

Evaluation of Texas A&M Sea Grant Marine Education Materials

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by

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INTRODUCTION

One purpose of the Texas A&M University Sea Grant College Program marine education project is to increase awareness of the Texas coastal zone through dissemination of marine education materials. The Program began publishing marine education materials in 1969, and, to date, has issued 35 books, periodicals, pamphlets and posters. Many of these are distributed free of charge, while others are sold at cost.

Texas' state-adopted textbooks contain very few marine-related examples or activities¹, and Sea Grant believes that the availability of free or inexpensive marine education materials encourages teachers to use marine and coastal examples in their classrooms.

From the start, the marine education staff has proceeded under various assumptions about who uses the material, how it is used, and how dissemination occurs. Specific assumptions have been that the material is used primarily by elementary and secondary teachers in Texas, that these teachers use the material as classroom lessons or units, and that people learn about the materials either directly from the Sea Grant Program or by "word of mouth." These assumptions had never been tested, however, so an evaluation of 17 of the marine education publications was initiated in Summer 1983.

A list of individuals who ordered materials between 1980 and 1982 was compiled and two random samples were drawn. A pretest questionnaire was mailed to 30 individuals during the summer, followed by a final questionnaire mailed to 290 people in Fall 1983. Thirty-nine percent responded to the final questionnaire.

The findings from the questionnaire did not validate the assumptions. Two-thirds of the individuals live outside the state of Texas, and only half of the

respondents are elementary or secondary teachers. The materials are used by a more diverse population than anticipated, and in more diverse ways. Users include librarians, museum officers, university professors and marine extension agents. The materials serve as aids in curriculum development, as a resource for college students, as displays at teacher workshops and as a reference for presentations to adult community groups. Despite the diversity of users and uses, however, the materials are used in some type of formal or informal educational setting.

The results indicate that the material is being disseminated into the general population. Some respondents had learned about the materials from colleagues, others from teacher workshops or conventions, and still others from the Sea Grant College Program. A number indicated they used the material in teacher workshops, thus promoting further dissemination. Nearly half of the respondents expressed extreme enthusiasm for the materials, while most of the others were neither highly enthusiastic nor highly critical. Only a small minority of the sample indicated that they had not found the materials useful for their needs.

METHODS

The population of interest in this study consisted of those who had ordered one or more of eight Texas A&M Sea Grant publications (Children's Literature: Passage to the Sea, Marine Organisms in Science Teaching, Investigating the Marine Environment and Its Resources, Fairy Tales of the Sea, Fairy Tales of the Sea Teacher's Guide, Sea Sources, It's Only a Little Planet, Mini-Learning Centers Set 1: Language Arts).² These publications range in length from 28 to 491 pages and in cost from \$2.00 to \$8.00. They cover all grade levels (K-12).

It was possible to compile a list of the names and addresses of individuals who ordered these publications between 1980 and 1982 from the Sea Grant files. Table 1 shows the total number of orders for each publication. Some people had

Table 1. Population Distribution by Publication Title

	Number	Percent
<u>Children's Literature--Passage to the Sea</u>	384	23
<u>Marine Organisms in Science Teaching</u>	349	21
<u>Investigating the Marine Environment and Its Resources</u>	327	20
<u>Fairy Tales of the Sea</u>	233	14
<u>Fairy Tales of the Sea--A Guide for Teachers</u>	124	7
<u>Sea Sources</u>	103	6
<u>It's Only a Little Planet</u>	76	5
<u>Mini-Learning Centers Set 1: Language Arts</u>	70	4
Total	1,666	100

ordered more than one book and their names appear on the distribution list for each publication. For this reason, the total number of individuals in the population given in Table 1 (1,666) is slightly inflated. The total number of distinct individuals ordering these materials would be somewhat less, but this difference is considered negligible for purposes of this study.

Nine additional publications ranging in length from 6 to 50 pages and covering all grade levels also were identified. Information about the people who ordered these materials was not included in constructing the population and sample since all but one are distributed free, but questions about these publications were included in the evaluation form.

Two random samples, stratified by publication title, were drawn. For example, 23 percent of the total population had ordered Children's Literature: Passage to the Sea, so 23 percent of the sample was drawn from this publication's sales records. The first sample of 30 people received a pretest survey, and the second sample of 250 received the final questionnaire. A third sample of 40 people was drawn in the same manner approximately one month after the final survey was mailed to replace those individuals whose questionnaires were returned by the post office. This kept the total sample size at approximately 250.

Thirty pretest questionnaires were mailed July 1, 1983 (see Appendix A), and a reminder postcard was sent July 19. Twelve surveys were returned by Sept. 12, nine completed and three returned as undeliverable, for a total return rate of 33 percent.

Two hundred and fifty final questionnaires were mailed Oct. 7, 1983. Unlike the pretest, the final questionnaire was divided into two sections. Questions 1 through 7 were generalized enough for anyone using Sea Grant marine education material. Questions 8 through 17 were specifically directed at elementary and secondary teachers (see Appendix B). Everyone was offered a Sea Grant publication

free as an incentive for returning the questionnaire. Reminder letters were sent to non-respondents on Nov. 4, and 40 additional questionnaires were mailed to compensate for those surveys returned by the post office. Reminder letters for this second mailing were sent Nov. 30, 1983. Of the 290 questionnaires mailed, 31 were undeliverable and 102 were returned completed for a 39 percent total return rate.³

Table 2 shows the regional distribution of both the population and the sample. Comparing the two columns of relative frequencies indicates that the sample is highly representative of the population from which it was drawn.⁴ Table 3 shows the population distribution and Table 4 shows the sample distribution of regions and states using slightly different classification schemes.

Table 2. Population and Sample Distributions by Region.

	Population		Sample	
	Absolute	Relative (%)	Absolute	Relative (%)
West	295	18	17	17
South (including Texas)	885	53	48	47
East	341	20	26	25
North	84	5	8	8
Foreign Countries	65	4	3	3
Total	1,670	100	102	100

Table 3. Population Distribution by Place of Residence

	Number	Percent
Texas	631	38
Outside of Texas	1,035	62
Total	1,666	100

Table 4. Sample Distribution of Regions and States

		Absolute Frequency
East Coast		38
Connecticut	4	
Delaware	3	
Georgia	2	
Maine	1	
Maryland	2	
Massachusetts	5	
New Hampshire	2	
New Jersey	5	
New York	3	
North Carolina	4	
South Carolina	2	
Virginia	4	
Washington, D.C.	1	
Gulf Coast		6
Alabama	2	
Florida	2	
Louisiana	2	
Texas		30
West Coast		16
Alaska	5	
California	6	
Oregon	4	
Washington	1	
Inland		9
Idaho	1	
Kansas	1	
Minnesota	1	
Nebraska	1	
Ohio	5	
Foreign Country		3
Canada	2	
Virgin Islands	1	
Totals	72	102

FINDINGS

The findings of this research respond to five questions:

1. Who uses the material?
2. How do people learn about the material?
3. What material is used?
4. How is it used?
5. What judgements are made about the usefulness of the material?

A distinction must be made between those questions answered only by educators and those answered by everyone who responded to the questionnaire. This is accomplished by categorizing the analysis into Section A, the total sample responding to questions 1 through 7, and Section B, the teachers responding to questions 8 through 27. Some or all of Section A was answered by 102 individuals. From this total, 71 elementary teachers, secondary teachers, university professors and others who have used the material with K-12 students also answered some or all of the questions in Section B.

In some instances, it also was necessary to distinguish between primary and secondary users. Primary users are those who answered the questionnaire or those who received materials directly from Sea Grant. Secondary users refer to those who use the material with the primary users or those who receive the materials from the primary users.

Who Uses the Material?

A. Total Sample

Primary Users: Table 5 shows the frequency distribution of the respondents' occupations. Fifty-one percent of the total sample were either elementary or secondary teachers, while 18 percent were university professors and personnel. Of

the 18 respondents who identified themselves as university personnel, six were education or marine education specialists, three were education coordinators, one was a science education research associate and one was a teacher supervisor. Three identified themselves as directors, one of a continuing education program, another of communications and information, and the third of a Center for Environmental Programs. The remaining university personnel were assistant or associate professors.

North Carolina State University, College of William and Mary, Oregon State University, Stephen F. Austin State University, College of the Atlantic, University of California at Berkeley, University of California at La Jolla, University of Delaware, University of Alaska at Juneau, University of Georgia, University of Minnesota at Duluth, Texas A&M University at Galveston, University of New Hampshire, West Georgia College, University of South Carolina and Bowling Green State University were represented in the sample.

The institutional personnel category (10 percent of the sample) includes those who use the material within the context of some specified institution, but who are not primary, secondary or university instructors. This includes two librarians, a

Table 5. Distribution of Respondents' Occupations

	Absolute Frequency	Relative Frequency (%)
K-6 Teacher	27	26
7-12 Teacher	26	25
University Personnel	18	18
Distributor	14	14
Institutional Personnel	10	10
Retired - Other	7	7
Totals	102	100

media services program director, a nature center worker, an assistant education officer for a mariners' museum, an environmental center's science coordinator, a sea lab director, a marine science center's education specialist, and a science educator for a summer program.

Those categorized as distributors (14 percent) include people who disseminate the material at a variety of locations, such as a workshop leader making presentations at different schools. The types of occupations included in this category were an elementary consultant, general education consultant, a county 4-H agent, a natural resources program director, three marine advisory agents, an extension specialist, an ecologist, a satellite oceanographer and a Chamber of Commerce officer.

The retired-other category (7 percent of the sample) includes five retirees, a graduate student and a systems engineer. One retired person identified himself as a parttime fisherman and crabber, another as a retired telephone company employee who had lived most of his life on a river near Chesapeake Bay and the Atlantic Ocean. There also is a retired teacher currently writing a book on the Texas coast, and a fourth person who promotes the humanities of the sea through articles and lectures.

Secondary Users: Table 6 shows the distribution of the types of people with whom respondents use the material. Some respondents use the material with people in more than one category (for example, a college professor might use the material both in the classroom and at workshops), so the total number of responses given to this question (154) exceeds the number of respondents. Three percent of the secondary users were preschool or kindergarten students; 25 percent, elementary students (1-6); 16 percent, junior high students (7-9); 21 percent, high school students (10-12); 6 percent, college students; 19 percent, teachers; and 9 percent, other adults.

Table 6. Distribution of Secondary Users

	Absolute Frequency	Relative Frequency (%)
Preschool/Kindergarten	4	3
Students, 1-6	39	25
Students, 7-9	25	16
Students, 10-12	32	21
College Students	10	6
Teachers	30	19
Other Adults	14	9
	<u>154</u>	<u>99</u>

Table 7. Distribution of Grade Level Taught by Respondents

	Absolute Frequency	Relative Frequency (%)
Preschool-3rd	18	19
4th-6th	32	34
7th-9th	16	17
10th-12th	25	26
College	4	4
	<u>95</u>	<u>100</u>

Table 8. Distribution of Number of Years Taught by Respondents

	Absolute Frequency	Relative Frequency (%)
1-3 years	4	6
4-6 years	8	11
7-10 years	16	22
11 plus years	43	61
	<u>71</u>	<u>100</u>

B. Teachers

Primary Users: Table 7 shows the grade level distribution of educator-respondents. Some teachers teach in more than one category, so the 95 total exceeds the actual number of respondents. Nineteen percent of the educators teach in preschool through third grade; 34 percent in grades 4 to 6; 17 percent in grades 7 to 9; 26 percent in grades 10 to 12; and 4 percent in college. Six percent have taught three years or less, 11 percent, four to six years, 23 percent, seven to ten years, and 61 percent have taught 11 years or more (see Table 8). Twenty-six percent are certified in kindergarten/elementary education, 20 percent in science, 18 percent in biology, 13 percent in chemistry, physics or math, 6 percent in English or reading, 4 percent each in special education, counseling, administration or media, 3 percent in earth or life science, and 2 percent in social studies (see Table 9).

Table 9. Distribution of Areas of Certification of Respondents

	Absolute Frequency	Relative Frequency (%)
Kindergarten-Elementary Education	30	26
Science	23	20
Biology	21	18
Chemistry/Physics/Math	15	13
English/Reading	7	6
Special Education	5	4
Counseling	4	4
Administration/Media	4	4
Earth/Life Science	3	3
Social Studies	2	2
	<hr/> 114	<hr/> 100

Table 10 shows the frequency that teachers are required to include marine information in their subject matter. Inclusion is optional 59 percent of the time, according to the respondents, and required just 41 percent of the time. Table 11 cross-tabulates the required versus optional status of marine information by subject. As indicated, marine information remains an option in most subjects, except, obviously, for marine science.

Table 12 lists the teachers' reasons for exercising the option to use marine information. The response total is 181 because a number of individuals checked more than one reason. Twenty-five percent of the teachers cited their own interest in oceanography, while 24 percent thought their students would be interested or

Table 10. Distribution of Required Versus Optional Status of Marine Information in the Subjects Taught by Respondents

	Absolute Frequency	Relative Frequency (%)
Required	30	41
Optional	44	59
	<u>74</u>	<u>100</u>

Table 11. Subject Taught by Required Versus Optional Status of Marine Information

	Required (%)	Optional (%)	Total (65)
Science	40	60	N=10
Biology/Life Science	6	94	18
Marine Science	100		19
Earth/Chemistry/Physics	33	66	9
Reading/Literature		100	3
Social Studies	50	50	2
Education	25	75	4

Table 12. Distribution of Reasons for Including Marine Information in Classroom

	Absolute Frequency	Relative Frequency (%)
Have personal interest in oceanography	45	25
Thought students would be interested in the material	44	24
Thought students should have some knowledge about marine environment	43	24
Thought students would find the material useful	26	14
Students said they wanted to learn about marine environment	11	6
Other	8	4
Live near coast	4	2
	<u>181</u>	<u>99</u>

should have some knowledge about the marine environment. Student requests account for 6 percent, while 4 percent simply indicated the "other" category, and 2 percent said they live near the coast.

C. Summary

Fifty-one percent of the primary users are elementary or secondary teachers, while 91 percent of the secondary users are involved with education either as students or teachers. Teacher-respondents most frequently teach in fourth through sixth or tenth through twelfth grades, and most have taught 11 years or more. The most common areas of certification listed are kindergarten-elementary education, science and biology. Except for marine science courses, teachers generally are not required to include marine information in their subject matter. The most frequent reason for doing so is that the particular teachers has a personal interest in oceanography.

How Do People Learn About the Material?

A. Total Sample

Primary Users: Table 13 lists the methods by which respondents learned about Sea Grant marine education materials. Some cited more than one source, thus the total number of sources (118) exceeds the total sample size (102).

Twenty percent indicated that they learned of the material through the quarterly newsletter Marine Education, making this the primary source of information. The least cited sources were Science and Children and college courses, each of which claimed 4 percent of the sample, and The University & The Sea, which claimed 6 percent of the sample. The remaining five sources claimed about an equal share of the sample, with 16 percent indicating that they learned about these materials from inservice workshops, 14 percent from conventions, 13 percent from the Sea Grant network, and 11 percent from recommendations from colleagues and from other unspecified or forgotten sources.

Table 13. Distribution of the Sources through which Respondents Learned about Marine Education Materials

	Absolute Frequency	Relative Frequency (%)
<u>Marine Education</u>	24	20
Inservice Workshop	19	16
Convention	17	14
Sea Grant Network	15	13
Recommendation from Colleague	13	11
Other	13	11
<u>The University & The Sea</u>	7	6
<u>Science and Children</u>	5	4
College Courses	5	4
	<u>118</u>	<u>99</u>

Table 14. Correlation of Source of Information by Respondents' Occupation

	K-6 Teacher	7-12 Teacher	University Personnel	Distributor Institutional Personnel Retired/Other
Sea Grant Publication/Network	25%	43%	68%	47%
Teacher Workshop/College Courses	44%	15%	5%	10%
Convention/Recommendation from Colleague/Other	<u>31%</u>	<u>43%</u>	<u>27%</u>	<u>43%</u>
Total (127)	N=32	N=40	N=22	N=30

Table 14 correlates the information sources with the respondents' occupations. As can be seen in this table, the nine categories from Table 13 have been collapsed into three. There were several instances such as this where the number of individuals in one or more categories was so small that analysis was meaningless when the variable was cross-tabulated with another variable. In such instances, the category was collapsed with other, logical categories. For example, the first category of Table 14, Sea Grant publication/network, now includes the three periodicals (Marine Education, The University & The Sea and Science and Children) as well as the Sea Grant network. Forty-three percent of the sample learned about the materials from these sources.

Forty-four percent of the elementary teachers learned about the materials from teacher workshops or college classes, 31 percent at conventions, from colleagues or from an unspecified source, and 25 percent through the Sea Grant publication network. On the secondary level, 43 percent cited the Sea Grant publications network as the primary source, another 43 percent cited conventions, colleagues or other, and 15 percent college classes or teacher workshops. Sixty-eight percent of university personnel learned about the materials through the Sea Grant network, 27

percent from conventions, colleagues or other, and 5 percent at teacher workshops or in college classes. Institutional personnel, distributors or retirees generally learn about the material through the Sea Grant network (47 percent) or from conventions, colleagues or other (43 percent), with just 10 percent citing teacher workshops or college classes.

Table 15 cross-tabulates the source of information by region. Those along the East Coast cited the Sea Grant network most frequently (50 percent), while those on the West Coast indicated conventions, colleagues or other (47 percent). Inland teachers generally learn about the materials at teacher workshops or in college courses (56 percent). Those along the Gulf Coast have the most diversity, with 37 percent citing the Sea Grant network, 35 percent college courses or teacher workshops, and 28 percent conventions, colleagues or other. Two foreign respondents learned about the materials through the Sea Grant network, while the third learned at a convention.

Table 15. Source Through Which Respondents Learned of Materials by Region

	East Coast	Gulf Coast	West Coast	Inland	Foreign Country
Sea Grant Publications/Network	50%	37%	29%	33%	67%
Teacher Workshops/College Courses	4%	35%	24%	56%	0
Conventions/Recommendations from Colleagues/Other	<u>46%</u>	<u>28%</u>	<u>47%</u>	<u>11%</u>	<u>33%</u>
Total (118)	N=46	N=43	N=17	N= 9	N= 3

B. Summary

It appears that most people learn about the materials from the Marine Education newsletter, at inservice workshops or conventions, through the Sea Grant net-

work, and from colleagues. Elementary teachers most often learn about the materials at teacher workshops or in college classes; secondary teachers, distributors, institutional personnel and retired people from Sea Grant publications, through the Sea Grant network, at conventions and from colleagues; and university people from Sea Grant publications or through the Sea Grant network. People from the East coast most frequently learn about the material from Sea Grant publications, through the Sea Grant network, at conventions and from colleagues; people from the Gulf coast from Sea Grant publications, through the Sea Grant network, at teacher workshops and in college classes; those from the West coast at conventions and from colleagues; and those inland at teacher workshops and in college classes.

Which Material Is Used?

A. Total Sample

Primary Users: Table 16 shows the frequency of use of the marine education materials. Many people had used more than one publication, and some had used a single publication in more than one way, so the total number of uses listed (538) exceeds the sample total of 102.

Investigating the Marine Environment and Its Resources was the most frequently used publication (13 percent), while Mini-Learning Centers Set 1: Language Arts, Vocational-Technical Marine Career Opportunities in Texas and Water: How Safe Are You? were the least frequently used (2 percent each). Investigating is used most frequently as a unit, a lesson, a display, for supplemental reading, enrichment activities or classroom presentations, and as a resource for college students. Appendix C includes an extended table of publication titles by use.

B. Summary

Survey responses indicate that the shorter, free publications are used less frequently than those that are longer and more comprehensive despite the fact that there is a charge for the latter. The most notable exceptions to this are It's

Only a Little Planet (74 pages) and Mini-Learning Centers Set 1: Language Arts (five activity folders), each of which costs \$5.00.

Table 16. Frequency of Use of Sea Grant Publications

	Absolute Frequency	Relative Frequency
Investigating the Marine Environment and Its Resources	71	13
Children's Literature-- Passage to the Sea	53	10
Fairy Tales of the Sea	47	9
Fairy Tales of the Sea A Guide for Teachers	42	8
Marine Organisms in Science Teaching	41	8
How to Set Up and Maintain a Saltwater Aquarium	40	7
Hurricanes on the Texas Coast	38	7
Marine Education (newsletter)	36	7
Careers in Oceanography	33	6
Sea Sources	29	5
Hurricane Warning!	24	4
Aquatic Science: Marine Fisheries Biology	18	3
Venomous Marine Animals (poster)	17	3
It's Only a Little Planet	15	3
Mini-Learning Centers Set 1: Language Arts	13	2
Vocational-Technical Marine Career Opportunities in Texas	11	2
Water: How Safe Are You?	10	2
	538	99

How Are the Materials Used?

A. Total Sample

Primary Users: Table 17 lists the frequencies of types of use of the marine education materials. Because there is such a diversity of uses and because, in some instances, the use is rather inventive, this discussion is more extensive than that in other sections of this report. Each category is illustrated with state-

Table 17. Distribution of Types of Use of Sea Grant Marine Education Materials

	Absolute Frequency	Relative Frequency
Resource for College Students/ College Classes	76	14
Personal Resource	55	10
Lesson	50	9
Teacher Workshop/ Adult Presentation	48	9
Display/Visual Material	47	9
Supplemental Reading/Enrichment Activities/Classroom Presentation	45	8
Unit	39	7
Distribution to Teachers/Others	38	7
Resource for Students	32	6
Aid in Developing Curriculum/ Writing	31	6
Received/Have Not Used	28	5
Other	19	4
Labs/Field Trips	15	3
Personal Use	15	3
	538	100

ments from the evaluation forms. Those publications used most frequently in each category are also listed.

The most frequently reported use is for college classes or as a resource for college students.⁵ One respondent wrote that the materials are being used in graduate and undergraduate courses, another said as reference by elementary and secondary education students for planning curriculum, and a third indicated the material served as a resource for student teachers in unit planning. Still another respondent replied that the materials are used as part of a marine resource center.

Marine Organisms in Science Teaching, Children's Literature--Passage to the Sea, Fairy Tales of the Sea and Investigating the Marine Environment and Its Resources are used most frequently as resources for college students.

The second most frequent use is as a personal resource for professional activities. This category is differentiated from the personal use category, where people read the materials simply for their own enjoyment. One person uses Investigating, Children's Literature and Marine Organisms as an information source for an environmental center program. A teacher responded that she looks through the Marine Education newsletter for classroom ideas, while another uses Hurricane Warning! as a reference for a unit on coastal zone management. The newsletter and Fairy Tales of the Sea Teacher's Guide are the publications most frequently used as a personal resource.

The third most frequent use of the publications is in a lesson. One teacher wrote that he uses Hurricanes on the Texas Coast in a history lesson, while another indicated she integrates Investigating into lessons in language arts, reading and science. These two publications were most frequently cited in this category.

Teacher workshops or adult presentations represent the fourth most frequent use. One teacher indicated she had used Marine Organisms in Science Teaching and How to Set Up and Maintain a Saltwater Aquarium to develop a marine science program

for eight elementary schools in her district. Another person replied that all the materials are used in inservice programs for K-12 teachers. Three people use Hurricanes on the Texas Coast and/or Hurricane Warning! in hurricane preparedness presentations for the public, and another person uses the information on algae in Investigating with adult community groups. The publications most frequently used in teacher workshops and adult presentations are Children's Literature--Passage to the Sea, Fairy Tales of the Sea and its accompanying teacher's guide.

Displays or visual material represent the fifth most common use of the materials. One teacher uses Marine Education in a continuing center in her classroom, while another uses Investigating, Water: How Safe Are You? and Mini-Learning Centers Set 1: Language Arts in a science corner as an individualized activity after a science unit on marine life. A third teacher mounts and laminates the appendices, tables and figures from Hurricanes on the Texas Coast for use in an interest center. One marine advisory agent displays the Venomous Marine Animals poster at local fishing tournaments to increase public awareness of the dangers associated with these animals. Investigating and the marine animals poster are used most frequently as display materials.

The sixth most common use is supplemental reading, enrichment activities and classroom presentations by someone other than the teacher. One person used Fairy Tales of the Sea in a program on sea subjects, while another used it as an enrichment element during a Sea Week program. Another teacher uses Investigating, Hurricanes on the Texas Coast and Careers in Oceanography as supplementary materials for an oceanography unit. Children's Literature, Investigating and Fairy Tales of the Sea were cited most frequently in this category.

The seventh most frequent use is as a unit. One teacher wrote that she uses Investigating for most of a five-week unit on oceanography. She also correlates her English classes with an oceanography unit by using many of the ideas in the

book. Another teacher said she teaches a literature unit with her oceanography unit, and finds Fairy Tales of the Sea particularly useful in combining science and literature. The publications used most frequently as units are Investigating and Hurricane Warning!.

Distribution to teachers and others represents the eighth most frequent use. Several people reported that they had sent some of the materials to other teachers, and others indicated that they had placed one or more of the publications in the library. One marine county extension agent distributes the Venomous Marine Animals poster to schools during presentations, and a marine advisory agent has distributed several hundred copies of How to Set Up and Maintain a Saltwater Aquarium at educational activities. The latter also includes Hurricane Warning! with other hurricane information in response to public requests, and distributes Aquatic Science: Marine Fisheries Biology during 4-H beach trips. According to the survey, Fairy Tales of the Sea A Guide for Teachers and Investigating are distributed most frequently.

The ninth most frequent use is as a student resource. Careers in Oceanography and Vocational-Technical Marine Career Opportunities in Texas are frequently used during high school career days, at career fairs and in counseling. Careers in Oceanography and Investigating are used most frequently as a student resource.

Curriculum development and as a writing aid represent the tenth most frequent use of the materials. One university professor compares the materials to what is or could be done in the Pacific northwest. Another person uses the materials as reference for articles and lectures, while still another has used Aquatic Science: Marine Fisheries Biology to develop a workbook for a New Jersey 4-H Marine Science weekend. The publications used most frequently in this category are Investigating and Children's Literature--Passage to the Sea. The "other" category includes all instances of use that do not fit previously mentioned categories.

The material is used less frequently in labs, before field trips or for personal use according to the survey. One teacher reports she used two sections from Investigating prior to a field trip, and several indicate they use the labs from Marine Education in their classes. Investigating is used most frequently in labs and before field trips, and Fairy Tales of the Sea is used most frequently for personal reading. Several indicate that they purchased this book to read to their children or grandchildren, and one man wrote that he has "given this wonderful book to children as birthday presents."

A number of the respondents use more than one of the Sea Grant marine education materials. Graph 1 shows the number of publications used by the respondents. Each individual used an average (or mean) of 4.45 publications, although 28 percent has used only one, 59 percent, three or less, and 79 percent, six or less. Graph 2 shows the number of different ways the publications are used. Primarily, these publications are used for a single purpose, such as a lesson (77 percent of the time). The publications are used for two purposes, such as a lesson and a student resource, 20 percent of the time, and for three purposes, such as a lesson or student resource and at a workshop, 3 percent of the time.

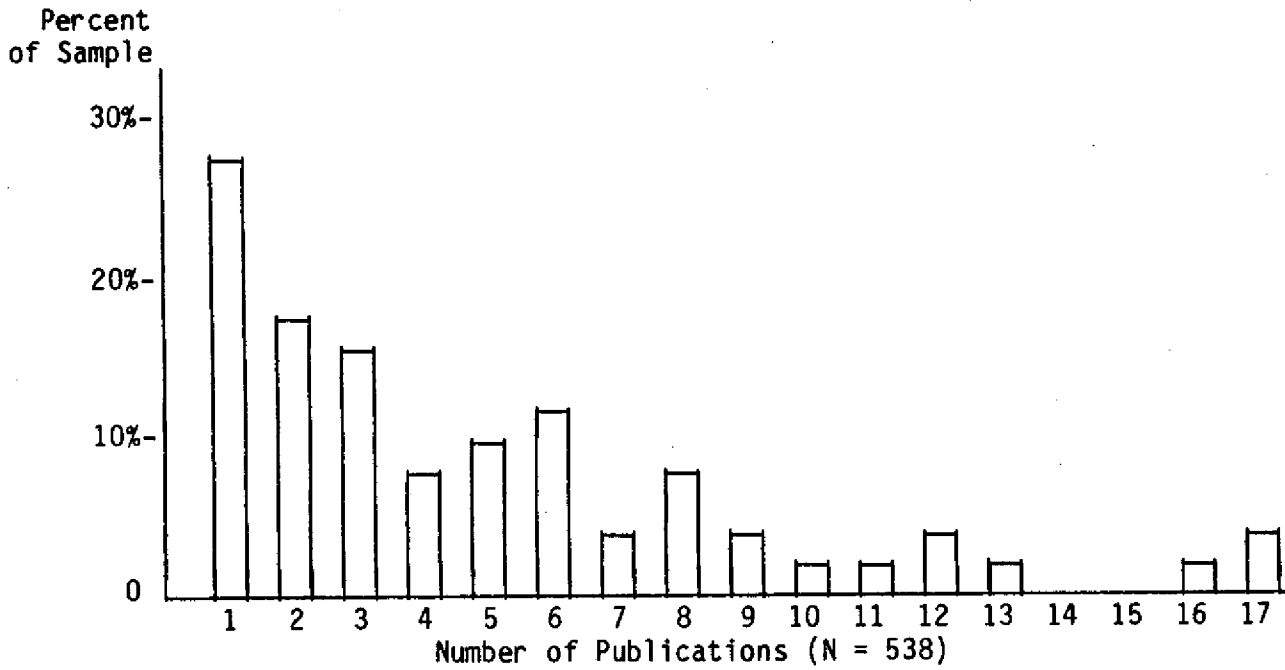
B. Teachers

Primary Users: Table 18 indicates the subjects in which the materials are used. Marine science, which includes courses such as marine science, marine biology, marine ecology or oceanography, is definitely the most popular category. The materials are used in a marine science setting 53 percent of the time. Language arts and science are distant second and third choices, being used 16 percent and 12 percent, respectively.

C. Summary

It appears that the materials are used by many different types of individuals in a number of diverse ways, although, nearly without exception, they are used

Graph 1. Total Number of Publications Used by Individual Respondents



Graph 2. Total Number of Ways Single Publication Used by Respondents

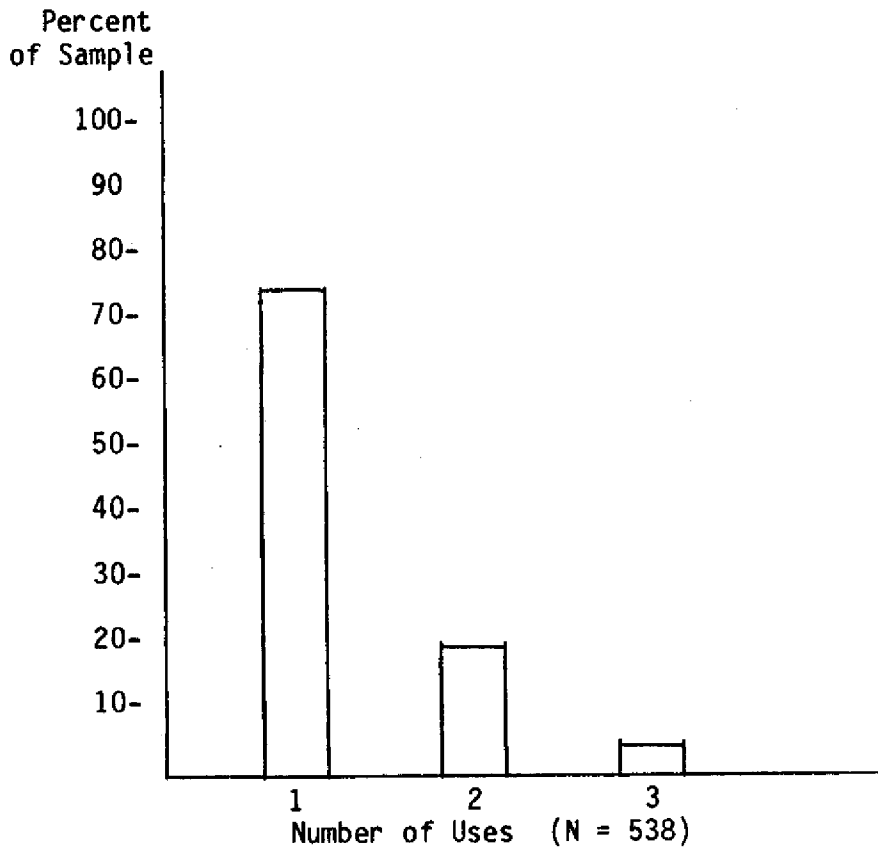


Table 18. Distribution of Subjects in Which Materials Were Used

	Absolute Frequency	Relative Frequency (%)
Marine Science	54	53
Language Arts	16	16
Science	12	12
Gifted/Special Education	7	7
Social Science	5	5
Earth/Life Science	4	4
Biology	3	3
Geology	1	1
	<u>102</u>	<u>101</u>

in either a formal or an informal educational setting. The most frequent uses of the materials are as a resource for college students and as a personal resource. The materials also are incorporated in the classroom in lessons, units and displays and used for supplemental reading, enrichment activities, classroom presentations, student resource, in lab activities and before field trips. The materials are used in an elementary or secondary classroom 42 percent of the time. Marine science classes use the material most, followed by language arts and science classes.

What Judgements Are Made About the Material's Usefulness?

In some instances, individuals made comments about specific publications. For example, people frequently reported they "had, but had not used" How to Set Up and Maintain a Saltwater Aquarium, and, on the whole, this particular publication evokes the most diverse comments. One teacher wrote that she had not used it but "planned to attempt it." Others, however, wrote such comments as "too vague to use," "good, but too brief, needs lot's more information," and "have found it too

poorly written--incomplete and misleading, very disappointed in it." At the same time, others expressed the following: "Used information in setting up aquarium." "This pamphlet was used by my student to set up our 60-gallon tank." "Yes! I have used this with great success!" "The aquarium is now a focal point for our classroom! Provides a chance for students to read, follow directions, observe and be responsible for a project."

One person, who uses Children's Literature--Passage to the Sea in a marine education course, wrote, "It is excellent!" Another professor, writing about Investigating the Marine Environment and Its Resources, said, "Reviewed work, extracting exercises that we can use for our teachers as a resource with other education materials. This is one of the better works currently out." He also wrote that Marine Organisms in Science Teaching is a "thorough unit which can be applied broadly."

In several instances individuals indicated that they had not used a particular publication yet, but planned to do so in the future. For example, one teacher responded, "I have a number of your materials, but have never developed a unit on 'The Sea.' It is my plan to do so in the future."

There were a few negative comments about the materials. One marine county extension agent wrote about Water: How Safe Are You?, "No use--I have it." A junior high teacher, writing about Aquatic Science: Marine Fisheries Biology, said, "I may use in oceanography for grade 8, but diagrams too small, too technical reading, lack of color makes it inappropriate for student use," and about Careers in Oceanography, "Eighth graders are very career conscious but they don't pick up on the bulletin, probably due to technical wording and lack of colored pictures." Another junior high teacher said about Marine Organisms in Science Teaching: "I love this kit, but I have never used it because of the organisms necessary for using it." A high school teacher wrote of the same publication, "I have this, but find some of

the labs too elementary for high school--I modify them before I use them." Referring to Investigating, she wrote: "I have to modify some of the materials for high school." Finally, a high school physics teacher wrote about Investigating: "Very little usage--our emphasis was more on physical and chemical aspects of aquatic research--level of sophistication was too low."

General Evaluations

Most of the evaluations were directed at the materials in general, rather than at specific items. Both the total sample and the teachers made evaluations, and they involved both primary and secondary users.

A. Total Sample

Primary Users: Fifty-four percent of the total sample indicate they find the materials "somewhat useful," while 43 percent find them "extremely useful." Only 3 percent report the materials "not at all useful" (see Table 19).⁶

Respondents made suggestions for improving the material (Table 20). Of the total 139 responses, 27 percent called for more hands-on activities, 25 percent for more classroom exercises, 11 percent for more material for younger children (K-3) and for more factual information, 9 percent for material written on a more sophisticated level, 8 percent for more material for informal classroom settings, and 3

Table 19. Distribution of Perceived Usefulness of Material

	Absolute Frequency	Relative Frequency (%)
Material extremely useful	40	43
Material somewhat useful	51	54
Material not at all useful	3	3
	94	100

Table 20. Distribution of Suggestions Given for Improving Material

	Absolute Frequency	Relative Frequency (%)
Include more "hands-on" activity	37	27
Include more classroom exercises	35	25
Include more materials for younger children (K-3)	15	11
Include more factual information	15	11
Write on a more sophisticated level	13	9
Include more material for informal classroom settings	11	8
Other	9	7
Improve organization of material	4	3
	<u>139</u>	<u>101</u>

percent for improved organization. Seven percent responded in the "other" category.

There were few specific suggestions for improving the material. For example, a marine education agent wrote that "packaging and contents have to lead teachers to think it will be relatively easy and enjoyable to try new lessons." An educational consultant felt that the materials could be improved by "including, wherever possible, step-by-step details and directions for teachers who avoid material out of their style." Finally, a department chairman at an intermediate school thought the materials could be improved by including more exercises that lasted between 40 and 50 minutes.

Table 21 shows the perceived usefulness of the materials by the respondents' occupations. Since only three individuals found the material not at all useful, this category was not considered in the contingency table. Fifty-four percent of those individuals in the institutional personnel/distributor/retired-other category

found the materials "extremely useful" for their needs. The next most favorable category was K-6 teachers, 48 percent of whom found the materials "extremely useful." University personnel were the least favorable, with only 25 percent finding the material "extremely useful."

Table 22 shows usefulness by publication title. In most cases, slightly more than half the individuals using the publication found it to be somewhat useful while slightly less than half found it to be extremely useful. Table 23 shows the type of use by the perceived usefulness of a particular publication. Respondents who found the material "extremely useful" include those who use it for distribution (69 percent), those who conduct teacher workshops or make adult presentations (68 percent), and those who use it in units (67 percent). Between 53 and 60 percent of those who use the material in lessons, as a student resource, in labs and before field trips, as display or visual material, as a personal resource, for supplemental reading, enrichment or class presentations, and as "other" also find it extremely useful. This also is true of 35 percent of those who use the material for a personal resource, 15 percent who use it as an aid in curriculum development or in writing, and 12 percent who use it as a resource for college students.

Secondary Users: The evaluation of secondary users, shown both in Table 24 and

Table 21. Usefulness of Materials by Respondents' Occupations

	K-6 Teacher	7-12 Teacher	University Personnel	Institutional Distributor Retired/Other
Material Extremely useful	48%	42%	25%	54%
Material Somewhat useful*	<u>52%</u>	<u>58%</u>	<u>75%</u>	<u>46%</u>
Total	N= 23	24	16	28

*There were three individuals who found the materials were "not at all useful."

Table 22. Usefulness by Publication Title

	Extremely Useful	Somewhat Useful	Total
Investigating the Marine Environment and Its Resources	49%	51%	N=69
Children's Literature-- Passage to the Sea	42%	58%	50
Fairy Tales of the Sea	48%	52%	42
Fairy Tales of the Sea Teacher's Guide	44%	56%	41
Marine Organisms in Science Teaching	50%	50%	38
How to Set Up and Maintain a Saltwater Aquarium	51%	49%	37
Hurricanes on the Texas Coast	47%	53%	36
Marine Education (newsletter)	51%	49%	35
Careers in Oceanography	45%	55%	29
Sea Sources	52%	48%	29
Hurricane Warning!	39%	61%	23
Aquatic Science: Marine Fisheries Biology	56%	44%	18
Venomous Marine Animals (poster)	63%	37%	16
It's Only a Little Planet	40%	60%	15
Mini-Learning Centers Set I: Language Arts	62%	38%	13
Vocational-Technical Marine Career Opportunities in Texas	45%	55%	11
Water: How Safe Are You?	50%	50%	10

Table 23. Type of Use of Publication by Perceived Usefulness

	Extremely Useful	Somewhat Useful	Total
Lesson	59%	41%	N=49
Unit	67%	33%	39
Student Resource	53%	47%	30
Labs/Field Trips	60%	40%	15
Display	60%	40%	47
Teacher Workshops/ Adult Presentations	68%	32%	47
Aid in Curriculum Development or in Writing	15%	85%	26
Resource for College Students	12%	88%	75
Personal Resource	35%	65%	54
Personal Use	57%	43%	14
Supplemental Reading/ Enrichment Activities/ Classroom Presentations	58%	42%	43
Distribution	69%	31%	35
Other	56%	44%	18

Table 24. Distribution of Secondary Users Who Responded Favorably to Material

	Absolute Frequency	Relative Frequency (%)
Favorable Responses	66	81
Unable to Evaluate Others' Responses	$\frac{15}{81}$	$\frac{19}{100}$

Table 25, reflects the opinions of those people who were the ultimate recipients. Table 24 shows that 81 percent of the respondents felt secondary users had responded favorably to the materials, while 19 percent felt they could not evaluate secondary users' opinions.

Table 25 shows the usefulness of the publications by the types of secondary users who received the material. Respondents using the material with students in grade 7 through 9 indicated they find the materials extremely useful (62 percent), while between 46 and 50 percent of those working with preschool children through grade 6, grades 10 through 12, college students and adults agree. The least favorable category was those individuals using the materials with teachers. Forty-one percent find the materials extremely useful, while 51 percent find them only somewhat useful.

Table 25. Usefulness of Material by Types of People Who Use the Materials

	K-6 Students	7-9 Students	10-12 Students	College Students	Teachers	Adults
Extremely useful	47%	62%	47%	50%	41%	46%
Somewhat useful	<u>53%</u>	<u>38%</u>	<u>53%</u>	<u>50%</u>	<u>59%</u>	<u>54%</u>
Total	N=40	21	30	8	29	13

B. Teachers

Primary Users: Sixty-seven percent of the teachers who responded to the evaluation form indicated that the Sea Grant marine education materials prompted them to make changes in their classroom teaching and/or in the preparation of their lesson plans. Conversely, 33 percent indicated the materials had not prompted any change (Table 26). Some of the reported changes include incorporating marine science as an enrichment project in science, introducing meaningful activities to

Table 26. Distribution of Teachers for whom Material Prompted Change in Classroom

	Absolute Frequency	Relative Frequency (%)
Materials prompted change	44	67
Materials did not prompt change	<u>22</u>	<u>33</u>
	66	100

Table 27. Distribution of Teachers Who Found Material Appropriate for Grade Level

	Absolute Frequency	Relative Frequency (%)
Found material appropriate for grade level	43	62
Found material inappropriate for grade level	5	7
Found material only with great effort	10	15
Found material with some minor changes	<u>11</u>	<u>16</u>
	69	100

Table 28. Change versus No Change Prompted by Sea Grant Materials by Materials Found versus Not Found for Grade Level Taught

	Material Found/ Found with Minor Changes	Material Not Found/ Found with Great Effort
Materials prompted change	70%	54%
Materials did not prompt change	<u>30%</u>	<u>46%</u>
Total (63)	N= 50	N= 13

increase student involvement, using marine materials in the ecology phase of an advanced biology class, developing a literature/language arts unit, developing new units and ideas and expanding subject areas, updating a marine biology curriculum, providing more information on coastal zone problems in a marine science class, adding a marine science unit in a fifth grade science class, teaching science concepts through marine examples wherever possible, and developing a state curriculum for kindergarten through sixth grade. Respondents also said the Sea Grant materials have encouraged them to search out marine science materials from other sources.

Table 27 shows the distribution of teachers who found material appropriate for their grade level. Sixty-two percent of the teachers were able to find appropriate material, while only 7 percent responded negatively. Fifteen percent indicated they found materials only with great effort, and 16 percent said they were able to make the material appropriate with some minor changes.

Table 28 indicates the changes prompted by the Sea Grant material according to grade levels. Seventy percent of those teachers who found material appropriate for their grade level indicated that the material had prompted them to make classroom changes. Of those who indicated they found the material inappropriate for their grade level or who had made it appropriate only with great effort, 54 percent still indicated that the Sea Grant material had prompted them to make changes in the classroom.

Table 29 shows the changes prompted by Sea Grant materials by region, with 69 percent of teachers on the East or Gulf Coasts indicating the materials prompted them to make changes in classroom teaching. Forty-seven percent of West Coast or inland teachers were prompted to make changes.

Classroom changes by area of certification is shown in Table 30. Seventy-two percent of those certified in science reported that the Sea Grant material prompted

Table 29. Change versus No Change Prompted by Sea Grant Materials by Region

	East Coast/ Gulf Coast	West Coast/ Inland
Materials prompted change	69%	47%
Materials did not prompt change	<u>31%</u>	<u>53%</u>
Total	N= 49	N= 19

Table 30. Change versus No Change Prompted by Sea Grant Materials by Area of Certification

	Kindergarten Elementary	Science	Other
Material prompted change	58%	72%	59%
Materials did not prompt change	<u>42%</u>	<u>28%</u>	<u>41%</u>
Total	N= 26	N= 57	N=17

Table 31. Usefulness of Material by Area of Certification

	Kindergarten Elementary	Science	Other
Material extremely useful	50%	44%	27%
Material somewhat useful	<u>50%</u>	<u>56%</u>	<u>73%</u>
	N= 28	59	16

Table 32. Distribution of Responses of Students to Material

	Absolute Frequency	Relative Frequency (%)
Enthusiastic	49	77
Just another subject	7	11
Other	7	11
Bored	<u>1</u>	<u>2</u>
	64	101

them to make classroom changes, while 58 percent of those certified in kindergarten or elementary education and 59 percent of those in other areas reported changes. (See Table 9 for a complete list of areas of certification.)

Finally, Table 31 shows perceived usefulness of the publications by area of certification. Those indicating the materials are extremely useful include 50 percent of those certified in kindergarten or elementary education, 44 percent in science, and 27 percent of those in other areas.

Secondary Users: Teachers reported that their students responded enthusiastically to the material 77 percent of the time. One teacher felt her students were bored with the material, and seven others said their students responded as to "just another subject" (see Table 32).

The response of students by material found versus not found for grade level is shown in Table 33. Eighty-nine percent of those teachers who found material appropriate for their grade level reported enthusiastic response from their students, while 58 percent of those who had not found appropriate material or did so only with great effort reported a similar response. Table 34 shows the usefulness of the publications according to student response. Of those teachers who found the materials extremely useful, 90 percent reported an enthusiastic response from their students. Of those who found the materials somewhat useful, 66 percent indicated that their students responded enthusiastically.

In terms of the usefulness of the publications by grade level taught (Table 35), 67 percent of teachers using the materials with students in grades 7 through 9 rated them extremely useful. This same response was indicated by 59 percent of those working with preschool through grade 6 students and 52 percent of those with students in grades 10 through 12.

Table 33. Material Found versus Not Found for Grade Level by Response of Students

	Material Found/ Found with Minor Changes	Material Not Found/ Found with Great Effort
Enthusiastic	80%	58%
Just another subject/ Bored/dislike it/other	<u>20%</u>	<u>42%</u>
Total	N= 49	12

Table 34. Usefulness of Material by Response of Students

	Material Extremely Useful	Material Somewhat Useful
Enthusiastic	90%	66%
Just another subject/ Bored/dislike it/other	<u>10%</u>	<u>34%</u>
Total	N= 29	32

Table 35. Usefulness of Material by Grade Level Taught

	P-3 Students	4-6 Students	7-9 Students	10-12 Students
Extremely useful	59%	59%	67%	52%
Somewhat useful	<u>41%</u>	<u>41%</u>	<u>33%</u>	<u>48%</u>
Total	N=17	29	15	25

SUMMARY

The overall evaluation of Sea Grant marine education materials is favorable. Slightly more than half of the respondents have a moderate attitude, being neither highly enthusiastic nor highly critical, but slightly more than 40 percent are enthusiastic and only 3 percent are critical.

The two suggestions given most frequently to improve the material are for more hands-on activities and more classroom exercises, which suggests that teachers would like more ideas to encourage student participation in the classroom. Only 3 percent felt the organization of the material needs improvement, indicating that the vast majority is satisfied with the present organization.

Institutional personnel, distributors and retired people rate the material "extremely useful" most frequently, while university personnel are least likely to do so. The manner in which individuals use the publications apparently affects their perceived usefulness. Those using materials in teacher workshops, adult presentations and the classroom as units or lessons are most likely to label them extremely useful. Conversely, those using the materials as a personal resource, an aid in curriculum development or in college classes are least likely to do so.

The majority (81 percent) feel that secondary users respond favorably, and those who use the materials with junior high students, in or out of the classroom, are most likely to consider the publications extremely useful.

Sixty-seven percent of the teachers indicate the Sea Grant materials have prompted them to make changes in their classrooms, and 62 percent say they find the material appropriate for their grade level. These teachers are more likely to make changes in their classroom than those who find the material inappropriate for their grade level. Teachers on the East or Gulf Coasts are more likely to make changes

in their classrooms than those on the West Coast or inland, as are those certified in science. Those certified in kindergarten/elementary education, however, are slightly more likely to find the material extremely useful than those certified in science. Those certified in other areas are least likely to do so.

Seventy-seven percent of the teachers say their students respond enthusiastically to the material. This response is more likely when teachers find material for their grade level, and those teachers who consider the material extremely useful are more likely to have enthusiastic students than those who find the material somewhat useful.

ENDNOTES

The results from the questionnaire seemed to confirm the assumption that textbooks generally contain little or no marine information, as shown in the two tables below.

Distribution of answers given to question 14, "Do the textbooks in the subjects you teach contain information on oceanography and marine-related topics?"

	Absolute Frequency	Relative Frequency (%)
No information	15	21
Some information	37	51
Contains a great deal of information	17	23
Some information but not suited to needs	<u>4</u>	<u>5</u>
	73	100

Subject Taught by Amount of Marine Information Contained in Textbook

	No Information	Some Information	Lot of Information	Information Not Suited to Needs	Total
Science	26%	63%	%	11%	N=19%
Biology/Life	13	81		6	16
Marine Science		13	81	6	16
Earth/Chemistry/Physics	40	20	40		5
Reading/Literature	33	50	17		6
Social Studies	67	33			3
Education	50	50			2

²The 17 publications covered by the questionnaire include nine sold for a nominal charge and eight that are distributed free. Annotations for each follow.

Investigating the Marine Environment and Its Resources. This resource unit includes a statement of purpose, goals and major objectives for the unit; a set of specific learning outcomes for each lesson; a teacher's guide; and a collection of more than 100 teaching/learning activities grouped by topics. The 21 topic clusters include science, social studies and language arts activities which concern the use of marine resources in the past, present and projected future along the Gulf coast region of Texas. (491 pages, \$8.00) A complete package includes the text, two cassette tapes, two filmstrips/cassette tapes, and a 48-piece card game (\$20.00).

Sea Sources. Selected bibliographic and resource materials on the subject of children's literature includes 745 titles divided into 10 categories: Information books; biographies/explorers; fiction; picture books; whales and sea mammals; folk and fairy tales; poetry/songs; activities; short stories and selected chapters; and bibliographies. (192 pages, \$4.00)

Children's Literature--Passage to the Sea. This marine awareness learning package is based on eight books by nationally recognized authors. At least one book is appropriate for each elementary grade and all have a sea or coastal setting. Each book is related to interest center activities which allow students to experiment with or express what they have learned. Complete directions for 39 activities are included; relates to language arts, music, art, science and social studies. (56 pages, \$2.00)

Marine Organisms in Science Teaching. This laboratory-oriented workbook includes 42 activities for using living marine organisms in existing science programs. The workbook is presented in a discovery type format which includes two sections for the teacher, a pre-lab and a post-lab, and a student investigation section. (192 pages, \$4.00)

Fairy Tales of the Sea. This collection of fairy tales includes tales from every inhabited continent so that American children and adults can enjoy their varied heritage. It is believed to be the only volume of international folk and fairy tales exclusively about the seas. The 25 tales range from the familiar, such as Hans Christian Andersen's The Little Mermaid, to the lesser known, such as Pearl Buck's adaptation of The Flying Ship. (152 pages, \$4.50)

Fairy Tales of the Sea Teacher's Guide. This guide is written with objectives according to the English Language Arts Curriculum Framework suggested by the Texas Education Agency. Activities cover the language arts of listening, reading, speaking and writing. Although designed for grades 4 through 9, there are some activities suitable for younger or older students. (28 pages, \$2.00)

Mini-Learning Centers Set I: Language Arts. This is a collection of five student-centered language arts activities. Each activity is self-contained in an 11 x 17-inch re-useable laminated folder and is intended to be completed in one short learning session. Objectives and concepts are listed for each activity. The set includes an information sheet for the teacher. (5 folders, \$5.00)

It's Only a Little Planet. Prepared specifically for a Day on the Bay cruise program, this booklet includes sections on coastal ecology, life in coastal waters, field equipment, analytical procedures and data collection. Also included are a glossary and metric conversion tables. (74 pages, \$5.00)

Careers in Oceanography. A handy guide to the field of oceanography, this booklet poses and answers such questions as "What is an oceanographer?," "Where does one study oceanography?" and "Who hires and supports oceanographers?" Nearly 25 sources of information are cited in the text; addresses of these agencies are provided. (12 pages, free)

Vocational-Technical Marine Career Opportunities in Texas. This booklet is to assist high school counselors, teachers and students better understand the career opportunities available in the Texas marine industry. It provides background information and descriptions of jobs in the maritime transportation, offshore mineral, oil and gas, commercial diving, commercial fisheries, and shipbuilding industries. Information about the training needed to enter particular positions also is included. Organizations and schools, with addresses, are listed at the end of each section for reference. (22 pages, free)

How to Set Up and Maintain a Saltwater Aquarium. This pamphlet outlines the basic steps to establishing a saltwater aquarium anywhere in the country. Presented in as simple language as possible, with accompanying cartoon illustrations, the guide is designed for young children but is equally useful for older students and adults. Detailed instruction are given on the materials needed, food preferences, synthetic saltwater, filter systems and potential problems. (8 pages, free)

Hurricane Warning! Owlie Skywarn talks about hurricanes in a style written for elementary students. Printed in large type for easy reading, the brochure tells of Hurricane Camille in story form and includes a checklist of do's and don't's when a storm threatens. There also is a safety certificate (to be signed by a teacher or other adult) signifying that the student knows the appropriate safety rules. (12 pages, free)

Water: How Safe Are You? Each year in Texas an average of 650 people get so involved in their activities that the end result is death by drowning. Since most victims are teenaged males between 15 and 29 years old, this bulletin points out some of the more obvious, but often forgotten, safety practices. Written primarily for a teenaged audience, it covers swimming, river recreation and boating. It includes a list of reference brochures, films, books and courses that can be used to supplement water safety instruction. (6 pages, free)

Hurricanes on the Texas Coast. This is designed to help coastal residents understand, prepare for and recover from the effects of hurricanes. Probability of hurricane occurrence, guidelines for individual responsibilities, checklists to help residents plan for safety and action taken by governmental and civilian agencies before/during/after a hurricane are discussed. (50 pages, free)

Aquatic Science: Marine Fisheries Biology. This illustrated booklet focuses on animal life in the marine areas of Texas and can be used as a handbook for the novice beachcomber or as an educational supplement in the classroom. Information is available on waves, tides and currents; shoreline organisms; estuaries; coastal food chains; fish and shellfish identification (including descriptions and line drawings of fish indigenous to Texas marine waters); and special project ideas

related to the life history and management of coastal organisms. A list of related reading materials is included. (18 pages, free)

Venomous Marine Animals. Ten categories of potentially dangerous marine organisms are illustrated on this poster--jellyfish, catfish, rays, sea urchins, toadfish, stargazers, worm, sponge and octopus. The accompanying descriptions can help people become more aware of how problems with these animals might develop, how they can be avoided and how certain injuries should best be treated if they occur. (Single sheet 25" x 18 1/2", \$1.00)

Marine Education. This quarterly newsletter is devoted to marine-related scientific facts, classroom activity suggestions and news items. Each issue contains a marine fact sheet formatted for easy duplication by classroom teachers. (Free to subscribers)

³Non-response is a problem encountered in every mail survey; indeed, low response rate is one of the major disadvantages of conducting surveys by mail rather than by personal interviews (K.D. Bailey). A randomly drawn sample is considered representative of the population from which it is taken. Non-response, however, threatens the randomness of the sample. If the people who do not answer the questionnaire are significantly different from those who do, our ability to generalize our research findings accurately to the broader population becomes questionable. E.R. Babbie indicates a second problem that can arise as a result of non-response when he writes that:

"[T]he body of inferential statistics used in connection with survey analysis assume[s] that all members of the initial sample complete and return their questionnaires. Since this almost never happens, response bias becomes a concern, with the researcher testing (and hoping for) the possibility that the respondents are essentially a random sample of the initial sample, and thus a somewhat smaller random sample of the total population."

There is some disagreement as to what constitutes an "adequate" response rate in mailed survey research. As Baily indicates, there are many more surveys which receive response rates of 10 to 20 percent than receive response rates of 80 to 90 percent (p. 153). Babbie believes that a response rate of around 50 percent is adequate (p. 355). However, he also argues that the overall response rate is but

one guide to the representativeness of the sample. While a high response rate has less of a chance of significant response bias than a low response rate, suggested percentages can only be used as a rough guide to whether or not a response rate is adequate. Babbie considers a demonstrated lack of response bias to be a more important factor than a high response rate in assessing the representativeness of the sample.

Babbie, E.R. The Practice of Social Research. Belmont, Calif.: Wadsworth Publishing Co., 1979, pp. 334-335, 355.

Bailey, K.D. Methods of Social Research. New York: Free Press, 1978, pp. 136, 153.

⁴A chi square calculated from the two distributions is 4.58, with 4 degrees of freedom, which was not significant at the 5 percent level. A chi square is a test of significance which is used to determine whether or not a sample is representative of the population from which it was drawn. In the population from this study, for example, 18 percent of the individuals came from the West. It is highly unlikely, however, that exactly 18 percent will come from the West when we draw a random sample. The chi squared statistic is used to determine to what extent the sample distribution can differ from the population distribution and still be considered representative.

If 15 percent of those who answered the survey came from the West, we would consider the survey representative. If 80 percent of those who answered came from the West, we would question the survey's representativeness. These types of considerations are important when we consider the fact that people from the West tended to respond less favorably to the material than those from the East and South. Therefore, if most of the people who answered the survey had come from the West rather than the East and South, the answers we received regarding marine education materials would have been far more negative and we would have concluded that

very few individuals were highly enthusiastic about the material. This conclusion would have been wrong, however, due to the fact that those individuals most favorable to the material were underrepresented in the sample.

The chi square in Table 3, therefore, indicates that the sample is representative of the population, or that there is no over- or underrepresentation of individuals from any one regional group. This finding increases our confidence that the sample is not biased, which is simply another way of saying that if we had sent the questionnaire to all 1,666 people in the population, the answers would not differ substantially from those received in this survey.

⁵Although university personnel comprised only 18 percent of the sample, "resource for college students" was the most frequently reported use of these publications. This can be explained by the fact that even though there were fewer instructors at the university level than at the elementary or secondary level, the university instructors, on the average, used a greater number of publications per person. As can be seen in Table 26, elementary teachers used an average of 2.9 publications, secondary teachers an average of 3.7, and university personnel an average of 6.6.

Average Number of Publications Used by Elementary Teachers, Secondary Teachers and University Personnel

Elementary	Secondary	University
2.9	3.7	6.6

F-Ratio = 5.297, df (2,63), p=.0075.

⁶The evaluation form included a question which asked respondents to indicate the extensiveness of the material's usage. It was decided later, however, that the concept "extensive use" was too subjective to make answers given to this question valid. For example, some might interpret "extensiveness of use" to mean whether they had used part of a publication or all of it, while others might mean whether they used the publication in a one-day lesson or in a four-week unit. There was no way to determine whether people were responding to this question in terms of amount of the publication used, the amount of time in which the publication was used, the number of people with whom it was used, or some other unknown criteria.

Appendix A
Pretest Evaluation Form and Reminder Postcard



Sea Grant College Program

Texas A&M University • College Station, Texas 77843-4115
(409) 845-3854

June 27, 1983

Dear

According to our records, you have received or purchased at least one of the marine education curricular materials from the Texas A&M University Sea Grant College Program during the past year. We would appreciate your taking a few minutes to complete this evaluation form and return it to us in the enclosed self-addressed, stamped envelope. The evaluation form should take about ten minutes to complete, and needs to be returned to us by July 15, 1983. As a state and federally funded program, we are always concerned with making the most effective use of our resources in a way that best serves the public.

Your response will help us document the results of our marine education activities as well as plan future activities. Although we would appreciate having your name and address, you may remain anonymous if you prefer.

Sincerely yours,

Lauriston R. King
Deputy Director
Sea Grant College Program



Sea Grant College Program

Texas A&M University • College Station, Texas 77843-4115
 (409) 845-3854

Name _____

Address _____

City _____ State _____ Zip _____

Position _____ Grade Level _____

School District _____

How many years have you taught? 1-3 / 4-6 / 7-10 / 11+
 Area(s) of certification _____

1. Are you required to include marine and oceanographic material in the subjects you teach?

Subject	Required	Optional
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>

2. If you are not required to include marine and oceanographic materials in the subjects you teach, what were your reasons for presenting them in the classroom?

- Have a personal interest in oceanography
- Thought students would be interested in the material
- Thought students would find the material useful
- Thought students should have some knowledge about the marine environment
- Students told me they wanted to learn about the marine environment
- Other (specify) _____

3. Do the textbooks in the subjects you teach contain information on oceanography and marine-related topics?

Subject	Textbook	No information	Some information	Contains a great deal of information	Some information but not suited for needs
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Please indicate your main use of the Texas A&M Sea Grant marine education materials that you have received or purchased by checking the appropriate box. If the material was used in a lesson or a unit, please write the name(s) of the subject(s) for which it was used.

Title	Part of Lesson	Complete Lesson	Part of a Unit	Complete Unit	Student Reference	Other specify
EXAMPLE			X Biology			
Investigating the Marine Environment and Its Resources						
Sea Sources						
It's Only a Little Planet						
Aquatic Science: Marine Fisheries Biology						
Hurricanes on the Texas Coast						
Children's Literature-- Passage to the Sea						
Marine Organisms in Science Teaching						
Fairy Tales of the Sea						
Fairy Tales of the Sea A Guide for Teachers						
Careers in Oceanography						
Vocational-Technical Marine Career Opportunities in Texas						
How to Set Up and Maintain a Saltwater Aquarium						
Hurricane Warning!						
Water: How Safe Are You?						
Mini-Learning Centers Set I: Language Arts						
Marine Education (newsletter)						
Venomous Marine Animals (poster)						

5. Have these materials prompted you to make any changes in your classroom teaching or in the preparation of lesson plans for a particular unit? Yes ___ No ___
For any other part of your curriculum? Yes ___ No ___ If yes, please describe

6. How have your students responded to this material?

Enthusiastic
Just another subject
Other (specify) _____

Boring
Disliked it

7. Were you able to find material appropriate for your grade level?

Yes
No

Only with great effort
With some minor changes

8. In what ways could the material be improved?

Include more classroom exercises
Include more factual information
Write on a more sophisticated level
Improve organization of material
Other (specify)

9. What types of marine education materials should Sea Grant develop in the future? Please list your ideas in order of priority.

10. How did you learn about our marine education materials?

Convention Inservice workshop Marine Education newsletter
The University & The Sea Science and Children The Science Teacher
 Recommendation from colleague Other (please specify) _____

11. When you ordered these materials, were they sent promptly?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

12. In order to help us with future surveys, we would appreciate it if you would write a brief evaluation of this questionnaire. Please indicate any questions you believe could be worded more clearly or given more adequate response categories.

REMINDER POSTCARD

Dear

According to our records, you were recently sent an evaluation form from the Sea Grant College Program at Texas A&M University concerning your use of marine education materials. If you have not completed this form, we would appreciate it if you would do so and return it to us as soon as possible. If you have returned the form, please disregard this notice.

Appendix B
Final Evaluation Form and Reminder Letter



Sea Grant College Program

Texas A&M University • College Station, Texas 77843-4115
(409) 845-3854

November 4, 1983

Dear

According to our records, you have received or purchased at least one of our marine education curricular materials from the Texas A&M University Sea Grant College Program during the past year. We would appreciate your taking a few minutes to complete this evaluation form and returning it to us in the enclosed self-addressed, stamped envelope. The evaluation form should take about ten minutes to complete, and will be most useful to us if we receive it by November 18, 1983.

As a state and federally funded program, we are always concerned about using our resources effectively to better serve citizens inside and outside of Texas. Your response will help us determine the effectiveness of our marine education materials as well as plan future activities. Although we would appreciate receiving your name and address, you may remain anonymous if you prefer. If you do choose to include your name and address, however, we will send you a free Sea Grant publication. You may choose the item you prefer from the list provided for you on the last page of the questionnaire.

Sincerely,

Feenan D. Jennings
Director
Sea Grant College Program

Name _____
Address _____
City _____
State _____
Zip _____
Position _____

1. How did you learn about our marine education materials?

- | | |
|--|--|
| <input type="checkbox"/> Convention | <input type="checkbox"/> Recommendation from colleague |
| <input type="checkbox"/> Marine Education Newsletter | <input type="checkbox"/> In-service Workshop |
| <input type="checkbox"/> The University & The Sea | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> Science and Children | |

2. When you ordered these materials, were they sent promptly?

- Yes
 No

3. Please write a brief description of your use of the marine education materials that you have received or purchased in the space provided below. If you are a teacher, please indicate if you used these materials as part of a lesson, a complete lesson, part of a unit or a complete unit. Also, write the name(s) of the subject(s) for which the materials were used.

Investigating the Marine Environment and Its Resources

Sea Sources

It's Only a Little Planet

Aquatic Science: Marine Fisheries Biology

Hurricanes on the Texas Coast

Children's Literature—Passage to the Sea

Marine Organisms in Science Teaching

Fairy Tales of the Sea

Fairy Tales of the Sea—A Guide for Teachers

Careers in Oceanography

Vocational-Technical Marine Career Opportunities in Texas

How to Set Up and Maintain a Saltwater Aquarium

Hurricane Warning!

Water: How Safe Are You?

Mini-Learning Centers Set 1: Language Arts

Marine Education (Newsletter)

Venomous Marine Animals (Poster)

4. Have you found these materials to be extremely useful, somewhat useful, or not at all useful for your needs? (Check the one that applies.)

- Extremely useful Somewhat useful Not at all useful

5. Which of the following best applies to your use of the material?

- I have made extensive use of the material
 I have made moderate use of the material
 I have not used the material

6. If you are in a position such as a librarian where the material is made available to other people, please check the following category that you feel best applies to use of the material.

- Requests for these marine education materials have been extensive
 Requests for these materials have been moderate
 Requests have not been made for these materials (If you did not intend for other people to use the material, please do not check this category)
 Cannot adequately evaluate extent of other people's use
 Question not applicable

Briefly describe the types of people who use this material.

- | | |
|---|--|
| <input type="checkbox"/> Students, Grades 1-6 | <input type="checkbox"/> College Students |
| <input type="checkbox"/> Students, Grades 7-9 | <input type="checkbox"/> Teachers |
| <input type="checkbox"/> Students, Grades 10-12 | <input type="checkbox"/> Interested Adults |

Have these people responded favorably to this material?

- | | |
|------------------------------|--|
| <input type="checkbox"/> Yes | <input type="checkbox"/> Cannot adequately evaluate other people's responses |
| <input type="checkbox"/> No | <input type="checkbox"/> Question not applicable |

7. In what ways could the material be improved?

- | | |
|--|--|
| <input type="checkbox"/> Include more classroom exercises | <input type="checkbox"/> Include more factual information |
| <input type="checkbox"/> Include more material for informal classroom settings | <input type="checkbox"/> Write on a more sophisticated level |
| <input type="checkbox"/> Include more "hands-on" activities | <input type="checkbox"/> Improve organization of material |
| <input type="checkbox"/> Include more material for younger children (K-3) | <input type="checkbox"/> Other (specify) |

If you used these materials in an elementary or a secondary classroom setting, please answer these additional questions.

8. School District _____

9. Grade Level _____

10. How many years have you taught? 1-3 4-6 7-10 11+

11. Area(s) of certification _____

12. Are you required to include marine and oceanographic materials in the subjects you teach?

Subject	Required	Optional
_____	_____	_____
_____	_____	_____
_____	_____	_____

13. If you are not required to include marine and oceanographic materials in the subjects you teach, what were your reasons for doing so?

- Have a personal interest in oceanography
- Thought students would be interested in the material
- Thought students would find the material useful
- Thought students should have some knowledge about the marine environment
- Students told me they wanted to learn about the marine environment
- Other (specify)

14. Do the textbooks in the subjects you teach contain information on oceanography and marine-related topics?

Subject	Textbook	No information	Some information	Contains a great deal of information	Some information but not suited for needs
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Have the Sea Grant marine educational materials prompted you to make any changes in your classroom teaching or in the preparation of lesson plans for a particular unit?

- Yes
- No

For any other part of your curriculum?

- Yes
- No

If yes, please describe:

16. Were you able to find material appropriate for your grade level?

- Yes
- Only with great effort
- No
- With some minor changes

17. How have your students responded to this material?

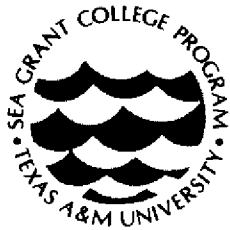
- Enthusiastic
- Bored
- Just another subject
- Disliked it
- Other (specify)

Please put a check beside the free publication that you would like to receive from the Texas A&M Sea Grant College Program.

- _____ **Aquatic Science: Marine Fisheries Biology.** TAMU-SG-79-405
- _____ **Careers in Oceanography.** TAMU-SG-79-608
- _____ **Vocational-Technical Marine Career Opportunities in Texas.** TAMU-SG-80-402
- _____ **Hurricane Warning!** TAMU-SG-82-401
- _____ **Water: How Safe Are You?** TAMU-SG-82-402
- _____ **Venomous Marine Animals** (poster). TAMU-SG-82-403
- _____ **Life On Board American Clipper Ships.** TAMU-SG-83-402

Return completed form to:

Sea Grant College Program
Texas A&M University
College Station, Texas 77843-4115
(409) 845-3854



Sea Grant College Program

Texas A&M University • College Station, Texas 77843-4115
(409) 845-3854

November 30, 1983

Dear

Several weeks ago we sought your opinions and ideas about materials produced by our marine education program. In order for us to improve our materials and better meet the needs of the public for marine education materials, we must rely on the informed judgement of knowledgeable individuals like yourself. So if you have not yet had an opportunity to fill out the evaluation form, we would very much appreciate it if you could do so, and return it to us as soon as possible. Also, please note that if you are willing to include your name and address, we will send you one free publication.

We look forward to hearing from you.

Sincerely,

Feenan D. Jennings
Director
Sea Grant College Program

Appendix C
Publication Title by Use

Use	Investigating the Marine Environment and Its Resources	Children's Literature-- Passage to the Sea	Fairy Tales of the Sea	Fairy Tales of the Sea Teacher's Guide	Marine Organisms in Science Teaching	How to Set up and Maintain a Saltwater Aquarium	Hurricanes on the Texas Coast	Marine Education	Careers in Oceanography	Sea Sources	Hurricane Warning!	Aquatic Science: Marine Fisheries Biology	Venomous Marine Animals	It's Only a Little Planet	Mini-Learning Centers Set 1: Language Arts	Vocational-Technical Marine Career Opportunities in Texas	Water: How Safe Are You?	Total
Lesson	8	3	1	3	2	1	9	3	4	4	2	2	1	2	1	2	2	50
Unit	9	3	5	2	3		5		1	1	6	1	1	1			1	39
Student Resource	5	3			1	4		3	9	2	1	1			1	1	1	32
Labs and/or Field Trips	4	1			1	3	1	3				1	1					15
Display/Visual Materials	8	3	4	4	4	3	2	1	1	3	1	1	8	1	2	1		47
Workshop/Adult Presentation	5	6	6	6	5	2	2	3	2	3	2	2	1	2	1			48
Aid in Developing Curriculum/Writing	3	4	3	3	3	2		2	3	2		2	1	1	1	1		31
College Resource	7	7	7	6	8	6	3	4	3	3	3	3	3	3	4	3	3	76

Publication Title by Use (continued)

Use	Investigating the Marine Environment and Its Resources	Children's Literature -- Passage to the Sea	Fairy Tales of the Sea	Fairy Tales of the Sea	Teacher's Guide	Marine Organisms in Science Teaching	How to Set Up and Maintain a Saltwater Aquarium	Hurricanes on the Texas Coast	Marine Education	Careers in Oceanography	Sea Sources	Hurricane Warning!	Aquatic Science: Marine Fisheries Biology	Venomous Marine Animals	It's Only a Little Planet	Mini-Learning Centers Set 1: Language Arts	Vocational-Technical Marine Career Opportunities in Texas	Water: How Safe Are You?	Total
Personal Resource	3	5			8	4	6	4	10	4	6	2			1		1	1	55
Personal Use	1	2	6		1	1	1		1	1					1				15
Not Used	1	3	1		2	3	8	2		2	1	1	1		1	1		1	28
Supplemental Reading/Enrichment Activity/Classroom Presentations	7	9	7		1	2	1	6	1	2	2	3				1	2	1	45
Distribution	5	3	4		5		1	4	4	1	2	3	4	1	1				38
Other	5	1	3		1	4	2		1						1	1			19
Total	71	53	47	42	41	40	38	36	33	29	24	18	17	15	13	11	10		538

