More fun activities and more kid attractions."
- "Make it more interesting for students and exciting."
- "Make it more kid friendly."
- "Make another section for student use only."
- "Make it more interesting."
- "Make a new screen, make it more exciting."
- "Put things on there more for kids."
- "Not so long of a video but it was good , more exciting stuff, subjects or searches, not so boring."
- "Make people want to watch the videos."
- "A suggestion is to make the video funnier."
- "Just make it more inviting for kids"
- "More brain pop."
- "Add more brain pop."
- "The pages could be a little more interesting and exciting to look at."
- "If it were more exciting, it would be easier to learn from it."
- "You could make it fun by having a scientist read what's on the page or something."
- "Have more fun stuff."
- "Make the videos not as corny."
- "Make it appealing to everyone."
- "I think you should have pictures and colors that interest others."
- "More interesting."

Make Site More Colorful (19)
- "Add color." (8)
- "Brighter colors." (2)
- "Add more solid colors."
- "Make it a little more colorful."

- "Change the style. The colors are boring colors."
- "Adding more color to the background."
- "Make the pages more colorful because green gets boring after awhile."
- "Pick different colors for the Web site."
- "Maybe you should use brighter colors."
- "Make it more colorful and more fun for kids to look at and learn."
- "Put more color. It's too dull."

Make Downloads Quicker (9)
- "Make loading quicker."
- "Make it download faster
- "Make the video clips load faster."
- "Quicken the loading."
- "You have to make the computer go little faster."
- "Make it quicker."
- "Make the videos faster."
- "Make the videos go faster."
- "I have only one suggestion, add speed when you video download."

Enhance the Homepage (8)
- "You should make the homepage more catchy."
- "Make the homepage more inviting."
- "You can make the front page a lot more exciting."
- "A little more color on the homepage and to we'll make it better."
- "Make the homepage a little more inviting."
- "I think 'Teachers' Domain: Physical Science' should make their homepage a little better."
- "Have a colorful main page that catches the eye."
- "Have better home page and break down the facts into little chunks."

Enhance Navigation/Searching (8)
- "I think that when you want to find something you just type it in and it will come up."
- "I think you should improve the searching because its hard to find what you're looking for."
- "Make the search faster or less complicated so it goes faster."
- "Easier to find information in paragraphs."
- "I think it should be easier to look for a specific lesson."
- "Make searches better and faster."
- "Make it easier for people to find things and more interesting so I can like it and be able to go on it often."
- "Make it easier to find things."

Edit Quizzes/questions (23)
- "Make questions understandable."
- "Have questions to be more fun."
- "The questions make them fun."
- "You could make the questions more interactive."
- "Better end questions."
- "Putting less questions."
- "I think that the questions should be a little more fun, you know, spice it up."
- "I don't think they should have the questions, or take some away."
- "Get rid of the questions and discussion part."
- "Maybe not so many questions after it."
- "Have multiple choice questions give examples of that thing you're on."
- "More quizzes."
- "Pop quiz."

- "A few easier questions."
- "Make the questions a little harder."
- "Make the questions easier for kids to understand."
- "I suggest to make the questions clearer."
- "Make the questions easy because it is too hard."
- "Make better questions."
- "They should make less questions."
- "To improve your site make the questions more interesting and make less of them."
- "More riddle questions."
- "Change the questions."

More pictures (9)
- "Add more pictures." (7)
- "More picture add sound like a song or something."
- "Add more realistic graphics."

Include More Information/Topics (8)
- "Make it more scientific. Get more into the subject like what the names of everything is. That way we can focus on more and know more about it."
- "Put it in more details and pictures. It help to understand things better."
- "I think there should be more info. on the topics."
- "For grades 6-8 more information on birth and reproduction."
- "Add it so it has more search options, especially horses."
- "Find more information."
- "Tell what they're about."
- "To put some more examples of physical science subjects on the site."

Make Site More Visually Appealing (8)
- "The Web site isn't very eye catching."
- "You could make the layout more attractive so people might be pulled in a little more."
- "I think you should make the Web site more eye catching."
- "I would present it in a more fun color fun way maybe put some fun images."
- "Add some things that are eye catching."
- "More flashy."
- "I think they should make the background more exciting."
- "Make it look more active."

Enhance Font(s) for Clarity (7)
- "Enlarge the words."
- "Make the font larger so it is easier to read."
- "Make the font bigger and change colors of background and print."
- "Make writing bigger."
- "Try to make the captions more bigger."
- "More readable captions."
- "Make works eligible to see."

Include Additional Educational Activities (5)
- "You need games and fun activities that help students understand science."
- "You should add some sciency activities."
- "I think you should add an activity to each different document, for example, with the hovercraft, make your own hovercraft activity."
- "Yes, more interactive learning activities."
- "Make a place for kids with activities to help them learn how and when etc."

- "I think they should have longer videos."
- "Longer videos."
- "I think the videos should be longer because it would be more understanding."
- "I suggest they have longer videos so kids can use the information from the videos."

Revise Login Process (4)
- "Get the password out of the program."
- "You can make the sign up easier."
- "I think you shouldn't need a password to get in, it should be free to just drop in."
- "I don't have any except for signing on but that was in the beginning."

Add Music/Sound Effects (3)
- "Add sound like a song or something."
- "Add hip hop music while viewing the pages, but no offensive language."
- "Add more sound effects."

Miscellaneous Suggestions (12)
- "Put more computers in the classroom."
- "Make it smaller."
- "Not so long of a video, but it was good."
- "I think the Web site is good, but needs a more attractive slogan after it says Teachers' Domain."
- "Having them read the background information."
- "Changing the Web site name."
- "Improve the HELP."
- "Have kids our age develop the site, help out."
- "The names of the movies so people know what they are called."
- "Give some pictures, video that takes the whole screen."
- "Make better related links."
- "Make all Web sites show."

MIDDLE SCHOOL TEACHER FEEDBACK

The following is a summary of responses to the pre- and post-use middle school teacher surveys. Note that written responses and multiple-choice selections are highlighted in mauve (Cynthia Brogan), blue (Shalini Rao) green (Deb Roussell). Rich Marcou did not submit a completed teacher survey. Questions and multiple-choice options are included in their entirety for the reader to gain a clear understanding of the actual range of ratings, statements, and sentence stem-completion wording available.

Expectations. Prior to using the *Teachers' Domain* Web site participating middle school teachers were asked to describe the types of information, activities, and other resources/content related to genetics, evolution, and ecology they would expect to be contained on the site. The following are their written responses to this inquiry:

- "Webquests; mini movies; scientists in the field." [Brogan]
- "Safety; scientific method; chemical reactions; energy." [Marcou]
- "(1) Clearly outlined activities for students to try at home about Earth, Earth's processes, weather, rocks ad minerals; (2) Activities and lesson plans for topics mentioned above, which peak student creativity and curiosity; and (3) Hands-on ideas using everyday materials for topics mentioned above (with minimal preparation time)." [Rao]

After using the Web site for one school term, middle school teachers were asked if the site had met their expectations. All three respondents reported that their expectations had indeed been met. When asked what word best describes the *Teachers' Domain* Web site, respondents offered the following remarks:

- "Online file cabinet" [Brogan]
- "Informative" [Rao]
- "Motivating" [Roussell]

Web Site Use. At the end of the term, teachers were asked to estimate the percentage of their own *Teachers' Domain* use they had given to performing classroom presentations. On average, they reported that 63.3% of their use had been directed at this activity. Asked to describe the ways that they have used *Teachers' Domain*, teachers offered the following written responses:

- "Direct instruction supplement ; Research for presentation." [Brogan]
- "As a resource of background information for myself and teaching resource in the class (e.g., interactive activities)." [Rao]
- "I have had my students view, read, and answer the questions." [Roussell]

At the end of the term middle school teachers also estimated that 60.0% of students' class or computer lab Internet use had been given to using the *Teachers' Domain* Web site, on average.

Teachers were asked if they personally printed any of the pages contained on the Web site. One of them reported that they had and the two other had not. They were also asked what length of video best meets their needs (short, medium, or long). Each of the teachers indicated that they prefer medium length videos. They also reported placing an average of 8 items in their Personal Resource Bin. Additionally, one teacher indicated that her students were most likely to be in the classroom when they visited the *Teachers' Domain*. Two teachers reported that their students only used the site on computers located in the computer lab.

Overall Rating of Web Site. After using the *Teachers' Domain* Web site over the course of one school term, participating middle school teachers were asked to rate the site, overall. Two of them gave the site a 5 rating (Very Good) on a five-point Likert scale ranging from 1 (Very Poor) to 5 (Very Good) and one gave it a 4 rating (Good), resulting in an average rating of 4.7.

Rating Usefulness and Informative Value. When middle school teachers were asked to rate how useful *Teachers' Domain* is to obtain resources and information that support their teaching, 2 of them rated the site's usefulness as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful) and one teacher rated its usefulness as 4 (Moderately Useful), resulting in an average rating of 4.7. When asked to indicate how informative they think the site is for their students, 2 of the teachers rated its informative value as "Very Informative" on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative) and 1 teacher rated it's value as "Okay, resulting in an average rating of 4.3.

Navigation and Finding Information. Middle school teachers were asked to specify how easy or difficult it is for them to find information they are looking for on the Web site. As indicated in Table 32, below, one of the teachers reported that it is "easy to find" what they are looking for and the other two indicated that it "took a little searching."

Table 32. Ability to Find Information

Variable	N	Categories	Responses
Ability to find information	3	Easy to find	1
		Took a little searching	2
		Somewhat difficult	0
		Not able to find	0

Similarly, probing for an understanding about what may have caused finding information to be challenging, two of the respondents reportedly concluded that the information they were looking for "is not available on the site."

What Teachers Like Most. When asked to specify what they like most about *Teachers' Domain*, participating teachers offered the following written comments:
- "Pulling resources from many different places into one site." [Brogan]
- "The site has great interesting video clips for students to watch and use." [Rao]
- "Information in text and video were very helpful. It worked to help all abilities." [Roussell]

What Teachers Like Least. When asked to specify what they like least about *Teachers' Domain*, respondents offered the following written comments:
- "Not enough interactive programs – heavy on videos." [Brogan]
- "Some information was difficult to find. For example, ideas to teach/review rocks and minerals were difficult to find." [Rao]
- "For me, it would have been great to have state frameworks alongside the topics." [Roussell]

What's Confusing or Too Challenging. Asked to describe anything about *Teachers' Domain* that they think is confusing or too challenging, teachers offered the following two written comments:
- "Finding my resources first time." [Brogan]
- "Obtaining general ideas first without having to select a grade level made it difficult to find useful material quickly." [Rao]
- "Some topics were advanced for my students." [Roussell]

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, two of the teachers simply wrote the word "Nothing." The following similarly positive comment was offered by the other responding middle school teacher:
- "I did not find anything on the site that I feel was inaccurate." [Roussell]

Comparison With Other Web Sites. When middle school teachers were asked to rate how well *Teachers' Domain* compares with other Web sites they like, one rated it as 5 (Very Good) and two rated it as 4 (Good), on a five-point scale ranging from 1 (Poor) to 5 (Very Good), resulting in an average rating of 4.3.

Rating Features and Resources. Teachers were asked to rate the *Teachers' Domain* features and resources listed in Table 33, on the following page. On average, these site components received ratings ranging from 4.0 to 5.0. The five most appreciated items are videos, documents, personal resource bins, and related links, each receiving an average rating of 5.0 on a on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). Other highly appreciated item, receiving a rating average of 4.7, are the interactive activities. Lesson plans and questions for discussion both received average ratings of 4.5.

Table 33. Rating Teachers' Domain Features and Resources

Features	Haven't Used	Very Poor	Poor	Fair	Good	Very Good	Average
Lesson Plans	1	–	–	–	1	1	4.5
Resource Highlights	–	–	–	–	3	–	4.0
Background Information	–	–	–	–	–	3	5.0
Questions for Discussion	1	–	–	–	1	1	4.5
Related Links	1	–	–	–	–	2	5.0
Search	–	–	–	–	2	1	4.3
Help	1	–	–	–	2	–	4.0
Personal Bins for Resources	1	–	–	–	–	2	5.0
Resources							
Videos	–	–	–	–	–	3	5.0
Still Images	–	–	–	1	1	1	4.0
Documents	–	–	–	–	–	3	5.0
Interactive Activities	–	–	–	–	1	2	4.7
Audio Resources	–	–	–	1	1	1	4.0

Probing for information about the usability of the features and resources listed above, teachers were asked if these components perform the way they expect them to. All three of the responding middle school teachers reported that they do. One teacher explained that "I was able to retrieve the information when needed." Similarly, when asked if the resources contained on the *Teachers' Domain* Web site support their teaching needs, all three of these teachers responded "Yes."

Changes in Instructional Strategies. Teachers were asked to describe how, if at all, their instructional strategies had changed over the course of using the *Teachers' Domain*. Respondents offered the following written remarks:

- "More inquiry based lessons using simulations." [Brogan]
- "It has been extremely helpful to have interactive activities and video clips as a supplement to my instructional strategies." [Rao]
- "When using the Web site, there is less instruction and more self-guided." [Roussell]

Helpfulness of Contextualized Information & Resources. Asked how helpful it is to have information and resources on the Web site contextualized and if they are organized in a useful manner, respondents offered the following written remarks:

- "Good organization; doesn't cover all main topics in textbook." [Brogan]
- "The topics and subtopics do not match our 6th grade curriculum, therefore were difficult to find. Much of the material online is unfamiliar to students who have not yet been given background information." [Rao]
- "Topics were very good. We might not have studied something yet when the students first viewed the site, but it helped when studying it later in class." [Roussell]

Perceived Value of Support Elements. In addition to the videos contained on the *Teachers' Domain* Web site, WGBH has made an effort to include supplemental features, resources, and organization for both teachers and their students. When asked if these elements of the site provide the intended support, all three of the middle school teachers responded by saying "Yes" it's worth the effort.

Usefulness of Backgrounders. Table 34, on the following page, summarizes teachers' attitudes about the usefulness of Backgrounders (i.e., educational text accompanying videos, still images, documents, interactive activities, and audio resources). Note that

all three of the middle school teachers who responded to this inquiry indicated that the Backgrounders are "Very Useful."

Table 34. Usefulness of Text Information

Variable	N	Categories	Responses
Backgrounders	3	Very Useful	3
		Moderately Useful	0
		Okay	0
		Slightly Useful	0
		Not Useful	0

Probing for an understanding of how the middle school teachers used the Backgrounders, they were asked to describe how they and/or their students made use of this text feature. The following are the responses to this inquiry:

- "It was a learning tool for me so I can mentally set up the activity for the students." [Brogan]
- "To enhance my own understanding of material." [Rao]

Usefulness of Lesson Plans. When asked to rate how useful the Lesson Plans contained on the *Teachers' Domain: Physical Science* Web site are for their teaching, two of the middle school teachers rated them as "Very Useful" and the other respondent gave them an "Okay" rating (See Table 35), resulting in an average rating of 4.3 on a 5-point scale ranging from 1 = "Not Useful" to 5 = "Very Useful.".

Table 35. Usefulness of Lesson Plans

Variable	N	Categories	Responses
Lesson Plans	3	Very Useful	2
		Moderately Useful	0
		Okay	1
		Slightly Useful	0
		Not Useful	0

Usefulness of Questions for Discussion. There are a set of Questions for Discussion that accompany each of the Web site's Backgrounders (i.e., educational text accompanying *Teachers' Domain* resources). When asked how useful these question prompts are, Table 36 shows that one of the of the participating teachers rated their inclusion as "Very Useful," another teacher rated then and "Moderately Useful" and a third teacher rated them as "Okay" on a 5-point scale ranging from 1 = "Not Useful" to 5 = "Very Useful," resulting in an average rating of 4.0.

Table 36. Usefulness of Questions for Discussion

Variable	N	Categories	Responses
Links to Standards	3	Very Useful	1
		Moderately Useful	1
		Okay	1
		Slightly Useful	0
		Not Useful	0

Usefulness of Links to Curriculum Standards/Frameworks. Teachers were asked if the links to state and national curriculum standards are helpful for their teaching. Table 37, on the following page, shows that 2 teachers rated the links as "Very Useful," two teachers rated them as "Very Useful," and 1 gave them a "Moderately Useful" rating on a 5-point scale ranging from 1 = "Not Useful" to 5 = "Very Useful," resulting in an average rating of 4.7.

Table 37. Usefulness of Links to Curriculum Standards/Frameworks

Variable	N	Categories	Responses
Links to Standards	3	Very Useful	2
		Moderately Useful	1
		Okay	0
		Slightly Useful	0
		Not Useful	0

Constraints On Using Teachers' Domain. Asked if they encountered any constraints to their use of *Teachers' Domain* and, if so, what can WGBH do to address these hurdles, respondents offered the following comments:

- "Not enough diversity of resources. Lots of NOVA and ZOOM video clips." [Brogan]
- "Having the option of viewing all available sources about a given topic at once would be helpful." [Rao]
- "The constraints were more to do with downloading the videos at our school site. They took too much time for the first person using the computer and once the video was in our cache it loaded right away." [Roussell]

Information WGBH Needs To Provide. Teachers were also asked for feedback about what additional information, if any, WGBH needs to provide for teachers so they can get the most out of *Teachers' Domain: Physical Science*. The following is the response offered by a middle school teacher:

- "Possibly a written guide to the site." [Roussell]

Teachers' Suggestions For Improving the Site. Teachers offered the following written responses when asked to offer suggestions for improving *Teachers' Domain*:

- "Add more diverse resources." [Brogan]
- "Teachers should be able to search for materials without specifying grade levels." [Rao]
- "(1) Workshop to introduce the site to teachers could be helpful; (2) Workshop with teachers who have already used the site; and (3) Frameworks along with each topic and how it could be used." [Roussell]

ELEMENTARY SCHOOL RESULTS

ELEMENTART SCHOOL STUDENT FEEDBACK

Background Variables. Background classification variables (self-reported ability to use a computer and experience with exploring the Internet prior to use of *Teachers' Domain: Physical Science*) were examined. Table 38, on the following page, shows that 61.6% of the elementary school students who participated in this study describe their ability to use a computer as being either "advanced" (15.4%) or "above average" (46.2%). Similarly, approximately 59.0% of the students indicated that they have either "advanced" (30.8%) or "above average" experience(28.2%) with exploring the Internet/World Wide Web.

Table 38. Background Variables

Variable	N	Categories	Responses Number (%)
Ability to use a computer	39	Advanced	6 (15.4%)
		Above average	18 (46.2%)
		Average	10 (25.6%)
		Just beginning	5 (12.8%)
Experience with exploring the Internet/World Wide Web	39	Advanced	12 (30.8%)
		Above average	11 (28.2%)
		Average	7 (18.0%)
		Just beginning	9 (23.0%)

Expectations. Prior to using *Teachers' Domain: Physical Science*, students were asked to describe the things they would like to see or do when they visit a Web site that contains information about physical science. Of the 39 students in the elementary school sample, a total of 37 provided a written response to this inquiry describing a broad range of expectations. The following are their comments:

- "I would like to know how to learn about planets or sound."
- "Air and space."
- "Air and space."
- "Space." • "Space and air."
- "Learn about space"
- "Electricity, space, rocks, planets"
- "Electricity."
- "Weather."
- "I would like to see something about chemicals."
- "Chemicals exploding."
- "Chemicals."
- "I would learn about gravity."
- "Heat."
- "Jobs."
- "I would like to learn about everything."
- "Air, heat, gravity, electricity."
- "Gravity, or movement, chemical."
- "Gravity and sounds."
- "Gravity, sounds."
- "Do science experiments."
- "I would like to learn about heat."
- "Mars, space, racks, air, planets."
- "I would like to learn about weather."
- "More writing about the subject."
- "What makes us the color of our skin; why do we need those little bumps in the corner of our eyes."
- "I would like it to be about gravity, biology, momentum, and air-pressure. Games."
- "I like games like the challenges on the Ancient Egypt Web site."
- "I think there should be a lot of games but they're more educational."
- "Games about science; [pictures] of the body."
- "Videos, games."
- "Movies, games."
- "Games about the subject."
- "Games." (3)
- "Play games, learn how to do different experiments or projects."
- "I like the physical."

Ways Students Used Teachers' Domain. Students were asked to describe the way(s) that they used information contained on the *Teachers' Domain: Physical Science* Web site. As the following student written comments explain, the site was used for completing class assignments, preparing for exams, and enhancing learning. The often overlapping remarks are presented unsorted to convey the full nature of their feedback.

- "I watched the videos or else I read the text."
- "Writing it down."
- "Sound, light."
- "On writing a paper."
- "To answer questions on paper."
- "I usually view it first."
- "I have studied for tests and subjects."
- "Watching the ZOOM shows."
- "I looked at the sound things, a little of the optics too."
- "I used the information to complete papers."
- "At school for work."
- "I used it to do sheets of paper the teacher gave us."
- "Like the folder."

Overall Rating of Web Site. After using *Teachers' Domain: Physical Science* over the course of one school term, elementary school students were asked to rate the site, overall. On average, respondents to this inquiry gave the site a 4.41 rating on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). As shown in Table 39, approximately 79.5% of the sample rated the site as either "Very Good" or "Good," 18.0% rated it as "Average," one student rated it as "Poor," and no student rated it as "Very Poor."

Table 39. Students' Overall Rating of Commanding Heights Online

Variable	*N*	*Categories*	*Responses* Number (%)
Overall Rating	39	Very Good	25 (64.1%)
		Good	6 (15.4%)
		Average	7 (18.0%)
		Poor	1 (2.5%)
		Very Poor	–

When asked what word best describes *Teachers' Domain: Physical Science*, one participating elementary school student described it as "Poor" and another as "Bad." All of the other respondents to this inquiry described it as either "Useful," "Awesome!," "Very good," "Cool!!!," "Good," "Interesting," "Fun," or "Okay." These responses are listed below (Note that numbers in parenthesis indicate the number of times the word was cited, if more than once.).

- Useful (21)
- Awesome!
- Very good
- Cool!!!
- Good (3)
- Interesting (3)
- Fun (2)
- Okay (3)
- Poor
- Bad

Learning Outcomes. Given the that the content of the *Teachers' Domain: Physical Science* Web site was designed for middle and high school students, learning outcomes were not assessed for elementary school students.

Rating Informative Value. Focusing on subjective assessment of the site, elementary school students were asked to indicate how informative they think *Teachers' Domain: Physical Science* is. Approximately 23.1% of the elementary school sample rated the site as either "Very Informative" or "Moderately Informative" (see Table 40); another 71.8% of this sample rated the site's informative value as "Okay," and two students rated it as "Slightly Informative." None of the students perceived the site to be "Not Informative." The mean rating is 3.26 on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative).

Table 40. *Perceived Informative Value of Commanding Heights Online*

Variable	N	Categories	Responses Number (%)
Informative Value	39	Very Informative	3 (7.7%)
		Moderately Informative	6 (15.4%)
		Okay	28 (71.8%)
		Slightly Informative	2 (5.1%)
		Not Informative	–

Overall Appearance. Students were asked to rate the overall look of *Teachers' Domain: Physical Science*. Table 41 shows that 12.9% of the respondents rated its overall appearance as either "Very Attractive" or "Moderately Attractive" and 82.0% gave its appearance a "Somewhat Attractive" rating The mean rating is 2.10 on a four-point scale ranging from 1 (Unattractive) to 4 (Very Attractive).

Table 41. *Overall Look of Teachers' Domain: Physical Science*

Variable	N	Categories	Responses Number (%)
Overall Look of the Web Site	39	Very Attractive	1 (2.6%)
		Attractive	4 (10.3%)
		Somewhat Attractive	32 (82.0%)
		Unattractive	2 (5.1%)

Overall Readability. Asked to rate the overall readability of text contained on the Web site, Table 42 shows that a third of the elementary school respondents (33.3%) rated its text as either "Very easy to read" or "Easy to read." Another 64.1% indicated that the site is "Somewhat difficult to read." The mean rating is 2.36 on a four-point scale ranging from 1 (Very difficult to read) to 4 (Very easy to read).

Table 42. *Overall Readability of Teachers' Domain: Physical Science*

Variable	N	Categories	Responses Number (%)
Overall Readability of the Web Site	39	Very easy to read	2 (5.1%)
		Easy to read	11 (28.2%)
		Somewhat difficult to read	25 (64.1%)
		Very difficult to read	1 (2.6%)

Changes of Interest in Related Topics. Both prior to and after using *Teachers' Domain: Physical Science*, elementary school students were asked to rate their interest level in learning about the eight physical science topics specified in Table 43. The table presents a summary of students' ratings on a five-point Likert scale ranging from 1 (Not interested at all) to 5 (Very interested). Paired pre- and post-use responses were

analyzed and changes in attitudes are indicated in the rightmost column. On average, the students' ratings of interest in each of these topics increased over the course of the study. When asked directly if their use of *Teachers' Domain: Physical Science* had increased their interest in physical science in general, 32 (82.0%) of the 39 participating elementary school students reported that it had.

Table 43. Pre- and Post-Use Interest in Learning About Topics* (N=39)

Variable	Categories	Pre-Use Responses	Pre Mean	Post-Use Responses	Post Mean	Mean Change
Properties of Objects and Materials	Very interested	10 (25.6%)		24 (61.5%)		
	Moderately interested	5 (12.8%)		3 (7.7%)		
	Medium interest	11 (28.2%)	3.15	3 (7.7%)	4.00	+ 0.85
	A little interested	7 (17.8%)		6 (15.4%)		
	Not interested at all	6 (15.4%)		3 (7.7%)		
Sinking and Floating	Very interested	12 (30.8%)		22 (56.4%)		
	Moderately interested	8 (20.5%)		5 (12.8%)		
	Medium interest	4 (10.3%)	3.28	8 (20.5%)	4.08	+ 0.80
	A little interested	9 (23.1%)		1 (2.6%)		
	Not interested at all	6 (15.4%)		3 (7.7%)		
Air Is Matter	Very interested	9 (23.1%)		24 (61.5%)		
	Moderately interested	4 (10.3%)		4 (10.3%)		
	Medium interest	7 (18.0%)	2.92	4 (10.3%)	4.05	+ 1.13
	A little interested	13 (33.3%)		3 (7.7%)		
	Not interested at all	6 (15.4%)		4 (10.3%)		
Heat	Very interested	14 (35.9%)		24 (61.5%)		
	Moderately interested	6 (15.4%)		5 (12.8%)		
	Medium interest	10 (25.6%)	3.49	4 (10.3%)	4.13	+ 0.64
	A little interested	3 (7.7%)		3 (7.7%)		
	Not interested at all	6 (15.4%)		3 (7.7%)		
Gravity	Very interested	17 (43.6%)		29 (74.4%)		
	Moderately interested	11 (28.2%)		7 (18.0%)		
	Medium interest	4 (10.3%)	3.87	3 (7.7%)	4.67	+ 0.80
	A little interested	3 (7.7%)		–		
	Not interested at all	4 (10.3%)		–		
Describing Motion	Very interested	11 (28.2%)		26 (66.7%)		
	Moderately interested	4 (10.3%)		4 (10.3%)		
	Medium interest	9 (23.1%)	3.05	2 (5.1%)	4.08	+ 1.03
	A little interested	6 (15.4%)		1 (2.6%)		
	Not interested at all	9 (23.1%)		6 (15.3%)		
Pushing and Pulling Objects	Very interested	10 (25.6%)		25 (64.1%)		
	Moderately interested	5 (12.8%)		4 (10.3%)		
	Medium interest	6 (15.4%)	2.87	5 (12.8%)	4.21	+ 1.34
	A little interested	6 (15.4%)		3 (7.7%)		
	Not interested at all	12 (30.8%)		2 (5.1%)		
Sound	Very interested	15 (38.5%)		27 (69.2%)		
	Moderately interested	8 (20.5%)		3 (7.7%)		
	Medium interest	7 (18.0%)	3.59	4 (10.3%)	4.31	+ 0.72
	A little interested	3 (7.7%)		4 (10.3%)		
	Not interested at all	6 (15.4%)		1 (2.6%)		

*Totals may not equal exactly 100.0% due to rounding.

Navigation and Finding Information. When asked if they experienced any problem(s) navigating/moving around in the Web site, 33 (84.6%) of the 39 elementary school students reported having no difficulty. Students were also asked to specify how easy or difficult it was for them to find information they were looking for on *Teachers' Domain: Physical Science*. As indicated in Table 44, 7 (18.0%) of the elementary school students reported that information was "easy" to find. Another 5 (12.8%) thought that it "took a little searching" to find what they were looking for. Reportedly, 26 (66.7%) of the elementary students felt that finding specific information was "somewhat difficult" and one of the students reported it to be "impossible." The mean rating is 2.46 on a four-point scale ranging from 1 (Impossible to find what you're looking for) to 4 (Easy).

Table 44. Ability to Find Information

Variable	N	Categories	Responses Number (%)
Ability to Find Information	39	Easy	7 (18.0%)
		Took a little searching	5 (12.8%)
		Somewhat difficult	26 (66.7%)
		Impossible	1 (2.6%)

What Students Like <u>Most</u>. Elementary school students were asked to specify what they like most about *Teachers' Domain: Physical Science*. As you will note from respondent's comments, they have a broad range of favorite features and resources.

- "The sound changer because it was fun."
- "All of the site. It is fun because I get to learn more about sound."
- "I like seeing sound because it is fun."
- "It showed a lot about sound."
- "The voice thing."
- "It's cool."
- "The games because I like to play."
- "The games because we learned and had fun."
- "The games they are fun."
- "The little movies because I like watching."
- "I like the little clips."
- "I like the movies, because I think they are very interesting."
- "Loch ness monster. I thought it was kind of cool that we could look at the video."
- "I like the videos because they are informative."
- "The videos because they were cool."
- "The small movie."
- "The radio transmission."
- "Pictures with words."
- "It tells what you want to know about in the writing."
- "Nothing because it wasn't really interesting."

What Students Like <u>Least</u>. Students were asked to specify what they like least about *Teachers' Domain: Physical Science*. Of the 39 elementary school students in this study, 19 (48.7%) provided an answer. The following are their broad ranging responses:

- "I like everything."
- "Too much stuff because it's confusing."
- "That some things don't exist."
- "Too many choices."
- "The ZOOM videos."
- "The ZOOM things, videos."
- "Videos."

- "The searching because it's frustrating."
- "Needs games."
- "Not very fast."
- "The thing I like least is that some sites don't open."
- "I didn't like the captions because you couldn't really read them."
- "The pages move slow sometime and sometimes I'm behind."
- "The captions on the video because they were blurry."
- "It's too short."
- "Just about everything because it wasn't interesting."
- "Not so quickly."
- "Hard to find topics in small amount of time."
- "I don't know."

Did Students Print Pages? When asked if they had printed any pages contained on *Teachers' Domain: Physical Science*, 23 (59.0%) of the 39 students in the elementary school sample reported that they had. In contrast, 16 (41%) said that they hadn't.

What's Confusing or Too Challenging. Asked to describe anything about *Teachers' Domain: Physical Science* that they think is confusing or too challenging, 5 elementary school respondents simply wrote the word "Nothing." Another 14 students offered the following similarly positive comments:

- "Nothing was confusing."
- "Nothing is confusing about this site."
- "Nothing was confusing or too challenging."
- "Not really anything."

Another 6 students offered the following additional remarks describing what they found confusing or too challenging about *Teachers' Domain: Physical Science*:

- "Searching."
- "Hearing what the people were saying."
- "I couldn't hear some things they said in the video."
- "Reading the captions."
- "Reading captions."
- "Too many words."

Comparison With Other Web Sites. When students were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, 7.7% rated it as "Very Good" (see Table 45). Another 69.2% rated it as "Good" and 12.8% rated the site as "Average." Approximately 7.7% rated it as "Poor" and one student gave it a "Very Poor" rating. The mean comparison rating is 3.72 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good).

Table 45. Comparison with Other Web Sites

Variable	*N*	*Categories*	*Responses* Number (%)
Comparison	39	Very Good	3 (7.7%)
		Good	27 (69.2%)
		Average	5 (12.8%)
		Poor	3 (7.7%)
		Very Poor	1 (2.6%)

Rating Features and Resources. To help determine which components were most useful to students, all respondents in the elementary school sample were asked to rate the *Teachers' Domain: Physical Science* features and resources listed in Table 46. On average, the features received ratings between 3.2 and 4.1 on a five-point scale ranging from 1 (Very Poor) to 5 (Very Good). The 4 features that were most appreciated by the students are *Videos*, *Documents*, *Resource Highlights*, and *Still Images*. All of the other features and resources were also very well rated.

Table 46. Rating Teachers' Domain Features and Resources

Features	Haven't Used	Very Poor	Poor	Fair	Good	Very Good	Average
Resource Highlights	5	–	–	6	5	23	3.9
Background Information	5	–	–	3	29	2	3.4
Questions for Discussion	2	2	1	5	27	2	3.5
Related Links	4	–	3	4	28	–	3.3
Search	5	2	1	4	26	1	3.2
Help	6	1	2	1	25	4	3.3
Resources							
Videos	–	–	1	3	27	8	4.1
Still Images	1	–	2	4	28	4	3.8
Documents	1	–	1	2	29	6	4.0
Interactive Activities	3	–	–	4	27	5	3.7
Audio Resources	6	1	1	2	25	4	3.3

Students' Suggestions for Improving the Site. When asked what suggestions they have for improving *Teachers' Domain: Physical Science*, 13 elementary school students responded with the following written feedback:

- "Make it have more fun games and activities."
- "Have more games."
- "Games should be put in the Web site."
- "More games that teach and are fun."
- "Make more games."
- "More games."
- "Have games."
- "Make it funny! (some of them)."
- "Make some funny."
- "Stop the gray and too much ZOOM."
- "Add more colors to the site."
- "I think they should redo the captions."
- "Easier to read. Pictures for all subjects."

<u>ELEMENTARY SCHOOL TEACHER FEEDBACK</u>

The following is a summary of responses to the pre- and post-use elementary school teacher surveys. Note that written responses and multiple-choice selections are highlighted in mauve (Carol Colgate – second grade teacher) and blue (Cheryl Klausner – fifth grade teacher). Questions and multiple-choice options are included in their entirety for the reader to gain a clear understanding of the actual range of ratings, statements, and sentence stem-completion wording available.

Expectations. Prior to using the *Teachers' Domain* Web site participating teachers were asked to describe the types of information, activities, and other resources/content related to genetics, evolution, and ecology they would expect to be contained on the site. The following are teachers' written responses to this inquiry:

- "Lesson plans; neat activities; correlation to national standards; related literature; resource books, places and addresses; local or national resource people or organizations like ICE, ACS, NSTA; pictures; video clips; interactive Web sites; worksheets and home links." [Colgate]
- "Interactive age-appropriate explorations which will enhance student learning. I am particularly interested in optics and sound content related materials. I would welcome some materials to provide extensions for some students." [Klausner]

After using the Web site for one school term, teachers were asked if the site had met their expectations. Both of the elementary school teachers reported that their expectations had indeed been met.

When asked what word best describes the *Teachers' Domain: Physical Science* Web site, participating elementary school teachers offered the following responses:
- "Useful" [Colgate]
- "Inviting" [Klausner]

Web Site Use. At the end of the term, teachers were asked to estimate the percentage of their own *Teachers' Domain: Physical* use they had given to performing classroom presentations. On average, they reported that 52.5% of their use had been directed at this activity. Asked to describe the ways that they have used the site, teachers offered the following written responses:
- "Classroom, demo material, personal info for lessons." [Colgate]
- "I used to light sites when I was teaching optics for a sound unit. I revamped my plans to use the 15 related sites." [Klausner]

At the end of the term teachers also estimated that 15.0% of students' class or computer lab Internet use had been given to using the *Teachers' Domain: Physical Science* Web site, on average.

Elementary school teachers were asked if they personally printed any of the pages contained on the Web site. Both of them reported that they had. They were also asked what length of video best meets their needs (short, medium, or long). The second grade teacher indicated that she prefers medium length videos and the fifth grade teachers prefers short videos. They also reported placing an average of 15 items in their Personal Resource Bin. Additionally, second grade students were most likely to be in the classroom when they visited *Teachers' Domain: Physical Science* and fifth graders made use of the site in the school's computer lab.

Overall Rating of Web Site. After using the *Teachers' Domain: Physical Science* Web site over the course of one school term, participating elementary school teachers were asked to rate the site, overall. The second grade teacher gave it a 4 (Good) rating and the fifth grade teacher gave it a 5 (Very Good) rating on a five-point Likert scale ranging from 1 (Very Poor) to 5 (Very Good).

Rating Usefulness and Informative Value. When the elementary school teachers were asked to rate how useful *Teachers' Domain: Physical Science* is to obtain resources and information that support their teaching, the second grade teacher rated the site's usefulness as 4 (Moderately Useful) and the fifth grade teacher rated it as 5 (Very Useful) on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful). Similarly, when asked to indicate how informative they think the site is for their students, the second grade teacher rated its informative value as 4 (Very Informative) and the fifth grade teacher rated it as 5 (Very Informative) on a five-point scale ranging from 1 (Not Informative) to 5 (Very Informative).

Navigation and Finding Information. Teachers were asked to specify how easy or difficult it is for them to find information they are looking for on the Web site. The second grade teachers reported that locating desired information "took a little searching" and the fifth grade teacher indicted that it is "easy" to find what she was looking for. Similarly, probing for an understanding about what, if anything, may have caused finding information to be challenging, the second grade teacher reportedly concluded that the information that could not be found was too hard to find so she gave up. The fifth grade teacher concluded that the information she could not find is not available on the site rather than being too difficult to find.

What Teachers Like <u>Most</u>. When asked to specify what they like most about *Teachers' Domain: Physical Science*, participating elementary school teachers offered the following written comments:

- "Interesting graphics. Easy to print out material. Easy reference sites." [Colgate]
- "I liked the ZOOM episode in conjunction with the hands-on activities." [Klausner]

What Teachers Like <u>Least</u>. When asked to specify what they like least about *Teachers' Domain: Physical Science*, the teachers offered the following written comments:

- "The time it takes to find what I need." [Colgate]
- "(1) Until last week my students all had to access the site through my username and password. Then Eric Friedman set up user groups. It would have been better to set this up to begin with. (2) One site I wanted to use (Tunes and Spoons) was not functioning." [Klausner]

What's Confusing or Too Challenging. Asked to describe anything about *Teachers' Domain: Physical Science* that they think is confusing or too challenging, elementary school teachers offered the following written comments:

- "Sometimes the subjects you are looking for are not cross referenced." [Colgate]
- "(1) The access to students until the user groups were set up. (2) I didn't realize I would need separate speakers to show video clips. (3) I had trouble downloading a few things. People at WGBH were very helpful." [Klausner]

Inaccurate or Unbelievable Content. Asked to describe any information contained on the Web site that they feel is either inaccurate or unbelievable, both of the elementary school teachers reported that there isn't.

- "I didn't see any." [Colgate]
- "I didn't find any." [Klausner]

Comparison With Other Web Sites. When the elementary school teachers were asked to rate how well *Teachers' Domain: Physical Science* compares with other Web sites they like, both of them rated it as "Very Good" on a five-point scale ranging from 1 (Poor) to 5 (Very Good).

Rating Features and Resources. Teachers were asked to rate the *Teachers' Domain: Physical Science* features and resources listed in Table 47, on the following page. The site components used by elementary school teachers are highly appreciated items, typically receiving either a "Very Good" or "Good" rating. The questions for discussion and personal bins for resources are reportedly the most valued features/resources for these teachers.

Table 47. Rating Teachers' Domain Features and Resources

Features	Haven't Used	Very Poor	Poor	Fair	Good	Very Good
Lesson Plans	–	–	–	–	1	1
Resource Highlights	–	–	–	–	2	–
Background Information	–	–	–	–	2	–
Questions for Discussion	–	–	–	–	–	2
Related Links	–	–	–	–	1	1
Search	1	–	–	1	–	–
Help	–	–	–	–	2	–
Personal Bins for Resources	–	–	–	–	–	2
Resources						
Videos	–	–	–	–	1	1
Still Images	–	–	–	–	1	1
Documents	–	–	–	1	1	–
Interactive Activities	–	–	–	–	1	1
Audio Resources	–	–	–	–	1	1

Probing for information about the usability of the features and resources listed above, teachers were asked if these components perform the way they expect them to. Both of the participating elementary school teachers reported that they do. Similarly, when asked if the resources contained on the *Teachers' Domain: Physical Science* Web site support their teaching needs, the teachers once again responded "Yes."

Changes in Instructional Strategies. Teachers were asked to describe how, if at all, their instructional strategies had changed over the course of using *Teachers' Domain: Physical Science*. Elementary school teachers offered the following written remarks:

- "I now have more resources and places to look for information. I also can have students use this site at home." [Colgate]
- "I used video clips more." [Klausner]

Helpfulness of Contextualized Information & Resources. Asked how helpful it is to have information and resources on the Web site contextualized and if they are organized in a useful manner, the fifth grade teacher offered the following written remarks:

- "I would have liked more resources for optics. The only topics that fit with my curriculum were sound and optics." [Klausner]

Perceived Value of Support Elements. In addition to the videos contained on the *Teachers' Domain: Physical Science* Web site, WGBH has made an effort to include supplemental features, resources, and organization for both teachers and their students. When asked if these elements of the site provide the intended support, both of the participating elementary school teachers responded by saying "Yes" it is worth the effort.

Usefulness of Backgrounders. Teachers were asked to rate the usefulness of the Web site's text information presented in the form of Backgrounders (i.e., educational text accompanying videos, still images, documents, interactive activities, and audio resources). The second grade teacher rated the Backgrounders as 4 (Moderately Useful) and the fifth grade teacher rated them to be 5 (Very Useful) on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful).

Probing for an understanding of how teachers used the Backgrounders, they were asked to describe how they and/or their students made use of this text feature. The

second grade teacher wrote: "To help me learn more about a topic response to this inquiry." No feedback to this inquiry was provided by the fifth grade teacher.

Usefulness of Lesson Plans. When asked to rate how useful the Lesson Plans contained on the Web site are for their teaching, both of the elementary school teachers rated them as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful).

Usefulness of Questions for Discussion. There are a set of "Questions for Discussion" that accompany each of the Web site's Backgrounders (i.e., educational text accompanying *Teachers' Domain* resources). When asked how useful these question prompts are, both of the elementary school teachers rated them as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful)..

Usefulness of Links to Curriculum Standards/Frameworks. Teachers were asked if the links to state and national curriculum standards are helpful for their teaching. Both of the elementary school teachers rated the links as "Very Useful" on a five-point scale ranging from 1 (Not Useful) to 5 (Very Useful).

Constraints On Using Teachers' Domain. Asked if they encountered any constraints to their use of *Teachers' Domain: Physical Science* and, if so, what can WGBH do to address these hurdles, the second grade teacher reportedly encountered no constraints and the fifth grade teacher offered the following description and suggestion:

- "The usual technological obstacles. The Internet was down one day. The students couldn't hear the video clips until I bought speakers. The one thing I would suggest is setting up the user group for students right at the beginning." [Klausner]

Information WGBH Needs To Provide. Teachers were also asked for feedback about what additional information, if any, WGBH needs to provide for teachers so they can get the most out of *Teachers' Domain*. The following is are responses from the elementary school teachers:

- "Help more teachers discover your Web site." [Colgate]
- "I thought, for the most part, it was set up in quite a user-friendly way." [Klausner]

Teachers' Suggestions For Improving the Site. The fifth grade teacher offered the following written response when the elementary school teachers were asked to offer suggestions for improving *Teachers' Domain*:

- "Making sure all the links are working or removed (e.g., virtual glass Xylophone – from Tunes & Spoons)." [Klausner]

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