AN EVALUATION GUIDE FOR ROOKERY BAY NATIONAL ESTUARINE RESEARCH RESERVE

by

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EXECUTIVE SUMMARY

Estuarine health is integral to the health of ocean environments (NOAA, 2017). The National Ocean and Atmospheric Administration realized this and created a network of protected reserves—the National Estuarine Research Reserve System (NERRS) (NOAA, n.d.). Environmental education (EE) is integral to NERRS success. These reserves offer unparalleled "living classrooms" for educators, students, and the public (NOAA, 2018). Rookery Bay, a NERR located in Naples, Florida, is home to one of the few undisturbed mangrove forests in the United States. The Environmental Learning Center (ELC) at Rookery Bay is an important resource to the local community provides summer education opportunities and K-12 field trip programming (Rookery Bay, n.d.).

Education evaluation for EE programs has become increasingly important as environmental concerns have moved to the forefront of some of the worlds social, political, and economic issues (Thomson, G. & Hoffman, J., n.d.). Evaluation methods can be used to improve environmental education programs and enable continued or improved success in achieving program goals (Thomson, G. & Hoffman, J., n.d.). However, a program evaluation has not yet been done for Rookery Bay's EE field trip curriculum. The objective of this project was therefore to develop an outcome-based evaluation guide to assess the desired outcomes from visiting students who participate in: (1) 4th grade Estuary Explorers, (2) 7th grade SURVIVORS, and (3) the high school and college students Field-Based Estuarine Studies programs. This was done by completing an education evaluation document analysis, logic models, and informational interviews, to create a retrospective survey which then went through user testing, and expert reviews. This project's deliverables are a well-informed guide containing the three different grade level surveys as well as guidelines and recommendations for data collection, analysis, and reporting.

INTRODUCTION

Section 1.1 The NERRS

Estuarine health is integral to the health of ocean environments. Estuaries filter out sediments and pollutants from river water, provide vital nursery and feeding grounds to most fish and shellfish in the United States, function as a natural buffer to the elements, and support a wide range of recreation, research, and education activities. Estuarine habitats such as salt marshes, mangrove forests, and oyster reefs are responsible for these ecosystem services. It is through natural contributions like these that economy and environment are intricately connected (NOAA, 2017).

The National Ocean and Atmospheric Administration (NOAA) realizes the value of these systems and created a network of protected reserves. The National Estuarine Research Reserve System (NERRS) is comprised of 29 estuarine areas across the nation that foster long-term research, education, and coastal stewardship. The NERRS mission is "to practice and promote coastal and estuarine stewardship through innovative research and education, using a system of protected areas" (NOAA, n.d.). Through collaboration with coastal states and territories, state agencies or universities are responsible for the day to management of each reserve and receive input from local partners (NOAA, n.d.).

Environmental education (EE) is a key component to NERRS success. These reserves offer unparalleled "living classrooms" for educators, students, and the public. Promoting estuarine literacy and producing impactful experiences are integral to instilling the essential stewardship practices that protect these environments. Children and adults who come to a reserve interested in learning about protecting and restoring estuaries can receive a tailored experience of what that local site has to offer. Additionally, there are many school curriculums freely available through the NERRS website that offer lessons on topics like nonpoint source pollution, resilient communities, habitat restoration, and invasive species (NOAA, 2018). The reserves are able to better serve their local communities by helping shape a new generation of educated environmentalists.

Section 1.2 Rookery Bay National Estuarine Research Reserve

Rookery Bay National Estuarine Research Reserve is located in Naples, Florida, and is home to one of the few undisturbed mangrove forests in the United States. The 110,000-acre

Reserve is made up of unspoiled mangroves, uplands, and protected waters. Rookery Bay's mission is "to provide a basis for informed stewardship of estuaries in Southwest Florida through research and education." The Reserve offers nature tours, a myriad of scheduled events, a half-mile observation bridge, and a two-story, 16,500 square foot Environmental Learning Center (ELC) containing multiple aquarium exhibits and interactive displays. The ELC is also equipped with four research laboratories, many classrooms, and a 140-seat auditorium (Rookery Bay, n.d.).

The ELC at Rookery Bay is an important asset to the local community. The environmental education resources they provide include summer education and field trip programs. The field trip courses consist of the following three programs:

- 4th grade Estuary Explorers which involves basic estuarine ecosystem activities surrounding habitats like mangroves and oyster reeds, classroom investigations of plankton, and water quality testing at the Rookery Bay ELC (Rookery Bay, n.d.).
- 7th grade SURVIVORS are exposed to critical thinking strategies, high level questioning and scientific techniques centered around concepts like energy transfer, biodiversity, adaptation, and ecologic disturbances (Rookery Bay, n.d.).
- High school and college students Field-Based Estuarine Studies programs are conducted for the most part aboard a research vessel and are well-suited for students in marine biology, environmental science, oceanography, general biology, chemistry classes and more. Students get to participate in a bottom trawl and/or a plankton tow where samples are collected and brought back to the lab station for additional activities (Rookery Bay, n.d.).

Section 1.3 Education evaluation

Evaluation is the systematic collection, analysis, and interpretation of information about the activities and outcomes of a program with the purpose of making judgements about what the program is doing and improving it (Patton, 1987). Effective and current education evaluation methods can be used to improve education programs and enable them to have continued or improved success in achieving their goals (Thomson, G. & Hoffman, J., n.d.). Additionally, there are increasing demands for quality and equity in different levels and types of education as well as accountability, transparency, and better education management (Baur and Moritz, 2013). Different forms of evaluation and assessment are necessary to understand how much students are truly

absorbing, for providing evidence to stakeholders, and improving programming and informing best teaching practices (Baur and Moritz, 2013).

It can be argued that effective environmental education is needed now more than ever. Existing knowledge, attitudes, and behaviors must be challenged or built upon in order to encourage a new generation of environmental stewards (Thomson et al., n.d.). In the five years Rookery Bay's education programming has been running, a program evaluation has not been performed and the effectiveness of their programs has not yet been analyzed in a systematic way.

Section 1.4 Project goals

A relationship was established with Rookery Bay's education program after communications work for them was completed through an internship with the Nicholas Institute for Environmental Policy Solutions. Rookery Bay Education Coordinator Sarah Falkowski then proposed an evaluation guide be created to allow for the future evaluation of their field trip program. The purpose of the evaluation would be to better inform the Reserve of changes in student's knowledge, interest, attitude, and behavior based on exposure to education programming across a variety of topics. Rookery Bay would then be able to convey that evidence to stakeholders and/or funders for future development. Through this project, the goal was to create an education program evaluation guide that Rookery Bay can later implement.

The outcome-based evaluation guide will assess the desired outcomes from visiting students who participate in: (1) 4th grade Estuary Explorers, (2) 7th grade SURVIVORS, and (3) the high school and college students Field-Based Estuarine Studies programs. Guidelines and various assessment materials were created for implementation based on program specific background research and testing. The guide outlines a mixed methods approach that provides information on how to collect, analyze, and report on data obtained through the use of retrospective surveys tailored to each program level based on current curriculum.

The guide will be used by Rookery Bay to complete their first formal education program evaluation since coming to fruition five years ago. This guide will serve to answer the question "is Rookery Bay meeting their outcome goals with current education programming?" By using all of the following methods, a comprehensive education evaluation guide was synthesized for Rookery Bay to employ at their convenience. Long-term goals of continual evaluation over the years will

help determine if Rookery Bay's objectives for each field-trip class are being properly met and where improvement or changes should be made.

BACKGROUND PROCESS & EXPLORATION

An evaluation usually centers around some kind of testing instrument to elicit results. Before a testing instrument can be produced, however, some investigation must be done on appropriate practices based on the program at hand. The figure below from My Environmental Education Evaluation Resource Assistant (MEERA) depicts a typical process. Because this project only focused on creating a guide, not the action of evaluation itself, only Phases 1 and 2 are relevant for this MP. The guide itself contains instructions on completing Phase 3, but Steps 5-7 were not within the scope of this project. Within Phases 1 and 2 are Steps 1-4. Step 1 is purely an administrative stage for determining things like budget, timing, and if the survey will be done in house. These questions have already been predetermined by Rookery Bay and will not be discussed in this MP. Steps 2 and 3, determining program logic and evaluation goals, played a part in informing the eventual the evaluation design (Step 4) which in this case was a survey. A pilot survey then went through user testing and an expert review to further refine it.

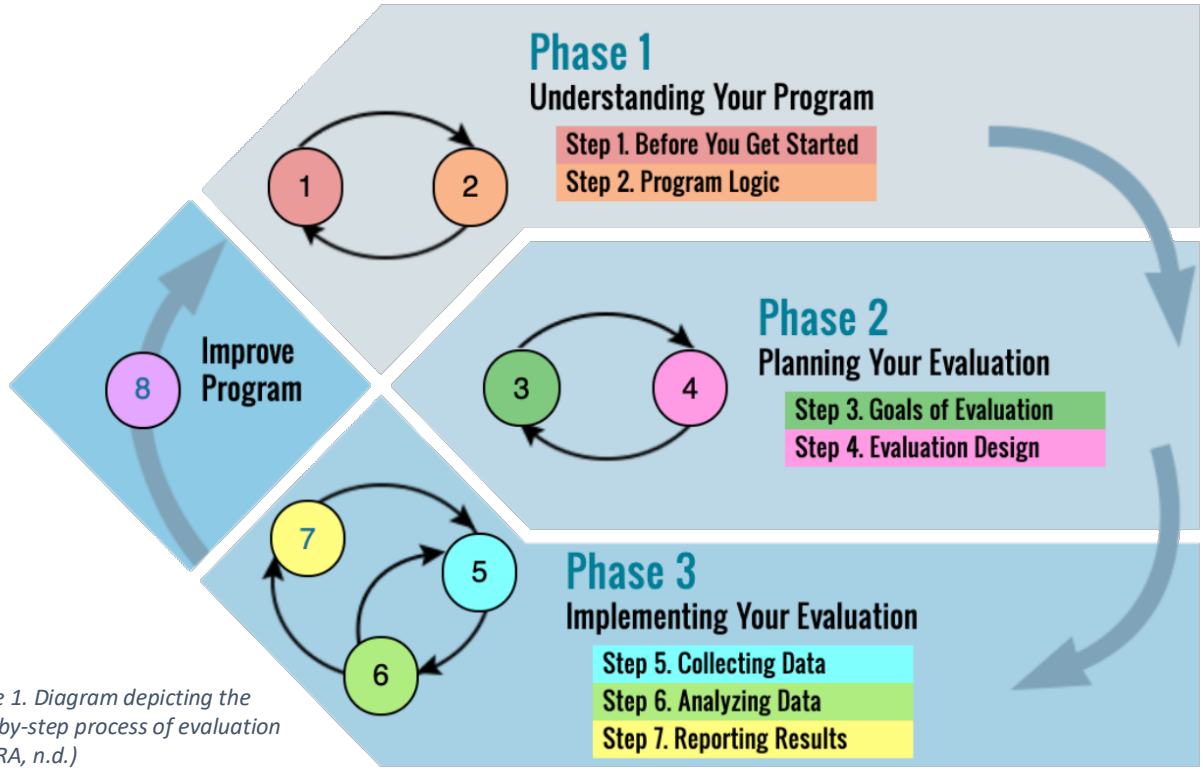


Figure 1. Diagram depicting the step-by-step process of evaluation (MEERA, n.d.)

With guidance from advisors, MEERA, and the Duke Clark Environmental Education Lab, the following processes were initiated; logic models filled in by Rookery Bay education specialists, a document analysis of past evaluations of similar programs, informational interviews done with education specialists at other NERRS, and user testing and expert reviews of the pilot survey instrument. This process is depicted in the diagram below (steps based on Figure 1).

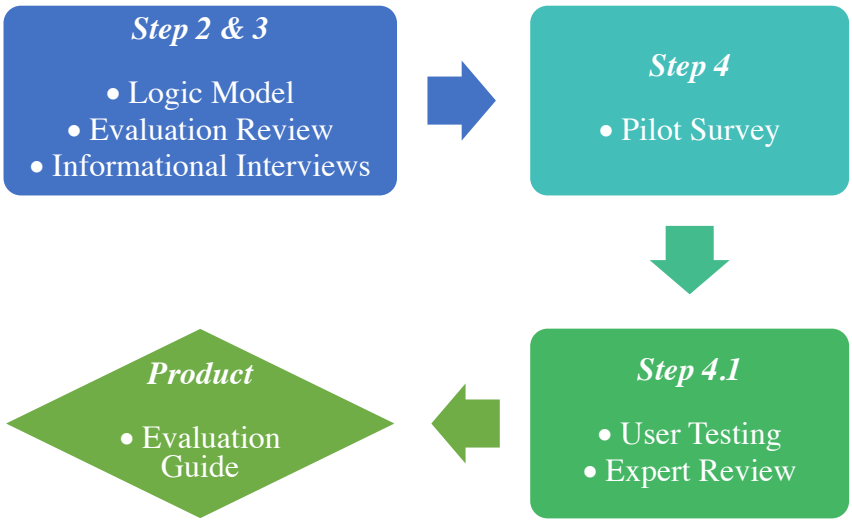


Figure 2. Product design process

Logic Models

Logic model diagrams help illustrate the rationale behind a program (MEERA, n.d.). Their purpose is to demonstrate the relationship between the resources you are investing (inputs), the activities carried out (outputs), and the benefits that are expected (outcomes) (MEERA, n.d.). Each education specialist at Rookery Bay completed a logic model for their grade level which determined what needed to be evaluated and what types of questions we wanted the evaluation to answer.

The template (i.e., blank) logic model used was the NOAA B-WET Program Logic Model (Appendix A). This template was chosen for its simplicity and because it has also been used for environmental education program evaluation. Additionally, because it was from another NOAA program, the format and wording was thought to be more familiar. The elementary, middle, and high school education specialists at Rookery Bay were provided with a blank logic model and guidance to adequately complete each of the components (inputs outputs, and outcomes). Rookery

Bay's education programs did not have clearly defined objectives at the time, so this exercise also helped define those objectives. The result of the logic models produced by Rookery Bay education staff were the following overarching outcome goals for student programming:

- Share experience, knowledge, and excitement from the field trip with friends and family
- Take opportunities to engage with local environmental groups (i.e. volunteer)
- Continue involvement with local and global environmental issues (voting, town halls, beach cleanups, follow environmental news, donating to organizations/causes, etc.)
- Continue taking classes in environmental/marine science
- Pursue a career in environmental/marine science
- Become a Rookery Bay volunteer if/when age 14+
- Visit the Reserve again with friends and family
- Become more comfortable in the outdoors

From this, an outcome-based evaluation was decided as best fit as they can help identify what a program is actually doing and changing. Outcome based evaluation takes a look at the impacts, benefits, or changes to program subjects as a result of said programs efforts based on subject participation (Thomson and Hoffman, n.d.). It is from this list that specifics markers or parameters for evaluation will be synthesized

Document Analysis

Eleven evaluations were elected from the MEERA website to design a well-suited evaluation tool. These evaluations were selected based on similarity to Rookery Bay's program topic and type (environmental education), evaluation type (outcome-based), and audience (primary and secondary school). The evaluations were then sifted through to identify what type of data were collected, how those data were collected, and how the data was analyzed. A table (Appendix B) was created that organized the evaluations by these categories. A quantitative survey questionnaire appeared in 10 out 11 of the evaluations as the data type/collection method. Nine out of those 10 evaluations used descriptive statistics to analyze the data. This led to the selection of a survey as the instrument of measure and a descriptive statistic approach to analyzing data.

Informational Interviews

Six education specialists in Florida, Alabama, Texas, and Puerto Rico NERRS were contacted for advice/experience/desires in regard to evaluation status of student education programs based on their existing relationship with Rookery Bay as a southeast NERR. Interview questions (Appendix C) were composed with help from advisors and Rookery Bay education staff. These questions revolved around advice, experience, or desires related to education programming, goals, and evaluation. Respondents were given the option to submit responses via phone call or individually filled out Word documents. A reminder email was sent after one week of no response. Answers were all open ended and qualitative in nature. Of the six education specialists contacted, one provided a phone interview and two provided email responses for a total of three interactions. One limitation for the interview response rate goes is that contacts were made following significant hurricane events that affected some NERRS sites.

The results of the NERRS Education specialist informational interviews further defined the evaluation for Rookery Bay. One specialist stated that, based on their own experience and extensive research, a retrospective survey was the most suitable method to evaluate given how the reserves field trip programs generally function. A retrospective survey's value is in its conduciveness to evaluating short programs, such as Rookery Bay's three-hour curriculum. They mentioned that giving a pre and post-test can undermine the outcome of an experience. These tests are not as useful when evaluating a single day or less programs as taking these too close together could bias post-experience responses (Stern and Powell, 2018). Further, if pre and post-test were performed, the Reserve would need cooperation from schools which can be prohibitively difficult as there is no monitoring of procedure and sometimes results never make it back to the Reserve. Another respondent from the interviews stated that all of their evaluation is done on site due to this same reason. A mention about on-site evaluation however, was to be careful in avoiding bias of those performing testing. Undesired results on one's own programming could cause conflict. Additional responses on questions about how data was analyzed were not detailed. From the combined interview feedback, it was decided that pre and post-testing was not appropriate as it would be too close together given the short schedule plus the direction for evaluation to be done on site at Rookery Bay. A retrospective survey was resultant as most well-suited for the situation.

PILOT SURVEY METHODS

User Testing

Based on background information gathered from the logic model, document review, and informational interview processes, a survey was created for each program and put through user testing on site at Rookery Bay. In the process of creating this survey, user testing was also performed. User testing allows for the identification of any potential problems respondents may have with the survey be it following instructions or confusion with phrasing and leads to the overall improvement in quality of data collected (Bergstrom, 2013). Therefore , the purpose of user testing on site was to find if students were able to navigate and comprehend survey questions created for future evaluation and to fine tune the evaluation instruments that will be used by Rookery Bay later on to gather evaluation data. Feedback only served to inform on a future version of the survey so individual's answers on each question did not matter and were not compared against one another.

There were two field trip sessions for each program level that took place between November 13th and 22nd in fall of 2019. At the end of each field trip session the entire class was split into groups of about 10 students either outside or in a classroom depending on the programming that day, how many moderators were available, and the weather. Moderators consisted of Rookery Bay staff (education department or otherwise), Rookery Bay volunteers, and myself. Each moderator had received instructions (Appendix D) a week prior to user testing. Once paper surveys were distributed, a consistent introductory script (Appendix E) was read to preface the activity and questions were answered. One moderator hosted each small student group and, using the Concurrent Think Aloud (CTA) technique, recorded comments, behaviors, and/or questions as they worked through the survey as a group on a moderator comment sheet (Appendix F). The CTA method was used because it helps in understanding participants' thinking as they are working through any issues (Bergstrom (2013). The strengths of CTA lie in being able to capture real-time feedback and any outward emotional responses (Bergstrom, 2013). Students also received a blank comment sheet (Appendix G) with space to write thoughts on each question if they preferred not to speak aloud. This activity was given 15-20 minutes for completion.

There were some limitations of this process. Younger students had less of an attention span by the end of the day. Multiple students were observed advancing through the entire survey without giving verbal or written comments till the end. Also, some surveys took place outside with

clipboards and heat and mosquitoes led to less focused respondents. As for the moderators, some were unable to receive instructions in a timely manner due to varied volunteer schedules or outdated emails used to send the instructions document. Additionally, some moderators had higher levels of investment than others in conducting completing their roles. This was reflected in a few incomplete or totally bare moderator comment sheets. Lastly, one of the user testing sessions had to be cancelled due to thunderstorms and was unable to be made up.

Expert Reviews

During the same week as user testing, informal interviews with Rookery Bay education specialists, of which there is one for each grade level (elementary, middle, and high school), were used to measure perceived usability, efficiency, and effectiveness of the student surveys. Each staff member was met with separately and reviewed the student survey respective to grade level. The education specialist expressed thoughts and/or wrote them down on a physical copy of the survey as I, the moderator, did the same.

There were also possible limitations of the expert review. These reviews had to take place during the week of user testing while on site. Some of these meetings took place after education staff had already experienced a user testing session with their specific grade level. This could have altered their comments as having already witnessed some of the results. This may not have exactly been a drawback but just something to note.

PILOT SURVEY RESULTS

User testing yielded significant insight into survey design. Moderator comment sheet and student comment sheet data were combined based on grade level. Each question's comments were summarized and reviewed to give an overall impression of the question and get a sense of how many responded in such a way. For most questions there was a general positive or negative sentiment identified and then aspects of the question that elicited such a response were determined. If anywhere on a moderator or student comment sheet there was non-response, the other aided in filling in the gaps. Expert reviews then further adjusted the pilot surveys. Rookery Bay instructors provided overall impressions of questions, suggested content changes, and gave formatting recommendations. All of this helped prepare the survey instrument to be its most useful version and garner accurate results for the evaluation. A detailed write-up of each grade

level feedback from user testing and expert reviews can be found on the following 12 pages (11-22). In the boxes are how the questions were displayed on the pilot survey. Questions modifications based on the results can be found in Appendix H.

Elementary School

User testing- summary of 67 student and eight moderator comment sheets from two user testing sessions with three different elementary school classes.

Expert review- summary of comments made by Rookery Bay NERR Elementary School Education Specialist Dita O'Boyle.

1. Your school's name _____ Your grade level _____

   a. Not reviewed.

2. How much did you enjoy the field trip on scale from 0 to 10? *Circle a number.*

I did not enjoy it — I really enjoyed it

0 1 2 3 4 5 6 7 8 9 10

   a. User testing- majority of students stated that this question was easy and simple.

   b. Expert review- easy and simple. Agreed this type of question would be widely understood and quick to answer.

3. In the left-hand column, circle the number that matches how much you agreed with each statement before attending this field trip. In the right-hand column, circle the number that matches how much you agree with each statement now.

	Before this experience						**After** this experience					
	Not really interesting		Fairly interesting		Very interesting		Not really interesting		Fairly interesting		Very interesting	
Marine science is interesting.	0	1	2	3	4	5	0	1	2	3	4	5
	😟	😕	😐	🙂	😀	😄	😟	😕	😐	🙂	😀	😄

   a. User testing- Some students readily understood this question but more reported that it was a bit confusing and made them unhappy. Clarifying or shortening the instructions and that only one number should be circled on each side would be helpful.

a. Expert review- Feedback expressed that the small text and colors needed improvement and there should be an attempt made to make the table more aesthetically pleasing. Also, instructions should be made clearer on how to navigate the question.

4. How much do you feel you learned from this field trip, on a scale from 0 to 10? *Circle a number.*

I did not enjoy it — I really enjoyed it

0 1 2 3 4 5 6 7 8 9 10

b. User testing- majority of students stated that this question was easy and simple though the response wording was incorrect.

c. Expert review- easy and simple. Agreed this type of question would be widely understood and quick to answer with a fix to the response wording.

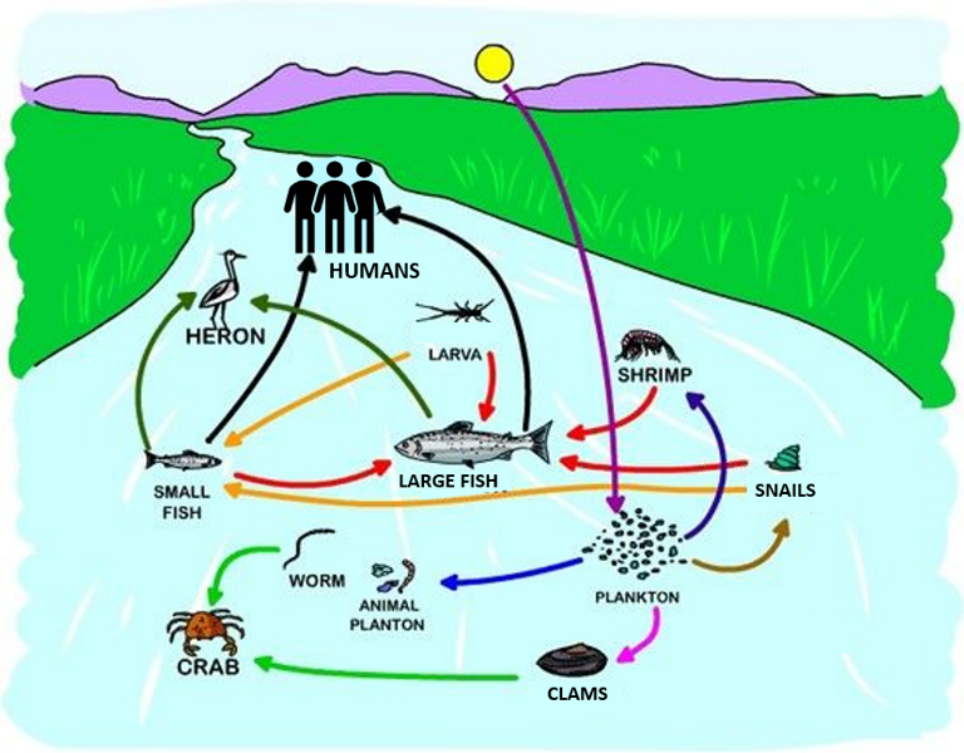
5. How much do you know about each of the following things because of the field trip? *Circle a number for each.*

How much did you learn about…	Nothing at all	→	A fair amount	→	A huge amount
Mangrove ecosystems	1	2	3	4	5
Oyster ecosystems	1	2	3	4	5
How estuarine waters are monitored	1	2	3	4	5

a. User testing- Most students thought this question was hard or confusing though some stated it was interesting. The word "ecosystem" was not universally understood and the layout confused many.

b. Expert review- Feedback expressed that the small text and colors needed improvement and there should be an attempt made to make the table more aesthetically pleasing. Also, instructions should be made clearer on how to navigate the question.

6. Read the following instructions to complete this activity.



Put a box around the organisms in the food web you knew **before** going on the field trip

Put a circle around the organisms in the food web you learned about **after** going on the field trip

It is okay if an organism has a box and a square. That will mean you learned more about them on the field trip, but still knew about them before.

a. User testing- Many students reported that this question was very confusing though a few found it interesting and enjoyed the complexity. A majority of respondents did not understand the instructions and the instructions being after the diagram made it even more hard to follow.

b. Expert review- Instructions need to come before the diagram. There are some organisms that should be replaced with one that is more specific to the local

ecosystem. This picture itself is somewhat busy and should be made to look more realistic and less like a cartoon.

7. How much do you think you would want to come back and visit Rookery Bay after this field trip on a scale from 0 to 10? *Circle a number.*										
Not at all										A huge amount
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

a. User testing- The majority of students stated that this question was easy and simple. Few students made comment that half numbers should be available.

b. Expert review- Comments given stated this question was easy and simple. Agreed this type of question would be widely understood and quick to answer.

Middle School

User testing- summary of 44 student and four moderator comment sheets from one user testing sessions with two middle school classes.

Expert review- summary of comments made by Rookery Bay NERR Middle School Education Specialist Jeannine Windsor.

1. Your school's name _____ Your grade level _____

a. Not reviewed.

2. How much did you enjoy the field trip on scale from 0 to 10? *Circle a number.*										
I did not enjoy it										I really enjoyed it
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

a. User testing- The majority of students stated that this question was easy and simple. Few students made comment that half numbers should be available.

b. Expert review- Comments given stated the question easy and simple. Expert agreed this type of question would be widely understood and quick to answer.

3. In the left-hand column, circle the number that matches how much you agreed with each statement before attending this field trip. In the right-hand column, circle the number that matches how much you agree with each statement now.

	Before this experience					**After** this experience				
	Not really interesting		Fairly interesting		Very interesting	Not really interesting		Fairly interesting		Very interesting
Marine science is interesting.	1	2	3	4	5	1	2	3	4	5
	🙁	😐	🙂	😀	😄	🙁	😐	🙂	😀	😄

a. User testing- Most students were able to answer this question but some did not like the format of it. Other comments made were that the instructions were too long and worded in an extraneous way. There were many comments that the emojis were a nice touch.

b. Expert review- Feedback provided was that this was a good question. However, small text and colors need improvement and there should be an attempt made to make the table more aesthetically pleasing.

4. How much do you feel you learned from this field trip, on a scale from 0 to 10? *Circle a number.*

I did not enjoy it — I really enjoyed it

0 1 2 3 4 5 6 7 8 9 10

a. User testing- The majority of students stated that this question was easy and simple though the response wording was incorrect.

b. Expert review- Comments given stated the question was easy and simple. Expert agreed this type of question would be widely understood and quick to answer with a fix to the response wording.

5. How much do you know about each of the following things as a result of field trip? *Circle a number for each.*

How much did you learn about…	Nothing at all	→	A fair amount	→	A huge amount
Mangrove ecosystems	1	2	3	4	5
Oyster ecosystems	1	2	3	4	5
How estuarine waters are monitored	1	2	3	4	5

a. User testing- Most students thought this question was not too difficult but could be made more specific. Some were confused but the overall consensus was that it is a good question.

b. Expert review- Feedback expressed that the small text and colors needed improvement and there should be an attempt made to make the table more aesthetically pleasing. Also, the list of topics should be more specific and expanded upon based on programming.

6. (Next Page)

6. Look at the list of ecosystem services provided by estuaries in the chart below. Select the ones you knew of before the field trip and write the numbers in the circle on the left. Select the ones you did not know of until after the field trip and write the numbers in the circle on the right. You do not have to use all of them and can feel free to write in others not listed.

Before the field trip	**After** the field trip
	

1. Seafood industry
2. Ecotourism
3. Food web
4. Erosion control
5. Biodiversity
6. Recreation
7. Jobs
8. Sense of place
9. Wildlife habitat area
10. Art material/inspiration
11. Wind/wave buffer
12. Carbon storage
13. Decomposition
14. Commercial fishing
15. Restoration efforts
16. Fish nursery
17. Property value
18. Aesthetics
19. Subsistence fishing
20. History/heritage
21. Education
22. Rookery
23. Adjacent habitat support
24. Dissolved oxygen levels
25. Scientific opportunity/ research

a. User testing- Most of the students reported that this question was too confusing and complex. There were too many choices and it was very time consuming. Certain words such as “ecosystem services” and “aesthetics” were unfamiliar. This question caused much conversation between the students and many voiced questions.

b. Expert review- Feedback given was that the question was too strongly worded/organized for middle school students. Three grouping would likely confuse students and keep them from understanding the instruction.

7. How much do you think you would want to come back and visit Rookery Bay after this field trip on a scale from 0 to 10? *Circle a number.*										
Not at all										A huge amount
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

a. User testing- The majority of students stated that this question was easy and simple. Few students made comment that half numbers should be available.

b. Expert review- Comments given stated the question easy and simple. Expert agreed this type of question would be widely understood and quick to answer.

<u>High School</u>

User testing- summary of 40 student and six moderator comment sheets from two user testing sessions with two high school classes.

Expert review- summary of comments made by Rookery Bay NERR High School Education Specialist Savannah Lawson.

1. Your school's name _____ Your grade level _____

a. Not reviewed.

2. How much did you enjoy the field trip on scale from 0 to 10? *Circle a number.*										
I did not enjoy it										I really enjoyed it
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

a. User testing- The majority of students stated that this question was easy and simple.

b. Expert review- Comments given stated the question easy and simple. Expert agreed this type of question would be widely understood and quick to answer.

3. In the left-hand column, circle the number that matches how much you agreed with each statement before attending this field trip. In the right-hand column, circle the number that matches how much you agree with each statement now.

	Before this experience					**After** this experience				
	Not really interesting		Fairly interesting		Very interesting	Not really interesting		Fairly interesting		Very interesting
Marine science is interesting.	1	2	3	4	5	1	2	3	4	5
	😕	😐	🙂	😀	😄	😕	😐	🙂	😀	😄

a. User testing- Most students were able to answer this question with ease but felt there were too may separate instructions and that they were on the whole too long and unnecessary. The before and after aspect was appreciated by some students and emojis were appreciated by most all of the students.

b. Expert review- Comments made directed the instructions be simplified and the table be enlarged and recolored for clarity. Additional statements should be added based on additional field trip programming as well.

4. How much do you know about the following topic as a result of field trip? *Circle a number for each.*

How much did you learn about…	**Nothing at all** →		**A fair amount** →		**A huge amount**
How altering the watershed changes an estuary	1	2	3	4	5

a. User testing- Students noted that the word "watershed" was not reviewed during the field trip and it caused some confusion. Otherwise, it was an easy and simple question.

b. Expert review- Feedback given stated it was a good assessment of material presented. However, the word "each" in the instructions implies more than one option to rate.

Comments also indicated the desire for more options be added to the list based on programming.

5. How much do you feel you learned about different STEM careers from this field trip, on a scale from 0 to 10? *Circle a number.*

Nothing at all — A huge amount

0 1 2 3 4 5 6 7 8 9 10

a. User testing- The majority of students stated that this question was easy and simple though the field trip did not review STEM career information explicitly.

b. Expert review- Comments given stated the question easy and simple. Expert agreed this type of question would be widely understood and quick to answer. More detail should be added, however, as "STEM careers" is a bit vague.

6. Did this field trip make you any **more likely** to do any of the following things? *Circle a number for each.*

	No more likely →		**Somewhat more likely** →		**Way more likely**
Help to protect my local environment.	1	2	3	4	5
Spend more time outside.	1	2	3	4	5
Talk with others about how to protect the environment.	1	2	3	4	5

a. User testing- The majority of students did not have any issues with this question.

b. Expert review- Remarks instructed the addition of a "before" mention in the instructions section of the question. For example, reword it as "Compared to how you felt before the field trip, did this field trip make you any **more likely** to do any of the following things? *Circle a number for each.*" Otherwise, this is a good question that does well to encourage reflection.

7. How much do you feel you learned about how you can be active in protecting the environment, on a scale from 0 to 10? *Circle a number.*

Nothing at all — A huge amount

0 1 2 3 4 5 6 7 8 9 10

a. User testing- The majority of students stated that this question was easy and simple, albeit a bit redundant as there are multiple 1-10 scale rating questions in the survey.

b. Expert review- Comments given stated the question easy and simple. Expert agreed this type of question would be widely understood and quick to answer.

8. Look at the list of ecosystem services provided by estuaries in the chart below. Select the ones you knew of before the field trip and write the numbers in the circle on the left. Select the ones you did not know of until after the field trip and write the numbers in the circle on the right. You do not have to use all of them and can feel free to write in others not listed.

Before the field trip	**After** the field trip
	

1. Seafood industry
2. Ecotourism
3. Food web
4. Erosion control
5. Biodiversity
6. Recreation
7. Jobs
8. Sense of place
9. Wildlife habitat area
10. Art material/inspiration
11. Wind/wave buffer
12. Carbon storage
13. Decomposition
14. Commercial fishing
15. Restoration efforts
16. Fish nursery
17. Property value
18. Aesthetics
19. Subsistence fishing
20. History/heritage
21. Education
22. Rookery
23. Adjacent habitat support
24. Dissolved oxygen levels
25. Scientific opportunity/ research

a. User testing- Most of the students reported that this question was confusing, long, and very time consuming. Certain words such were unfamiliar and the instructions were too lengthy. This question caused much conversation between the students and many voiced questions.

b. Expert review- Feedback given was to reconfigure the question into a chart format but retain the ecosystem services concept and similar options. All around it needed to be simplified, take less time, and be more straightforward.

9. How much do you think you would want to come back and visit Rookery Bay after this field trip on a scale from 0 to 10? *Circle a number.*

Not at all — A huge amount

0 1 2 3 4 5 6 7 8 9 10

a. User testing- The majority of students stated that this question was easy and simple, albeit a bit redundant as there are multiple 1-10 scale rating questions in the survey.

b. Expert review- Comments given stated the question easy and simple. Expert agreed this type of question would be widely understood and quick to answer.

DISCUSSION

Rookery Bay's evaluation guide (Appendix H) went through a rigorous cycle of refinement and testing. There is no one size fits all evaluation that can produce results for every program. The employment of a program specific logic model, document analysis, and interviews to create a survey which then went through careful user testing and expert review gives Rookery Bay a device to progress their EE program. When evaluation is pursued with the guidance and recommendation provided, a picture of what needs to change will become clear. If anything about the program changes there are a plethora of resources available from both NERR colleagues and academic research to correctly adapt the guide. Additionally, the process followed here can be replicated for other sites.

This entire process has contributed to the larger need of increasing the efficacy and efficiency of EE programs in the NERRS network. Not all reserves have an evaluation system in place but in order to continue the conservation of our coasts, evaluation is necessary. The reserve's programs not only have the power to build knowledge but can also help create a new generation of natural resource professionals, stewards, donors, and more which will continue in a cascade throughout time. Without evaluation, there are few measurable markers of success for these important goals.

Recommendations would be to work with local translators to translate surveys for Spanish and creole speaking students and/or to ensure translators are on trips and able to assist. This however could compromise the validity of the survey if not done properly so a decision must be made if translating is worthwhile and within the Reserve's capabilities Another recommendation is to give ample time and comfortable space to perform the evaluation. It may be wise to appoint a lead or point person to orchestrate the evaluation who is removed from the field trips. This would ensure biases or to an extreme, falsified results, do not occur. Clear and advanced communication with education staff and anyone who may be impacted by its occurrence will help it go over more smoothly. If changes are made to programming, note must be made in the evaluation to maintain consistency. It is also recommended that the evaluation be executed on a certain time schedule so, for example, year to year results can be accurately compared against one another to see if any changes occurred due to intervention.

ACKNOWLEDGEMENTS

I am immensely grateful to my advisors, Dr. Nicolette Cagle and Dr. Grant Murray, for helping me develop this project and for their guidance and encouragement throughout its progression. I am also grateful to Sarah Falkowski who helped establish and facilitate my relationship with Rookery Bay as well as provide fantastic accommodations when I visited. Additionally, I would like to thank Dita O'Boyle, Jeannine Windsor, and Savannah Lawson for their time and expertise at various stages throughout the project. Finally, I am grateful for the endless support I have been offered by the greater Nicholas School and Marine Lab communities, including that from faculty, staff, and fellow students.

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APPENDIX A: Blank Logic Model

NOAA California B-WET Program
Logic Model Example

Logic Model for [Project Name]

Audience: Identification/Description

Overall Goal: to improve…

Objectives (what your audience will be able to do/say/feel, etc. after the project)	**Resources** (what you have or need to do your project)	**Activities** (what you do to make project happen)	**Outputs** (what you produce or deliver as part of the project)	**Short-term Outcomes** (audience changes immediately after or within 1 to 2 years)	**Mid- to Long-term Outcomes/Impacts** (audience changes after a longer time — 2+ years)
	•	•	•	•	•
	•	•	•	•	•
	•	•	•	•	•

APPENDIX B: Document Analysis Table

	1	2	3
	Teachers for Tigers in Bhutan: Applied Environmental Education Program Evaluation	**Effects of Outdoor Education Programs for Children in California**	**Evaluation of New Hampshire Education and Environment Team Summer Institute, 2003-2006**
Summary	Designed to train teachers in tiger biology/ conservation, cultural perspectives, scientific methodology to study tigers, and introduces teaching techniques and strategies for using a variety of different subjects to teach about these topics.	The study focused on three target sites "to examine the effects of outdoor education experiences on students' behavior and learning."	This program is a multi-day residential professional development program for K-8 educators. The program focuses on natural science content and related teaching skills with the hope that educators will integrate more natural science instruction into their curriculum.
Program Type	Lesson/ Unit/ Curriculum/ Workshop/ Course	Field Trip/ Guided Tour/ Interpretive Exhibits/ Camp/ Residential Program/ Outdoor Adventure/ Recreation	Workshop/ Course
Program Topic	Animals/ Plants/ Wildlife/ Biodiversity/ Ecosystems	Animals/ Plants/ Wildlife/ Biodiversity/ Ecology/ Ecosystems/ Earth Science	Animals/ Plants/ Wildlife/ Ecology/ Ecosystems
Audience	Teachers/ Nonformal Educators	Primary School/ Underserved Minority Groups	Teachers/ Nonformal Educators
Evaluation Type	Evaluation Plan/ Process/ Implementation/ Outcome	Evaluation Plan/ Outcome	Process/ Implementation/ Outcome
Type of Data	Quantitative/ Qualitative	Quantitative/ Qualitative	Quantitative/ Qualitative
Data Collection	Interviews/ Logs/ Journals/ Student Work Observations/ Visitor Tracking Questionnaires/ Surveys	Observations/ Visitor Tracking/ Standardization Tests/ Questionnaires/ Surveys	Questionnaires/ Surveys
Analysis- Quantitative	Descriptive Statistics	Descriptive Statistics	Descriptive Statistics

	4	5	6
	IslandWood Evaluation Project: Assessment of Student Outcomes from IslandWood's School Overnight	**A formative evaluation of the Prairie Science Class**	**Colorado Youth Corps Final Evaluation Report**
Summary	The program works with schools to provide hands-on and inquiry-based learning experiences at the outdoor learning center and in the classroom, with a focus on watersheds, ecosystems, and team-building.	The Prairie Science Classroom uses a local prairie wetlands ecosystem as an integrating and motivating environmental learning context for fifth grade students.	The program provides young adults with seasonal full-time employment in conservation and stewardship projects. Crew leaders receive training in environmental education and in implementing lessons from the curriculum The Colorado Outdoor Odyssey: A Tool Kit for Environmental Work and Learning.
Program Type	Camp/ Residential Program/ Outdoor Adventure/ Recreation/ Out of School/ After School	Lesson/ Unit/ Curriculum	Lesson/ Unit/ Curriculum/ Issue Investigation/ Service Learning/ Camp/ Residential Program/ Out of School/ After School
Program Topic	Ecology/ Ecosystems/ Earth Science/ Pollution/ Recycling/ Waste Reduction/	Animals/ Plants/ Wildlife/ Biodiversity/ Ecology/ Ecosystems/ Earth Science	Animals/ Plants/ Wildlife/ Career Choices/ Earth Science
Audience	Primary School/ Secondary School	Primary School	Secondary School/ College/ Continuing Education/ Nonformal Educators
Evaluation Type	Evaluation Plan/ Process/ Implementation Outcome/ Impact	Process/ Implementation/ Outcome	Outcome
Type of Data	Quantitative/ Qualitative	Quantitative/ Qualitative	Quantitative/ Qualitative
Data Collection	Interviews/ Logs/ Journals/ Student Work/ Questionnaires/ Surveys	Focus Groups/ Standardized Tests/ Questionnaires/ Surveys	Questionnaires/ Surveys
Analysis- Quantitative	Descriptive Statistics/ Inferential Statistics	Descriptive Statistics/ Inferential Statistics	Descriptive Statistics/ Inferential Statistics

	7	8	9
	Evaluation of the Chesapeake Bay Foundation's Conservation Education Programs	**Evaluation of the Environmental Education Program at the New Jersey School of Conservation**	**Evaluating the Effectiveness of Residential Environmental Education Programs in Fostering Positive**
Summary	The goal of the evaluation was to determine to what extent programs influence participants' level of environmentally responsible behaviors. Data were collected on variables that have been linked to environmentally responsible behaviors includeing participants' environmental sensitivity, perceived knowledge of	The program serves elementary and middle-school students in New Jersey Schools. The four curricular areas taught include environmental sciences, humanities, outdoor pursuits and social sciences.	Sought to determine whether residential environmental education programs are more effective at fostering positive attitudes towards wildlife than in-class wildlife experiences, and whether or not these attitudes would last up to 2-3 months after the program. Six residential centers that provide wildlife environmental education were studied, all
Program Type	Lesson/ Unit/ Curriculum/ Issue Investigation/ Service Learning/ Field Trip/ Guided Tour/ Workshop/ Course	Lesson/ Unit/ Cirriculum/ Field Trip/ Guided Tour/ Camp/ Residential Program	Camp/ Residential Program
Program Topic	Animals/ Plants/ Wildlife/ Biodiversity/ Ecology/ Ecosystems/ Earth Science/	Animals/ Plants/ Wildlife/ Pollution/ Recycling/ Waste Reduction	Animals/ Plants/ Wildlife
Audience	Secondary School/ Teachers	Secondary School	Primary School/ Secondary School
Evaluation Type	Process/ Implementation	Outcome	Outcome
Type of Data	Quantitative	Quantitative/ Qualitative	Quantitative/ Qualitative
Data Collection	Logs/ Journals/ Student Work/ Questionnaires/ Surveys	Questionnaires/ Surveys	Interviews/ Questionnaires/ Surveys
Analysis- Quantitative	Descriptive Statistics	Descriptive Statistics/ Inferential Statistics	Descriptive Statistics

	10	11
	Making a difference in nature: an evaluation of Hidden Villa Environmental Education Program:	**An Elementary School Environmental Education Field Trip: Long-Term Effects on Ecological and**
Summary	The program works with 2nd – 6th graders who visit the Hidden Villa farm and wilderness for a one or two day field trip. The Hidden Villa evaluation was designed to determine how the program's goals align with visiting classroom teachers' goals.	The authors evaluated the long term effects of Parks as Classrooms, an environmental education program by the Great Smoky Mountains National Park (GSMNP).
Program Type	Field Trip/ Guided Tour	Field Trip/ Guided Tour
Program Topic	Agriculture/ Gardening/ Animals/ Plants/ Wildlife/ Biodiversity/ Ecology/	Animals/ Plants/ Wildlife/ Biodiversity/ Pollution
Audience	Primary School	Primary School
Evaluation Type	Process/ Implementation	Outcome
Type of Data	Qualitative	Qualitative
Data Collection	Existing Data/ Documents/ Focus Groups/ Interviews/ Observations/ Visitor Tracking/ Questionnaires/ Surveys	Interviews
Analysis- Quantitative	N/A	N/A

APPENDIX C: NERRS Informational Interview Questions

1. What is the general structure of your education program? (age, activities, length, etc.)
2. Do you have specific outcome goals for your education program? (changes in program participants' knowledge, beliefs, and/or behavior)
    a. If yes, what are they?
    b. How did you come up with them?
3. Have you ever had an evaluation of the education program performed? If yes please answer the following questions. YES, nothing broad or via an external professional, all "in-house"
    a. How often?
    b. Who performs them? (Internal or external party)
    c. What are the general methods used for data collection (e.g. pre/posttest, interviews, surveys) and analysis?
4. If you have not performed an education evaluation, do you have any interest in doing so and have you taken any steps towards doing so?
5. Are your results available and would you be willing to share them?

APPENDIX D: Moderator Instructions

Hello all,

During our upcoming field trip, we will be testing out a program evaluation survey with the students which is in development by a graduate student at Duke University. The overarching goal of this activity is to identify any comprehension issues with the survey, be it spelling, grammar, navigating questions, etc. Results will be used to make structural improvements upon the survey. We will not actually be analyzing students answers to survey questions.

We are asking our volunteers and staff to help moderate this activity. The procedures are as follows along with instruction for your duties.

1. Students will enter the classroom and be split into groups of no more than 10 students each. A staff member or volunteer will be put with each group to be moderator. The number of groups will depend on the number of staff/volunteers available but the smaller the groups the better.
2. An introductory script will be read by the lead Rookery Bay educator once students are situated. Any questions about the activity will be answered and then the paper surveys will be passed out to everyone in the group, including the staff/volunteers.
3. Staff and volunteers will lead their small groups of students using the Concurrent Think Aloud (CTA) method. In CTA, the moderator only uses prompts such as “mm hmm,” and “keep talking.” The goal is to encourage students to keep a running stream of consciousness as they work. Moderators will take notes of what participants say and do, without attempting to interpret their actions and words, and especially noting places where they encounter difficulty. Groups will go from question to question at their leisure but the entire activity should take less than 30 minutes.
    a. Along with the survey, students will be given a piece of paper to write down their feedback if they would prefer not to voice their thoughts.
4. Moderators will collect their group's surveys and put them in an envelope.

This is not meant to be an intense activity. We would like for you to be as detailed and specific as possible but if you miss any comments from students, it’s the end of the world.

If you have any questions feel free to reach out to Natalie.Rodriguez@duke.edu

APPENDIX E: Introductory Script

In an effort to make our programs the best they can be, we are asking each of you to complete a survey that will take approximately 15 minutes. We would like to make sure that students are able to understand these survey questions and answer them with ease. As you go through the survey with your group, write down or speak aloud to your instructor if you do not understand what a question is asking, how to answer it, or what certain words mean. What you do not understand may be different from your neighbor. We will go one question at a time.

The survey is optional. You will not receive a grade, and your names will not be recorded or linked to your answers. Please read each question carefully and write down or voice any and all questions or comments about it you have. We really appreciate your participation. You are the first students to see this survey and we want to make it the best it can be for others after you. When you are finished, we will collect your surveys. Thank you!

APPENDIX F: Moderator Comment Sheet

Moderator Comment Sheet

Question 1:

Question 2:

Question 3:

Question 4:

Question 5:

Question 6:

Question 7:

Question 8:

APPENDIX G: Student Comment Sheet

Student Comment Sheet

Please give comments about each question as you go. It is okay if you have no comments about a question. Comments may be about how easy or hard it was to answer, if you liked or disliked the question, if you found something confusing, didn't know a word, etc.

Question 1: _____
_____
_____
_____

Question 2: _____
_____
_____
_____

Question 3: _____
_____
_____
_____

Question 4: _____
_____
_____
_____

Question 5: _____
_____
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_____

Question 6: _____
_____
_____
_____

Question 7: _____
_____
_____
_____

Question 8: _____
_____
_____
_____

APPENDIX H: Rookery Bay Education Evaluation Guide

ROOKERY BAY EVALUATION GUIDE

by

Natalie Rodriguez
Advisors: Nicolette Cagle & Grant Murray
May 2020

Statement of Purpose

This evaluation will provide Rookery Bay National Estuarine Research Reserve (RBNERR) with better awareness, knowledge or understanding, engagement or interest, attitude, behavior, or skills produced from their education programming in order to make improvements accordingly and better communicate program impacts to stakeholders.

Evaluation Goals

The long-term goals include determining if (1) Rookery Bay's objectives for each field-trip class are being properly met and if (2) the visiting teachers believe the programs are effective and properly impactful as well.

Audience

The visiting students and teachers to be evaluated are participants in (1) 4th grade Estuary Explorers, (2) 7th grade SURVIVORS, and (3) the high school and college Field-Based Estuarine Studies programs.

Outcomes

For the students, the following will be quantified by employing retrospective pre-post survey techniques, scaled responses, and knowledge-based questions.

- Share experience, knowledge, and excitement from the field trip with friends and family
- Take opportunities to engage with local environmental groups (i.e. volunteer)
- Continue involvement with local and global environmental issues (voting, town halls, beach cleanups, follow environmental news, donating to organizations/causes, etc.)
- Continue taking classes in environmental/marine science
- Pursue a career in environmental/marine science
- Become a Rookery Bay volunteer if/when age 14+
- Visit the Reserve again with friends and family
- Become more comfortable in the outdoors

The information desired from teachers includes opinion based open response questions that will be analyzed quantitatively.

- Useful and non-useful aspects of the program and general satisfaction
- How they learned of the field trip and if they would go on to recommend Rookery Bay

Methods

Students and teachers will take the following surveys at the end of their field trip when all programming has been executed. Once instructions are stated, the paper surveys will be distributed. Rookery Bay staff will then collect surveys and store safely for later analysis.

Analysis & Reporting

Descriptive statistics will be used to analyze data gathered. Over time, evaluation data will be able to show if programming is effective or if any changes made have affected outcomes. See supplemental excel document for further information. Evaluation reporting will be done in accordance of requirements by funding agency or inquiring party.

Budget and Schedule

This will be determined on a yearly basis by Rookery Bay administration.

General Considerations

1. Establish dates and times the data collection will take place. Be sure to think about the effect of vacations, weather, exams, and special events. Make-up days may be necessary.
2. Obtain the necessary approvals needed from administrators, faculty, volunteers, and other personally. Early communication of purposes and expectation to work the evaluation into schedules will help.
3. Select who will be on the evaluation team. Conduct and orientation session discussing the need for consistency, order, awareness of personal bias and subjective influences, personality influences, and the need to cross-monitor the process closely. Practice sessions may be necessary.

Considerations Before, During, After

Before

1. Review the instrument, data recording sheets and directions closely
2. Practice using the instrument and rehearse process
3. Ensure necessary materials are available and ready to go
4. Check set-up of where the evaluation is to take place. If possible, remove any clutter, distractions and other sources of influence

During

1. Stay alert for possible disruptions and monitor the comfort of those being evaluated
2. Remain a neutral personality; keep an interest in the process but ensure that you do not intrude into the evaluation and encourage biased responses
3. When giving instructions, speak clearly, slowly and loud enough for all to hear. Follow directions exactly and make sure all questions are answered.

After

1. Collect and count all material
2. Briefly check for completeness
3. Make note of any special incidents that could have affected results
4. Organize and store data safely for analysis before departure from the activity

(Adapted from NOAA California B-WET Program, Tool: Evaluation Design Checklist and UNESCO/UNEP Evaluating Environmental Education in Schools: A practical guide for teachers prepared by Dean B. Bennett)

Elementary School Survey 1/2

Your school's name _ Grade level _ _ _ _ _

In an effort to make our programs the best they can be, we are asking each of you to complete a survey that will take approximately 15 minutes. The survey is optional. You will not receive a grade, and your names will not be recorded or linked to your answers. Please read each question carefully and answer honestly. We really appreciate your participation!

---

1. How much did you enjoy the field trip on scale from 0 to 10? *Circle a number.*

I did not enjoy it — I really enjoyed it

1 2 3 4 5 6 7 8 9 10

---

2. Circle the emoji that matches how much you agreed with each statement before attending this field trip, and then how much you agree with each statement now.

	BEFORE this experience						**AFTER** this experience					
Marine science is interesting	**Not really interesting** →		**Somewhat interesting** →		**Very interesting**		**Not really interesting** →		**Somewhat interesting** →		**Very interesting**	
	0	***1***	***2***	***3***	***4***	***5***	***0***	***1***	***2***	***3***	***4***	***5***
	😞	😕	😐	🙂	😃	😄	😞	😕	😐	🙂	😃	😄

---

3. How much do you feel you learned about estuaries on this field trip? Circle a number.

I did not learn anything — I learned a lot

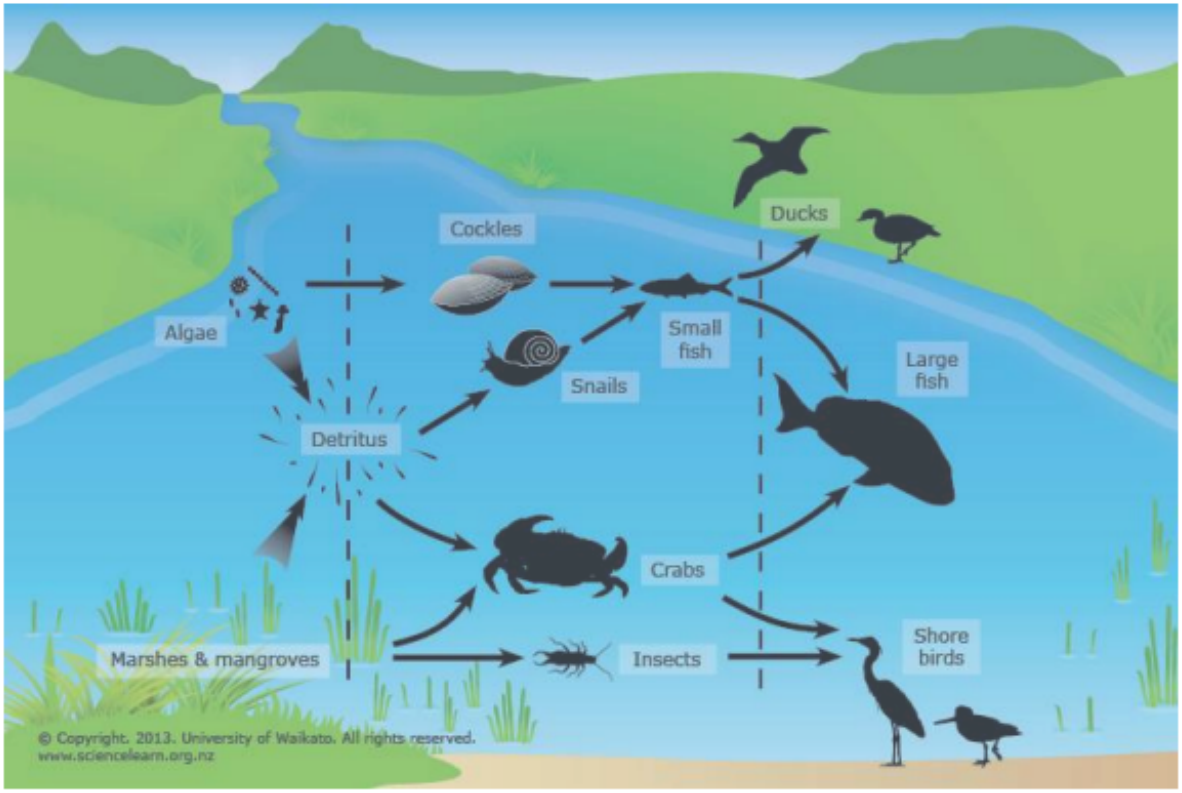
1 2 3 4 5 6 7 8 9 10

---

4. Rank how much you know about each of the following things because of the field trip. *Circle a number for each.*

How much did you learn about	**Nothing at all** →		**A fair amount** →		**A large amount**
Mangrove habitat.....	***1***	***2***	***3***	***4***	***5***
Oyster habitat.....	***1***	***2***	***3***	***4***	***5***
How to measure water health (salinity, temperature, dissolved oxygen, etc.).....	***1***	***2***	***3***	***4***	***5***
Why plankton are important.....	***1***	***2***	***3***	***4***	***5***

5. Put a box around the organisms in the food web you knew **BEFORE** going on the field trip
Put a circle around the organisms in the food web you learned about **AFTER** going on the field trip
It is okay if an organism has a box and a square. That will mean you learned more about them on the field trip, but still knew about them before.



---

6. How much do you think you would want to come back and visit Rookery Bay after this field trip on a scale from 0 to 10? *Circle a number.*

Not at all. Very much!

1 2 3 4 5 6 7 8 9 10

Middle School Survey 1/2

Your school's name _ Grade level _ _ _ _ _

In an effort to make our programs the best they can be, we are asking each of you to complete a survey that will take approximately 15 minutes. The survey is optional. You will not receive a grade, and your names will not be recorded or linked to your answers. Please read each question carefully and answer honestly. We really appreciate your participation!

---

1. How much did you enjoy the field trip on scale from 0 to 10? *Circle a number.*

I did not enjoy it — I really enjoyed it

1 2 3 4 5 6 7 8 9 10

---

2. Circle the emoji that matches how much you agreed with each statement before attending this field trip, and then how much you agree with each statement now.

	BEFORE this experience						**AFTER** this experience					
Marine science is interesting	**Not really interesting** →		**Somewhat interesting** →		**Very interesting**		**Not really interesting** →		**Somewhat interesting** →		**Very interesting**	
	0	***1***	***2***	***3***	***4***	***5***	***0***	***1***	***2***	***3***	***4***	***5***
	😟	😕	😐	🙂	😃	😄	😟	😕	😐	🙂	😃	😄

---

3. How much do you feel you learned about estuaries on this field trip? Circle a number.

I did not learn anything — I learned a lot

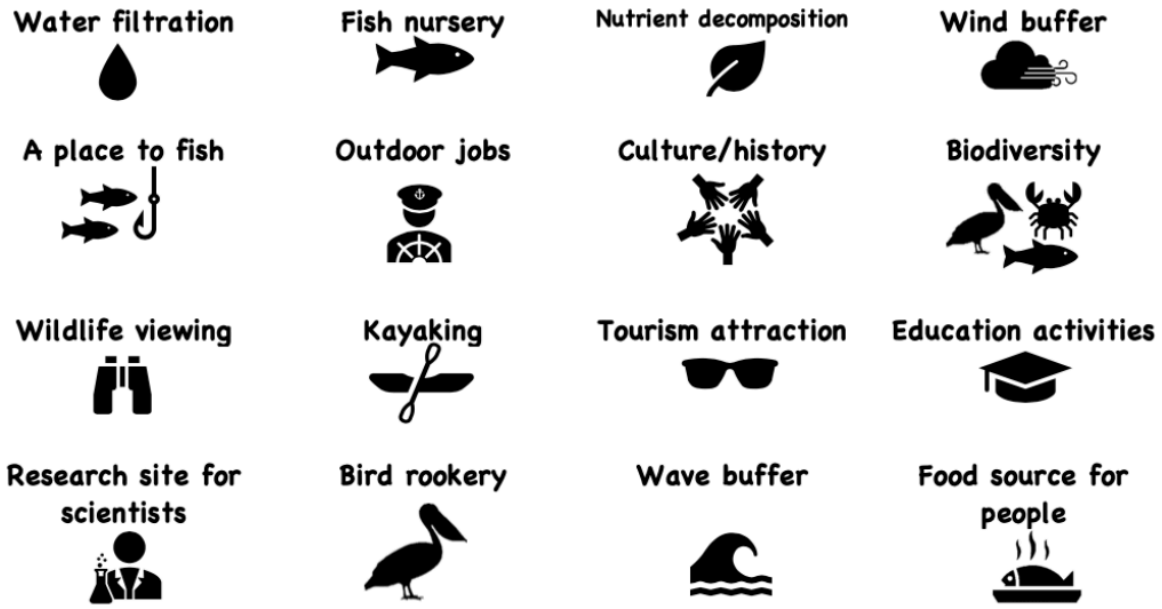
1 2 3 4 5 6 7 8 9 10

---

4. Rank how much you know about each of the following things because of the field trip. *Circle a number for each.*

How much did you learn about	**Nothing at all** →		**A fair amount** →		**A large amount**
Mangrove habitat.....	***1***	***2***	***3***	***4***	***5***
Oyster habitat.....	***1***	***2***	***3***	***4***	***5***
How to check the health of waters in our estuaries (salinity, temperature, dissolved oxygen, etc.).....	***1***	***2***	***3***	***4***	***5***

5. Nature can benefit people in many ways. Circle all the ways estuaries contribute to people's lives that you learned about today in Rookery Bay.



---

6. How much do you think you would want to come back and visit Rookery Bay after this field trip on a scale from 0 to 10? *Circle a number.*

Not at all. Very much!

1 2 3 4 5 6 7 8 9 10

High School Survey 1/2

Your school's name _ Grade level _ _ _ _ _
Did your boat do a trawl or water quality? _

In an effort to make our programs the best they can be, we are asking each of you to complete a survey that will take approximately 15 minutes. The survey is optional. You will not receive a grade, and your names will not be recorded or linked to your answers. Please read each question carefully and answer honestly. We really appreciate your participation!

---

1. How much did you enjoy the field trip on scale from 0 to 10? *Circle a number.*

I did not enjoy it — I really enjoyed it

1 2 3 4 5 6 7 8 9 10

---

2. Circle the emoji that matches how much you agreed with each statement before attending this field trip, and then how much you agree with each statement now.

	BEFORE this experience						**AFTER** this experience					
Marine science is.....	not interesting →		somewhat interesting →		very interesting		not interesting →		somewhat interesting →		very interesting	
	0	*1*	*2*	*3*	*4*	*5*	*0*	*1*	*2*	*3*	*4*	*5*
A career in natural sciences is.....	not interesting →		somewhat interesting →		very interesting		not interesting →		somewhat interesting →		very interesting	
	0	*1*	*2*	*3*	*4*	*5*	*0*	*1*	*2*	*3*	*4*	*5*

---

3. How much do you feel you learned about estuaries on this field trip? Circle a number.

I did not learn anything — I learned a lot

1 2 3 4 5 6 7 8 9 10

4. Rank how much you know about each of the following things because of the field trip. *Circle a number for each.*

How much did you learn about	Nothing at all →		A fair amount →		A large amount
The importance of mangroves/ estuaries.....	1	2	3	4	5
What ecosystem services provided by estuaries are.....	1	2	3	4	5
How to check on the health of the waters in our estuaries.....	1	2	3	4	5
The importance of plankton in estuaries.....	1	2	3	4	5

5. Look at the list of ecosystem services provided by estuaries below. Check the ones you knew about before attending this field trip, and then check the ones you learned about now after attending the field trip. *It is okay if an ecosystem service has a check before and after. That will mean you learned more on the field trip, but still knew about it beforehand.*

Ecologic			*Social*			*Economic*		
	Before	After		Before	After		Before	After
Wildlife habitat area	☐	☐	Recreation (fishing, kayaking, etc.)	☐	☐	Tourism opportunities	☐	☐
Erosion control (wind/wave buffer)	☐	☐	Education activities	☐	☐	Commercial fishing income	☐	☐
Fish nursery	☐	☐	Historical/heritage significance	☐	☐	Property value increase	☐	☐
Decomposition/ food web function	☐	☐	Research opportunities	☐	☐	Seafood industry (USA/global)	☐	☐
Water quality maintenance	☐	☐	Wildlife viewing opportunities	☐	☐	Jobs provided	☐	☐

6. How much do you think you would want to come back and visit Rookery Bay after this field trip on a scale from 0 to 10? *Circle a number.*

Not at all. Very much!

1 2 3 4 5 6 7 8 9 10