Fishing: Get in the Habitat! MinnAqua Leader's Guide: An Evaluation of Distribution Methods, Implementation, and Program Outcomes

A Report Prepared for the MN Department of Natural Resources MinnAqua Program
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Abstract

The *Fishing: Get in the Habitat! MinnAqua Leader's Guide* is a curriculum created by the Minnesota Department of Natural Resources primarily for formal and non-formal instructors working with youth in third through fifth grade by aligning lessons to the benchmark level of the Minnesota Academic Standards for those grades. The Leader's Guide aims to increase students' understanding about Minnesota fish, aquatic resources, and resource management. It also aims to involve students in aquatic-related service learning projects, connect students to their local aquatic resources through the recreational activity of angling, and foster lasting stewardship of Minnesota's aquatic resources. An evaluation was conducted to assess the distribution methods, implementation, and outcomes of the Leader's Guide in order to inform decisions relating to future distribution, training workshops, and follow-up support. The results of the evaluation suggest the Leader's Guide is achieving its intended knowledge, affective, and skill-based outcomes. Implications for future implementation and distribution are discussed.

Introduction

In response to national trends toward declining youth participation in fishing, wildlife watching, camping, and hiking, the Minnesota Department of Natural Resources (DNR) is thinking more strategically about how to ensure the future of resource conservation. Recognizing that recreational hunting and fishing can create strong connections to the environment, hunters and anglers are important advocates for conservation of natural resources (Abraham, 2007). Further, hunting and fishing financially support fish and wildlife habitat conservation initiatives through license fees, equipment sales, and excise taxes. Conservation of fish and wildlife habitat benefits all citizens, not just hunters and anglers, through benefits such as erosion control, water quality improvement, and access to places for wildlife observation and other outdoor recreation opportunities (Abraham, 2007).

In efforts to promote stewardship among today's youth and to help ensure the conservationists of tomorrow, the Minnesota DNR developed the *Fishing: Get in the Habitat! MinnAqua Leader's Guide* for formal and non-formal instructors primarily working with children in grades three through five, with lessons aligned to the benchmark level of the Minnesota Academic Standards for those grades. While objectives contained in the Leader's Guide are targeted for grades three through five, the concepts are relevant for any participant new to the topics covered in the Leader's Guide. In support of the DNR's goal of providing natural resources stewardship education to Minnesota citizens and the Division of Fish and Wildlife's goal of introducing participants to recreational angling, the Leader's Guide aims to increase students' understanding of Minnesota fish, aquatic resources, and resource management; involve students in aquatic-related service learning projects, and connect students to their local aquatic resources through the recreational activity of angling.

The first Leader's Guide was completed as a resource for the MinnAqua program, within the Minnesota DNR Division of Fish and Wildlife in 1992. In 2000, MinnAqua, the angling and aquatic education program of the Minnesota DNR Division of Fish and Wildlife, determined there was a need to revise the Leader's Guide to better align it with "best practices" in fishing, boating, and aquatic stewardship education and better foster stewardship of Minnesota's aquatic resources. MinnAqua also wanted to increase their outreach potential by creating a more in-depth and user-friendly resource for educators. Through an extensive formative evaluation process (Nelson, 2006a), the Leader's Guide was revised and subsequently published in 2007. The new Leader's Guide was distributed through training workshops throughout Minnesota for teachers and nonformal educators, and by mail to target audiences.

After a year of distribution and implementation, MinnAqua determined information was needed to inform decisions relating to future distribution of and training in use of the Leader's Guide, as well as assessment information as to whether educators were using the guide and if program outcomes were being achieved. They contacted an external evaluator, an environmental education researcher at the University of Minnesota Duluth, to assist them with the program evaluation. The following report provides a description of the development of this program evaluation and the results, as well as recommendations for consideration by MinnAqua.

Program Description

The *Fishing: Get in the Habitat! MinnAqua Leader's Guide* is a curricular resource containing 39 lessons organized into six chapters: 1.) Aquatic Habitats; 2.) Minnesota Fish; 3.) Water Stewardship; 4.) Fish Management; 5.) Fishing Equipment and Skills; and 6.) Safety and the Fishing Trip. The appendices include a variety of planning aids, as well as resources for service-learning. Lessons are correlated with Minnesota Academic Standards for third through

fifth grade in a variety of subject areas and Environmental Literacy Scope and Sequence benchmarks[1]. The Leader's Guide is distributed in two formats. Educators attending a workshop receive a binder that contains some of the lesson plans, as well as a CD that contains the complete Leader's Guide. Educators not attending a workshop can request the CD.

The Leader's Guide was designed primarily for instructors of third through fifth grade by aligning lessons to the benchmark level of the Minnesota Academic Standards for those grades. (Some benchmarks for standards in History and Social Studies address through the 8th grade level). Many lessons include options for kindergarten through second grade. While objectives contained in the Leader's Guide are targeted for grades three through five, the concepts are relevant for any participant new to the topics covered in the Leader's Guide. MinnAqua intends for instructors to use the Leader's Guide by selecting one lesson per chapter, along with implementing a fishing trip and an aquatic-based service-learning project.

The Leader's Guide as a resource tool was designed to ultimately contribute to conservation of Minnesota's aquatic resources. Through its activities, fishing trip, and service-learning project, the Leader's Guide aims toward short-term goals of awareness, appreciation, knowledge, and skills. In turn, these short-term outcomes influence medium-term outcomes, such as skill development in issue investigation and participation in fishing, which in turn contribute to the long term outcomes of participation in local communities as informed decision-makers and stewards of aquatic resources. See Figure 1 for a logic model of the Leader's Guide, which displays the connections among activities and intended outcomes. For more information on the Leader's Guide, see http://www.mndnr.gov/minnaqua.

[1] This framework provides a systems approach to environmental education in Minnesota for preK through adult learners. It describes key concepts about the interaction of natural and social systems and a sequence in which they are to be taught. It also discusses benchmarks, standards, and applications for using this framework. See http://www.seek.state.mn.us/eemn_c.cfm.

Review of Literature

Evaluation is a process involving systematic collection of information about a program to make improvements, judgments, and decisions about future programming (Patton, 1997). Program evaluations are conducted with a specific *use for* and *user of* the evaluation in mind. Program evaluation can be approached from a variety of perspectives. Fitzpatrick, Sanders, and Worthen (2004) list five common approaches: objectives-oriented evaluation; management-oriented evaluation; consumer-oriented evaluation; expertise-oriented evaluation; and participant-oriented evaluation. Evaluators often draw from several evaluation approaches in efforts to address the particular situation at hand. These approaches, or combinations of these approaches, can be used to address formative evaluation (program improvement) purposes, as well as summative evaluation (decision-making) purposes.

Evaluation is critical to high-quality environmental education programming. A substantial amount of time, effort, and resources often are invested into the development of programs; program evaluation can help environmental educators know what the benefits of that investment are. Program evaluation can provide the systematic insight into what is and is not working in a program; it can provide evidence of outcomes, as well as other types of information necessary for sound decision-making. Evaluation is a recommended component of every environmental education program (Athman & Monroe, 2001; Coyle, 2005). Coyle (2005), in *Environmental Literacy in America*, suggests assessment and evaluation of program effectiveness should be routine rather than the exception.

A review of literature on evaluations of aquatic education programs yields some evidence as to the *potential* of aquatic education programs in fostering resource stewardship and conservation. However, evaluations of these programs tend to focus on cognitive knowledge,

and less on affective objectives and stewardship behaviors. For example, results from an evaluation of Montana Fish, Wildlife, and Parks' *Hooked on Fishing* program suggest students learned fishing skills and gained knowledge about Montana's fish and aquatic resources and the importance of clean water for people, plants, and wildlife (Flowers & Hagengruber, 2007). An evaluation of MinnAqua's *Angling and Aquatic Education Clinics*, reported increased knowledge of angling and aquatic resources (Nelson, 2006b). This evidence of knowledge and skill outcomes may be less reflective of aquatic education's potential, but more a function of a program's emphasis on short-term learning goals, as well as the challenges of longitudinal evaluations needed to capture impacts such as behavior change and improved natural resources conditions.

There is a research base supporting the philosophical underpinnings on which the *Fishing: Get in the Habitat! MinnAqua Leader's Guide* was developed. When the goal is responsible environmental behavior, research suggests frequent and sustained experiences in environmental education and direct experiences in nature (Chawla, 1998; Corcoran, 1999). Research further suggests specific instructional strategies such as participation in service-learning; partnerships with experts, mentors, and community leaders; collecting and analyzing information; participation in project-based environmental problem-solving; and investigating environmental issues when the goal is responsible environmental behavior (Monroe, 2003). Knapp (2000) suggests focusing on in-depth, sequential learning, grounded in sound educational philosophy. MinnAqua's conceptual framework for the Leader's Guide suggests this research base was incorporated into its development. Thus, it is reasonable to believe that the Leader's Guide, if used as intended, has the potential to increase knowledge of and appreciation for Minnesota's aquatic resources, as well as provide students with opportunities to develop and

practice the angling and stewardship skills necessary for conservation of Minnesota's aquatic resources.

Evaluation Methodology

Evaluation Purpose and Questions

Several evaluation approaches guided the evaluation of the Leader's Guide. A management-oriented approach guided this evaluation, given there was a need for information that could guide what were managerial decisions, such as future implementation and distribution of the Leader's Guide. A participant-focused approach was also used, as the intent was to provide data that was truly of use to stakeholders; thus, the MinnAqua director and program education specialists were involved in the process of developing evaluation questions and framing the data collection approaches. Further, because of the Minnesota DNR's interest in measurable outcomes, the objectives-oriented approach also guided this evaluation, with a focus on specifying objectives and determining the extent to which they were achieved.

The evaluator and MinnAqua staff collectively articulated a logic model of the program (see Figure 1) and an evaluation purpose and questions, based on MinnAqua's interest in collecting information that could inform decisions relating to future distribution, training workshops, and follow-up support. The stated purpose of the evaluation was to assess the distribution methods, implementation, and program outcomes of the *Fishing: Get in the Habitat! Leader's Guide*. By doing so, the following two overarching evaluation questions were addressed: 1.) Are revisions to the current distribution and training workshop approach needed? 2.) Is follow-up support needed for those receiving the Leader's Guide, and if so, what kind or type do teachers and program leaders suggest? These overarching questions and categories were broken down into sub-questions, which are detailed in Figure 2. After the evaluation purpose

and questions were articulated, the evaluator, with input from MinnAqua stakeholders, drafted a two-phased evaluation plan. This plan, summarized in Figure 3, is detailed in the sections that follow.

Participants

The participants in the first phase of this evaluation were instructors (teachers or nonformal program leaders or instructors) who had the Leader's Guide in their possession and may or may not have used the Leader's Guide. From MinnAqua's list of approximately 400 instructors who had received the Leader's Guide, 265 instructors were randomly sampled. This number was based on a $\pm$ 10% sampling error rate and an assumed 30% response rate, with 78 being the desired number of instructors needed to generalize to the population (Dillman, 2000).

In addition, there were seven teacher participants (ranging in grade levels from 3rd to 5th) and one nonformal instructor participant (a Girl Scout troop leader) in the second phase of the evaluation. These eight were purposefully selected, as they had indicated being willing to participate and an understanding of the Leader's Guide in the first phase of the evaluation. These eight also represented a range of school settings. All students of these instructors were invited to participate in the student data collection portion of the evaluation.

Data Collection Tools

Several tools were needed to address the evaluation questions and the specific needs of the evaluation users. This multiple method approach is supported in the evaluation literature: Evaluators must be able to use a variety of tools and be "flexible in matching research methods to the nuances of particular evaluation questions and the idiosyncrasies of specific decision-maker needs" (Patton, 1997, p. 277). Tools were developed based on the evaluation questions, resources available, the intended uses for the evaluation, and the desire to minimize additional

layers of student assessment. The data collection tools are described below and linked to the specific evaluation questions in Figure 3:

- *Phase One Instructor Questionnaire:* This questionnaire contained multiple sections; respondents completed sections according to whether or not they had used the Leader's Guide. The questionnaire contained fixed-response items, as well as likert-type items and open-ended questions. Items addressed distribution (how the Leader's Guide was received), implementation, and effectiveness of the Leader's Guide. The questionnaire was pilot tested with 10 Minnesota teachers/program leaders prior to implementation. Items were revised based on feedback from the respondents. See Figure 4.

- *Student Questionnaire:* The student questionnaire was used in a pretest-posttest treatment group-only design. It measured changes in self-reported knowledge about aquatic habitats, MN fish, and fish management and self-reported procedural knowledge of water stewardship and fishing. It also measured changes in self-reported awareness of local aquatic environmental issues, the need for conservation of natural resources, and the roles the DNR and citizens play in conservation. In addition, the questionnaire measured changes in self-reported appreciation for aquatic resources and interest in fishing. Students created a code, which allowed for matching of pretests and posttests, while allowing students' responses to be anonymous. This questionnaire was piloted (in a "think-aloud" format) with five students prior to implementation. Directions for the questionnaire and items were revised according to students' feedback. See Figure 5.

- *Phase Two Instructor Questionnaire*: This questionnaire was primarily for teachers/program leaders who participated in the student data collection portion of the evaluation. This instrument measured teachers' perceptions of the effectiveness of the Leader's Guide in increasing students' knowledge, procedural knowledge, skills, awareness, and appreciation relating to aquatic resources though likert-type items. There also were open-ended questions for gathering feedback relating to future use and distribution of the Leader's Guide. See Figure 6.

- *Activity-Embedded Assessments:* The lessons in the Leader's Guide include assessment options, as well as suggestions for scoring students' work and sample rubrics. Instructors participating in the student data collection portion of the evaluation were asked to collect assessment information when they implemented an activity's assessment option. They were encouraged to share students' products (graded or un-graded) or provide copies of their assessment of students' work (a completed checklist or rubric). The intent was for this data to supplement students' self-reported knowledge and skills, as well as teachers' perception of the effectiveness of the Leader's Guide.

Procedures

Permission to conduct the evaluation was sought from the University of Minnesota's Institutional Review Board, who governs research activities that involve data collection from

human subjects. They determined the evaluative purpose of this study did not fall within their definition of research; thus, their approval was not required for this evaluation. The first instructor questionnaire was administered by mail during spring 2008. The questionnaire was accompanied by a gift card for an on-line bookstore in the amount of $5 in advance appreciation for their participation. The response rate, 49% (N = 129), was higher than anticipated.

In May 2008, the eight instructors were invited to participate in the second phase of the evaluation, and permission was obtained from school administrators. Over the summer of 2008, the evaluator confirmed interest and willingness to participate. The evaluator mailed a packet of evaluation materials (pretests, posttests, consent forms, directions, etc.) to instructors at the beginning of September 2008. Instructors were asked to do the following:

- Obtain parental consent if required by their district;
- Administer the pretests to students (instructors were reminded that the evaluation was not of them, but instead of the Leader's Guide; they were told that students' should not be encouraged to respond in a particular manner; it was also explained that "teaching to the test" or influencing students' responses would reduce the usability of the information collected and not be helpful to MinnAqua; if possible, instructors were encouraged to have a classroom helper or parent volunteer administer the pre- and posttests, to avoid having the instructor's teaching be influenced by the items on the tests);
- Implement the Leader's Guide in the way MinnAqua intended it to be implemented when it was designed (teach one lesson from each of the 6 chapters in the Leader's Guide; take their students fishing, and carry out a service project with the students). If one of the assessment options were implemented as part of an activity, instructors

were asked to collect assessment information (such as students' work, graded or un-graded, or their scoring rubrics, for example); the time frame for implementation was September through the end of November 2008;

- Administer the posttests to students; and
- Complete the Phase Two Instructor Questionnaire.

Instructors were provided with postage-paid mailers to return data collection materials. As an incentive to participate, instructors were reimbursed for materials they purchased to teach or support their lessons (up to $150). When they completed the data collection, they received a list of MinnAqua-related materials, from which they could select materials up to a value of $100.

All eight instructors completed the evaluation, with a total of 145 students completing the evaluation and using codes that allowed for matching their pre- and posttests. Of the respondents, 63.4% were girls (n = 92), and 36.6% were boys (n = 53). Most respondents were 9 and 10 year olds (83.3%, n = 120); 11.1% were 8 year olds (n = 16). The remaining respondents included a seven-year-old, six eleven-year-olds, and a thirteen-year-old. One of the groups participating in the evaluation was a Girl Scout troop, thus resulting in a wider age range of participants.

Data Analysis

The data from the Phase One and Phase Two Instructor Questionnaires were analyzed using descriptive statistics and correlation analyses. For both questionnaires, data from open-ended responses were summarized in efforts toward data reduction and interpretation. The data from students' pre- and posttests were analyzed using descriptive and inferential statistics. Paired samples t tests were conducted to evaluate if posttest responses were significantly higher than pretest responses. The significance level for each analysis was $\alpha = .05$. Missing data were handled by excluding cases listwise. Due to only one teacher submitting activity-embedded

assessment data, the evaluator was unable to formally analyze the data as intended. Instead this data was shared with MinnAqua staff to illustrate findings from the other data collection methods and for internal discussion among their staff. It is likely that asking teachers to submit student assessment products in addition to teaching the lessons, administering the pre- and posttests, and completing an instructor questionnaire was more than what was reasonable to expect teachers to do; or it may be that teachers were having students create assessment products, but preferred to have students keep the records of their work, and Xeroxing the creative products was time-consuming and not very practical.

Limitations

There were several limitations to this study. Due to the educational setting, the evaluation questions involved in this evaluation could not be investigated feasibly through a randomized, experimental design. The internal validity was further weakened from a lack of control groups for the student pre- and posttests and potentially from the instructors' administration of the pre- and posttests. Due to these threats to internal validity, and to the self-reported nature of the data, the ability to make causal attributions is limited; the results presented are perceived outcomes, which may be different from *actual* outcomes. While recognizing these limitations, it is also important to note that this study was conducted as a program evaluation, not as research. Decisions were made in efforts to yield useful data to inform decisions in a cost-effective manner, while minimizing the amount of student testing time that takes away from instructional time.

Evaluation Results

The results are presented by assessment category, rather than by data collection tool, as some questions are answered evidence gained from multiple evaluation tools. Summaries of

results by tool and item are presented in Figures 4-6. Summaries of key findings are presented in Figures 7-9.

Assessment of Distribution Methods

Of the 129 respondents to the Phase One Instructor Questionnaire, 80 (69.0%) were teachers, 26 (20.2%) were nonformal program leaders/instructors, and 14 (10.8%) indicating being someone other than a teacher or nonformal leader/instructor. Respondents received the Leader's Guide primarily through a MinnAqua workshop (73.4%, $n = 94$). The remaining respondents received it by mail, from a colleague, or through some other manner.

For those receiving the Leader's Guide through a workshop, the average length of the workshop was four hours, with the length ranging from one to eight hours. Participants did not choose the length of workshop to attend; length of workshop was dependent on venue and context, as well as the MinnAqua specialist presenting the workshop. Respondents' perceived the workshop overall to be effective ($M = 4.24$, $SD = .63$, on a scale of one to five, where one corresponded to *not at all effective* and five to *very effective*). Respondents perceived the workshop to be effective in each of the following: conveying the overall purpose of the Leader's Guide ($M = 4.40$, $SD = .63$); helping them become familiar with the Leader's Guide *(*$M = 4.35$, $SD = .79$); helping them understand how the Leader's Guide is supposed to be implemented *(*$M = 4.18$, $SD = .87$); motivating them to want to use the Leader's Guide ($M = 4.22$, $SD = .81$); and helping them understand the relevance of the Leader's Guide to the work they do ($M = 4.03$, S$D = .93$).

Workshop effectiveness was perceived similarly by teachers and nonformal program leaders/instructors. Effectiveness of the workshop overall was significantly related to length of workshop ($r = .21$, $p = .04$), with those attending longer workshops perceiving the workshop to

be more effective. Effectiveness of the workshop in motivating them to want to use the Leader's Guide was also significantly related to length of workshop ($r = .27$, $p = .01$), with those attending longer workshops perceiving the workshop to be more effective in motivating them to want to use the Leader's Guide.

About half of the respondents who had attended the workshop and responded to the open-ended question indicated the workshop went well. The other half of the respondents offered suggestions for workshop improvement. While there were generally no suggestions for workshop improvement repeated consistently across respondents, the following suggestions were offered by more than one participant: increase workshop length; adjust pacing and amount of content to reduce feelings of being rushed; provide the opportunity to see more of the resource or the resource as a whole instead of only pieces; and incorporate examples of real-world use. The only suggestion frequently mentioned was to offer workshops at schools or within school districts.

Regarding suggestions relating to future distribution of the Leader's Guide, almost all of the respondents ($n = 121$) indicated the way they obtained the Leader's Guide was effective. Yet there were mixed reactions as to whether or not the training workshop should be required; some felt it necessary and/or the best distribution approach, and others suggested the workshop wasn't needed. Forty-six of the 95 respondents to this question (48.4%) indicated they would have been motivated to access the Leader's Guide from a website, without participating in the training workshop. Sixty-nine of the 95 respondents to this question (72.6%) indicated ability to use the Leader's Guide without participating in the training workshop. While teachers and program leaders/instructors responded similarly in terms of motivation to access the Leader's Guide from the website without the training, there appeared to be a difference in terms being able to *use* the

Leader's Guide without the workshop; 69.9% of teachers (of the 73 responding to this question) said they could have used the Leader's Guide without a workshop compared to 86.7% of program leaders (of the 15 responding).

Respondents had a variety of suggestions for future distribution of the Leader's Guide, as well as for marketing the Leader's Guide; none of the suggestions, however, were frequent or consistent suggestions across respondents. Suggestions included the following avenues: website; CD; attachment or link emailed to teachers; combined with Project WET or WILD workshops; and relevant conferences, conventions, and outdoor expos. Suggestions for marketing the Leader's Guide included sending sample lessons to schools with directions as to how to access the Leader's Guide; distributing a short video to schools along with an offer to present a workshop; links to the Leader's Guide on relevant websites; sending flyers to target audiences; and emailing all Minnesota teachers with a sales pitch.

Regarding understanding of the overall purpose of the Leader's Guide, 57.3% ($n = 71$) of respondents indicated they knew the purpose. Yet none of these respondents stated the goal to the extent it is stated in the Leader's Guide (none stated it to include the knowledge, service-learning, fishing, and stewardship components). Some stated one or two of the goal's sub-components, others emphasized knowledge or fishing skills in their responses, and others offered incorrect or vague goals. Understanding of the purpose of the Leader's Guide did not appear to be related to how they obtained the Leader's Guide.

Regarding understanding of how MinnAqua intended the Leader's Guide to be implemented, ten of the 125 respondents to this question indicated an understanding of implementation that was aligned with MinnAqua's intentions. The majority of respondents ($n = 102$) indicated their understanding of the way the Leader's Guide is to be implemented is in

whatever way best suits their educational needs and settings. Understanding of implementation did not appear to be related to method the Leader's Guide was obtained.

Assessment of Implementation

Forty-three of the 112 respondents to this question (38.4%) indicated they had implemented some portion of the Leader's Guide. For about half of the users, implementation was both indoors and outdoors; for the other half, implementation was indoors. Implementation of the Leader's Guide was primarily with Kindergarten through second grade students, third grade students, and ninth through twelfth grade students (about 22% in each category). Activities from the Leader's Guide were most frequently implemented within science classes. Most respondents (72.3%) indicated using the Leader's Guide by integrating it into an existing class or program (generally science), rather than as a "stand-alone" or extra activity.

While the three most frequent uses for the Leader's Guide were to teach about aquatic habitats, Minnesota fish, and water stewardship, respondents also were using the Leader's Guide to teach about fisheries management, fishing equipment and skills, and fishing safety, as well as to facilitate fishing trips and service-learning projects. Respondents most frequently indicated they were using the Leader's Guide to supplement, enrich, or support what they were already teaching. Other frequent responses included fostering appreciation for the natural world, teaching about aquatic related topics, and motivating their students.

About a third of respondents (44 of the 119 respondents to this question) indicated either anticipating or already having encountered obstacles to use of the Leader's Guide. Teacher respondents were more likely to indicate having encountered or anticipating encountering obstacles than instructors in nonformal settings. Of those indicating they anticipated or had already encountered obstacles, half indicated the obstacle to be lack of time. Other frequent

responses included having to print the lessons, amount of materials/size of binder, the need to make age-appropriate adaptations for educators that received the guide and taught high school students, and lack of access to necessary materials/equipment.

Use of the Leader's Guide did not appear to be influenced by (related to) how respondents obtained the Leader's Guide, nor to their perceptions as to the effectiveness of the distribution method in general or the effectiveness of specifically the workshop. Use of the Leader's Guide also did not appear to be influenced by respondents' understanding of the purpose of the Leader's Guide or their understanding of how the Leader's Guide is intended to be implemented. Further, use of the Leader's Guide did not appear to be related to whether or not respondents encountered or anticipated encountering obstacles.

Regarding follow-up support and/or assistance implementing the Leader's Guide, 72 of the 113 respondents to this question (63.7%) indicated support would encourage their general use of the Leader's Guide. The type of support most frequently suggested as being helpful was additional training and curricular resources. Other frequent suggestions included sharing examples or stories of how the Leader's Guide is being used and adapted or information on successful users, access to local fishing experts and aquatic scientists, and access to an education specialist who could answer questions and help trouble-shoot obstacles they encountered.

More specifically, 41 of the 121 respondents (33.9%) indicated needing assistance in *implementing a fishing trip*, and another 51 (42.1%) indicated this assistance would be helpful (but not necessary). The most frequently suggested form of assistance was equipment. An expert to lead the trip/expertise in fishing, funding for transportation, and help organizing and supervising the trip were also frequently suggested. Thirty of the 121 respondents (25.0%) indicated needing assistance in *implementing the service project*, and another 61 (50.8%)

indicated this assistance would be helpful (but not necessary). The most frequently suggested form of assistance was ideas for projects; transportation funding was also frequently suggested. Other suggestions were time for and help in planning, help in implementing, and help finding community partners.

Assessment of Program Outcomes

Respondents who had already implemented the Leader's Guide (n = 46) perceived it to be effective overall (M= 4.29, SD = .48), on a scale where one corresponded to *not at all effective* and five to *very effective*. Specifically, they perceived the Leader's Guide as effective in supporting their curricular goals (M = 4.24, SD = .71) and engaging students in learning (M = 4.54, SD = .66). Respondents also indicated the Leader's Guide to be effective in fostering partnerships with local aquatic professionals (M = 3.95, SD = .75) and stimulating interest in recreational fishing (M = 4.34, SD = .75);

Results from students' pre- and posttests indicated that when the Leader's Guide was implemented as intended, students' knowledge about aquatic habitats, Minnesota fish, and fish management was increased. Data showed significant increases from pretest means to posttest means on self-reported knowledge of aquatic habitat, $t(143) = -6.94$, $p < .001$; knowledge of Minnesota fish, $t(142) = -7.24$, $p < .001$; fishing regulations $t(140) = -7.09$, $p < .001$; and fish management $t(141) = -9.28$, $p < .001$. Posttest means corresponded to a rating of "some" knowledge. These student results were consistent with the results of the Phase Two Instructor Questionnaire. Instructors perceived participation in the program increased their students' knowledge about aquatic habitats somewhat (M = 3.30, SD = .48); knowledge about MN fish very much (M = 3.90, SD = .32); and knowledge about fish management somewhat (M = 2.90, SD = .32).

Results from students' pre-and posttests also indicated students' procedural knowledge of and skills in water stewardship and fishing increased. There were significant increases from pretest means to posttest means on self-reported procedural knowledge of water stewardship, $t(142) = -6.01$, $p < .001$, and fishing, $t(142) = -5.35$, $p < .001$. Posttest means corresponded with a rating of between "some" and "a lot" of knowledge. This was consistent with data from the Phase Two Instructor Questionnaire, which suggested instructors perceived participation increased their students' procedural knowledge of and skills in water stewardship somewhat ($M = 3.20$, $SD = .63$) and fishing knowledge and skills very much ($M = 3.80$, $SD = .42$).

When implemented as intended, it appears the Leader's Guide increased science process skills to some degree. Results of the Phase Two Instructor Questionnaire indicated instructors perceived students' science process skills increased somewhat (average rating across all items was 3.00, $SD = .22$). Prediction skills and communication skills received the highest rating by instructors (somewhat to a lot); measurement skills received the lowest rating (a little). Instructors perceived observation skills, classification skills, inference skills, data collection and interpretation skills, and hypothesizing skills as increasing somewhat.

The results suggest the Leader's Guide increased students awareness of local aquatic problems and issues (a problem in which people don't agree upon the solution). The increase in correct responses from pretest to posttest was significant for students' identification of local aquatic problems, $t(140) = -6.21$, $p < .001$ and for students' identification of local aquatic environmental issues, $t(135) = -4.20$, $p < .001$. While data showed a significant increase, posttest scores indicated generally low levels of knowledge with respect to identification of issues, with only 16.8% of students providing a correct response on the posttest. Instructors, however, perceived participation in the program increased their students' awareness of both general

environmental issues and local aquatic environmental issues very much (M = 3.70, SD = .48 and (M = 3.60, SD = .48 respectively)

Regarding awareness of the need for conserving natural resources, results suggest students' awareness did not increase, as there was not a significant change in responses from pretests to posttests, $t(142) = .12$, $p = .90$. Students' pretests, however, suggest they were aware of the need for conserving natural resources prior to their participation in the MinnAqua activities. Students' understanding of whose responsibility it is to care for Minnesota's aquatic habitats and resources also did not increase. While there was no significant change in responses, $t(140) = -.53$, $p = .60$; 92.2% of the students responded correctly on the pretest, leaving little room for increase. Instructors, however, perceived participation in the program increased their students' awareness of the need for conserving natural resources very much (M = 3.80, SD = .42).

Results suggest students' awareness of the role the DNR plays in conservation increased, as there was a significant increase from pretests to posttests in the number of students correctly identifying at least one way the DNR participates in conservation of resources, $t(141) = -7.44$, $p < .001$. Results also suggest students' awareness of the role citizens play in conservation increased, as there was a significant increase from pretests to posttests in the number of students correctly identifying at least one thing citizens could do to care for natural resources, $t(143) = -4.16$, $p < .001$ and one thing they could do to care for natural resources, $t(125) = -4.40$, $p < .001$. This is consistent with results of the Phase Two Instructor Questionnaire. Instructors perceived participation increased students' awareness of the roles the DNR play in conservation somewhat (M = 3.40, SD = .84) and the roles Minnesota citizens play in conservation of natural resources very much (M = 3.80, SD = .63). Further, instructors perceived students' awareness of the roles

they play as students in conservation of natural resources increased very much ($M = 3.90$, $SD = .32$).

When implemented as intended, results suggest the Leader's Guide may have increased students' appreciation for Minnesota's aquatic resources and habitats. The number of respondents indicating an appreciation for fish, wildlife, clean water, and aquatic habitats on the posttests was significantly higher than the number of respondents indicating appreciation for these items on the pretests, $t(138) = 4.00$, $p < .001$; $t(139) = -2.54$, $p = .01$; $t(141) = -3.32$, $p < .01$; and $t(139) = -3.65$, $p < .001$, respectively. Yet, there was no significant change on the item measuring appreciation for Minnesota's lakes, streams, rivers, and wetlands, $t(137) = .87$, $p = .34$. However, students' pretest responses indicated high levels of appreciation prior to participation in the MinnAqua activities. Several comments added by students to their posttests further suggest that students appreciate these aquatic resources: "We have adopt-a-road, why not adopt-a-lake?" and "I'm going to volunteer for the DNR when I'm older."

While results from the Phase One Instructor Questionnaire indicated instructors perceived the Leader's Guide effective in stimulating interest in recreational fishing ($M = 4.34$, $SD = .75$, $n = 46$), student data suggests the Leader's Guide did not increase students' interest in fishing; **a**cross the four items addressing interest in fishing on the student pre-posttest, there were not significant changes from pretest to posttest scores ($p > .05$). Students' posttest responses indicated they on average liked going fishing, would be excited about going fishing if someone invited them, think they'll go fishing once in a while as adults, and probably teach others to fish when they are adults; these responses were similar to their pretest responses, suggesting students were interested in fishing prior to their participation.

Discussion

In general, results suggest when the Leader's Guide is implemented as intended by MinnAqua, the program outcomes are achieved. Specifically, there is evidence to suggest the Leader's Guide is increasing students' knowledge about aquatic habitats, Minnesota fish, and fish management, as well as their procedural knowledge of and skills in water stewardship and fishing and their science process skills. The Leader's Guide also appears to be increasing students' awareness of the roles the DNR and Minnesota citizens play in conservation.

While awareness of local aquatic issues increased, there appears to be room for additional awareness-building, as generally low levels of awareness were suggested by posttest scores, even though this was an increase from pretest to posttest. Students seemed to appreciate Minnesota's aquatic resources, were aware of the need for natural resource conservation, and appeared interested in fishing *prior* to their participation in the Leader's Guide. Thus, while MinnAqua perhaps can't attribute participation in the Leader's Guide to these outcomes, perhaps these dispositions toward conservation and interest in fishing make the Leader's Guide more appealing to students and contribute to the building of other understandings and skills. Or it may be that this interest in fishing and appreciation for natural resources make the Leader's Guide an effective and motivating context for learning the cognitive concepts associated with the Leader's Guide.

On the other hand, if Minnesota youth already are interested in fishing, perhaps MinnAqua may need to re-consider this program outcome (increasing interest in fishing). Is there another outcome that should be considered in its place? For example, are there barriers that intervene between children's interest in fishing and the actual behavior of recreational fishing? Perhaps the Leader's Guide, through either activities within the curriculum or through the distribution approach, could address those barriers; thus, the desired outcome might be reducing

barriers to youth participation in the recreational activity of fishing, rather than increasing interest in fishing.

Or perhaps the barrier to be addressed is getting teachers who aren't inclined toward environmental education, the outdoors, or fishing to use the Leader's Guide. Perhaps the evaluation finding that students appeared to already have an interest in fishing and an appreciation for natural resources, prior to their participation in the Leader's Guide activities, could be explained by the teachers who chose to use the Leader's Guide—teachers who perhaps have a strong inclination toward the outdoors and through incorporating other outdoor or environmental learning experiences into their classrooms have conditioned their students toward appreciation of natural resources. Thus, while the student participants in this evaluation already appeared to have the desired outcome, students of teachers who don't incorporate other kinds of outdoor/environmental experiences may greatly benefit from a program designed to increase appreciation of natural resources and interest in fishing. The challenge, however, may be in getting these teachers to use the Leader's Guide.

Instructors perceived the Leader's Guide as effective in supporting their curricular goals, engaging students in learning, fostering responsible participation in stewardship of Minnesota's aquatic resources, and fostering partnerships with local aquatic professionals. Instructors reported very positive reactions from students' participation in the activities. Combining these perceived outcomes with data from the students' pre- and posttests, it appears that implementation of the Leader's Guide, as intended by MinnAqua, can, in general, achieve the desired outcomes. Because instructors were directed to implement one activity per chapter, it could be that implementing multiple activities could result in stronger increases of awareness, knowledge, and skills. For example, with awareness of local aquatic issues, it may take more

than one experience or activity for that awareness to be built. Further evaluation would be needed to confirm perceived outcomes, as well as to understand how varying the intended implementation directions influences outcomes.

However, given that results generally were favorable, it may be that MinnAqua focuses future efforts not on revisions to the Leader's Guide and further evaluation, but instead on distribution of the Leader's Guide and follow-up support. There were two over-arching questions guiding this evaluation: 1.) Are revisions to the current distribution and training workshop approach needed? 2.) Is follow-up support needed, and if so, what kind or type do teachers and program leaders suggest? These questions will be discussed further in the next two sections, in the context of recommendations stemming from the results of this evaluation.

Recommendations Relating to Distribution of the Leader's Guide

- *Use multiple forms of distribution for the Leader's Guide.* Results suggested there is not a one-size-fits-all approach to distribution of the Leader's Guide. Some respondents thought they needed the training workshop, and others thought they didn't. Further, whether or not respondents' used the Leader's Guide did not appear to be related to how they obtained the Guide; thus, there doesn't appear to be one method of distribution that is clearly best. MinnAqua may want to consider multiple forms of distribution, including workshops and online distribution, as well as distribution at relevant conferences and conventions.
- *Distribute Leader's Guide through workshops when the aim is motivating instructors to use the Guide.* While actual use did not appear to be related to whether or not participants had attended a workshop, motivation to use the Guide may likely be related to actual use of the Guide. Workshops seemed to be successful in motivating

instructors to use the Guide, particularly if they attended a longer workshop. The workshop may not be as useful in helping instructors learn to use the Leader's Guide, as respondents indicated they likely could have been able to use the Leader's Guide without a workshop.

- *When using workshops as a form of distribution, offer workshops that are of longer rather than short duration.* Respondents' perceptions of workshop effectiveness were significantly related to length of workshop they attended, with those attending longer workshops perceiving the workshop as more effective. Thus, if the investment is made to offer workshops, the workshops need to be longer than brief, introductory sessions, so that participants perceive the workshop as effective, and in particular, effective in motivating them to want to use the Leader's Guide. Longer workshops also may reduce participants' feelings of being rushed, as well as provide opportunity to explore more of the Leader's Guide.
- *Bring workshops to schools or within school districts.* Respondents consistently suggested holding workshops at schools. While this would help with access, it also may help with a barrier several indicated encountering: teaching within a team of grade-level teachers, but being the only one on the team with the training. MinnAqua may want to consider holding workshops at schools, if they don't already, as that may make it more likely for teachers to attend and more likely an entire teaching team attends.
- *Emphasize overall purpose and ideal implementation of the Leader's Guide in whatever distribution method is used.* While use did not appear to be related to respondents' understanding of the purpose of the Leader's Guide, MinnAqua invested much effort in

determining this purpose and wants to make sure this purpose is being achieved. Thus, while instructors appear to be able to implement the Guide without fully knowing MinnAqua's purpose for the Leader's Guide, making sure instructors understand the purpose would seem to be important from MinnAqua's perspective. Further, most instructors understood the ideal implementation of the Leader's Guide to be whatever met their educational needs and settings. While that may be an advantage in terms of more instructors using the Leader's Guide, it may result in implementation that is too brief or too piecemeal to result in the outcomes MinnAqua desires. Assessment of outcomes indicated that when the Leader's Guide is implemented as intended by MinnAqua, program outcomes are achieved. If however, instructors select only one activity or if instructors, for example, skip the chapter on stewardship, it is unlikely that participation in the Leader's Guide will contribute to stewardship of Minnesota's aquatic resources, which is the end to which MinnAqua's educational efforts are directed.

- *Incorporate examples of how others are using the Leader's Guide into distribution or marketing of the Leader's Guide.* Respondents on multiple questionnaire items indicated they'd benefit from examples of how the Leader's Guide is being used, examples of modifications other teachers have made, and stories of success. This may foster motivation to use the Leader's Guide, as well as increase respondents' perceptions of the usability of the Leader's Guide. One way this might be achieved is through a community network portal or social website for users, where teachers contribute their stories – both challenges and successes.

- *Consider the importance of the interdisciplinary nature of the Leader's Guide.* Use of the Leader's Guide seemed concentrated in science. If MinnAqua's intent was something other than use primarily in science, this may be an area to target through whatever distribution method is used. It also could be emphasized through marketing, as well as through sharing stories of successful use in a variety of subject areas.

Recommendations Relating to Follow-Up Support

Over half of respondents indicated follow-up support would encourage their use of the Leader's Guide. Investing in follow-up support might boost the implementation rate, although there are users of the Leader's Guide who are using it without support and it's hard to tell from this evaluation if additional support would indeed result in use. Regarding the fishing trip, the most frequently suggested form of assistance was equipment. An expert to lead the trip/expertise in fishing, funding for transportation, and help organizing and supervising the trip were also frequently suggested. The most frequently suggested form of assistance for the service project was ideas for projects; transportation funding was also frequently suggested. Other suggestions were time for and help in planning, help in implementing, and help finding community partners. Given the role the fishing experience and service project participation play in the intended outcomes of stewardship skills and interest in recreational fishing, supporting instructors in these components may help ensure they are being implemented.

In the context of follow-up support, it is worth considering the finding that method of obtaining the Leader's Guide and length of workshop were not related to use of the Leader's Guide: No training, brief training, and longer trainings all resulted in both use and non-use by respondents. This might lead MinnAqua to question the value of the workshop.

Perhaps the intent behind follow-up support (encouraging use of the Leader's Guide) could be merged with use of workshops for Leader's Guide distribution. Many of the suggestions for follow-up support are topics and issues that could be addressed through a distribution workshop. For example, workshop leaders could provide time and assistance during the workshop for locating equipment, brainstorming service project ideas, identifying community partners or local angling experts, etc. Further, lack of time was the most frequently listed obstacle. While this could be viewed as an area for follow-up support, strategies for reducing this obstacle could be incorporated into the workshop. For example, workshop leaders could provide participants with enough time to incorporate activities into their lesson plans or become familiar with the existing planning aids contained within the Leader's Guide, or for working with other grade-level team members to strategize how to integrate activities into their existing curriculum. Or instead, perhaps the Leader's Guide is distributed, and then MinnAqua offers workshops as a form of follow-up support.

Implications for Environmental Education

The results of this evaluation provide further evidence of the potential of educational programs in efforts toward conservation of natural resources. When implemented as intended, the Leader's Guide appears to be achieving short-term program outcomes. Since underlying program assumptions appear to be consistent with research literature relating to responsible environmental behavior, it is reasonable to assume the Leader's Guide is supporting the ultimate goal of conservation of Minnesota's aquatic resources.

While the potential exists, the challenge lies in the in congruency between the implementation MinnAqua intends and instructors' tendency to implement the Guide in whatever way suits their needs. This challenge is familiar to many nonformal environmental

educators. While some implementation is probably preferable to no implementation, it is unlikely that the desired outcomes (and ultimately conservation of natural resources) will be achieved when implementation is limited to an activity or two, or if implementation is piecemeal and something other than deliberate and sequential. On the other hand, teachers generally are more likely to use a curriculum that is "flexibly adaptive," curriculum that allows for teachers to adapt it to their needs and classroom context (Fishman & Krajcik, 2003). Consequently, the following questions may be worth considering as nonformal environmental educators begin the program development process:

- Can a variety of implementation formats lead to desired results?
- How can we design programs in which a variety of forms of implementation can lead to the desired results?
- How can we design programs so that ideal implementation is feasible for intended users?
- How can we support users in ideal implementation of the programs we develop?
- How can we develop programs that encourage deliberate, purposeful use rather than a less-focused, pick-and-choose approach, or do teachers not even want such a structured program?

Further implications for environmental education lie in the area of distribution of program materials. Workshops are a common form of distribution for environmental education program materials. This evaluation suggests there isn't a one-size-fits-all approach to distributing the Leader's Guide; this likely is true for other environmental education materials. This evaluation also suggests distribution preferences and needs differed between nonformal educators and from formal educators. Further, results from this evaluation suggest distribution method was not related to actual use of the Leader's Guide. Thus, before assuming the

appropriate distribution approach is through a workshop, environmental educators may want to consider alternative distribution options by soliciting suggestions from intended users. Likewise, environmental educators may want to consider how the strategies of training workshops and follow-up support can be merged, ultimately supporting users in use of the program materials.

A final implication from this evaluation is a reinforcement of the value of program evaluation. A substantial amount of time, effort, and resources were invested into the initial development of the Leader's Guide and its revision. Through this evaluation, MinnAqua has a more clear understanding of the benefits of that investment. Further, this evaluation provided data necessary for sound decision-making relating to future distribution and implementation. And while not a primary purpose for this evaluation, the results of this evaluation can be useful in marketing of the program, as well as for providing stakeholders with increased accountability.

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Figure 1. *Logic Model of Fishing: Get in the Habitat! MinnAqua Leader's Guide*

Situation	Inputs	Outputs		Intended Outcomes		
		Activities	Participation	Short-term	Medium Term	Long Term
MinnAqua, the angling and aquatic education program of the MN DNR, developed a pilot project, *Fishing …Get in the Habitat*, comprised of a youth activity booklet and a Leader's Guide, to better address state-level EE goals and tie angling into a larger environmental context. This project was adopted by the DNR Division of Fish and Wildlife in 1992. In 2000, MinnAqua determined there was a need to revise the Leader's Guide to better align it with "best practices" in fishing, boating, and aquatic stewardship education (RBFF, 2003) and better foster stewardship of Minnesota's aquatic resources.	Coordinator and 4 regional education specialists USFWS Sport Fish Restoration Program funding Original version of the Leaders' Guide "Re-Write Leader's Guidelines," stemming from EE and education research literature and from an informal needs assessment Content expert reviewers and formative evaluator	**Leader's Guide CD ROM and Binder** containing: • 39 lessons in six chapters: 1. Aquatic Habitats 2. Minnesota Fish 3. Water Stewardship 4. Fish Management 5. Fishing Equip. & Skills 6. Safety & the Fishing Trip • Supporting materials (22 appendices of resources, correlations to education standards, planning aids for service-learning projects, etc.). **Ideal Implementation:** One lesson per chapter and a fishing trip and an aquatic-based service-learning project **Each lesson:** • Contains background information, illustrations, learning objectives, instructions for activities, assessment options, and extension ideas. • Is correlated with MN Academic Standards (Science, Language Arts, History, Social Studies, and Math) and MN Environmental Literacy Scope and Sequence benchmarks • Can stand alone or be combined in thematic units.	• K – 8th grade teachers in formal education settings and their students (primary audience is 3rd-5th grade teachers and students) • Youth program leaders in nonformal education settings and their youth participants • Outdoor industry/ retail professional staff in nonformal education settings and their youth participants	**Teachers/Program Leaders** • Use of Leader's Guide to teach about aquatic habitats, MN fish, water stewardship, fisheries management, fishing equipment and skills, and fishing safety • Use of Leader's Guide to facilitate fishing trips and service-learning projects relating to aquatic resources • Knowledge and skills relating to topics covered in the Leader's Guide **Students** • Knowledge about aquatic habitats, MN fish, and fish management • Procedural knowledge of and skills in water stewardship and fishing • Development of science process skills • Awareness of local aquatic environmental issues • Awareness of the need for conserving natural resources and of the roles the DNR and MN citizens play in conservation • Appreciation for MN's aquatic resources & habitats • Interest in fishing	**Teachers/ Program Leaders** • Perception of Leader's Guide as effective in supporting curricular goals and engaging students in learning • Development of partnerships/ projects with local, aquatic resources/angling professionals **Students** • Systems-based understanding of interconnection of natural, built and social components of environment • Skill development in issue investigation, decision making, problem solving, and systems thinking in an aquatic environment context • Participation in fishing	Sustainable implementation of *Fishing: Get in the Habitat!* Participation in local communities as informed decision-makers and active stewards of MN's aquatic resources Responsible, life-long participation in recreational fishing and sharing of that activity with others **Desired Impact:** Conservation of Minnesota's aquatic resources Healthy aquatic ecosystems entrusted to future generations of Minnesotans

(Logic Model Continued)

EXTERNAL FACTORS: standards-based accountability emphasis, effectiveness of introductory workshop

PROGRAM ASSUMPTIONS:

- MinnAqua Leader's Guide lessons are developmentally-appropriate, relevant, real-world, experiential, interdisciplinary, systems-based, and standards-based.
- Alignment of lessons to MN Academic Standards enhances the usability of the lessons and relevance to classroom curriculum for teachers.
- Addressing academic standards through a local environmental context increases relevancy and engages students in learning; aquatic resources and fishing are engaging aspects of a local environment for teachers and students.
- Fishing/aquatic resources-themed lessons encourage teachers to use the outdoor local environment as an extension of the classroom; outdoor learning engages students and enhances learning.
- Teachers want and will use educationally-sound, external curricula to supplement their classroom curricula.
- Teachers have the knowledge, skill, and motivation necessary to select a lesson or combine lessons into units that will effectively support and enrich their classroom curricula; a variety of lesson combinations, when supplemented with a service-learning project and a fishing trip, can lead to the intended outcomes.
- Through the Leader's Guide workshop, teachers will realize the importance of and implement environmental service-learning projects, even though this aspect appears as an appendix in the Leader's Guide.
- Awareness, knowledge, procedural knowledge, skill development, and appreciation are antecedents to responsible environmental behavior and conservation of Minnesota's aquatic resources.
- Service learning experiences influence the knowledge, attitudes, skills, and motivation necessary for students' continued participation in their local communities as informed decision-makers and active stewards of MN's aquatic resources.
- Learning about fishing (equipment, ethics, and skills) and having the opportunity to participate in a fishing trip will increase students' interest in fishing; an interest in fishing and participation in a fishing experience are antecedents to lifelong, responsible participation in fishing.

MinnAqua Program
Minnesota Department of Natural Resources
Division of Fish and Wildlife
500 Lafayette Road
St. Paul, MN 55155-4020
www.dnr.state.mn.us/minnaqua/index.html

MinnAqua Mission
Provide life-long educational programming that will increase people's knowledge and understanding about aquatic ecosystems, management, and resource issues; help people acquire skills related to aquatic recreation, careers, and teaching; and foster better stewardship of Minnesota's natural resources.

Figure 2. Evaluation Focus for the *Fishing: Get in the Habitat!: MinnAqua Leader's Guide*

The purpose of this evaluation is to assess the distribution methods, implementation, and program outcomes of the *Fishing: Get in the Habitat!* Leader's Guide. This information will be used by MinnAqua staff to inform decisions relating to future distribution, training workshops, and follow-up support.

Evaluation Questions (to be answered through an assessment of distribution, implementation, and program outcomes)

1. Are revisions to the current distribution and training workshop approach needed?
2. Is follow-up support needed, and if so, what kind or type do teachers and program leaders suggest?

Assessment of Distribution Methods:

1. How is the Leader's Guide being distributed?
    a. How many are obtaining the Leader's Guide through the workshop v. some other way? What is the range of variation in workshop length?
2. What are teachers'/program leaders' reactions to the current distribution method and suggestions for future distribution?
3. Are teachers/program leaders' understandings of the purpose and "ideal implementation" of the Leader's Guide related to distribution method?

Assessment of Implementation

1. How is the Leader's Guide being implemented in the formal setting? In the nonformal setting?
    a. Of those receiving the Leader's Guide, how many have implemented it? With what grade level or age of students? In what classes or programs? As a stand-alone piece or integrated into/supporting a specific course(s)? For what purpose?
    b. What specific sections/activities are being implemented?
2. Are teachers/program leaders using the Leader's Guide to:
    a. Teach about aquatic habitats, MN fish, water stewardship, fisheries management, fishing equipment and skills, and fishing safety?
    b. Facilitate fishing trips?
    c. Facilitate service-learning projects relating to aquatic resources?
    d. Teach about aquatic habitats, MN fish, water stewardship, fisheries management, fishing equipment and skills, and fishing safety AND facilitate a fishing trip and service-learning project?
3. What influences teachers'/leaders' choices regarding what/how much to implement?
    a. Distribution approach?
    b. Understanding of "ideal implementation?"
    c. Understanding of purpose of the Leader's Guide?
    d. What barriers prevent teachers'/leaders' use (and ideal use) of the Leader's Guide?
    e. What motivates teachers to use the Leader's Guide?
4. Do teachers/program leaders perceive follow-up support would encourage use and ideal implementation? If so, what kind/type of support would be helpful?

Assessment of Program Outcomes

1. Do teachers perceive the Leader's Guide as effective in supporting their curricular goals and engaging students in learning? In fostering partnerships with local, aquatic resource professionals or agencies? In stimulating interest in recreational fishing and fostering responsible participation in stewardship of MN's aquatic resources?
2. When implemented as intended, does the Leader's Guide increase students':
    a. Knowledge about aquatic habitats, MN fish, and fish management?
    b. Procedural knowledge of and skills in water stewardship and fishing?
    c. Proficiency with science process skills?
    d. Awareness of local aquatic environmental issues?
    e. Awareness of the need for conserving natural resources and of the roles the DNR and MN Citizens play in conservation?
    f. Appreciation for MN's aquatic resources and habitats?
    g. Interest in fishing?

Figure 3: Summary of Data Collection, Design, and Sampling

Assessment Area/Question	Data Collection Tool	Source(s) of Information:	Design and Sampling
Distribution methods	Phase 1 Instructor Questionnaire	Teachers and program leaders	Cross-sectional survey design; Random sample of Minnesota teachers/program leaders who have the Leader's Guide
Implementation	Phase 1 Instructor Questionnaire	Teachers and program leaders	Cross-sectional survey design; Random sample of Minnesota teachers/program leaders who have the Leader's Guide
Program outcomes			
1. Do instructors perceive the Leader's Guide as effective in supporting their curricular goals and engaging students in learning? In fostering partnerships with local, aquatic resource professionals or agencies? In stimulating interest in recreation fishing and fostering responsible participation in stewardship of MN's aquatic resources?	Phase 1 Instructor Questionnaire	Teachers and program leaders	Cross-sectional survey design; Random sample of Minnesota teachers/program leaders who have the Leader's Guide and implemented any part of the Leader's Guide
2a. When implemented as intended, does the Leader's Guide increase students' knowledge about aquatic habitats, MN fish, and fish management?	Student Questionnaire (self-reported knowledge)	Students	Pretest-Posttest Treatment Group Only design; All students of the instructors participating in Phase 2 of the evaluation
	Activity-embedded assessment (assessment products examined for evidence of students' knowledge about aquatic habitats, MN fish, and fish management)	Teachers/program leaders (collect students' work)	Posttest-only; All students of the instructors participating in Phase 2 of the evaluation
	Phase 2 Instructor Questionnaire	Teachers/program leaders	Cross-sectional survey design (after the program); Instructors whose students participated in Phase 2 of the evaluation

Assessment Area/Question	Data Collection Tool	Source(s) of Information:	Design and Sampling
2b. When implemented as intended, does the Leader's Guide increase students' procedural knowledge of and skills in water stewardship and fishing?	Student Questionnaire (self-reported knowledge and skills)	Students	Pretest-Posttest Treatment Group Only design; All students of the instructors participating in Phase 2 of the evaluation
	Activity-embedded assessment (assessment products examined for evidence of students' procedural knowledge of and skills in water stewardship and fishing)	Teachers/program leaders (collect students' work)	Posttest-only All students of the instructors participating in Phase 2 of the evaluation
	Phase 2 Instructor Questionnaire	Teachers/program leaders	Cross-sectional survey design (after the program); Instructors whose students are participating in Phase 2 of the evaluation
2c. When implemented as intended, does the Leader's Guide increase students' proficiency with science process skills?	Activity-embedded assessment (assessment products examined for evidence of students' science process skills)	Teachers/program leaders (collect students' work)	Posttest-only All students in the classrooms participating in Phase 2 of the evaluation
	Phase 2 Instructor Questionnaire	Teachers/program leaders	Cross-sectional survey design (after the program); Teachers whose students participated in Phase 2 of the evaluation
2d. When implemented as intended, does the Leader's Guide increase students' awareness of local aquatic environmental issues?	Student Questionnaire	Students	Pretest-Posttest Treatment Group Only design; All students of the instructors participating in Phase 2 of the evaluation
	Activity-embedded assessment (assessment products examined for evidence of students' awareness of local aquatic environmental issues)	Teachers/program leaders (collect students' work)	Posttest-only All students of the instructors participating in Phase 2 of the evaluation
	Phase 2 Instructor Questionnaire	Teachers/program leaders	Cross-sectional survey design; Instructors whose students participated in Phase 2 of the evaluation

Assessment Area/Question	Data Collection Tool	Source(s) of Information:	Design and Sampling
2e. When implemented as intended, does the Leader's Guide increase students' awareness of the need for conserving natural resources and of the roles the DNR and MN Citizens play in conservation?	Student Questionnaire Phase 2 Instructor Questionnaire	Students Teachers/program leaders	Pretest-Posttest Treatment Group Only design; All students of the instructors participating in Phase 2 of the evaluation Cross-sectional survey design (after the program); Instructors whose students participated in Phase 2 of the evaluation
2f. When implemented as intended, does the Leader's Guide increase students' appreciation for MN's aquatic resources and habitats?	Student Questionnaire	Students	Pretest-Posttest Treatment Group Only design; All students of the instructors participating in Phase 2 of the evaluation
2g. When implemented as intended, does the Leader's Guide increase students' interest in fishing?	Student Questionnaire	Students	Pretest-Posttest Treatment Only design; All students of the instructors participating in Phase 2 of the evaluation

Figure 4: Phase One Instructor Questionnaire Items and Results

Fishing: Get in the Habitat! Leader's Guide Instructor Questionnaire

Directions: The questions that follow pertain to the ***Fishing: Get in the Habitat!*** *MinnAqua Leader Guide*, an educational Leader's Guide produced by the DNR's MinnAqua program. Regardless of whether or not you've used the Leader's Guide, you are invited to complete the questionnaire and return it in the attached addressed, stamped envelope. The questionnaire should take about 15-20 minutes to complete. Note that the questionnaire is double-sided. No responses are more desirable than others, so please try to respond with what is true for you! **Thank you very much for your**

1. Are you a: (*n*=129)

   € teacher in a formal classroom setting 80, 69.0%
   € program leader/instructor in a nonformal (non-classroom) setting 26, 20.2%
   € other: _____14, 10.8%

2. How did you obtain the *Fishing: Get in the Habitat!* MinnAqua Leader's Guide? (*n*=128)

   € at a training workshop **(proceed to question 3)** 94, 73.4%
   € mailed to me from MinnAqua **(go to question 8)** 12, 9.4%
   € given to me by a colleague **(go to question 8)** 7, 5.5%
   € other: _____**(go to question 8)** 15, 11.7%

3. If you received the Leader's Guide through a training workshop, please indicate the approximate length of your workshop: (**if you didn't attend a workshop, please go to question 8**). (*n*=90)

   €< 1 hour €1 hour €2 hours €3 hours €4 hours €5 hours €6 hours €7 hours €8 hours
   Mean length = 4.13 hours (Median and mode = 4) (10 - 1 hr; 14 - 2hr; 13 - 3hr; 20 - 4 hr; 6 - 5 hr; 14 - 6 hr; 3 - 7 hr; 10 - 8 hr)

4. How would you rate the effectiveness of the training workshop on each of the following items? (*n*=95)

	Very effective	Effective	Somewhat effective	Ineffective	Very ineffective
Conveying the overall purpose (goal) of the *Fishing: Get in the Habitat*! Leader's Guide *M* = 4.40, *SD* = .63	€	€	€	€	€
Helping you become familiar with the Leader's Guide and its contents *M* = 4.35, *SD* = .73	€	€	€	€	€
Helping you learn how to use the Leader's Guide *M* = 4.27, *SD* = .79	€	€	€	€	€
Helping you understand how the Leader's Guide is supposed to be implemented (how the Leader's Guide ideally is to be implemented) *M* = 4.18, *SD* = .87	€	€	€	€	€
Motivating you to want to use the Leader's Guide M = 4.22, *SD* = .81	€	€	€	€	€
Helping you understand the relevance of the Leader's Guide to the work you do in the classroom or nonformal education setting *M* = 4.03, *SD* .93	€	€	€	€	€

Overall workshop effectiveness (average of the 6 items): *M* = 4.24, *SD* = .63

5. Do you have any suggestions relating to the training workshop and in particular, suggestions relating to using the workshop as an approach for distributing the Leader's Guide? (*n* = 40)

   23 respondents commented it was fine/went well/was good etc. (3 of the 22 commented on the hands-on component, 1 on the method of splitting into groups to present the lesson, 1 liked being able to see both the print and electronic resources)

   Suggestions relating to the workshop:
   3 indicated needing a longer workshop
   3 indicated feeling rushed or overwhelmed
   2 indicated wanting to have seen the entire resource instead of just parts (just samples of lessons)
   2 suggested incorporating examples of real world use, such as classrooms that have used and modified the curriculum or a video of the curriculum in action
   1 suggested targeting workshops by grade level (having workshop for K-2 v. K-6 for example)

   Suggestions relating to using workshop as an approach for distribution:
   3 respondents indicated not needing the workshop
   1 suggested targeting nonformal educators,
   1 suggested targeting EE specialists at schools
   1 suggested hosting trainings within school districts

6. Assuming you heard or knew about the MinnAqua Leader's Guide (knew it existed), would you have been motivated to **access** the Leader's Guide from a website? (*n* = 95)

   - € Yes, I would have been motivated to access it via a website 46, 48.4%
   - € No, I needed the workshop, as I wouldn't have bothered to find it from a website 49, 51.6%

6. Would you have been able to **use** the Leader's Guide without having attended the training workshop? (*n* = 95)

   € Yes 69, 72.6% € No 26, 27.4%

7. **(All Respond)** Do you feel the way **you** obtained the Leader's Guide (website, workshop, etc.) was effective? (*n* = 121) € Yes 116, 95.9% € No 5, 4.1% (of those responding no, 2 obtained it through a training, 2 through a colleague, and 1 through some other manner; of the 2 obtaining it through the workshop, they perceived the effectiveness of the workshop to be a 4.33, 4.50; length of those two workshops were 4 hours and 8 hours)

   What other forms of distribution do you suggest MinnAqua consider in their efforts to make this Leader's Guide *accessible* to instructors and *encourage and prepare instructors to use it*? What other suggestions do you have for MinnAqua to consider as they determine how they'll distribute the Leader's Guide in the future? (*n* = 80)

   Approach:
   Workshop was necessary/best - 10
   Online via a website – 5
   On a CD/DVD that can be ordered (not all have internet access) – 4
   Partner with Project WET or WILD – 4
   Distribute CD of curriculum at Conferences/Conventions – 4

MSTA, MN Ag Teachers, State FFA, Education MN, etc.
Offer training through technology (web casts, online tutorials) - 2
Distribute CD/curriculum at fishing/sporting expos, state/county fairs - 2
Offer CEU credits with workshop – 2
Distribute it via an attachment to an email – 1
Email teachers the link to the website - 1
Train teachers who then train other teachers - 1
Keep both options of website and training – 1

Workshop Locations:
Workshops at schools and/or within a district – 11
Workshop at a nature center or park and recreation departments – 2
Workshop at school that is part of required staff training – 1
Summer class at ELC – 1

Raise awareness among/get materials to:
Curriculum specialists – 3
Pre-service teachers – 1
Scout leaders – 1
4-H - 1
High School teachers – 1
College professors to share with students - 1

Marketing:
Send samples to schools/teachers, with rest accessible online – 4
Send flyers to target audiences to raise awareness of workshop and Leader's Guide – 4
Links to or articles about Leader's Guide on websites, such as Girl Scouts, MSTA, etc. - 2
Distribute short video to schools, and if school is interested, present workshop there - 1
Encourage teachers to invite other teachers – 1
Articles in magazines, such as teacher magazines, Volunteer - 1
Email all teachers with a sales pitch - 1

About the workshop:
Keep hands-on component/practice component – 2
Include a hands-on component of going fishing - 2
Show more of the lessons/more time on lessons - 2
Let participants browse online lessons/resources – 2
Present lessons earlier in the workshop – 1
Provide workshops with outdoor component for teachers who aren't comfortable with outdoor teaching -1
Have workshop focus just on the Leader's Guide, rather than the Leader's Guide part of broader workshop -1

Other:
Keep relationship with MN STEP – 2
Partner with Gander Mountain -1
Available in languages other than English – 1
Explore possibility of seasonal/school year fishing permits to encourage fishing -1

8. **(All Respond)** Do you know the goal (intended outcome or overall purpose) of the *Fishing: Get in the Habitat!* Leader's Guide? (*n* = 124) € Yes 71, 57.3% € No 7, 5.6% € Not Sure 46, 37.1%

If you responded yes, what is your understanding of this goal?

Stated goal in the Leader's Guide: instructors will use it to: teach about MN fish, aquatic resources, and resource management (knowledge); lead students outdoors and initiate self-sustaining program such as volunteer monitoring, shoreline restoration, and other service-learning projects (service-learning/action); connect students to their local aquatic resources through angling (fishing); and promote lasting stewardship of MN's aquatic resources (stewardship)

Number of respondents stating the goal in terms of:
Knowledge – 15
Service-Learning/Action – 0
Fishing – 16
Stewardship – 5
A combination of the sub-goals (at least two of the sub-goals, but not all) – 22
All of the sub-goals/full definition – 0
Vague or Goal other than as stated in Leader's Guide – 18 (vague: "greater understanding by students;" or incorrect: "to have the science specialist teach it")

10. **(All Respond)** What is your understanding of the way the Leader's Guide is supposed to be implemented? (What is the ideal way MinnAqua would like you to use the Leader's Guide?) (*n* = 125)
    - € I'm not sure 10, 8.0%
    - € In whatever way best suits my educational setting and goals 102, 81.6%
    - € As single, stand-alone lessons 1, .8%
    - € Implement *all* the activities from any *one* chapter
    - € Implement all the activities from any *one* chapter AND a fishing trip and service project 1, .8%
    - € Implement *one* activity from *each* chapter
    - € Implement *an* activity from *each* chapter AND a fishing trip and service project 10, 8.0%
    - € Implement the entire Leader's Guide 1, .8%

11. **(All Respond)** Do you anticipate encountering or have you already encountered *obstacles* to use of the Leader's Guide? (n=119) € Yes (44, 37%) € No (75, 63%)

    If you responded yes, what obstacles have made or might make implementation difficult?
    Most frequently listed obstacles: lack of time (23); having to print the lessons (8); amount of materials/size of binder (4); need for adapting materials for grade level I teach (4); cost of/access to necessary materials/equipment (4); lack for transportation for trip/project (3); other obstacles (listed by one or two respondents): difficulty accessing online materials; lack of an "at a glance" topical section; lack of school support; lack of supervision for trip/project; team-teaching setting and team not having training or wanting to implement Leader's Guide; lack of relevance to what I teach; cultural bias

12. **(All Respond)** Would follow-up support from MinnAqua encourage and/or support your use of the Leader's Guide? (n=113) € Yes 72, 63.7% € No 41, 36.3%

    If you responded yes, what kind or type of follow-up support would you find helpful? (for example, additional training? additional curricular resources? access to aquatic scientists? help with organizing a fishing trip? etc.)
    Additional training and/or curricular resources – 11
    Sharing examples and stories of how it's being used or modified/information on successful users – 8
    Access to experts/aquatic scientists and local fishing experts – 8
    Access to education specialist to ask questions or trouble-shoot – 4
    Access to someone who could come in to teach the curriculum – 3

Email or newsletter updates of workshops, new lessons, new ideas, and online resources – 2
Service-learning resources and ideas – 2
Supplies/money for supplies - 2
Resources on current events – 1
Newsletter highlighting a lesson – 1
Expert to accompany field trip – 1
Virtual field trip - 1

13. **(All Respond)** Is it likely you would need assistance or support in implementing a fishing trip? (*n*=121)

- € No; I can do this on my own/with my own skills and resources (29, 24%)
- € While support would be helpful, I would still be able to implement a fishing trip for my students without assistance from MinnAqua (51, 42.1%)
- € Yes, I would need support and/or assistance. (41, 33.9%) Please list what kind or type of support you would need to implement a fishing trip:

equipment – 15
expertise in fishing/expert to teach this - 9
funding for transportation – 8
help organizing/planning the trip – 8
help with supervising the trip -5
ideas of locations - 3
time for planning the trip – 2
ideas for gaining school board/parent support – 2
ideas for overcoming liability concerns - 1

14. **(All Respond)** Is it likely you would need assistance or support in implementing a service project relating to aquatic resources? (*n*=120)

- € No; I can do this on my own/with my own skills and resources 29, 24.2%
- € While support would be helpful, I would still be able to implement a service project with my students without assistance from MinnAqua 61, 50.8%
- € Yes, I would need support and/or assistance. 30, 25.0% Please list what kind or type of support you would need to implement a service project:

Ideas/directions/age-appropriate ideas – 9
Transportation funds – 5
Time for planning – 3
Help in planning – 3
Help in implementing – 3
Community partners – 1

15. **(All Respond)** To date, have you implemented any part of the MinnAqua Leader's Guide? (*n*=112)

- € Yes **(proceed to Question 16)** 43, 38.4%
- € No **(go to Question 18)** 32, 28.6%
- € Not yet, but I plan to **(go to Question 18)** 37, 33.0%

16. If you have implemented any portion of the MinnAqua Leader's Guide: (*n* = 47) **(if you haven't, please skip to Question 18.)**

Did you implement it in €a classroom/indoors 21, 44.7% €outdoors 5, 10.6% €both 21, 44.7%

With what grade level did you use it (if you used it with youth outside the classroom, check the closest equivalent grade level to the age you worked with): (*n*=44)
€K-2 10, 22.7% €3rd 10, 22.7% €4th 4, 9.1% €5th 5, 11.4% €6th-8th 5, 3.9% €9th-12th 10, 22.7%

In what class(as), subject area(s), or program(s)?
Science – 11
Agricultural/natural resource science – 5
Environmental science – 1
One in each: field day, camping trip, girl scout meeting, art, language arts, social studies, math, gifted after school program, within a service learning project, as a naturalist activity in our magnet school, at a nature center)

(Question 16 continued)
What specific activities or lessons did you use? (you can list titles or page numbers)
Fishing trip, used background knowledge v. the activities, slide show of fish species, fish jeopardy, food chain tag, paper Mache fish, fish identification, fish parts, fish IQ, water habitat site study, macro invertebrate mayhem, pop can casting, run for habitat, form and function, rods and reels, macro invertebrate ID, at the waters edge, fish sense, fish families, fishing regulations, safety, at the water's edge, incredible journey, lake game, run for your life cycle, food chain tag, fish prints, would you drink this water, fish families, adapted for habitats, wonderful watersheds (note: most teachers left this blank, thus this shouldn't be interpreted as activities most frequently used; overall uninterpretable results)

Did you use the Leader's Guide to (check all that apply): (*n*=45)

- € Teach about aquatic habitats 34, 75.5%
- € Teach about MN fish 36, 80%
- € Teach about water stewardship 21, 46.7%
- € Teach about fisheries management 7, 15.5%
- € Teach about fishing equipment and skills, and/or fishing safety 18, 40.0%
- € Take students on a fishing trip 14, 31.1%
- € Implement a service-learning project relating to aquatic resources 13, 28%

Did you use the lesson(s) in the Leader's Guide: (check all that apply) (*n*=47)

- € As a stand alone, "extra" activity that doesn't support or align with existing educational goals or content areas 7, 14.9%
- € By integrating it into an existing class or program (or connecting it with content from an existing class or program) 34, 72.3%
  6 used it both in both ways,12.8%

For what reason(s) did you use the Leader's Guide? (check all that apply) (*n*=47)

- € To supplement, enrich, or support what I am already teaching 42, 89.4%
- € To teach about fish and/or aquatic related topics 29, 22.5%
- € To foster interest in or appreciation for the natural world 30, 63.8%
- € To motivate my students/youth (to engage them in a topic I thought they'd find interesting, relevant, or fun) 26, 55.3%
- € Other: 16, 35.6%

17. How effective do you perceive the Leader's Guide is in each of the following areas? (*n*=46)

	Very effective	Effective	Somewhat effective	Ineffective	Very ineffective
Supporting your curricular goals *M*=4.24, *SD*=.71	€	€	€	€	€
Engaging students/youth in learning *M*=4.54, *SD*=.66	€	€	€	€	€
Fostering partnerships with local, aquatic professionals *M*=3.95, SD=.75	€	€	€	€	€
Stimulating interest in recreational fishing *M*=4.34, SD=.75	€	€	€	€	€
Fostering responsible participation in stewardship of Minnesota's aquatic resources *M*=4.15, *SD*=.89	€	€	€	€	€
Overall Effectiveness (average of 5) *M*=4.29, *SD*=.48					

Figure 5: Student Pretest/Posttest Items and Results

1. Instead of writing your name, please create your own code:
The second letter of your last name (if your last name was Smith, you'd write M) ____
The date of your birthday (if it's May 16, you'd put 16) _____
Your middle initial ____

2. Are you a € Girl *n*=92, 63.4% € Boy *n*=53, 36.6% (*N*=145)

3. How old are you _____ Most respondents were 9 and 10 year olds. Range of ages of respondent was 7-13; year olds. Frequencies: 1-7yr old (.7%), 16-8 yr olds (11.1%), 82-9 yr olds (56.9%), 38-10 yr olds (26.4%), 6-11 yr olds (4.1%), 1-13 yr old (.7%)

4. Have you ever been fishing? € Yes € No
Of the 144 respondents on the pretest, 132 (91.7%) had been fishing, as compared to 138 of the 141 posttest respondents (97.9%). This increase is significant, $t(139) = -2.54$, $p = .01$.

5. How much do you know about: (please respond what is true for YOU, not how much you think you should know, or how your friend knows)

	Pretest Mean	Pretest *SD*	Posttest Mean	Posttest *SD*	Significance of change
The lakes, rivers, streams or ponds near your home	2.38	1.02	2.97	.95	$t(143) = -6.94$, $p < .001$
The fish that live in Minnesota's lakes, rivers, and streams	2.50	.96	3.13	.86	$t(142) = -7.24$, $p < .001$
The rules and regulations about fishing	2.49	1.08	3.18	.79	$t(140) = -7.09$, $p < .001$
How the Department of Natural Resources (DNR) manages fish and water resources	1.77	.96	2.75	.96	$t(141) = -9.28$, $p < .001$
Taking care of Minnesota's lakes, rivers, streams and ponds (things you could do to protect or clean up Minnesota's waters)	2.93	1.06	3.48	.80	$t(142) = -6.01$, $p < .001$
Fishing (fishing equipment, fishing skills, and fishing safety)	3.04	1.07	3.56	.71	$t(142) = -5.35$, $p < .001$

Note: N = 141-144, depending on the item;
Note: Scale of 1 (Not very much) to 4 (A lot)
Note: All items showed significant increase from pretest to posttest.

6. Think about the lakes, rivers, and streams near where you live. Do you know of any problems affecting any of these places? If so, write them here:
Of the 145 respondents on the pretest, 42.8% (*n*=62) answered correctly, 9.0% (*n*=13) answered partially correctly, and 48.3% (*n*=70) answered incorrectly. Of the 141 respondents on the posttest, 72.3% (*n*=102) answered correctly, 3.5% (*n*=5) answered partially correctly, and 24.1% (n=34) answered incorrectly. The change in *correct* responses from pretest to posttest was significant, $t(140) = -6.21$, $p < .001$.

7. Of the problems you listed, are any of them problems where people don't really agree on how to solve them (or people have different ideas on what should be done about the problem)? If so, list those problems where people don't agree on the solution:
Of the 145 respondents on the pretest, 2.8% (*n*=4) answered correctly, 4.8% (*n*=7) answered partially correctly, and 92.4% (*n*=134) answered incorrectly. Of the 137 respondents on the posttest, 16.8% (*n*=23) responded correctly, 10.9% (*n*= 15) responded partially correctly, and 72.3% (*n*=99) responded incorrectly. The change in correct responses from pretest to posttest was significant, $t(135) = -4.20$, $p < .001$.

8. How important do you think it is that we take care of Minnesota's lakes, streams, and rivers and the animals and plants that live in them?

€ Not at all important € A little important € Important € Very important

Based on data from the 143 respondents, the mean pretest response was 3.80 (*SD*=.58) and the mean posttest response was 3.80 (*SD*=.58), which corresponded to a rating of very important. There was no change between the pretest and posttest responses, $t(142) = .12$, $p = .90$.

9. Whose responsibility is it to take care of Minnesota's natural resources (trees, lakes, rivers, air, prairies, wildlife, etc.)?

- € No one's; these natural resources are already taken care of
- € People like scientists and park rangers and game wardens
- € Everyone's responsibility

Based on data from the 141 respondents, 92.2% (*n*=130) thought it was everyone's responsibility, 5.7% (*n*=8) thought it was the responsibility of scientists/rangers/wardens, and 2.1% (*n*=3) thought it was no one's responsibility. Of the 145 respondents on the posttest, 93.8% (*n*=136) thought it was everyone's responsibility, 4.1% (*n*=6) thought it was the responsibility of scientists/rangers/wardens, and 2.1% (*n*=3) thought it was no one's responsibility. The increase in number of responses of "everyone's responsibility" from pretest to posttest was not significant, $t(140) = -.53$, $p = .60$.

10. Can you think of anything the Department of Natural Resources (DNR) does to help take care of Minnesota's natural resources (trees, lakes, rivers, air, prairies, wildlife)? Write your ideas here:

Of the 144 respondents on the pretest, 29.2% (*n*=42) answered correctly. Of the 143 respondents on the posttest, 65.7% (*n*=94) answered correctly. The increase in correct responses from pretest to posttest was significant, $t(141) = -7.44$, $p < .001$.

11. Can you think of anything people who live in Minnesota (Minnesota citizens) can do to take care of the natural resources (trees, lakes, rivers, air, prairies, wildlife) in our state? Write your ideas here:

Of the 145 respondents on the pretest, 61.4% (*n*=89) answered correctly. Of the 144 respondents on the posttest, 80.6% (*n*=116) answered correctly. The increase in correct responses from pretest to posttest was significant, $t(143) = -4.16$, $p < .001$.

12. Can you think of anything YOU can do to take care of the natural resources (trees, lakes, rivers, air, prairies, wildlife) in Minnesota? Write your ideas here:

Of the 142 respondents on the pretest, 66.9% (*n*=95) answered correctly. Of the 129 respondents on the posttest, 88.4% (*n*=114) answered correctly. The increase in correct responses from pretest to posttest was significant, $t(125) = -4.40$, $p < .001$.

13. Pretend you are standing on the edge of a lake. Which of these might you most likely be thinking: (just check one!)

- € This lake is really beautiful.
- € This lake could provide a lot of water for people who don't have any water.
- € This lake would be a great place for swimming or fishing or boating.
- € This would be a good place to build a home.
- € This lake is important because it provides a home for fish, other wildlife, and plants.

Of the 145 pretest respondents, the most frequent response was "this lake is important because it provides a home for fish, other wildlife, and plants" (*n*=81, 55.9%). Of the 139 respondents on the posttest, the most frequent response was "this lake is important because it provides a home for fish, other wildlife, and plants" (n=92, 66.2%). The increase in number of responses from pretest to posttest was significant, $t(138) = -2.25$, $p = .03$.

14. Which of these are you thankful for? (You can check as many of the boxes as you'd like

- € My family
- € Clean air
- € My friends
- € Flowers, trees, and other plants
- € My clothes and food
- € Fish
- € Nature
- € Things I like to use or play with in my free time
- € Stores
- € My home
- € Clean water
- € Lakes, rivers, streams, and ponds
- € Wildlife

The four responses of interest in this item are as follows: fish; wildlife; clean water; and lakes, rivers, streams, and ponds (collectively indicating appreciation in Minnesota's aquatic resources and habitats). The number of respondents indicating appreciation for these items on the posttests was significantly higher than the number of respondents indicating appreciation for these items on the pretests.

	Percentage of respondents indicating appreciation on pretest	Percentage of respondents indicating appreciation on posttest	Significance of change
Fish	80.6%	94.3%	$t(138) = -4.00$, $p < .001$
Wildlife	89.7%	96.4%	$t(139) = -2.54$, $p = .01$
Clean water	89.7%	97.9%	$t(141) = -3.32$, $p < .01$
Lakes, rivers, streams, and ponds	87.6%	97.9%	$t(139) = -3.65$, $p < .001$

15. Which of these kids are you most like? (just check one box!)

- € Kids who really appreciate (are thankful for) Minnesota's lakes, streams, rivers, and ponds.
- € Kids who somewhat appreciate Minnesota's lakes, streams, rivers, and ponds.
- € Kids who don't appreciate Minnesota's lakes, streams, rivers, and ponds.
- € Kids who really don't appreciate Minnesota's lakes, streams, rivers, and wetlands at all

Of the 138 respondents on the pretest, the average response was 1.24 (SD=.52), which corresponded to a rating of really appreciating Minnesota's lakes, streams, rivers, and ponds. The average response (n=138) on the posttest was 1.20 (SD=.47), which also corresponded to a rating of really appreciating Minnesota's lakes, streams, rivers, and ponds. This change in mean response was not significant $t(137) = .87$, $p = .34$.

16. Which of these kids are you most like? (just check one box!)

- € Kids who don't like going fishing at all.
- € Kids who aren't sure if they like fishing because they haven't tried it.
- € Kids who like going fishing a little bit.
- € Kids who really like going fishing.

Of the 137 respondents on the pretest, the average response was 3.47 (SD=.77), which corresponded to a rating of kids who like going fishing a little bit to kids who really like going fishing. The average response on the posttest (n=137) was 3.62 (SD=.61), corresponding to the same rating as the pretest. This change in mean response was not significant $t(136) = -1.20$, $p = .051$.

17. If one of your family members or friends invited you to go fishing, would you: (just check one box!)

- € Be very excited and want to go with them
- € Be excited and want to go with them
- € Not be that excited about going, but still go with them
- € Probably not go with them
- € Definitely not go with them

Of the 138 respondents on the pretest, the average response was 1.54 (*SD*=.66), which corresponded to a rating of being excited and wanting to go along fishing to being very excited and wanting to go along. The average response (*n*=138) on the posttest was 1.54 (*SD*=.65), which corresponded to the same rating. There was no significant change from pretest to posttest $t(137) = .00$, $p = 1.00$.

18. When you are a grown-up, do you think you'll go fishing? (just check one box!)

- € Yes; I think I'll go fishing often
- € Yes; I think I'll go fishing once in a while
- € Maybe I'll go fishing
- € No; I don't think I'll go fishing
- € No; I definitely won't go fishing

Of the 138 respondents on the pretest, the average response was 1.87 (*SD*=.77), which corresponded to a rating of going fishing once in a while as a grown-up. The average response on the posttest was 1.80 (*SD*=.75), which corresponded to the same rating. This change was not significant $t(137) = 1.18$, $p = .24$.

19. When you are a grown-up, do you think you will teach others, such as your children, or nieces and nephews, or a friend, to fish? (just check one box!)

- € Yes; I'm sure I will
- € Yes; I probably will
- € Maybe I will
- € No; I don't think I will
- € No; I'm sure I won't

Of the 138 respondents on the pretest, the average response was 1.85 (*SD*=.98), which corresponded to a rating of probably helping teach others to fish when a grown-up. The average response on the posttest was 1.74 (*SD*=.89), which corresponded to the same rating. This change was not significant $t(137) = 1.30$, $p = .19$.

Figure 6: Phase Two Instructor Questionnaire Items and Results

Name:_____

Respondents: 10 teachers/program leaders responded to the questionnaire; 6 of them participated in the evaluation activities involving student data collection, and 4 of them taught at a school where there was a teacher participating in the student data collection activities.

1. What activity or activities did you implement from each of the following chapters?

Chapter 1: Aquatic Habitats _____

Chapter 2: Minnesota Fish _____

Chapter 3: Water Stewardship _____

Chapter 4: Fish Management _____

Chapter 5: Fishing Equipment and Skills_____

Chapter 6: Safety & Fishing Trip _____

All 10 respondents indicated implementing an activity per chapter; there were not patterns in terms of which specific activities were implemented.

2. Briefly describe the fishing trip you took with your students (what kind of fishing, where, when, how long, before or after the lessons, etc.)
All 10 respondents indicated implementing a fishing trip.

3. Briefly describe the service project you and your students did.
Seven of the 10 respondents indicated implementing a service project.

4. Based on your observations and interactions with your students, do you feel their participation in the Fishing: Get in the Habitat! program increased their:

	Not at all	A little	Some what	Very much
Knowledge about aquatic habitats? *M* = 3.30, *SD* = .48	€	€	€	€
Knowledge about MN fish? *M* = 3.90, *SD* = .32	€	€	€	€
Knowledge about fish management? *M* = 2.90, *SD* = .32	€	€	€	€
Procedural knowledge and skills relating to water stewardship? *M* = 3.20, *SD* = .63	€	€	€	€
Procedural knowledge of and skills relating to fishing? *M* = 3.80, *SD* = .42	€	€	€	€

Do you have anything you'd like to add or explain in further detail relating to this question?

5. To what extent do you feel participation in this program increased students' proficiency with the following science process skills?

	Not at all	A little	Some what	Very much
Observation skills (using senses to find out about objects and events and their characteristics, properties, differences, similarities, and changes) *M* = 3.10, *SD* = .57	€	€	€	€
Classification skills (grouping or ordering objects or events according to similarities or differences in properties) *M* = 3.10, *SD* = .32	€	€	€	€
Measurement skills (comparing an unknown quantity with a known reference unit) *M* = 2.10, *SD* = .57	€	€	€	€
Inference skills (interpreting or explaining observations) *M* = 3.00, *SD* = .00	€	€	€	€
Prediction skills(forming an idea of an expected result, a belief of what will occur based upon present knowledge and understandings, observations, and inferences) *M* = 3.40, *SD* = .70	€	€	€	€
Communication skills (using the written and spoken word, graphs, demonstrations, drawings, diagrams, or tables to transmit information and ideas to others) *M* = 3.50, *SD* = .71	€	€	€	€
Data collection skills (gathering and recording information about observations in a systematic way) *M* = 3.10, *SD* = .57	€	€	€	€
Data interpretation skills (organizing, analyzing, and synthesizing data in ways that lead to the construction of inferences, predictions, or hypotheses) *M* = 2.90, *SD* = .57	€	€	€	€
Hypothesizing skills (making educated guesses based on evidence that can be tested through experimentation) *M* = 2.80, *SD* = .42	€	€	€	€

Mean of science process items = 3.00, *SD* = .22

Do you have anything you'd like to add or explain in further detail relating to this question?

6. To what extent do you feel participation in this program increased students'

	Not at all	A little	Some what	Very much
Awareness of environmental issues in general? *M* = 3.70, *SD* = .48	€	€	€	€
Awareness of local aquatic environmental issues? *M* = 3.60, *SD* = .70	€	€	€	€

Awareness of the need for conserving natural resources? *M* = 3.80, *SD* = .42	€	€	€	€
Awareness of the roles the DNR plays in conservation of natural resources? *M* = 3.40, *SD* = .84	€	€	€	€
Awareness of the roles MN citizens play in conservation of natural resources? *M* = 3.80, *SD* = .63	€	€	€	€
Awareness of the roles they, as students, play in conservation of natural resources? *M* = 3.90, *SD* = .32	€	€	€	€

Do you have anything you'd like to add or explain in further detail relating to this question?

7. Are there any other learning outcomes or benefits for you or your students that you believe resulted from your teaching of this curriculum? If so, please describe them:
Bringing together of community resources and people to pull off an excellent day of fishing
Learning about something (fishing) they can take home to their families
Sharing a common experience (fishing trip) created a bond between students; inviting grandparents to fish and share stories made the experience richer
Using the identification key to identify fish helped kids feel smart
Learning they can make a difference in protecting our resources

8. What were your students' reactions to participating in this curriculum?
Enthusiastic
Excited
Loved it
Loved it
Anticipation, excitement, fascination
Lots of fun
Loved it

9. What barriers did you encounter as you implemented this curriculum?
Equipment for fishing and organizing the service project
Making copies of the handouts and lessons (I'm a volunteer program leader and don't have access to free copies)
Not having a CD/DVD player in classroom to use your CD
We passed fish on to other teachers which got smelly
Time
We kept frozen fish to do the fish prints and we decided we should have invested in some rubber ones instead

10. Do you have suggestions regarding revisions to the Leader's Guide and the activities contained in it? If so, please write them here:
Manual is a bit overwhelming (but good!)
Provide a booklet for students

11. Do you have suggestions regarding how MinnAqua should be encouraging teachers to use the Leader's Guide? Currently, MinnAqua would like teachers to be implementing an activity per chapter, plus the fishing trip and the service project, similar to what you've just done. Is that what you'd recommend? Please write your thoughts here:

Curriculum should be spread out over two grade levels with a trip each year; it was a wonderful experience but too much for one year when one also has to teach required/adopted resources

Encourage teachers to use all lessons – lots of great information and fun activities for kids (scout leader's suggestion)

Find a grade-level for this – it ties with the 4th grade MN curriculum which worked for us (4th or 5th)

Activities make the point and are easy to do in short periods of time; yes I'd recommend what MinnAqua suggests

Set up good the way it is

Thank you very much for your time, effort, and participation! It is sincerely appreciated!

Figure 7: Summary of Key Findings from Phase I Instructor Questionnaire

Description of Respondents:

- Of the 129 respondents, 80 (69.0% were teachers, 26 (20.2%) were nonformal program leaders/instructors, and 14 (10.8%) indicating being someone other than a teacher or nonformal leader/instructor.
- Of the 128 respondents to this question, 94 (73.4%) received it at a training workshop, 12 (9.4%) received it by mail, and 7 (5.5%) received it from a colleague. Fifteen (11.7%) indicated receiving it through some other method.
- Of the 90 respondents who attended the workshop and responded to the particular item on workshop length, the average length of the workshop they attended was 4 hours.

Respondents' Perceptions as to the Effectiveness of Training Workshop (by average rating)

- Overall effectiveness corresponded to a rating of effective (M = 4.24, SD = .63)
- Effective in conveying the overall purpose of the Guide (M = 4.40, SD = .63)
- Effective in helping them become familiar with the Guide and its contents (M = 4.35, SD = .79)
- Effective in helping them understand how the Guide is supposed to be implemented (M = 4.18, SD = .87) (Note: Yet 10 of the 125 respondents, 8.0%, indicated a correct understanding of the way MinnAqua would like them to use the Guide)
- Effective in motivating them to want to use the Guide (M = 4.22, SD = .81)
- Effective in helping them understand the relevance of the Guide to the work they do in their respective work settings (M = 4.03, SD = .93)
- *Note: effectiveness of the workshop was perceived similarly by teachers and nonformal program leaders/instructors (no significant differences in their responses)
- *Note: Effectiveness of the workshop overall was significantly related to length of workshop (r = .21, p = .04), with those attending longer workshops perceiving the workshop to be more effective; effectiveness of the workshop in motivating them to want to use the guide was also significantly related to length of workshop (r = .27, p = .01)

Need for Workshop

- Of the 95 respondents, 46 (48.4%) would have been motivated to access the Guide from a website, without participating in the training workshop
- Of the 95 respondents, 69 (72.6%) indicated being able to use the Guide without participating in the training workshop
- Teachers and program leaders/instructors responded similarly in terms of motivation to access the Guide from the website without the training, but there appeared to be a difference between teachers and program leaders/instructors in terms being able to *use* the guide without the workshop; 69.9% of teachers (of the 73 responding to this question) say they could have used the Guide without a workshop v. 86.7% of program leaders (of the 15 responding)

Suggestions Relating to the Workshop

- Of the 40 respondents to the open-ended question, 23 indicated the workshop went well and didn't have suggestions for improvement.

- The following were general suggestions from respondents relating to the workshop: a longer workshop is needed; adjustment of pacing/amount of content is needed, as participants felt rushed; desire to see the resource as a whole instead of only parts; incorporation of examples of real-world use, perhaps through a video of the curriculum in action; targeting the workshop to specific grade levels; have the workshop be specifically on the Guide instead of part of a larger/broader workshop; keep the hands-on/practice component; include a component where participants actually go fishing; show more of /spend more time on the lessons; let participants browse the lessons and resources online; present the actual lessons sooner in the workshop; include a component for teachers who are uncomfortable taking students outdoors; offer training through technology (webcast or online tutorial); offer CEU credits along with the workshop or make it available for graduate credit; work with school administration to have the workshop be a part of required staff training (each suggestion offered by 1-3 respondents)
- Respondents frequently suggested holding workshops at schools or within school districts; several suggested having the workshop at a nature center or park and recreation department or as a summer class at a residential environmental learning center.

Suggestions Relating to Future Distribution of the Guide

- 95.9% of the respondents (n = 121) indicated the way the obtained the Guide was effective; of those indicating it wasn't effective, 2 obtained the Guide at a workshop, 2 through a colleague, and 1 through some other manner; this may suggest the appropriateness of the current approach (distribution through both the workshop and mailing).
- There were mixed reactions as to whether or not the workshop was needed; some felt it was necessary or the best approach, and some suggested not requiring it; others suggested having multiple options for accessing it.
- Suggestions for *distribution* included the following: online; on a CD/DVD; as an attachment to an email; as a link emailed to teachers; by partnering with Project WET or WILD workshops; distribution at conferences and conventions (MSTA, MN Agriculture Teachers, FFA, Education MN, etc.); distribution at fishing/sporting expos and state/county fairs; train the trainer workshops (each suggested by 1-4 respondents)
- Suggestions for *marketing* the Guide included the following: distribute a short video to schools and if the school is interested, present a workshop; encourage teachers to invite other teachers; send sample lessons to schools/teachers, with directions as to how to access the Guide; have links to the Guide or articles about the Guide on relevant websites (Girl Scouts, MSTA, etc) and magazines; send flyers to target audience; email all MN teachers with a sales pitch (each suggestion offered by 1-4 respondents)
- Suggested audiences to target: nonformal educators (scout leaders, 4-H leaders); EE specialists at schools; pre-service teachers; high school teachers; curriculum specialists, college professors (each offered by 1 or 2 respondents); several respondents suggested the relationship with MN STEP be continued, and another suggested partnering with Gander Mountain for marketing and distribution

Understanding of the Overall Purpose of the Guide

- Of the 124 respondents, 71 (57.3%) indicated they knew the purpose, 7 (5.6%) indicated not knowing the purpose, and 46 (37.1%) indicated being unsure of the purpose. Yet of the 71 (57.3%) who indicated they knew the purpose, none stated the goal to the extent it is stated in the Guide (the knowledge, service-learning/action, fishing, and stewardship components). Twenty-two stated part of the goal (more than one, but not all, of the goal's sub-components); 15 emphasized just the knowledge portion of the goal; 16 emphasized just the fishing portion of the goal; 5 emphasized the stewardship portion of the goal; and 18 stated either a vague or incorrect goal. (Yet participants rated the workshop effective in terms of helping them understand the purpose of the Guide).
- Understanding of the purpose of the Guide did not appear to be related to whether or not participants have implemented the Guide.

Understanding of How the Guide is Intended to Be Implemented

- Of the 125 respondents, 10 (8.0%) indicated an understanding of implementation that was aligned with MinnAqua's intentions for the Guide (an activity per chapter, a fishing trip, and a service project); the majority of respondents (102 respondents, 81.6%) indicated their understanding of the way the Guide is to be implemented is in whatever way best suits their educational setting and goals.

Obstacles to Use of the Guide

- Of the 119 respondents, 44 (37%) indicated either anticipating or already having encountered obstacles to use of the guide. The obstacles respondents listed are as follows: lack of time (23); having to print the lessons (8); amount of materials/size of binder (4); need for adapting materials for grade level I teach (4); cost of/access to necessary materials/equipment (4); lack for transportation for trip/project (3); difficulty accessing online materials (2); lack of an "at a glance" topical section(1)
- Whether or not respondents encountered or anticipated encountering obstacles does not appear to be related to whether or not they have implemented the Guide (it appears they are implementing the Guide in spite of obstacles). However, it may be related to type of user, as 41.3% of the 80 teacher respondents indicated they had encountered or anticipated encountering obstacles, where as 30.8% of the 39 program leaders indicated encountering or anticipating obstacles.

Need for Support/Assistance in Implementation

- Of the 113 respondents, 72 (63.7%) indicated follow-up support would encourage and/or support their use of the Guide. The type of support most frequently suggested as being helpful was additional training and curricular resources (11 respondents). Other frequent suggestions included sharing examples or stories of how the Guide is being use or information on successful users, access to local fishing experts and aquatic scientists, and access to an education specialist who could answer questions and help trouble-shoot. Other suggestions included the following: access to someone who could come into the classroom and teach a lesson; updates of workshops, new lessons, new ideas, resources, etc; supplies; resources on current events; a newsletter highlighting a lesson; and a virtual trip.

- Of the 121 respondents, 41 (33.9%) indicated needing assistance in implementing a fishing trip, and another 51 (42.1%) indicated this assistance would be helpful (but not necessary). The most frequently suggested assistance was equipment (15). An expert to lead the trip/expertise in fishing, funding for transportation, and help organizing and supervising the trip were also frequently suggested. Others suggested ideas for locations, time for planning the trip, ideas for gaining school board/parent support, and ideas for overcoming liability concerns.
- Of the 120 respondents, 30 (25.0%) indicated needing assistance in implementing the service project, and another 61 (50.8%) indicated this assistance would be helpful (but not necessary). The most frequently suggested assistance was ideas (age-appropriate ideas as well as directions); transportation funding was also frequently suggested. Other suggestions were time for and help in planning, help in implementing, and help finding community partners.

Implementation of the Guide

- Of the 112 respondents, 43 (38.4%) indicated already having implemented some portion of the Guide.
- For about half of the users, implementation has been both indoors and outdoors. For about the other half of the users, implementation was indoors.
- Implementation has been primarily with K-2rd grade students, 3rd grade students, and 9th-12th grade students (about 22% in each category). About 10% of respondents are using the Guide with 4th graders, and another 10% with 5th graders, and about 4% with 6th-8th graders.
- When asked in what subject area or within what program are they implementing the Guide, the most frequent response was science (11), followed by high school natural resource/agricultural science (5). The following areas were indicated by one respondent: environmental science; field day; camping trip; scout meeting; art; language arts; social studies; math; a gifted after-school program; within a service learning project; as a naturalist activity in a magnet school; and at a nature center.
- Based on this data, it is unclear what specific activities or lessons are being used, as respondents generally skipped this question. However of the 45 respondents, most (34 and 36 respectively) indicated using the Guide to teach about aquatic habitats and about MN fish. Twenty-one indicated using it to teach about water stewardship. Eighteen indicated using it to teach about fishing equipment or fishing skills, and 14 to take students on a fishing trip. Thirteen indicated using it to implement a service project, and 7 indicated using it to teach about fisheries management.
- Of the 47 respondents, 34 (72.3%) were using the Guide by integrating it into an existing class or program, and 7 (14.9%) were using the Guide for teaching stand-alone, "extra" activities that don't align with existing content areas or goals. Six (12.8%) have used it in both ways.
- The most frequent reason for using the Guide as indicated by respondents (n=47) is to supplement, enrich, or support what they were already teaching (42, 89.4%). Respondents were also using the Guide to foster interest in or appreciation for the natural world (30, 63.8%) and to teach about fish and/or aquatic related topics (29, 22.5%). Twenty-six (55.3%) of the respondents indicated using the Guide to motivate their students/youth.

- Implementation of the Guide does not appear to be related to respondents' perceptions as to the effectiveness of the workshop, how respondents' obtained the Guide, understanding of ideal implementation and overall purpose of the Guide; and whether or not they had encountered or anticipated encountering obstacles.

Effectiveness of the Guide (add in from student data, and second instructor questionnaire)

- Respondents (n = 46) perceived the Guide as effective overall (M= 4.29, SD = .48). Specifically, they perceived the Guide as effective in supporting their curricular goals (M = 4.24, SD = .71); engaging students in learning (M = 4.54, SD = .66); stimulating interest in recreational fishing (M = 4.34, SD = .75); and fostering responsible participation in stewardship of Minnesota's aquatic resources (M = 4.15, SD = .89). Respondents also indicated the Guide to be effective in fostering partnerships with local aquatic professionals (M = 3.95, SD = .75).
- Perception of effectiveness of the Guide was significantly related to respondents' perception of the effectiveness of the workshop ($r = .58$, $p < .001$).

Figure 8: Summary of Key Findings from Student Questionnaire

Respondents:
Of the 145 respondents who completed both a pretest and posttest and had used codes that allowed for matching pretests with posttest, 63.4% were girls (n = 92) and 36.6% were boys (n = 53). Most respondents were 9 and 10 year olds (83.3%, n = 120); 11.1% were 8 year olds (n = 16). The remaining respondents included a seven year old, 6 eleven year olds, and a thirteen year old. One of the groups participating in the evaluation was a Girl Scout troop, thus resulting in a wider age range of participants.

When implemented as intended, does the Guide increase students' knowledge about aquatic habitats, MN fish, and fish management?
(Item 5, first 4 sub-items)
Results suggest yes, as there were significant increases from pretest means to posttest means on self-reported knowledge of aquatic habitat, $t(143) = -6.94$, $p < .001$; on knowledge of MN fish, $t(142) = -7.24$, $p < .001$; on fishing regulations $t(140) = -7.09$, $p < .001$; and on fish management $t(141) = -9.28$, $p < .001$. Posttest means corresponded in general to a rating of "some" knowledge.

When implemented as intended, does the Guide increase students' procedural knowledge of and skills in water stewardship and fishing?
(Item 5, sub-items 5 and 6).
Results suggest yes, as there were significant increases from pretest means to posttest means on self-reported procedural knowledge of water stewardship, $t(142) = -6.01$, $p < .001$, and fishing, $t(142) = -5.35$, $p < .001$. (The pretest/posttest did not address skills, just procedural knowledge) Posttest means corresponded with a rating of between "some" and "a lot" of knowledge.

When implemented as intended, does the Guide increase students' awareness of local aquatic environmental issues?
(Items 6 and 7)
Results suggest yes, as the increase in correct responses from pretest to posttest was significant for students' identification of local aquatic problems, $t(140) = -6.21$, $p < .001$ and for students' identification of local aquatic environmental issues, $t(135) = -4.20$, $p < .001$. It is important to note, however, that while the evaluation question of interest was to determine if awareness increased and results suggest an increase, posttest scores indicated generally low levels of knowledge with respect to identification of issues, with only 16.8% providing a correct response on the posttest.

When implemented as intended, does the Guide increase students' awareness of the need for conserving natural resources and of the roles the DNR and Minnesota citizens play in conservation?
(Items 8-12)

Results suggest students' awareness of the need for conserving natural resources did not increase, as there was not a significant change in responses from pretests to posttests, $t(142) = .12$, $p = .90$. However, it is important to note students' were aware of the need for conserving natural resources prior to their participation in the MinnAqua activities; thus a "ceiling effect"

likely accounts for this finding of no significant change in responses from pretests to posttests. Results relating to students' perceptions as to whose responsibility it is to care for Minnesota's aquatic habitats and resources are similar. There was no significant change in responses, $t(140) = -.53$, $p = .60$; however 92.2% of the students responded correctly on the pretest, leaving little room for increase.

Results suggest students' awareness of the role the DNR plays in conservation increased, as there was a significant increase from pretests to posttests in the number of students correctly identifying at least one way the DNR participates in conservation of resources, $t(141) = -7.44$, $p < .001$. Results also suggest students' awareness of the role citizens play in conservation increased, as there was a significant increase from pretests to posttests in the number of students correctly identifying at least one thing citizens could do to care for natural resources, $t(143) = -4.16$, $p < .001$, and one thing they could do to care for natural resources, $t(125) = -4.40$, $p < .001$.

When implemented as intended, does the Guide increase students' appreciation for Minnesota's aquatic resources and habitats?

(Items 14 and 15)

Results are unclear as to if students' appreciation for Minnesota's aquatic resources and habitats was increased. The number of respondents indicating an appreciation for fish, wildlife, clean water, and aquatic habitats on the posttests was significantly higher than the number of respondents indicating appreciation for these items on the pretests, $t(138) = 4.00$, $p < .001$; $t(139) = -2.54$, $p = .01$; $t(141) = -3.32$, $p < .01$; and $t(139) = -3.65$, $p < .001$. Yet, there was no significant change from pretest to posttest on the item measuring appreciation for Minnesota's lakes, streams, rivers, and wetlands, $t(137) = .87$, $p = .34$. Students' pretest responses indicated high levels of appreciation prior to participation in the MinnAqua activities, and thus, a "ceiling effect" was likely on this item.

When implemented as intended, does the Guide increase students' interest in fishing?

(Items 16-19)

Across the four items addressing interest in fishing, there were not significant changes ($p > .05$) from pretest to posttest scores. Students' posttest responses indicated they on average liked going fishing, would be excited about going fishing if someone invited them, think they'll go fishing once in a while as adults, and probably teach others to fish when they are adults; these responses were similar to their pretest responses, again suggesting the possibility of a "ceiling effect."

Figure 9: Summary of Key Findings from Phase Two Instructor Questionnaire

Respondents:
10 teachers/program leaders responded to the questionnaire; 6 of them participated in the evaluation activities involving student data collection, and 4 of them taught at a school where there was a teacher participating in the student data collection activities.

Implementation:
All 10 respondents indicated implementing an activity per chapter and a fishing trip. Seven of the 10 respondents indicated implementing a service project.

When implemented as intended, does the Guide increase students' knowledge about aquatic habitats, MN fish, and fish management?
Results suggest teachers perceive participation in the program increased their students' knowledge about aquatic habitats somewhat (M = 3.30, SD = .48); knowledge about MN fish very much (M = 3.90, SD = .32); and knowledge about fish management somewhat (M = 2.90, SD = .32).

When implemented as intended, does the Guide increase students' procedural knowledge of and skills in water stewardship and fishing?
Results suggest teachers perceive participation in the program increased their students' procedural knowledge of and skills in water stewardship somewhat (M = 3.20, SD = .63) and procedural knowledge of and skills relating to fishing very much (M = 3.80, SD = .42).

When implemented as intended, does the Guide increase students' proficiency with science process skills?
Results suggest teachers perceive participation in the program increased their students' science process skills somewhat (average rating across all items was 3.00, SD = .22). Prediction skills and communication skills received the highest rating by teachers (somewhat to a lot); measurement skills received the lowest rating (a little). Teachers perceived observation skills, classification skills, inference skills, data collection and interpretation skills, and hypothesizing skills as increasing somewhat.

When implemented as intended, does the Guide increase students' awareness of local aquatic environmental issues?
Results suggest teachers' perceive participation in the program increased their students' awareness of environmental issues in general very much (M = 3.70, SD = .48) and local aquatic environmental issues very much (M = 3.60, SD = .48)

When implemented as intended, does the Guide increase students' awareness of the need for conserving natural resources and of the roles the DNR and Minnesota citizens play in conservation?
Results suggest teachers' perceive participation in the program increased their students' awareness of the need for conserving natural resources very much (M = 3.80, SD = .42). Results also suggest increased awareness of the roles the DNR play in conservation somewhat (M = 3.40, SD = .84) and the roles Minnesota citizens play in conservation of natural resources very

much (M = 3.80, SD = .63). Further, results suggest teachers perceive students' awareness of the roles they play as students in conservation of natural resources increased very much (M = 3.90, SD = .32)

Additional benefits/outcomes:
Bringing together of community resources and people to pull off an excellent day of fishing
Learning about something (fishing) they can take home to their families
Sharing a common experience (fishing trip) created a bond between students; inviting grandparents to fish and share stories made the experience richer
Using the identification key to identify fish helped kids feel smart
Learning they can make a difference in protecting our resources

Student Reaction to the Activities:
Positive (enthusiasm, excitement, loved it, anticipation, fascination, fun)

Barriers:
Equipment for fishing; organizing the service project; making copies of the handouts and lessons when one doesn't have access to free copies; lacking CD/DVD player in the classroom; logistics of using frozen fish multiple times; time

Suggestions for the Guide:
Manual is a bit overwhelming (but good!)
Provide a booklet for students

Suggestions for How Teachers Should be Encourage to Use the Guide (Ideal Implementation):
Curriculum should be spread out over two grade levels with a trip each year; too much for one year when one also has to teach required/adopted resources
Encourage teachers to use all lessons (scout leader's suggestion)
Find a grade-level (4^{th}/5^{th}) for this – it ties with the 4^{th} grade MN curriculum
Currently stated is good (2)