Assessment of Forever Earth Curriculum 2009-2010: Final Report

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Final Report

Assessment of Forever Earth Curriculum 2009-2010

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Executive Summary

Forever Earth is a floating environmental laboratory and learning center at Lake Mead National Recreation Area that provides hands-on science experiences for students in the Clark County School District. The Forever Earth program was brought about through the efforts of numerous partners including Forever Resorts, a division of Forever Learning LLC, the National Park Service, Lake Mead National Recreation Area; Outside Las Vegas Foundation; and UNLV’s Public Lands Institute. In 2005, a formal written agreement was reached between Fun Country Marine Industries and UNLV’s Public Lands Institute to operate and manage the Forever Earth houseboat for the purpose of enhancing outdoor environmental education efforts in Southern Nevada. During the first year of the assessment program, knowledge, attitude, and performance assessments were developed to document the effectiveness of program events over the duration of the program. The findings from the first three years of assessment revealed that students’ knowledge and attitudes increased substantially as a result of participating in the Forever Earth field trips. Results also demonstrated that teachers’ perceptions of the curriculum were very favorable. In this final year of assessment (2009/2010), students again completed knowledge, attitude, and performance assessment and results indicated that students’ knowledge, attitudes, and skills increased substantially as a result of participating in the Forever Earth field trips.
Introduction

The Forever Earth program was brought about through the efforts of numerous partners including Forever Resorts, a division of Forever Learning, LLC: the National Park Service, Lake Mead National Recreation Area; Outside Las Vegas Foundation; and UNLV’s Public Lands Institute. In 2005, a formal written agreement was reached between Fun Country Marine Industries and UNLV’s Public Lands Institute to operate and manage the Forever Earth houseboat for the purpose of enhancing outdoor environmental education efforts in Southern Nevada.

A development team consisting of science educators from Clark County School District (CCSD) and informal educators from UNLV’s Public Lands Institute (PLI) and Lake Mead National Recreation Area was formed to create the Forever Earth curriculum. The four member On-Site Experience Development Team consisted of program staff from the PLI and Lake Mead National Recreation Area. This team created the programming that was delivered aboard the Forever Earth Vessel and on land at Lake Mead National Recreation Area, and focused on creating engaging activities and ensuring that the mission and vision of the National Park Service and Lake Mead National Recreation Area was accurately presented. The Classroom Experience Development Team authored the pre-visit and post-visit lessons. This team, consisting of four members (two from PLI and two from CCSD), ensured that grade-appropriate science standards were met and that the Clark County educator’s perspective was carefully considered.

The curriculum for each grade level was developed to complement traditional classroom studies in grades four, five, six, and seven with engaging, participatory, on-site activities and support lessons based upon a solid framework for inquiry and discovery. Students participated in activities, performed investigations, and used scientific equipment to discover the answers to key questions. Curricula for grades four, five, six, and seven were developed, field tested and delivered.

In 2006/2007, our research team became responsible for developing an assessment plan in order to document the effectiveness of the curriculum over the duration of the program. We developed assessment instruments and administered these instruments to program participants. In the second and third years of the assessment program (2007/2008, 2008/2009) the assessments were modified slightly and again administered. In this report, we describe the assessment plan and provide results for 2009/2010 based on completed assessments.

Context

The significant water and other natural resources found within Lake Mead National Recreation Area provide extraordinary material for learning about science and the environment. The primary objective in developing curriculum for the Discover Mojave Forever Earth Project was to create interdisciplinary, interactive, and inquiry-based programs for students on the floating environmental education center and research laboratory. Under the direction of Daphne Sewing, Discover Mojave Forever Earth
Project Manager for PLI, the curriculum development team created a curriculum in which participants learned about the importance of the lake and public land to the desert’s flora and fauna. The curriculum manual included detailed descriptions and facilitator’s guides for the activities conducted; on-site activity support materials; and pre-trip and post-trip classroom activities with accompanying support materials.

Participants in Forever Earth programs explored the Lake Mead aquatic environment and its interrelationships with the surrounding area through their participation in the following four curricula:

- **Grade 4: Just Passing Through! The Water Cycle!**
  Students learned about Lake Mead’s water use cycle by following one drop of water and then diagramming this important cycle on a magnet board. Working as scientists, students determined if water is the same in all parts of the lake by comparing water samples from the middle of the lake and from Las Vegas Bay.

- **Grade 5: Finicky Fish Finish…Last!**
  Students explored what has happened to the Colorado River and the reasons why it is so difficult for a native fish species, the razorback sucker, to thrive in this changed environment. Students collected water quality data to determine whether habitat conditions are sufficient for the survival of young razorback suckers.

- **Grade 6: Alien Invaders!**
  Students studied Lake Mead to determine whether it is at risk for invasion by zebra mussels. Students learned about the consequences the zebra mussels could have on the lake and its living and non-living resources. In January 2007, this curriculum was revised after the discovery of quagga mussels, another invasive species.

- **Grade 7: GSI: Geo Scene Investigation**
  Students are introduced to topographic and geologic maps and participate in an inquiry-oriented activity designed to introduce them to the geology, landforms, geologic processes, and geologic timeline of the Lake Mead National Recreation Area.

Each of these events was one time only, and was initially supposed to last between two and a half to four hours on the boat, not including pre-trip and post-trip activities. However, it was necessary for PLI staff to develop additional on-shore activities for many of the groups participating in the Forever Earth program. For insurance purposes, only 23 students were permitted on the boat at any one time. Given that most of the classes had in excess of 23 students, most were split into two groups, with one group on the boat for two hours and the other group doing on-shore activities for two hours.
Assessment Program

In the first three years of the assessment program, data was collected from both students and teachers. The assessments were conducted over time (i.e., pre- and post-intervention). Pre-test assessments were conducted in the classroom during the pre-trip visit. Post-test assessments were conducted onsite upon completion of the day’s activities. In years three and four a delayed maintenance measure was added in the form of a follow-up post-test (Gall, Gall, & Borg, 2006), administered one to two weeks after completion of the event. The use of a follow-up post-test strengthens the estimate of the long-term program effect (Rossi, Lipsey, & Freeman, 2004). In year four (2009/2010) data was not collected from teachers, as previous years’ results have been remarkably consistent with respect to both interview and survey data, with all teacher participants indicating positive attitudes towards the Forever Earth program and its curriculum.

Student Assessment

Student assessment items were developed in alignment with the Forever Earth curriculum. Students were assessed for three areas of growth including knowledge, attitudes, and skill performance for the four curricula. No modifications were made to the assessments in 2009/2010.

Knowledge Items

Assessments for each of the four curricula included four to five knowledge questions related to the specific activity (e.g., Throughout time, what geologic actions or processes have been at work at Lake Mead?). These knowledge questions consisted of constructed-response items, where students were required to generate answers in response to a prompt rather than choose from a set of alternatives. Knowledge questions were developed to assess the instructional objectives outlined in each of the curricula. For example, one of the stated knowledge objectives for Geo-Scene Investigation (Grade Seven) was “Students will identify common rocks and minerals of the Lake Mead area.” The corresponding knowledge item on the pre- and post-test was Describe some of the common rocks and minerals of the Lake Mead area. Developing items for each knowledge objective help to ensure content-validity of the assessment (Thorndike, 2005). See Appendix A for an example of a knowledge assessment.

Attitude Items

The attitude scales that were developed in 2006/2007 were based on existing assessments (Metzger & McEwen, 1999; Musser & Diamond, 1999; Schindler, 1999) that were designed for the purposes of assessing children’s attitudes to recreational events and to the environment. We constructed similar attitude scales to measure children’s attitudes towards the Forever Earth curriculum and to the environment.

An attitudes assessment was developed for each curriculum. The attitude pre-test included four items. The first two items on each attitude assessment were questions related to the specific event (e.g., Learning about native and non-native fish in Lake
Mead was very interesting to me.) The second two items were related more generally to the Forever Earth activity (e.g., I would like to do another Forever Earth Activity).

At post-test, the four pre-test items were repeated and four additional questions were included for grades four, five, and six that were designed to measure more general attitudes towards the environment (e.g., I learned important things today about the water). The seventh grade post-test eliminated questions five and six because these two items were not strongly related to the seventh grade curriculum. See Appendix B for an example of an attitude assessment.

**Skills**

Because each curriculum included a hands-on activity component, such as students using a plankton net to collect plankton as part of the sixth grade curriculum, we felt that it was important to include a performance assessment component. As Stiggins (2005) notes, observing and evaluating skills as they are being performed can be a rich and useful source of information about the attainment of specific skills. Skill performance assessments, in the form of a checklist completed by the event facilitator, were designed to measure whether or not the child demonstrated a particular skill related to the curriculum objectives and the Nevada Science Content Standards. For example, one of the science standards in the sixth grade curriculum is that students know how to use appropriate technology and laboratory procedures for observing, measuring, recording, and analyzing data. The performance skill related to this objective was Participant collects water sample and performs water quality measurements. Event facilitators determined whether or not the participant demonstrated the skill by checking one of two columns: demonstrates skill or does not demonstrate skill. (See Appendix C for a sample performance assessment).

In the first year of the assessment program, these performance assessments were not conducted. Primarily, this was due to the time constraints faced by program facilitators as they assessed knowledge and attitudes for 1200 participants. In the second year, the performance assessments were conducted by randomly selecting two schools at each grade level, except for seventh grade because only one seventh grade classroom completed the seventh grade curriculum and measurement tools. Initially, at each grade level, students were randomly selected. However, given the ease with which trained observers and staff found they could complete the assessments, all students from the selected schools were assessed on their performance. In 2009/2010 the same sampling strategy was used with the goal of sampling at least two schools for each grade level. However, the sixth grade curriculum was not implemented in any sixth grade classrooms, and as a result, there were no completed assessments for the sixth grade curriculum.

**Summary of Assessment Program**

The assessment plan of the Forever Earth curriculum in 2009/2010 included two data collection components:

1. the pre- and post-test measures of students’ knowledge and attitudes
2. a two-week follow-up post-test measure of students’ knowledge henceforth referred to as the “repeated post-test” and a two-week follow-up of attitudes referred to as “post-test general attitudes”

**Implementation**

The assessments were conducted over time (i.e., pre- and post-intervention) to determine the effectiveness of the curriculum in having an impact on student knowledge and attitudes about the environment, and the performance of skills related to the curriculum content at each grade level.

In the first year of the assessment program, the curriculum was implemented on 39 separate occasions in the 2006/2007 school year, involving 1263 students from 18 schools. All participants completed the knowledge and attitude components of the assessment program. In the second year of the assessment program, a sampling strategy was initiated in which two schools at each grade level that experienced the curriculum intended for that grade level were randomly selected for assessment of knowledge, attitudes, and skills. That is, two fourth grade classrooms that signed up for the water cycle curriculum (4th grade curriculum) were assessed. This selection criterion was followed for all grade levels in years three and four. In year 4 (2009/2010), 68 fourth graders, 61 fifth graders, and 60 seventh graders completed the assessments.

**Analysis**

The knowledge measure, where students responded to open-ended questions, was analyzed using content analysis (Berg, 2001), in which student responses were coded in three categories (no knowledge, partial knowledge, and more complete knowledge). For example, a student response of “I don’t know” to the question “Can quagga mussels thrive in Lake Mead? Why or why not?” was coded as no knowledge because the response contained little, or incorrect, knowledge. Partial knowledge occurred when a student responded with some correct information or provided a very general statement (e.g., “Yes, quagga mussels can thrive in Lake Mead”). Student responses coded as more complete knowledge typically included more specific information or more than one example or reason (e.g., “Yes, quagga mussels can survive in Lake Mead as long as there is lots of plankton, and the temperature and pH of the water are in the right range”).

The scoring guide that was developed in the first year of assessment was revised in Fall 2008 to account for the variety of responses that occurred in the large sample. We calculated the median rank across the three knowledge categories (no knowledge, partial knowledge, and more complete knowledge) for all pre- and post- assessments. A no knowledge response was assigned a 0; a partial response was assigned a 1; and a more complete response was assigned a 2. See Appendix D for a sample scoring guide.

The analysis of attitudes compared pre-test and post-test ratings by students who participated in the events. Ratings were made on a 1-5 Likert scale.
**Results**

Student Knowledge

Student pre- and post-test knowledge scores are shown in Table 1. Individual scores ranged from 0 to 2 on four separate measures for a total composite score that ranged from 0 to 8.

Statistically significant gains occurred at each grade level. Scores were treated as interval data and compared using paired samples t-tests between pre-test and post-test composite scores. A negative t-score indicates that the post-test mean was higher than the pre-test mean, which occurred at each grade level. These findings show that there was a significant increase in knowledge at each grade. Table 1 shows that knowledge increased substantially from pre-test to post-test across the 4th, 5th and 7th grade samples. The increase at 4th, 5th and 7th grade was two standard deviation units, which is considered a very large effect size. Comparing pre- and post-test understanding, participants went from an average level .50 understanding (i.e., partial knowledge) at pre-test to close to a level 1.5 understanding (i.e., more complete knowledge) at post-test.

In addition, there was a significant increase in knowledge at each grade between the pre- and repeated post-test. In contrast, the difference between post-test and repeated post-test was significant only at the 4th grade, indicating a significant long-term gain. Scores between the post-test and repeated post-tests did not differ at the 5th and 7th grades, indicating maintenance of gains over the long-term.

Pre and post-test means for each knowledge item were also calculated for every grade level (see Table 2). Statistically significant gains occurred between the pre-test item and the post-test item in all cases except for Item 2 at the 4th grade level.

Student Attitudes

Means, standard deviations, and reliability scores for pre-, post-test, and post-general attitude scores are shown in Table 3. Scores were treated as interval data and compared using paired samples t-tests. We created three different attitude scores, including pre-test attitudes, the matching post-test attitudes (i.e., same four items completed as the pre-test), and general post-test attitudes. We refer to these as pre-test, post-test, and post-general attitudes respectively. Each rating was made on a 5-point scale and summed to create a score that ranged from 5 to 20. These scores were divided by the number of items to create a mean composite score from 1 to 5. Each of the scores exceeded the minimally acceptable value of .70 for coefficient alpha.
Table 3 reveals that pre-test and post-test attitudes differed significantly for the 4th and 5th grades. Post-test attitudes were significantly higher in both cases. The same pattern occurred for pre-test and post-test general attitudes in the 4th and 5th grades. Pre-test and post-test scores did not differ in the 7th grade. Pre-test and post-test general scores did not differ at any of the grades, indicating maintenance of favorable attitudes at a two-week follow-up.

The data shown in Table 3 indicate that attitudes increased significantly from pre-to post-test and remain stable from post-test to the follow-up post-test. Overall, these findings suggest that attitudes improved significantly due to instruction and remained high.

Student Skills

Curriculum-relevant performance skills were assessed at each grade level. One hundred percent of students at each grade level performed these skilled successfully, indicating that all students achieved mastery of curriculum-relevant field skills.

Conclusions

The purpose of this report was to provide results from the assessment program of Discover Mojave Forever Earth in 2009/2010 implementation year. The assessment program that was implemented was designed to evaluate the effectiveness of the four separate curricula that were developed.

Results support several conclusions. The most important is that each of the curricula assessed (fourth, fifth, and seventh grades) produced substantial increases in knowledge, indicating that the activities had significant instructional benefit. A second conclusion is that student attitudes improved significantly after experiencing the curriculum in two of the three grade levels. A third conclusion is that all participants achieved mastery of the skills assessed within each curriculum. A fourth finding is that the gain between pre-and post-test for knowledge and attitudes was maintained at the two-week follow-up post-test.

Recommendations

1. Continue the assessment program for students. Results suggest that the assessment instruments used for students were reliable and sensitive to growth over time with respect to their knowledge, skills, and attitudes.
2. Examine and consider revising the knowledge items that did not increase significantly between the pre and post-test (Grade 4: item 2). Students scored high on the pre-test item which may indicate prior knowledge. One consideration would be to make the item difficulty level higher.
Table 1: Pre, Post and Repeated Post-Test Composite Knowledge Scores by Grade Level

<table>
<thead>
<tr>
<th>Grade</th>
<th>Sample Size</th>
<th>Pre-test Mean and Standard Deviation</th>
<th>Post-test Mean and Standard Deviation</th>
<th>Repeated Post-test Mean and Standard Deviation</th>
<th>t value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre/Post</td>
<td>68</td>
<td>3.23; .95</td>
<td>-16.18</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td>4th</td>
<td></td>
<td>Pre/Repeated Post</td>
<td>68</td>
<td>3.23; .95</td>
<td>-21.81</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post/Repeated Post</td>
<td>68</td>
<td>5.82; 1.25</td>
<td>-4.17</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td>5th</td>
<td></td>
<td>Pre/Post</td>
<td>61</td>
<td>1.53; 1.05</td>
<td>-16.82</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre/Repeated Post</td>
<td>61</td>
<td>1.53; 1.05</td>
<td>-14.48</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post/Repeated Post</td>
<td>61</td>
<td>5.77; 2.08</td>
<td>1.93</td>
<td>n.s.</td>
</tr>
<tr>
<td>7th</td>
<td></td>
<td>Pre/Post</td>
<td>60</td>
<td>1.71; 1.42</td>
<td>-10.79</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre/Repeated Post</td>
<td>60</td>
<td>1.71; 1.42</td>
<td>-13.65</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post/Repeated Post</td>
<td>60</td>
<td>4.06; 2.38</td>
<td>-1.89</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Note: (4 items, 0-2 rubric score, 0-8 range). n.s. denotes a comparison that is not statistically significant.
Table 2: Pre and Post-test Means for Knowledge Items by Grade Level

<table>
<thead>
<tr>
<th>Item</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre1</td>
<td>.59; .57</td>
<td>.79; .41</td>
<td>.77; .56</td>
</tr>
<tr>
<td>Pre2</td>
<td>.88; .32</td>
<td>.38; .52</td>
<td>.23; .50</td>
</tr>
<tr>
<td>Pre3</td>
<td>.81; .52</td>
<td>.18; .38</td>
<td>.30; .49</td>
</tr>
<tr>
<td>Pre4</td>
<td>.96; .50</td>
<td>.07; .25</td>
<td>.42; .53</td>
</tr>
<tr>
<td>Pre5</td>
<td></td>
<td>.16; .41</td>
<td></td>
</tr>
<tr>
<td>Post1</td>
<td>1.79; .53</td>
<td>1.26; .51</td>
<td>1.23; .59</td>
</tr>
<tr>
<td>Post2</td>
<td>.88; .40</td>
<td>1.02; .61</td>
<td>1.00; .86</td>
</tr>
<tr>
<td>Post3</td>
<td>1.51; .61</td>
<td>.93; .68</td>
<td>.83; .84</td>
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<tr>
<td>Post4</td>
<td>1.63; .48</td>
<td>1.36; .68</td>
<td>1.00; .71</td>
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<tr>
<td>Post5</td>
<td></td>
<td>1.20; .68</td>
<td></td>
</tr>
<tr>
<td>Repeated Post1</td>
<td>1.94; .29</td>
<td>1.16; .55</td>
<td>1.35; .54</td>
</tr>
<tr>
<td>Repeated Post2</td>
<td>.87; .38</td>
<td>1.08; .52</td>
<td>1.03; .90</td>
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<tr>
<td>Repeated Post3</td>
<td>1.87; .34</td>
<td>.72; .55</td>
<td>1.02; .65</td>
</tr>
<tr>
<td>Repeated Post4</td>
<td>1.79; .40</td>
<td>1.10; .70</td>
<td>1.03; .68</td>
</tr>
<tr>
<td>Repeated Post5</td>
<td></td>
<td>1.10; .50</td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Pre- and Post and Repeated Post-test Composite Attitude Scores by Grade Level

<table>
<thead>
<tr>
<th>Grade</th>
<th>Pre-test Mean, Standard Deviation, and Reliability</th>
<th>Post-test Mean, Standard Deviation, and Reliability</th>
<th>Repeated Post-test Mean, Standard Deviation, and Reliability</th>
<th>t value</th>
<th>Significance</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4th N = 68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific Pre/Post</td>
<td>4.19; .57 (.70)</td>
<td>4.68; .42 (.86)</td>
<td></td>
<td>-7.67</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td>Specific Post/RP</td>
<td>4.19; .57 (.70)</td>
<td>4.59; .51 (.89)</td>
<td></td>
<td>-5.87</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td>General Post/RP</td>
<td>4.68; .42 (.86)</td>
<td>4.59; .51 (.89)</td>
<td></td>
<td>1.98</td>
<td>n.s.</td>
</tr>
<tr>
<td>5th N = 61</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific Pre/Post</td>
<td>4.09; .77 (.81)</td>
<td>4.50; .49 (.85)</td>
<td></td>
<td>-4.37</td>
<td>p &lt; .000</td>
</tr>
<tr>
<td>Specific Post/RP</td>
<td>4.09; .77 (.81)</td>
<td>4.38; .70 (.90)</td>
<td></td>
<td>-2.84</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>General Post/RP</td>
<td>4.50; .49 (.85)</td>
<td>4.38; .70 (.90)</td>
<td></td>
<td>1.92</td>
<td>n.s.</td>
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<tr>
<td>7th N = 60</td>
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<td></td>
<td></td>
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<tr>
<td>Specific Pre/Post</td>
<td>3.92; .71 (.82)</td>
<td>4.01; .91 (.90)</td>
<td></td>
<td>-.75</td>
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<td>3.92; .71 (.82)</td>
<td>4.11; .75 (.87)</td>
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<td>4.01; .91 (.90)</td>
<td>4.11; .75 (.87)</td>
<td></td>
<td>-1.30</td>
<td>n.s</td>
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</table>

Note: n.s. denotes a test that is not statistically significant.
References


Appendix A: Forever Earth Post-Assessment: 5th Grade

1. Which of these fish are native to Lake Mead? Which are non-native to Lake Mead? Draw a line from each fish to the correct circle.

   - Striped Bass  NATIVE FISH
   - Channel Catfish
   - Razorback Sucker  NON-NATIVE FISH
   - Colorado Pikeminnow
   - Bluegill
   - Common Carp

2. Why did the razorback sucker become endangered?

   [Provide a response]

3. How do the striped bass and other non-native species affect the razorback sucker in Lake Mead?

   [Provide a response]

4. What are the habitat needs of the razorback sucker?

   [Provide a response]

5. What did you learn about the fish in Lake Mead?

   [Provide a response]
Appendix B: Fourth Grade Attitude Assessment (Post)

1. I would tell my friends to do this program on the Forever Earth Floating Classroom.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |

2. Learning about water at Lake Mead was very interesting to me.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |

3. The Forever Earth activities were fun.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |

4. I would like to do another Forever Earth program.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |

5. I learned how important Lake Mead is to plants, animals, and people.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |

6. I learned important things today about the water.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |

7. I learned how people can use Lake Mead without hurting it.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |

8. Because of what I learned today, I think it’s important to take care of Lake Mead.
   | Strongly agree | Agree | Not Sure | Disagree | Strongly Disagree |
   | 5               | 4     | 3        | 2        | 1                 |
## Appendix C: Performance Rubric: Forever Earth – Finicky Fish Finish Last (5th grade)

<table>
<thead>
<tr>
<th>Participant Name</th>
<th>Objective 1</th>
<th>Objective 2</th>
<th>Objective 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demonstrates Skill</td>
<td>Does not Demonstrate Skill</td>
<td>Demonstrates Skill</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Appendix D: Scoring Guide

Forever Earth Assessment: 4th Grade Scoring Guide

1. Describe what happens when Lake Mead’s water is used by people by putting these steps in order from 1 through 6. Write the number on the line in each circle.

   1. START HERE!  
      Lake Mead

   5. Las Vegas Wash  
      (A)

   2. Water Treatment  
      Plant (B)

   3. Wash clothes  
      (D)

   4. Sewage Treatment  
      Plant (C)

   END HERE!  
   Lake Mead

More complete: 2 points
- Response has 3-4 items in the correct order
Partial complete: 1 point
- Response has 1-2 items in the correct order
Less complete: 0 points
- Response has no items in the correct order

2. How is the water from Las Vegas Wash different from water already in the lake? Answer “yes” or “no” to the following questions.

   _Yes_____ Would one water sample be clearer than the other sample?
   _No_____ Would the plankton be different?

More complete: 2 points
- Response has both items answered correctly
Partial complete: 1 point
- Response has one item answered correctly
Less Complete: 0 points
- Response has neither item answered correctly
3. List some of the reasons why the water is so low in Lake Mead

More complete: 2 points
- Response has 2 correct responses and no more than 1 incorrect answer
  - People have used the water for different things
  - Evaporation
  - Drought

Partial complete: 1 point
- Response must include one correct positive item

Less complete: 0 points
- Response does not include any correct items
  - The dam has a leak
  - Pollution

4. What can you do to save and protect the water in Lake Mead?

More complete: 2 points
- Response includes two correct answers
  - Take shorter showers
  - Turn off the tap when brushing teeth
  - Don't litter
  - Only use what you need
  - Use less water
  - Recycle

Partial complete: 1 point
- Response includes one correct answer or one less-specific answer
  - Don't waste water

Less complete: 0 points
- No information or incorrect information provided