UNIVERSITY OF MINNESOTA

This is to certify that I have examined this copy of a Master's Plan B Field Project by

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March 24, 2022

Date

River Quest: A Programmatic Evaluation

A FIELD PROJECT PROPOSAL
SUBMITTED TO THE FACULTY OF
THE UNVERSITY OF MINNESOTA
BY

Ellen Munshower

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF ENVIRONMENTAL EDUCATION

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Dedication

I dedicate this thesis to my parents, who are always encouraging me to be curious and follow my passions. Thank you for guiding me towards a meaningful and rewarding field. I also dedicate this to all professionals who help others learn, whether an educator or not. Knowledge is meant to be shared.

Abstract

The purpose of this evaluative study was to assess to what extent that the River Quest program in Duluth, MN achieves its mission of "enhance[ing] awareness and understanding of the St. Louis River ecosystem and interrelated commercial, industrial, and recreational activities" in participants, and supports local teacher's curricula (*About Us*, n.d.). More specifically, the following learning outcomes were investigated through this study: Knowledge regarding water safety; knowledge of the interactions between the river and recreational, commercial, and industrial activities in the region; attitudes regarding water conservation. From a survey of past participants and an interview with an educator that attended in the past, findings showed that the River Quest program is successfully educating students about the subjects, and the program is viewed in an overall positive light.

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Chapter 1

Introduction

Background

River Quest is an educational outreach program held every spring since 1993, located in Duluth, MN. Learning stations are hosted by a variety of local organizations and businesses, including MN Sea Grant, the City of Duluth, the Duluth Seaway Port Authority, and others for a four-day period in May each year. Sixth-grader students from participating schools in the Duluth, MN-Superior, WI area arrive for either a morning or afternoon 3-hour time slot to learn about the St. Louis River ecosystem and related commercial, industrial, and recreational activities. There are over a dozen hands-on educational stations for students to visit and learn from, while carrying "passports" to take notes about what they have learned. Topics include invasive species, pollution, commercial shipping, and beach safety. Approximately 1,500 sixth-grade students from 13 area schools attend annually. While the program began in 1993, it has yet to have a formal evaluation conducted to assess the effectiveness of the program in achieving its mission to “provide hands on learning experiences that enhance awareness and understanding of the St. Louis River ecosystem and the interrelated commercial, industrial, and recreational activities in the Duluth-Superior Harbor, part of the St. Louis River Estuary” in local 6th grade students (*About Us*, n.d.). The desired outcome of River Quest is to educate participants on water safety, the ecology of the river and environmentally responsible behaviors, and the commercial and industrial activities that occur in the area.

Purpose Statement

The purpose of this study was to evaluate the River Quest program’s educational outcomes and overall impact on participants. This study provided information for two key

groups. The first was to inform the River Quest board if they're meeting their mission. Secondly, this study informed formal educators as to the educational relevance of student participation.

Research Questions

The following questions guided this study:

1. How effective is the River Quest program at meeting their mission of "enhance[ing] awareness and understanding of the St. Louis River ecosystem and interrelated commercial, industrial, and recreational activities"?
    a. How effective is River Quest in educating students on safe recreational practices on large bodies of water, specifically, Lake Superior?
    b. How effective is River Quest in educating students about the St. Louis River ecosystem?
    c. How effective is River Quest in educating students about the St. Louis River commercial/industrial activities in the area?
    d. What are student's attitudes towards the River Quest program as a whole?
2. Is River Quest serving its purpose in supporting teacher's curricula?

Definitions of Terms

This section defines the concepts used in this study. Each term is listed with a nominal definition, and when needed, an operational definition to identify how the term will be measured.

Program Evaluation

The collection of information about the activities, characteristics, and outcomes of programs in order to determine the worth of programs and potentially improve their effectiveness (Patton, 2002).

Attitude

Learned predisposition to respond in a favorable or unfavorable manner toward objects, events, and other referents (*Environmental Literacy Framework*, 2015).

Intention

An individual's aim or plan that can be a strong predictor of a behavior, as well as one's attitudes, and perceived behavioral control (Ajzen, 1985; Maki & Rothman, 2017)

Knowledge

Environmental literacy entails knowledge of: Physical and ecological systems, social, cultural and political systems, environmental issues, multiple solutions to environmental issues, and citizen participation and action strategies (*Environmental Literacy Framework*, 2015).

Outreach

Services that typically involve one-time or short duration contact with the public. The service informs, excites interest, or creates curiosity in participants (Clark et al., 2016; Monroe et al., 2007).

Field Trip

A program that provides student experiences outside of the classroom at interactive locations designed for educational purposes (Tal & Morag, 2009).

Experiential Education

Experiential education is a teaching philosophy that informs many methodologies in which educators purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, clarify values, and develop people's capacity to contribute to their communities (*Association for Experiential*

Education, 2021). In the context of this evaluation, it is the hands-on learning opportunities provided at particular learning stations at the River Quest program.

Environmental Education

A process that helps individuals, communities, and organizations learn more about the environment, and develop skills and understanding about how to address global challenges. It informs and inspires. It influences attitudes. It motivates action. EE is a key tool in expanding the constituency for the environmental movement and creating healthier and more civically-engaged communities ("About EE and Why It Matters," 2015).

Water Safety Behaviors

In this program the water safety lessons are geared towards safety on Lake Superior, or any large body of cold water. It is thus presented as three key areas of water safety: Awareness of rip currents and how to behave when caught in one; the importance of bringing and wearing personal floatation devices (PFDs); how to react when suddenly being immersed in cold water. The lessons are in line with the United States Lifesaving Association (*USLA*, n.d.).

Significance

The River Quest program is significant because it "provide(s) students with hands-on learning experiences that enhance awareness and understanding of the St. Louis River ecosystem and interrelated commercial, industrial and recreational activities" (*About Us*, n.d.). The information students are given at the program can foster a greater understanding of their community, an appreciation for the environment and awareness of environmentally responsible behaviors, and even save lives.

This evaluation provides resources to further enhance and strengthen the outreach program. Based on the findings, recommendations were made for improving content and delivery to students. The completion of this study also boosts the credibility of the program. The findings here will be a resource to present to potential donors or sponsors of the program. They can also be reviewed by school districts, to reinforce the program's value and relevancy for state standards.

Chapter 2

Literature Review

River Quest

Background

The River Quest program began in 1993, after the Executive Director of the Western Lake Superior Sanitary District, Kurt Soderberg, spoke to John Goldfine, owner of Vista Fleet, an excursion boat company based in Duluth (*About the Vista Fleet*, n.d.; *About Us*, n.d.). Their conversation revolved around teaching local children the importance of the St. Louis River to the Twin Ports area. Ray Skelton, Port Authority Special Projects/Environmental and Government Relations Director joined the team and helped them obtain nearly 20 local industries as sponsors for the proposed program. With that, the outreach program was born and that first year saw nearly 800 sixth-grade students from Duluth MN, Hermantown MN, Proctor MN, and Superior WI boarding the two Vista Fleet boats to participate in this educational program (*About Us*, n.d.).

Since that first year River Quest has continued to grow, as of 2021, nearly 27,000 students have attended this program. Each May, sixth-grade classes from nearby schools are invited to participate in the program to explore the Duluth-Superior estuary and learn about its ecosystem and interrelated industrial, commercial, and recreational activities and safety. Students rotate to twelve hands-on educational stations for students to interact with. Although there are eighteen stations that participate in River Quest, several stations only do two of the four days, splitting their time with another group. Six of the stations are located on the Vista Star vessel and the other six are located at the Duluth Entertainment Convention Center (*About the Vista Fleet*, n.d.; *About Us*, n.d.). Despite the growing scale of the program, there has not been a systematic

evaluation of River Quest since its inception in 1993. Although there has not been an official evaluation, an examination of the program as well as its goals indicates there are some underlying guiding theories that the program is based on. Since it is situated in these theories, the program can be expected to be successful in reaching its learning outcomes.

Theoretical Foundations

Mission Statement: River Quest provides students with hands-on learning experiences that enhance awareness and understanding of the St. Louis River ecosystem and interrelated commercial, industrial, and recreational activities.

The theoretical foundations that support this program and are the basis for this study are the theory of place-based education, brain based learning, and responsible environmental behaviors. These three theories relate directly to the methods and approaches towards education displayed in the River Quest program. While these theories are not explicitly stated in the mission on River Quest, they are the foundation upon which it stands.

Place-Based Learning

In his book *Place Based Education: Connecting Classroom and Communities*, David Sobel (2004) defines and outlines the benefits of place-based education. He describes it as the use of one's local environment or community as a starting point in education. It is not limited to environmental education, but can be applied to any subject in a school's curriculum (Sobel, 2008). Place-based education typically focuses on having real-world learning experiences and provides hands-on opportunities for students. Through place-based learning students can develop an appreciation for the natural world, especially the ecosystem that they inhabit and their community they live in (Derr, 2002; Sobel, 2008).

Place-based pedagogies can promote integrative learning by providing local examples of lessons outlined by standards. Often time place based learning is cross disciplinary and encourages students to examine problems or phenomena from different approaches and appreciate other perspectives (Coker, 2017). Place based education is typically grounded in the issues and values of local communities. It focuses on using the local resources to integrate context for learners. When partnerships between schools and communities are created, place-based education can boost student achievement and critical thinking skills (Powers, 2004). Most environmental education programs typically include some level of a 'sense of place' in their curricula, with the assumption that getting learners to care about one place in particular, will lead them to care about the environment in general (Derr, 2002). When lessons are grounded in a learner's own community, they can more easily see the relevance of what they are learning-which can make them engage more deeply in the learning process (Powers, 2004; Sobel, 2004).

Local ecology investigation offer students the opportunity to explore and analyze their own local environment (Bodzin, 2008). At the River Quest program students are learning about their own place from a myriad of perspectives. The lessons may be about different topics and taught from various sources, but all of them are rooted in the local community. Students are able to draw their own connections between the lessons as they go through the program.

Brain-Based Learning

Brain-based learning theory uses different areas of science to investigate learning. It uses biological approaches as well as acknowledging that social and psychological processes correlate to neurobiological processes to investigate how people learn (Schenck & Cruickshank, 2015). The brain-based learning theory postulates that understanding how the human brain learns, can

provide a better understanding of different learning styles held by students. Learning styles are distinct factors that affect how a student processes and retains information. Because every person has a different background and thus different reactions and attitudes towards new information, everyone learns in different ways. Brain-based learning claims that a person's learning style is determined by the ways their brain functions. To apply this theory to environmental education is to develop lessons in ways that can cater to different thinking and learning styles of the student (De Vita, 2001; Duman, 2010).

The idea of learning styles is not without its critics. In their analysis of Kolb's theory of learning styles, Schenck and Cruickshank (2015) comment that because there is great variability between every individual's brain, in every context, in every learning event, the brain-based theory should be focused on teaching rather than one of learning. Kolb and Kolb (2005) do state that there is no such thing as a fixed learning style. They state that learning happens on a continuum that can range from reflective observation to active experimentation. Whichever approach to brain-based learning one chooses to take, however, both have common themes. According to the brain-based learning theory, learning is strengthened through experiences and connections to existing knowledge (Kolb, 1984; Schenck & Cruickshank, 2015). River Quest uses concepts or sights students are familiar with and expand on them. Most of the learning at River Quest also involves hands on activities or demonstrations to help students grasp the key concepts.

Positive Environmental Behavior

Positive environmental behaviors, sometimes also known as pro-environmental behaviors are actions taken by an individual that purposefully minimize the negative impact their actions

have on their environment, both natural and human-constructed (Kollmuss & Agyeman, 2002). Studies show that environmental education improves academic performance, enhances critical thinking skills, and increases these positive environmental behaviors (Ardoin et al., 2018; Blatt, 2013; Ernst & Monroe, 2004). Because children are typically curious about the environment they live in, River Quest provides an opportunity to answer their questions and provide additional information. Some environmental educators view middle grade students (5th grade to 8th grade) as decisive years in moral development, and thus a crucial time to promote environmental awareness (Crabtree, 1974; Kahn Jr. & Kellert, 2002). Programs like River Quest that investigate local ecosystems can promote learning in an interdisciplinary context. Students are able to explore relationships among chemical, biological, physical, and geological characteristics of the St. Louis estuary. Understanding the ecology helps build a more comprehensive knowledge of issues such as water quality, pollution, and the impact of land use practices and personal actions on the St. Louis River ecosystem (Bodzin, 2008). In short, the ecology focused learning stations teach students what sort of ecological processes are happening around them, and how they can behave in a way that is beneficial to the watershed they live in (*About Us*, n.d.).

Program Components

The format of the River Quest program is as follows. Classes begin the program by entering the DECC or Vista Star. Students are given "passports" which includes a map of the estuary, and a list of all the stations with space to take down any notes of ideas or key concepts the identify throughout the day. They rotate around between the six stations, spending ten minutes at each before moving on to the next, and then switch to the other location. All of the educational stations at River Quest fall under one of three umbrella topics: Ecology, water recreation, and commercial/industrial practices in the estuary. After visiting all twelve locations

students end the program. It should be noted that a handful of the stations are only present for half of the days and swap out with another station, so students that attend the first two days will not have an identical experience to those that attend the third or fourth day. Each station at River Quest is required to create a 1-page resource sheet to provide to each teacher. These sheets describe the station and the MN and WI educational standards that it addresses. These sheets are available to teachers prior to the event and can be used by teachers to prepare their students for the day.

There are seven stations that cover the ecology of the St. Louis estuary and how students can model environmentally responsible behaviors in their own local environment. The topics of these stations include stream geomorphology, storm sewers vs. sanitary sewers, habitat restoration for the piping plover, erosion, what defines an estuary, and fish physiology (*Learning Stations*, n.d.). The final station is called 'Get Habitattitude!' and covers invasive species. These stations are all under the umbrella subject of ecology and teach students about their environment as well as their role in it, promoting positive environmental behaviors. This is in line with the Minnesota state science standard 6E.3.2.1.3: "Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment" (2019 Minnesota Academic Standards in Science, 2019). It also aligns with the Wisconsin state science standard SCI.ESS3.C.m: "Human activities have altered the hydrosphere, atmosphere, and lithosphere which in turn has altered the biosphere. Changes to the biosphere can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth" ("Wisconsin Standards for Science," 2017).

Teaching water safety to children can save lives. While actions to prevent drowning for toddlers and young children often involve fencing, supervision, and child safe play areas, the

variety of drowning locations and activities in older age groups makes prevention a more significant challenge (Petrass & Blitvich, 2014). As children become more independent, the importance of teaching them safe behaviors grows. According to the World Health Organization, in the United States of America drowning is the second leading cause of unintentional injury death in children aged 1–14 years (Drowning, 2020). While not the deadliest of the Great Lakes, Lake Superior has claimed 58 lives in the past 10 years (Statistics – Great Lakes Surf Rescue Project, n.d.). The number of drownings each year has gone down, but education is one of the best ways to get it to zero.

Water safety to prevent drowning takes many forms. At River Quest there are three separate stations that focus on water safety. The first focuses on the importance of bringing and wearing PFDs. It covers how they work, and why every student should have one when on the water (*It Floats, You Don't. Wear Your Life Jacket!*, 2020). The second station on water safety covers hypothermia. Lake Superior is the coldest of the Great Lakes and this cold is a significant threat even with PFDs. This station covers the effects of hypothermia as well as methods for conserving body heat when in a cold water situation (*Cold Hand Luke (Hypothermia & Water Safety)*, 2020; *Lake Superior*, n.d.). The final water safety station, is titled 'Break the Grip of the Rip!' and concentrates on rip current safety (*Break the Grip of the Rip!*, 2020). These stations are important in keeping local children safe. Studies have shown that even if adolescents had taken swimming lessons as a young child, they will undergo skill decay over time if the knowledge learned does not get used. In a study by Petrass and Blitvich (2014), they found that there were no water safety skills in participants who reported undertaking formal swimming lessons or swimming within a school curriculum. Refreshing water safety knowledge is crucial. One of the main challenges of working with young adults is capturing this age group for refresher training.

In a study on military recruits, Wisher et al. (1991) found that after formal training, it only takes a small amount of refresher training to reacquire a skill that has been forgotten. These small quick learning stations provide that exact refresher.

The third and final focus of the River Quest program is educating local youths about the industry and commercial use in the estuary. This follows the previously mentioned WI and MN standards of human impact on an ecosystem. These learning stations cover important relevant topics such as sustainable forestry, storm and sanitary sewers, cargo transport along the lakes, and other interactions between industry and the river system that can be directly observed by the students in their local area. The stations that fall under this category all emphasize the importance of making sustainable choices in business. These lessons provide multiple perspectives and prevent formations of one-dimensional views of how the market and environment interact. The importance of understanding economic consequences in the environment as well as the solutions is supported by literature (Chalecki, 1974; Doeleman, 1983; Lubbers, 1982).

Teaching youth about their local industry can help create more engaged community members. River Quest has six learning stations that focus on commercial and industrial activities in the St. Louis River system. Many of the learning stations are local industries outlining their role in the community, like the Midwest Energy Resources Company, and Duluth Seaway Port Authority. Others explain their work and how it affects the environment, like the Western Lake Superior Sanitary District's station on water treatment, or Verso Corporation's presentation on sustainable forestry. The pulp and paper mill Sappi presents on their water efficiency and how to reduce water consumption. The US government is even represented with the U.S Coast Guard's station on oil spill response (*Learning Stations*, n.d.).

The evaluation will be based on the consistency between the program's goals and the attitudes and knowledge of the students, and teacher opinions of the program effectiveness. The measures are knowledge, attitude towards the subjects learned, and opinion of the program's effectiveness and relevancy. A Logic Model (Appendix A) was created to guide the evaluation process.

Program Evaluation

Program evaluation is the process of collecting information on a program in a systematic way, in order to make decisions about future programming (Patton, 2002). The use of evaluation in environmental education has evolved over time. Environmental education projects started getting evaluated on a large scale in the United States in the 1960s for projects funded by the Department of Education. The prevalent theory at the time was positivism, therefore methods like randomized control trials were considered the ideal approach for evaluation (Fleming & Easton, 2010). While this style of study was considered the best, it was not without drawbacks. Studies could easily become very costly, and it was not uncommon for them to be inconclusive due to the intricacies of assigning causation. The findings in these evaluations were often not even used by practitioners. This was primarily due to the study not taking practitioner needs into account during the design process. Because of these issues there has been a shift toward a more diverse range of evaluation approaches (House, 2005; West, 2015). Many environmental educators are now evaluating their own projects rather than using external evaluators, to avoid the previously mentioned pitfalls. In this study, the evaluation is being done by a Sea Grant-funded graduate student. Internal evaluations can be advantageous because the staff know the project and its objectives, and are more likely to put the findings into practice than if external evaluators are used (Easton, 1997).

There are some drawbacks of internal evaluations, however. Doing project evaluation involves specific skills and knowledge of research methods that environmental educators may not possess. Because of this internal evaluators may need additional training and guidance that an external evaluator would not (West, 2015). Researchers have outlined gaps between how evaluation theorists say evaluations should be conducted, and the practice that actually occurs (Christie, 2003). This can include evaluators unintentionally introducing bias into their evaluation. An example of this is that students that attended a camp led by someone doing the evaluation may want to please the practitioner and the data would suffer from social desirability bias (West, 2015). By remaining a few steps removed from the program itself (due to its 2020 and 2021 cancellation due to COVID-19 and being unable to attend any programming), this study will avoid many of the complications that can occur with internal evaluations.

Program evaluations can provide systematic understanding of what does and does not work in the program being investigated. The process and approach can vary, but the goals are usually similar. Doing an evaluation allows for program coordinators and educators to gain perspective. Having research-based evidence of the impacts of a program can help guide future decisions made by administration. Evaluative research can be useful in identifying the strengths and weaknesses of a program. It can also justify claims and improve credibility of the program and the professionals who lead it (Ernst et al., 2009). Often times evaluations investigate if the mission statement of the organization or the program itself is being followed, or to what extent (Matiasek & Luebke, 2014).

The general process of evaluation, as outlined in *Evaluating Your Environmental Education Programs* and supported by *The SAGE Encyclopedia of Social Science Research* is somewhat standardized. No matter the purpose of the evaluation, one begins with focusing the

evaluation, or asking “why” the evaluation is needed. Understanding who will use the results and for what informs the rationale for the evaluative study. After establishing the purpose, the next step is to develop the plan for evaluation. This is done by identifying the evaluative questions and what tools will be used to ask them. Once the data collection tools are decided, they need to be developed. This can be through modifying established tools or creating them. This is also the step where any pilot tests should be carried out, to ensure the tools are relevant and effective. Next is data collection. This step is guided by the methods established in the evaluative plan. As data is collected, how it will be analyzed should be at the forefront of the researcher’s mind. After all the data is collected, it is time to begin data analysis. All the information should be organized and summarized. Results should be interpreted through the lens of the evaluation questions. After the data is analyzed, the original evaluation questions should be answered. The results from the study should then be presented in a report to the stakeholders and decisions regarding the program can be made (Ernst et al., 2009; Patton, 2004). There are three distinct types of evaluation: Front-end, formative, and summative. Front end evaluations are done plan the development of a program. Formative evaluation is used to improve a program and are typically done before programs are officially implemented. Summative evaluations, the type of evaluation done here, are used to provide information about an ongoing program. This particular summative evaluation is objective oriented, so it focuses on the extent that the objectives of the program are achieved (Ernst et al., 2009).

Efficacy of Field Trips in Education

River Quest falls under the category of the “field day/trip” approach to outreach programming. There is some debate on the benefits of field days, but there is strong research to suggest they are worthwhile learning opportunities. Field trips offer opportunities to forge

connections that can build understanding and develop an enjoyment of learning (Behrendt & Franklin, 2014). The positive interest and attitudes towards learning that can be fostered on field trips can lead to a deeper engagement of the material (Adams et al., 2012). They can also be beneficial for the formal educators that take the students on the trips. A study by Dillon et al. saw some teacher-student relationships improve during outdoor learning opportunities (2005). Field trips can provide formal educators with fresh ideas for teaching material and even give them a new perspective on a subject.

While it is apparent that field trips promote student engagement, they are also effective education tools. One review found that experiential learning at locations away from school not only increases student interest, but also knowledge levels as well (Behrendt & Franklin, 2014). In interviews and surveys taken after field trips, a majority of students are able to recall key information learned during the program (Carlson et al., 2009; Greene, 2013; Hudak, 2003; Nadelson & Jordan, 2012). Field trips can also promote higher level thinking strategies in students as they form connections between lessons and experiences (Behrendt & Franklin, 2014). In one study by Greene, students were asked to draft a short essay on a painting they had not seen before. Students that had recently gone on a field trip to an art museum scored higher and showed more complex levels of critical thinking than those that did not go on the trip (2013). Research indicates that the informal learning environments most field trips occur in contribute to students knowledge and skills differently than school-based instruction (Adams et al., 2012; Phillips et al., 2007). This can help provide learning opportunities for students that do not do well in a typical formal classroom.

Field trips are effective when done properly, but when little effort or thought is put in, their learning benefits are minimal. Field trips are most effective when there is a connection between what is being studied in the classroom, and what is presented on the trip. Some literature suggests that simply assigning a worksheet is not enough to create a connection (Griffin & Symington, 1997; Kisiel, 2006). Teachers must show why the field trip is an important part of a student's education for it to be effective. The success of a field trip is not only the responsibility of the facility providing the learning opportunity, but also the educator to introduce topics before, and provide time to debrief afterwards.

Chapter 3

Methodology

Purpose

The purpose of this summative evaluation was to determine the extent that the St. Louis River Quest program was fulfilling its goals of educating local youth about the St. Louis River estuary. The research questions were:

1. How effective is the River Quest program at meeting their mission of "enhance[ing] awareness and understanding of the St. Louis River ecosystem and interrelated commercial, industrial and recreational activities"?

    a. How effective is River Quest in educating students on safe recreational practices on large bodies of water, specifically, Lake Superior?

    b. How effective is River Quest in educating students about the St. Louis River ecosystem?

    c. How effective is River Quest in educating students about the St. Louis River commercial/industrial activities in the area?

    d. What are student's attitudes towards the River Quest program as a whole?

2. Is River Quest serving its purpose in supporting teacher's curricula?

Treatment

Sixth-grade students attended a three-hour long hands-on educational program comprised of twelve ten-minute learning stations that fall under one of the three umbrella categories. The

three themes were the 1) ecology of the St. Louis River system; 2) interrelated commercial and industrial activities in the area; and 3) water safety.

Design

This study was a summative evaluation of the program with a one-group posttest only design. A survey was administered to students that had attended the program in the past to assess their experiences, and an interview was conducted with a teacher that attended in the past to assess his opinions on the program. While the River Quest program has sixteen unique stations (though only twelve are visited by each class), there are three main foci of the River Quest program: Safe recreation in the estuary and on Lake Superior, the ecosystem of the estuary, and commercial / industrial practices in the estuary. To investigate how effective the program was on educating the participating students on these subjects, one learning station from each category was investigated. Each station was selected by meeting the following criteria:

- fits under one of the three main foci
- has educational materials available for analysis
- those responsible for the station responded affirmatively to participate after being contacted via personal communication
- the station is offered all four days of the program

The learning stations selected were as follows: ‘Break the Grip of the Rip!’ represented the water safety focus. ‘Get Habitattitude!’ represented the ecology focus, and ‘Great Lakes Cargo Capital’ represented the learning stations that cover commercial and industrial practices.

Table 1. Survey Constructs and Items

Construct	Survey Questions
Water Safety	Question 8: How do you know it's a good day to go to the beach? Question 9: If you were caught in a rip current, how effective do you think each of the following strategies would be for escaping?
Ecology	Question 10: What are aquatic invasive species? Question 11: What are some ways aquatic invasives arrive to the St. Louis estuary?
Commercial and industrial practices	Question 12: What did you learn the most about industry in the St. Louis River harbor? Question 13: What are some advantages of shipping by water?

Population and Sample

The population for this study was ninth-grade students in the twin ports area of Duluth, Minnesota, and Superior, Wisconsin that attended the River Quest program when they were in the 6th grade, as well as a 6th grade teacher that attended the River Quest program with their classes. Because of COVID-19 restrictions, ninth-grade students were queried by evaluating their retention of overarching lessons from the River Quest program via an online survey. Since over 1,000 students can attend the event, a sample of students was selected from participating schools via cluster sampling, this is a method of sampling where the population is divided into a number of clusters that contain individuals with characteristics being investigated (Robson & McCartan, 2016). In this case the clusters were schools with students that had participated in River Quest. Schools were contacted, and those that responded positively were selected to participate, which

resulted in a convenience sample of schools. From them an additional convenience sample of ninth-grade classrooms were chosen. Selection process involved approaching principals at participating schools and getting approval to distribute electronic surveys to students in the ninth-grade science classes who had attended the last in-person River Quest program. The goal was to have 100 students from schools that agree to participate and return parent consent forms. The students selected received a link to the survey and were asked to answer all the questions. No personal data on any of the students was collected, thus making all students and their responses anonymous. To assure that the program was aligning with what was being taught in the classroom, a sixth-grade teacher that brought his class to the River Quest program was invited via email to participate in a focus group. This qualitative data was used to triangulate what was learned in the student survey results.

Constructs and Measures

A survey instrument was developed specifically for this study, guided by the program's logic model that aligns program activities with desired outcomes and by the evaluation questions at hand. To encourage participation, the survey was devised to require less than ten minutes to complete. The survey questions can be found in Appendix B. This instrument was designed to assess knowledge and recreational and water safety behaviors about the St. Louis estuary and Lake Superior, as well as attitudes towards the program itself. Knowledge was assessed by students self-reporting if they felt they learned new information at the program as well as a short series of questions about specific lessons learned regarding each of the three overarching topics. Attitudes towards the program were assessed in questions that asked students about their subjective feelings about the program (what they enjoyed or did not enjoy). Finally, behaviors were investigated by asking students about what actions they take/would take regarding water safety.

A set of questions to guide the interview was also developed for this study. This structured list of questions guided the interview to determine teacher opinions on the program's effectiveness. The guiding questions for the interview can be found in Appendix B. The questions strived to determine the teacher's perception on the program's effectiveness and relevancy as an educational tool and what lessons he felt the students are taking away from the program. To ensure face, content, and criteria validity, the instruments were reviewed by a panel of experts using the following criteria for selection:

- Familiarity with the River Quest Program (purpose and mission)
- Expertise with program evaluation
- Expertise with survey research and focus groups
- Expertise with ninth-grade knowledge levels (age appropriateness)

Procedures

All students were queried, because it was assumed all students had gone through the River Quest program. If a student listed themselves has having not attended River Quest in the past, their survey ended. While the study was submitted to the IRB for approval, it was determined that this evaluation was not considered research and was thus exempt. Classroom teachers that agreed to participate were provided a passive consent form to send to parents/guardians of the ninth graders. Students whose parents did not choose to opt out were given an internet link to the survey that included an assent statement. The teachers asked students to take the survey during a homeroom or study period using an electronic device (see Appendix B for the survey). Data was collected via Qualtrics survey instrument. An additional note was sent out to sixth-grade teachers at participating schools asking them to attend one short virtual focus group session. This was later changed due to lack of responses to be a single interview.

The session was confidential. Notes were taken during the interview session for later review and analysis.

Conditions of Testing

The survey was administered to 264 local ninth-grade students from two schools in the Twin Ports area. These were the only two schools, out of a population of fourteen that had principals who responded positively to the request of administering a survey during school hours. Out of the sample of students, 44.7% (n=118) reported having attended the River Quest program in the past and consented to taking the survey. Students that did not consent or had not attended River Quest did not complete the survey.

While the intent was to utilize a focus group to interview local teachers to gain their perspectives using qualitative responses, many did not respond to the request for participation. Many of those that did indicate that time constraints and conflicting schedules prevented them from participating. Only one teacher out of the fifteen teachers contacted was interviewed. The interview, however, allowed for more in-depth responses and a more personal conversation. The prompts written for the focus group were still followed (see Appendix C). The teacher interviewed had been a chaperone for his school at past River Quest events and taught sixth grade English and math. Because the information from this interview came from a single teacher, the responses and the feedback represent only the teacher's views and cannot be generalized to represent all local teachers that attend River Quest with their classes.

The results are presented in order of the research questions that guided the study:

1. How effective is the River Quest program at meeting their mission of "enhance[ing] awareness and understanding of the St. Louis River ecosystem and interrelated commercial, industrial, and recreational activities"?
    a. How effective is River Quest in educating students on safe recreational practices on large bodies of water, specifically, Lake Superior?
    b. How effective is River Quest in educating students about the St. Louis River ecosystem?
    c. How effective is River Quest in educating students about the St. Louis River commercial/industrial activities in the area?
    d. What are student's attitudes towards the River Quest program as a whole?
2. Is River Quest serving its purpose in supporting teacher's curricula?

Analysis

Data for this study was both quantitative and qualitative in nature. The quantitative data from the survey results were examined using only descriptive statistics. The frequency of scores for survey questions that investigated knowledge levels were reported. Comprehension was determined in different ways based on the topic and is outlined in Chapter 5.

Further insight or potential explanations for the results was gathered from the qualitative data. The analysis was guided by the evaluation questions from the interview was reviewed for topics that were frequently brought up or had strong reactions. A Strength, Weakness, Opportunity, and Threat (SWOT) analysis was devised to show the overall results of the evaluation.

Chapter 4

Results

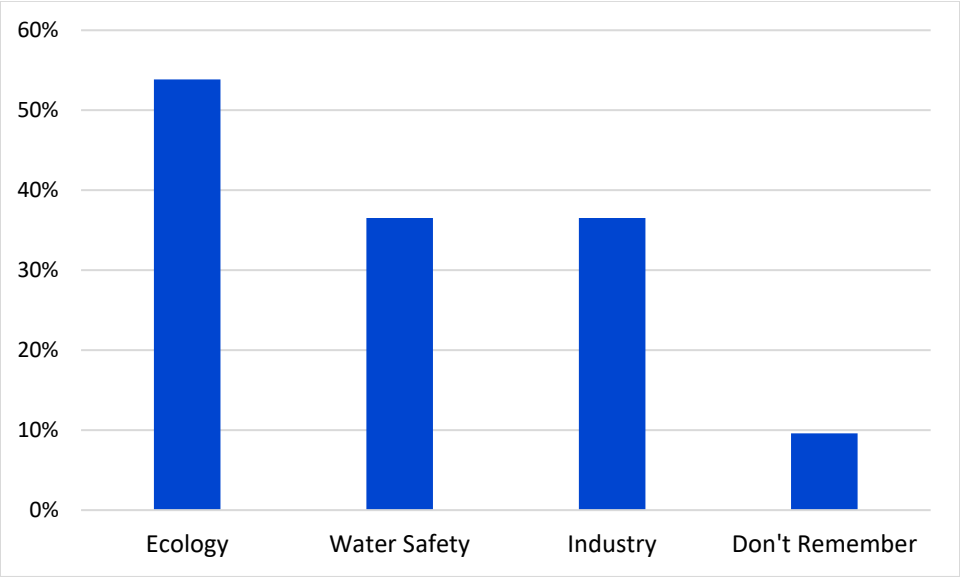
The goal of this study was to evaluate the educational outcomes of the River Quest program. It was intended to inform the River Quest board if they are meeting the mission of the program, as well as to be used as a tool to inform formal educators about the educational relevance of student participation. Of the 264 students that received the survey, 38% (n=100) of them did not attend River Quest in the past, and 17% (n=46) of them did not consent to take the survey. The remaining 45% (n=118) took the survey.

Knowledge

Before students were asked questions that tested their knowledge of the three umbrella categories, they were given an open response question. This question asked, “What are some things you learned at River Quest” and they were free to type whatever they felt (Figure 1). Their answers were sorted by the three main umbrella topics. If a student listed information from more than one topic, every topic mentioned was given a point (e.g., If a student said they learned about invasive species and shipping practices, both ecology and industry received one point). Answers involving ecological lessons appeared the most (54%) with water safety and industrial topics tying in second (37%).

Figure 1.

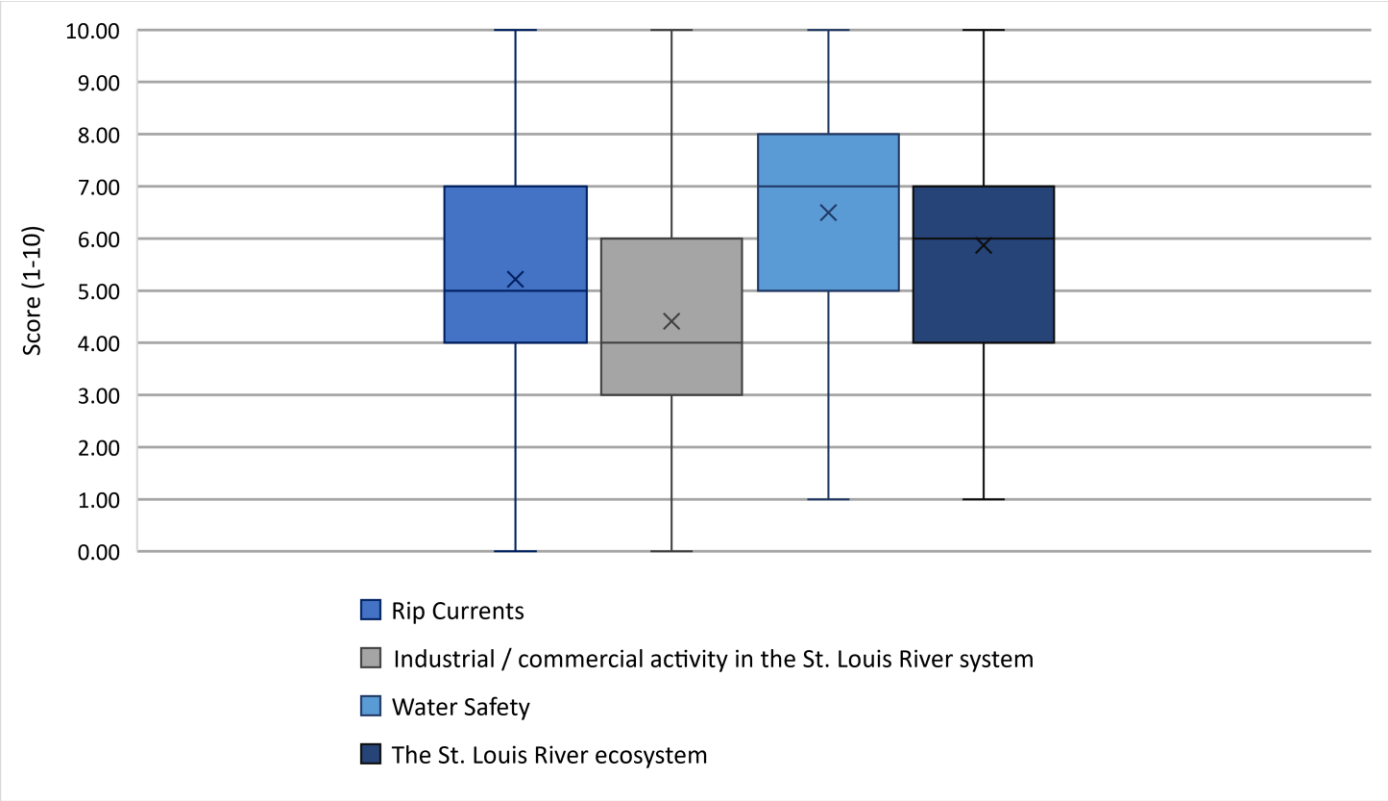
Self-reported topics learned at River Quest (n=52)



Students were also asked to rate on a scale of 1 to 10 how much River Quest improved their understanding of the different topics presented at River Quest. Water safety had the highest rating at an average of 6.5, followed by ecology at 5.9, rip currents at 5.2, and industry at 4.4 (Figure 2).

Figure 2.

Box and whisker plot indicating average rating and range of how much RQ improved student's understanding of umbrella topics (n=95)



Note: X indicates the average rating, middle bar indicates the median value

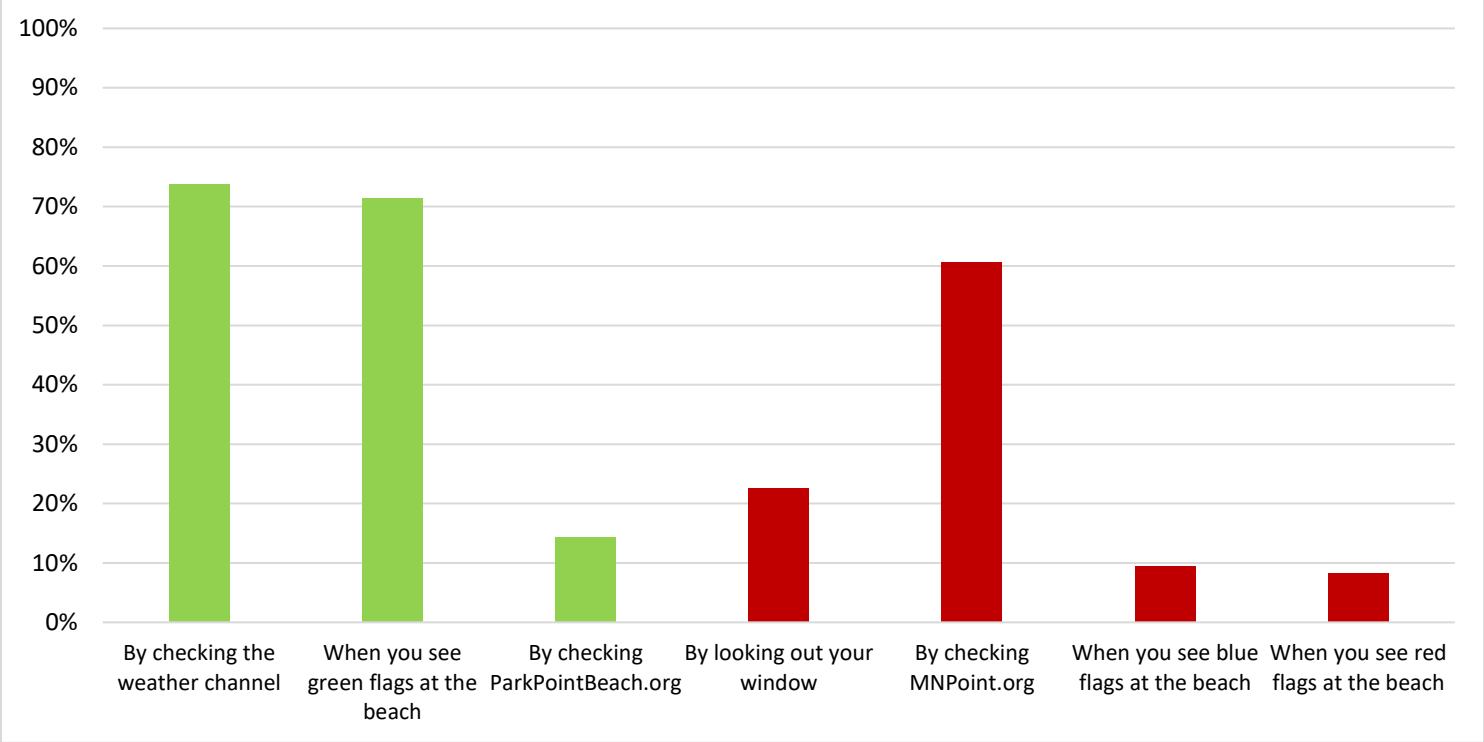
Safe recreational practices education

Students were asked how to determine whether or not it was a good day to go to the beach (Figure 3). At River Quest, the "Break the Grip of the Rip" booth highlighted different resources for assessing beach conditions. This included checking the weather and looking for green flags flying along the beach area. The booth also gave them a specific internet resource for checking the conditions along the most popular local beach: https://www.parkpointbeach.org. To verify that students were not simply choosing this as a response that "seemed" right, a fictitious website (MNPoint.org) was also added as an option for this question. Students were asked to

select all correct responses and could select up to all seven choices. The most commonly selected incorrect answer was identifying the incorrect website from which to retrieve information.

Figure 3.

Responses to the survey question "How do you know it's a good day to go to the beach?"

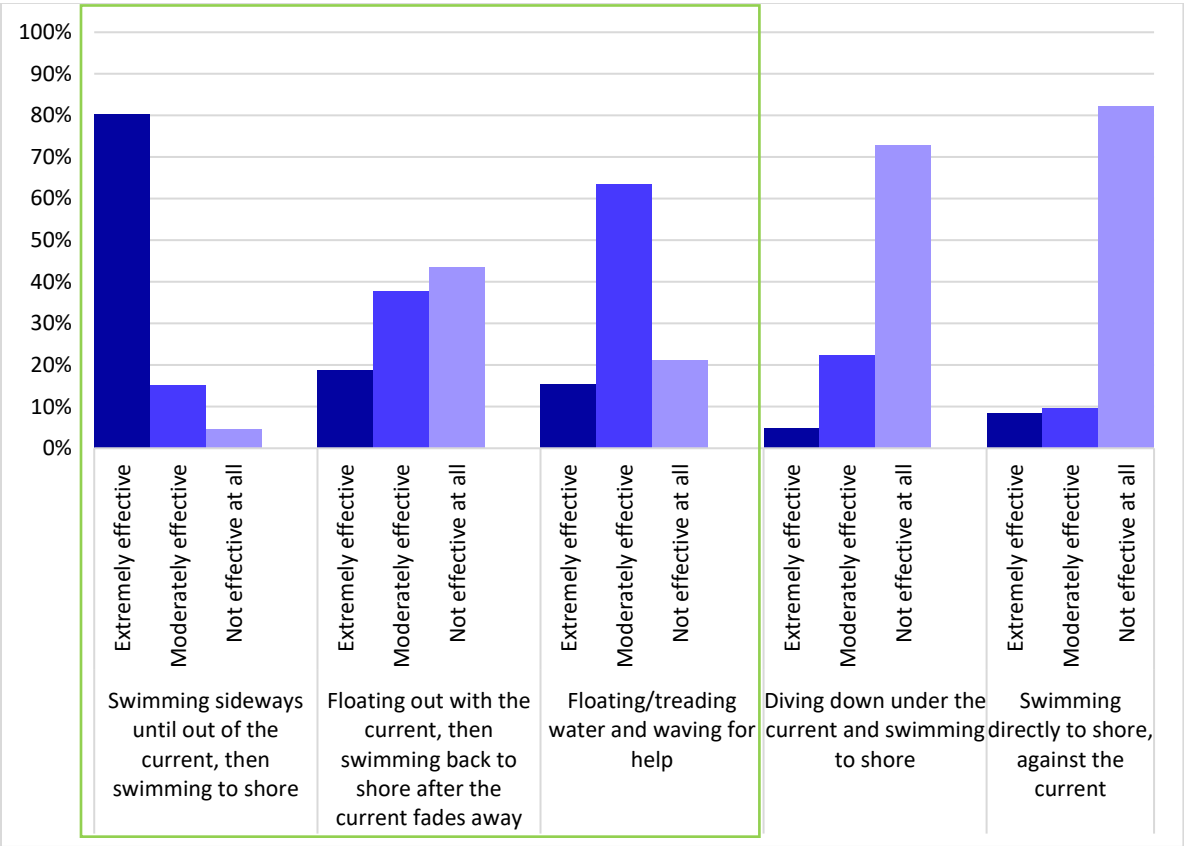


Note: Green bars indicate safe practices discussed at River Quest, red bars indicate unsafe or incorrect practices

The next safety related question asked students to rate the effectiveness of various strategies for escaping a rip current, should they find themselves caught in one (Figure 4). Once again, the first clusters of columns of the graph indicated correct choices, outlined in a green square, while the last two are incorrect methods of escaping a rip current. The respondents were able to rate the strategies as extremely effective, moderately effective, or not effective at all.

Figure 4.

Ratings of effectiveness for strategies for escaping Rip Currents (n=85)

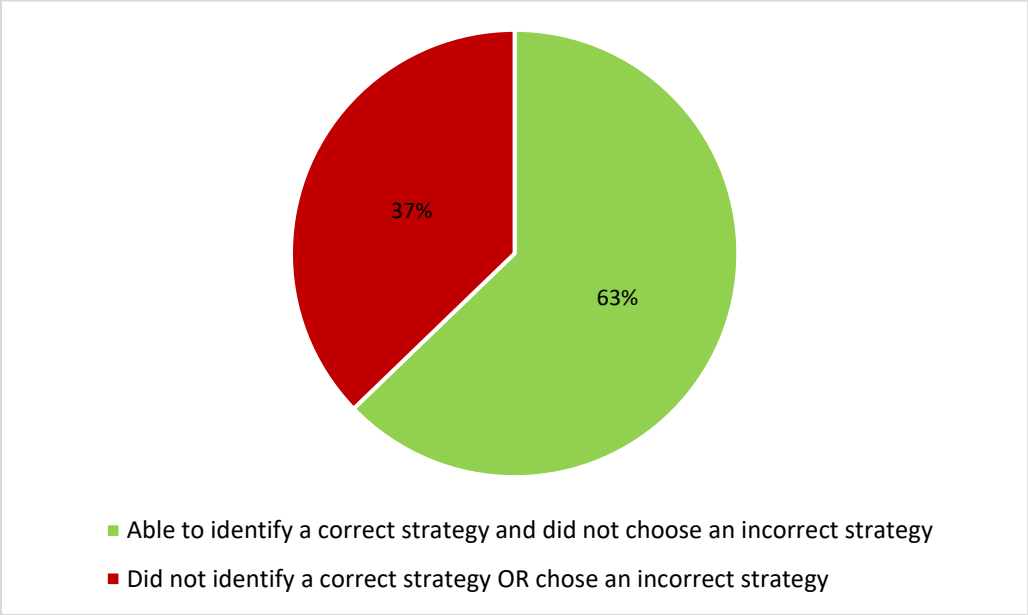


Note: Green box indicates safe choices discussed at River Quest

The desired outcome of this program is that all participants know at least one effective strategy for escaping rip currents and do not think they should do an unsafe strategy. If a student knows one correct method, but also thinks even just one incorrect one is correct, the program has not been effective. Therefore, this data was sorted by how many of the respondents correctly identified at least one effective strategy, while recognizing all of the ineffective ones (Figure 5). Responses were considered correct if they listed appropriate rip current responses as extremely or moderately effective. When rating an unsafe response to being caught in a rip current, only a response of “not effective at all” was accepted as correct.

Figure 5.

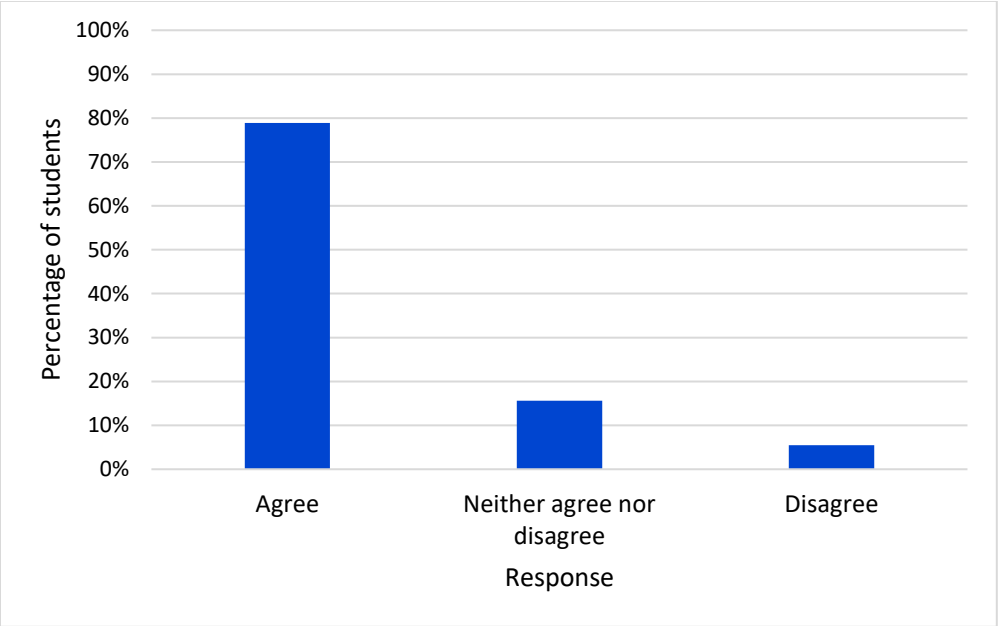
Rip current safety question responses(n=85)



Not only were students tested on their knowledge, but they were also asked to report their own feelings of knowledge. On the topic of water safety, 79% (n=86) of the students that took the survey reported that they felt that they learned new information about water safety during River Quest (Figure 6).

Figure 6.

New information learned about water safety in the St. Louis estuary (n=108)

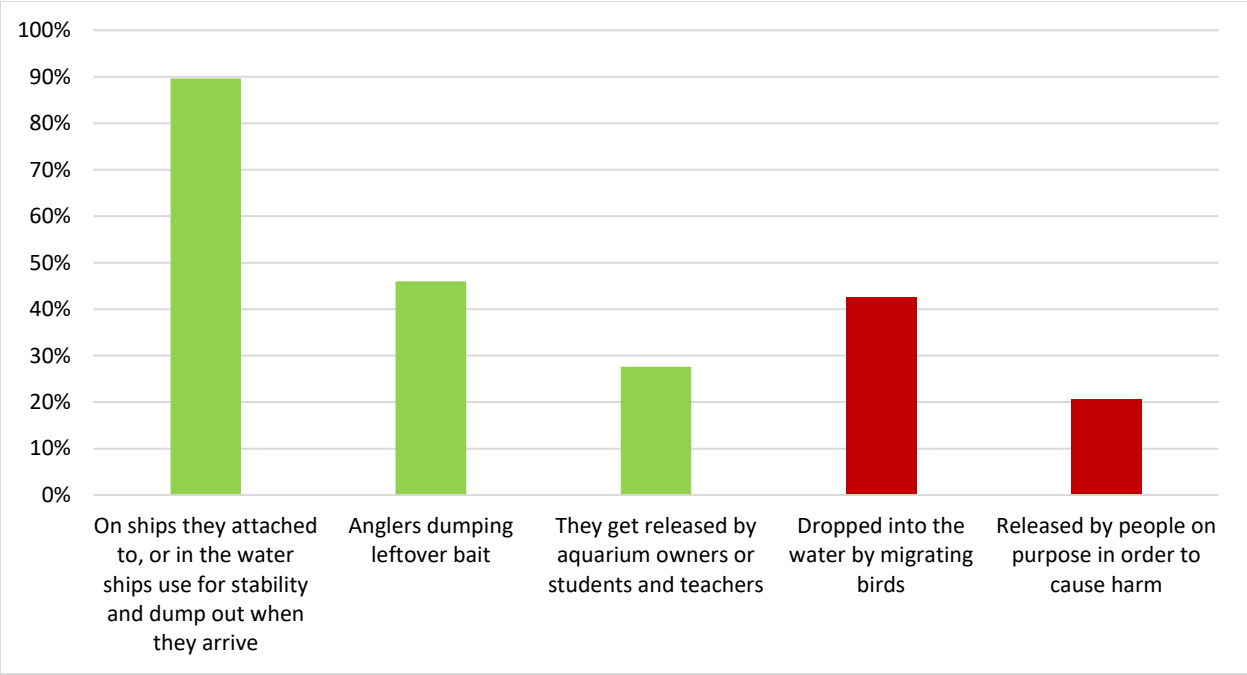


Ecological and Economical Education

The next two questions were those relating to the "*Get Habitattitude!*" booth. Students were asked to identify the correct definition of an aquatic invasive species from a list (See Question 7 in Appendix B). A majority of students (77%, n=67) chose the correct definition. Question 8 asked students to select from a list the ways that aquatic invasive species have been introduced to the St. Louis Estuary (Figure 7). The first three columns of the graph are the answers covered in the program, the last two are not methods mentioned in the "*Get Habitattitude!*" lesson. Because these options are technically feasible, future studies may consider adjusting this comprehension question to list incorrect responses that are not possible. This question examined if students were able to recall the specific lessons covered at the Habitattitude booth (Figure 8).

Figure 7.

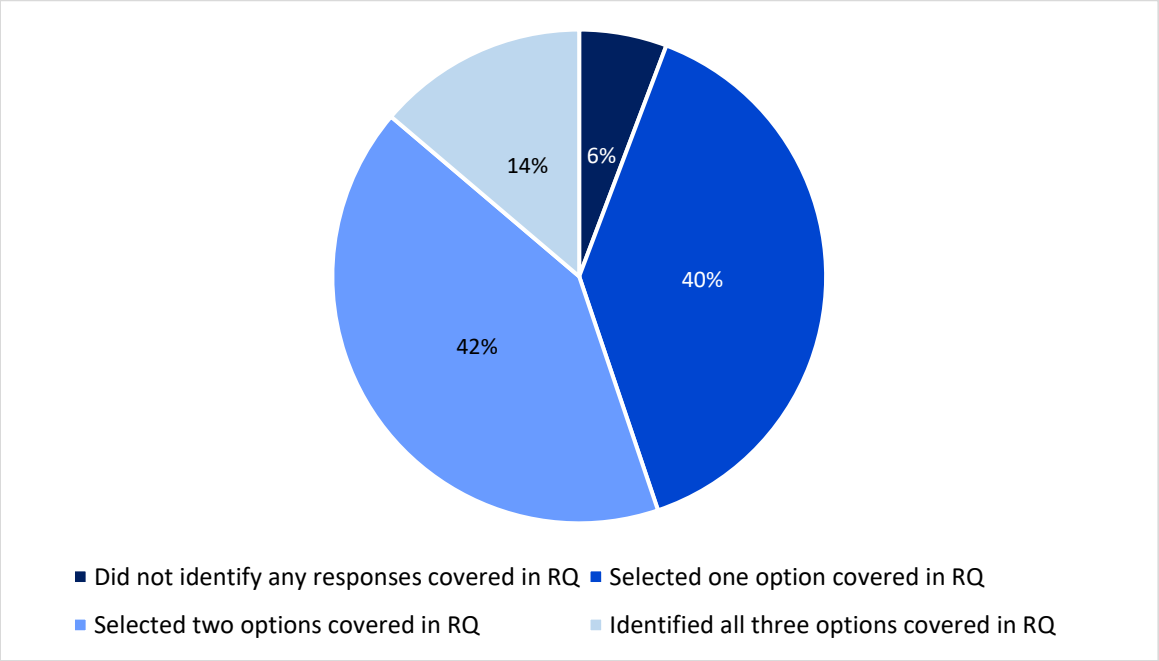
Ways aquatic invasive species have arrived at the St. Louis estuary (n=87)



Note: Green bars indicate methods discussed at River Quest, red bars indicate methods not covered at River Quest

Figure 8.

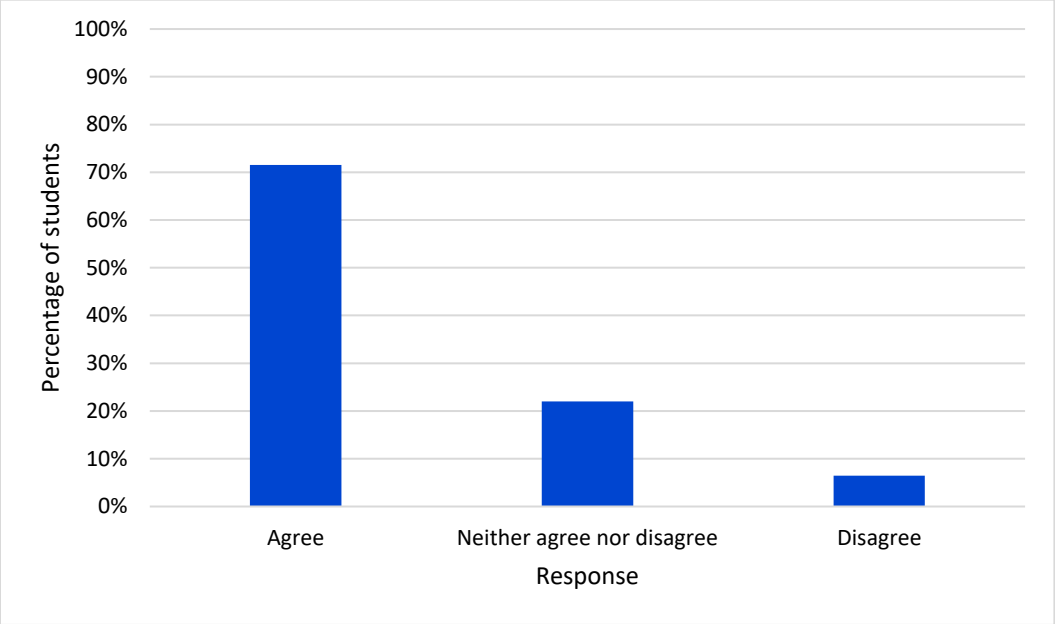
Responses to invasive species question (n=87)



Students were again asked to report their own feelings of knowledge about this subject. In this area, 72% (n=78) of survey takers reported that they felt they had learned new information about the ecology of the estuary while attending River Quest (Figure 9).

Figure 9.

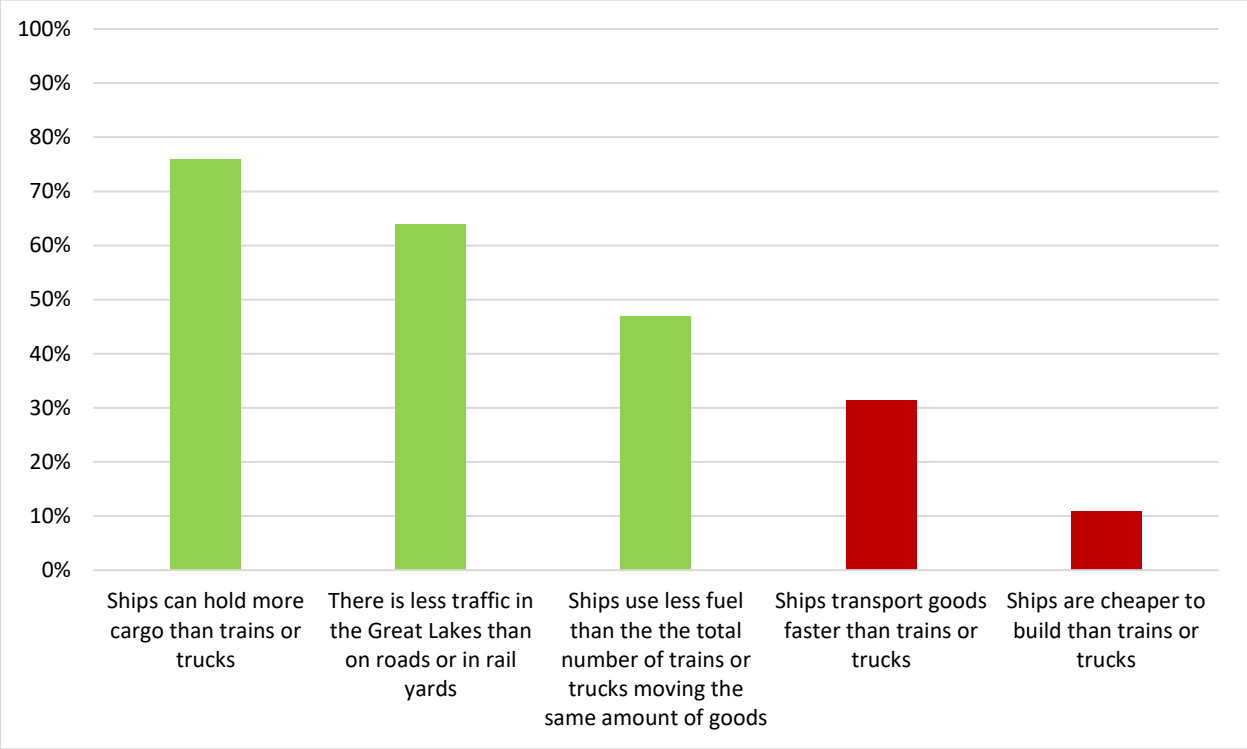
New information learned about the ecology of the St. Louis estuary (n=108)



Finally, for their industry question from the Great Lakes Cargo Capital booth, students were asked to identify advantages of shipping by water (Figure 10). They were once again given a list of options and asked to select any that they felt were correct. Each option that was discussed at River Quest had a value of one point, the other two options that were not discussed during the program were worth zero points. A student with a perfect score would have three points, and a student who did not select any of the options that they were taught at River Quest would have a score of zero. The average score for this question was 1.8 points. With this question, over half (62%) of the students were able to identify at least two of the primary advantages covered by the program at River Quest (Figure 11).

Figure 10.

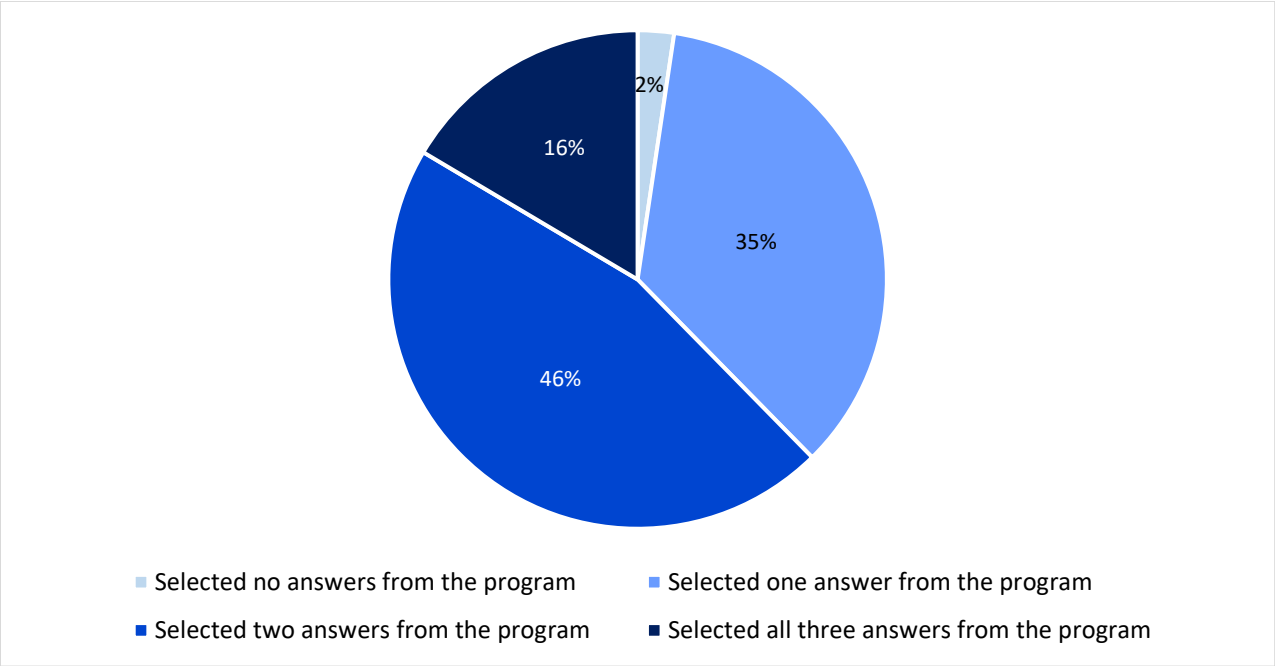
Selected advantages of shipping by water (n=84)



Note: Green bars indicate factors discussed at River Quest, red bars indicate factors not covered at River Quest

Figure 11.

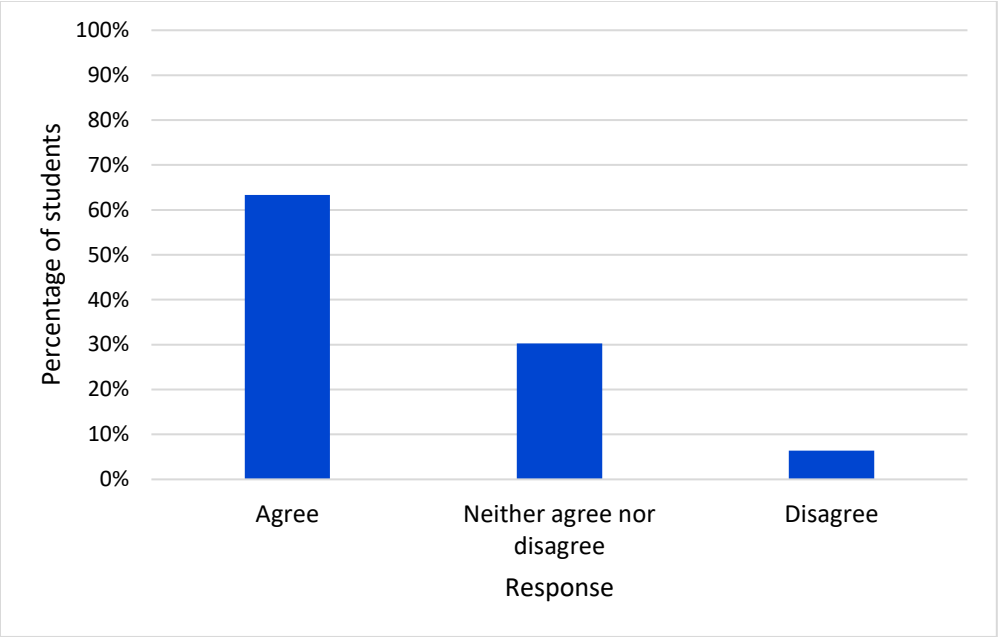
Responses to shipping by water question (n=84)



For the topic of industry, 63% of the students that took the survey reported that they felt they had learned new information at River Quest (Figure 12).

Figure 12.

New information learned about the industry in the St. Louis estuary (n=108)



Overall Attitudes

Before the students responded to the more specific questions about the specific topics of River Quest, they were asked more broad questions. This was done to assess their personal views on the program without influencing them through the more targeted questions. The questions were subjective, and they were instructed to give their personal opinions. Some key insights from this portion of the survey were that a majority (62%, n=67) of students enjoyed the program (Figure 14), The program had an 85% (n=92) satisfaction rate which was determined by students that expressed interest or ambivalence to doing the program again (Figure 13). Even higher than that, 87% (n=94) students listed at that they enjoyed at least one aspect of River Quest. According to this question, the most popular aspects of River Quest was being aboard the Vista Star and participating in hands-on activities (Figure 15).

Figure 13.

Responses to the statement "I would like to do another River Quest program" (n=108)

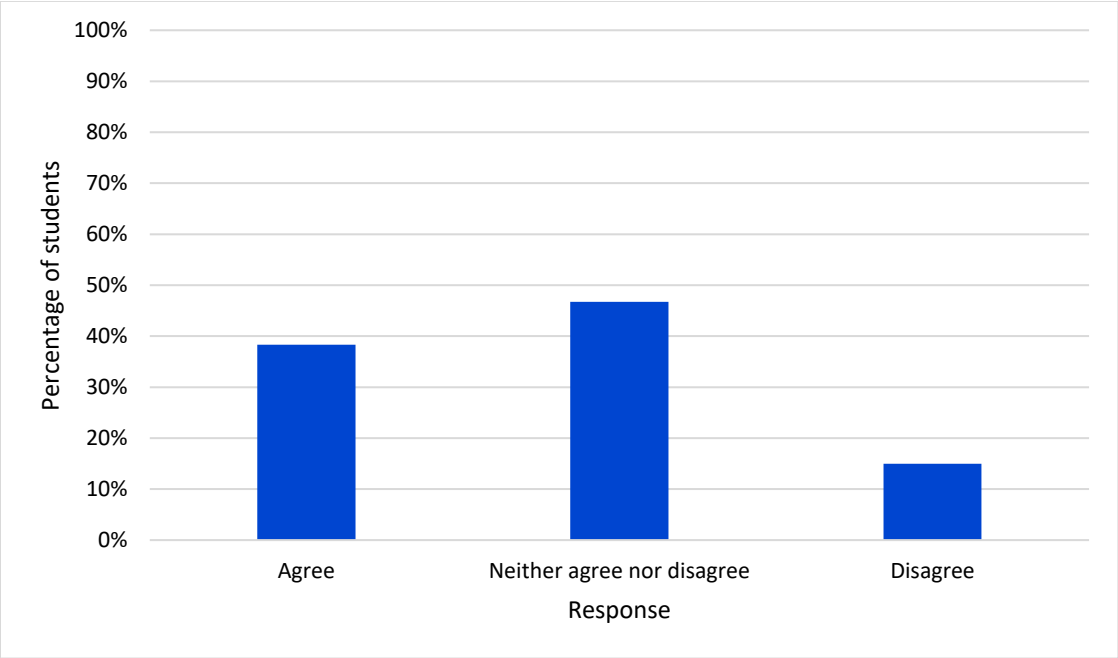


Figure 14.

Student's enjoyment of River Quest (n=108)

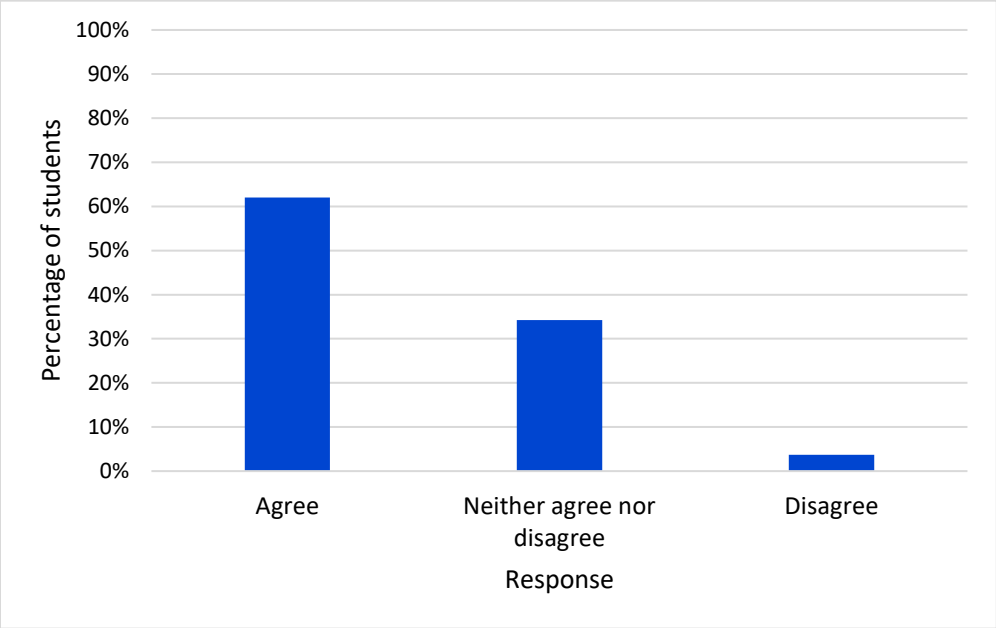
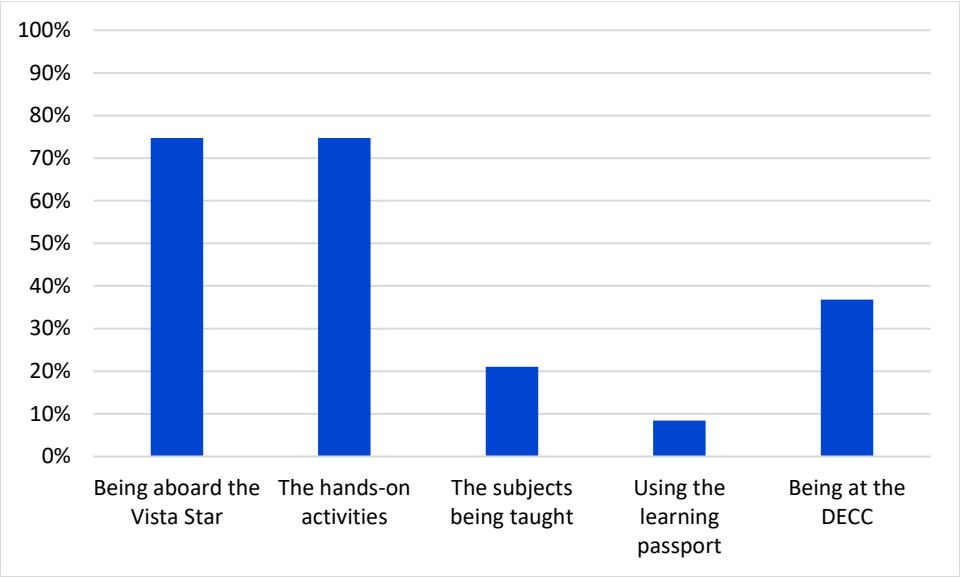


Figure 15.

Most fun aspects of River Quest (n=98)



Supporting Teacher's Curricula

The prompts used for the interview with the local teacher can be found in Appendix C. While they were originally written for a focus group, all questions were asked during the interview. Responses from the teacher were coded and are summarized below.

Importance of Supporting Classroom Curricula

- Very important for River Quest to support academic standards: "It makes sense that if we are going to take time out of the school day, and, you know, like, if we're all in this together, and if we have good standards, which we are charged to teach our students, all that we do in our school day should move students towards achieving these standards."
- River Quest does a good job of supporting science standards.

Constructive feedback

- Currently the program is very dense for the length of time that it runs, students do not have enough time to register what they were learning: "One of the things I wonder about is its brevity. There is so much being thrown at them in such a short time, without- a lot of it without a lot of follow up. […] They sit there for 15 minutes and get very interesting information, and the presentations are great, but it might be something that doesn't have any lasting effect, so I wonder about that."
- Teachers of other subjects besides science could be involved but are not because their standards aren't being supported in this program.

Recommendations for Program Improvement

- Having the students moved around less could provide more time for lessons. A lot of the day is about the mechanics of moving to different spots around the vessel/DECC. Presenters would spend less time getting students settled and the students will have time get invested in the presentation if there is more time.
- River Quest should expand to cover standards of other subjects like math and English to get other teachers involved. The topics can be the same, but they could put other skills to use.
    - Math standard example: Ratios
    - English example: Listening

Overall Attitude towards River Quest

- The program was very useful in introducing 6th graders to the unique place they live within/nearby: "[River Quest] helps the students just know what an estuary is, and

recognize that, um, we live near one and there's a unique sort of, uh, biological structure that happens to be here."

- River Quest successfully engages students that attend it.
- While there is a lot of movement, it is planned and organized really well.
- The concepts River Quest educators are presenting are at the right level of comprehension skills of the students: "…after a decent presentation, those are appropriate questions to ask [6th grade] students."

Summary

Overall review of the survey shows high levels of satisfaction and enjoyment of the program. There are also high rates of knowledge about the subjects presented during the programs three years after completion. While the number of students that responded to the survey was well over the goal of 100, the number of teachers was significantly lower than planned. This led to the focus group being switched to an interview, which provided its own advantages. The information gleaned from the interview as well as the survey responses was summarized into a SWOT analysis below (Table 2). The following chapter will elaborate on the significance of the findings from this investigation. The responses to the survey indicate a high retention rate and the program is viewed as favorable. The teacher response provided insight on strengths and weaknesses of the program, which will be discussed in the next chapter.

Table 2.

SWOT Analysis

Internal

Positive	Strengths • Program is viewed very positively by teacher and respondents • Program supports MN and WI science standards • Key concepts are retained 2.5 years after the program	Weaknesses • Time wasted during transitions and settling the students down at the start of a new lesson • Lack of follow-up by some teachers
	Opportunities • Expanding to other ages • Inclusion of other subjects and educational standards • Creation of an introduction lesson or follow-up lesson for classrooms	Threats • Teachers not wanting to chaperone the program • Not staying current with standards • Density of information presented (too much information and presented with too many facts v. conceptual learning)	Negative

External

Chapter 5

Discussion

Introduction

The purpose of this study was to evaluate the educational outcomes of River Quest as well as assess the impact of the program on participants. With approval from local principals and teachers, this study surveyed past participants of the River Quest program using an online questionnaire. A local teacher was also interviewed to gain a more comprehensive insight of the outcomes of River Quest. While the intent was to conduct a focus group with multiple teachers, the need to pivot and do a more in-depth interview with a single educator provided significant feedback that created a more holistic understanding of the program. The mixed method approach, of utilizing quantitative data from the survey, as well as the qualitative information from the interview was integral to providing a comprehensive assessment of the program.

Limitations

The major limitation of this study lies in the design. Not having a pretest level or control group prevented examining the knowledge levels before attending the program. While the study investigated whether knowledge is present, one cannot be sure where it came from. The construct of interest in this study was more so the retention of knowledge, not just knowledge itself.

This study is designed around the River Quest program and focuses on the schools that attend it. The results cannot be generalized beyond this program or to other audiences. This study is also limited in its qualitative data. The report from the teacher represents only a single perspective from the local schools and does not represent all the teachers in the area.

The impacts of the COVID-19 pandemic heavily influenced this study. There was no option for any on site investigations or observations, as the program was cancelled in 2020 and

virtual in 2021. Pandemic fatigue in teachers may also play a part in the lack of responses from requests for focus group participation. This study was limited by time constraints, and therefore could not be conducted during the next in person program.

Discussion of Survey Data

Subject comprehension was determined by response rates of one incorrect answer or less. The results of the survey indicate that, overall, most students (62%, n= 108) enjoyed River Quest (Figure 14) and most students (85%) were interested or at least neutral towards the idea of returning to the program (Figure 13). These findings, along with the affirming responses from the interview, indicate that the program is viewed positively by participants. This aligns with research into the value of field trips. Not only are they valuable for the material that they teach, but also as tools to help students enjoy learning and have positive experiences through education (Adams et al., 2012; Behrendt & Franklin, 2014). Most respondents to the survey were able to identify at least one aspect of the field trip that they particularly enjoyed (Figure 15). While it is heartening to hear that the program is seen as enjoyable, the primary goal of this study was to investigate if it is achieving the learning goals it has set.

Water and Recreation Safety

The first of the three main topics of the program is water recreation safety. 79% (n=85) of the students reported that they felt they learned new information about water safety at River Quest (Figure 6). The responses to the two survey questions that specifically targeted this knowledge were encouraging. It must be noted that a confounding variable existed for this question that shows many students getting an incorrect answer. The “Break the Grip of the Rip” booth heavily promoted the use of a particular website that had all the safety information necessary for visiting Park Point. This website is parkpointbeach.org. To investigate whether the

students remembered this site, a fictitious website was also listed (MNPoint.org) in order to minimize students assuming that they should select the website listed. The use of MNPoint.org skewed the data, while students seemed to know there is a website that can guide them, they may not have remembered the URL. In this instance it may be more important that students learned that there is a website they can search for, rather than remembering the actual URL. While those that selected the wrong website did choose incorrectly, they seem to have retained the knowledge that there is a website about Park Point, two years after attending River Quest.

The second question on water safety listed different methods for escaping a rip current. This question had a 60% (n=51) pass rate, with 95% (n=81) of students selecting at least one correct answer (Figure 4). The primary message shared with students at River Quest is to swim sideways if caught in a rip current. The other correct responses, floating, treading water, are included, but as secondary– if you cannot swim sideways. Given that only 5% indicated that this primary method was not effective, there appears to be a very high rate of understanding of what was presented in the program. Water safety knowledge can save lives, and with 63% of the responses correctly identifying at least one correct method for escaping rip currents and correctly recognizing unsafe choices (Figure 5), the River Quest is promoting water safety effectively. Even if students had known this water safety information prior to attending the event, there is strong evidence that underlines the importance of refresher courses to maintain the knowledge (Petrass & Blitvich, 2014; Wisher et al., 1991). When rating how much River Quest improved their understanding of the umbrella topics, water safety scored highest with an average score of 6.5 out of 10, and knowledge of rip currents had an average score of 5.2, with a rating of 5 identified as “a moderate amount” (Figure 2). All of this information indicates that the water

safety stations were successfully educating the 6th graders that attend River Quest, and that the information is retained ~2.5 years after the program ends.

Ecology

There were also two questions that specifically targeted the ecological topics discussed at the River Quest program. The first question, which asked students to select the correct definition of invasive species, was answered correctly by 77% (n=67) of the respondents (Figure 5). The second question, which was similar to the water safety questions, in that students were asked to select as many correct answers as possible, had a pass rate of 85% (n=74) (Figure 7). It is, therefore, surprising that despite having such high rates of correct answers, this category received an average score of 5.9 when students were asked to rate how much they felt River Quest improved their knowledge (Figure 2). In addition to this, only 72% (n=78) of students felt that they learned new information at River Quest (Figure 9).

These disconnects may be due to the fact that students felt they already had a well-established knowledge of the topics presented before attending the program. When given the opportunity to report what they remember learning into a blank text box, 54% (n=28) of students included some mention of lessons relating to the ecology of the estuary (Figure 1). It is clear that many students remember learning about ecology at River Quest, but it may be that some of the lessons are already familiar to them. Based on this data, the ecology related lessons at River Quest seem to be using effective teaching methods, as students are retaining this information after the program. It may be, however, that there is room to expand into more complex concepts or ideas to push the student's knowledge levels. This may be done in the classroom after the program, or during the program itself.

Industry

While this topic only had one question to investigate their knowledge, it had the highest passing rate of the three categories with 93% (n=78) of students selecting all correct answers or only one incorrect answer (Figure 10). Despite this, when asked if they felt they learned new information about industry in the estuary, 62% (n=67) of students responded positively, the lowest of the three categories (Figure 12). River Quest also received a rating of 4.4 on whether it improved their knowledge of the industry / commercial activity in the St. Louis River system. Once again this may be due to the students feeling as if they already had the knowledge that was presented to them before the program.

Discussion of Interview Data

As mentioned in Chapter 4, only one teacher responded positively to the request for an interview out of 15 that were contacted. Some expressed schedule limitations and, while speculative, the low turnout rate may have also been a result of COVID-19 stress and the time of year the requests were made. During the interview, the teacher had many positive comments about River Quest. That does not, however, mean that there are not areas that could be improved. One example is the comment that so much information is being given over a short span of time. A way to minimize this, according to the teacher, may be to have less moving around during the two-hour period. With each change of location, whoever is running the station has to get the students situated and gain their attention before beginning their presentation. Time can be saved by having students move less in between programs. The teacher also suggested having some sort of precursor to the program to help spread out the vast amount of information. Having teachers introduce some of the information before the field trip or do some follow-up work after returning to school would allow for the program to continue as designed but lessen the density of the

program. However, all of the teachers that sign up for River Quest are provided information on what will be presented prior to the event and have access to it afterwards. While not all teachers take advantage of this or use this information, this comment from the interview makes it clear that all teachers may not be aware of the resources available to them. Should efforts be made to encourage teachers to utilize this information prior coming to River Quest, there may be an improvement in student comprehension and engagement.

Another note from the interview is the possibility of expanding the academic standards that River Quest seeks to meet. While it may seem natural that there is a focus on science standards, there may be room for including math and or English standards as well. The two specific examples given by the teacher was the use of ratios as a math standard or listening skills as an English standard. Especially in the latter option, River Quest does not need an extensive overhaul to incorporate new standards. Existing programs may just need to examine some of the Minnesota and Wisconsin state standards for other subjects and note any connections they might see. If River Quest is able to connect itself to other subjects, there can be opportunities to have follow up lessons given by more than one teacher. While a science teacher may review the ecological lessons from the field trip, an English teacher may have students reflect on the program. A math teacher may use relevant real-world problems related to the local industry to highlight their current topic. This recommendation is more reliant on creating new connections than it is designing new programming. A summary of the teacher's comments on River Quest have been arranged into a SWOT analysis (Table 2).

Implications

Based on the survey responses and the feedback from a local educator, River Quest is presenting age-appropriate information that challenges the visiting students. Most students are

able to retain some information for at least two years (77.6% n=67). Not only did they retain comprehension levels, but 96% (n=104) of past participants also report having a positive experience at River Quest. When self-reporting, students indicated they learned a “moderate amount” about each of the main topics of river quest (Figure 2).

While the current programming supports science standards, there is room to improve supporting teacher curricula. I recommend that there be an improvement of cooperation with the local teachers in future programming to better ensure that the information learned during River Quest better fits into classroom curricula. Introducing the subjects in class before the trip or having some sort of debrief in the schools will create more time for students to process the information from River Quest and may improve learning outcomes, based on the interview with the teacher. While resources are available for this, there appears to be a need to communicate to the teachers more clearly about these resources and how they might be used. Studies show that field trips are much more effective when there is a clear connection to the classroom (Griffin & Symington, 1997; Kisiel, 2006). If this is not a feasible option, removing some of the transitions between booths or even lowering the number of booths to visit may enhance learning by slowing down the pace of the program. River Quest is successful in creating a positive experience but improving the learning outcomes will help it remain relevant to local educators.

Another way to improve how River Quest can support the curricula of local schools is through expanding the standards that it covers. One threat to River Quest is if not enough teachers chaperone the program (Table 2). If the standards being met at the program expand beyond just science into other topics, teachers of these topics may be more inclined to attend the program. This may also promote follow up after the conclusion of the program. Not putting all

the emphasis on science may allow for teachers of other subjects to review what was discussed at the program.

Future Research

Future evaluations of the River Quest program should strive to collect evaluative data at a time when the event is being held in person and to interview students who had attended the event more recently. For example, surveying students within a week of the program, (as opposed to immediately after the event to avoid confounding effects of testing that may be present in a group that had only moments ago attended the program). While this study was able to investigate retention rate, it encountered the confounding effects of history and maturation. Different perspectives on areas to improve can be gained via in person observation, rather than secondhand accounts. In addition to this, a future study that evaluates student knowledge before and after the program or using a control group of students who did not attend River Quest could be a stronger design to address potential discrepancies in reported levels of learning by running statistical analysis such as chi-squared tests. If non-River Quest participants had similar responses as those who did, it would speak to ineffectiveness of the program at influencing desired constructs. If non-participants knew less, that would indicate program effectiveness.

A future study that focuses on teacher feedback would also provide relevant information. If it is possible to get higher teacher participation levels, having teachers who can participate in the program as evaluators to provide feedback to the stations would be another way to get input from educators. This study was an evaluation of the program itself but may be a steppingstone in a larger analysis of the benefits of hands-on learning and field trips on education.

To make sure this program stays on track and maintains its credibility as an educational opportunity, the program should undergo intermittent evaluations. Without any sort of consistent

analysis, the program may become stagnant and lose relevancy to the changing curricula of the area. While this study was cross sectional, a future study that does a time series analysis, via some sort of posttest after several River Quest programs, will give a fuller understanding of the program's strengths, weaknesses, opportunities, and threats to its continuing success.

Conclusion

This evaluation found that, overall, the River Quest program is meeting its mission and is a successful program. Students showed a high level of concept retention after 2.5 years and reported having a positive experience at the program. The educator interviewed also lauded the program's content and efficiency. While the program supports science curricula, there is room to expand into more disciplines than science alone and to consider topics from other subject areas. There is also a need to alleviate the density of the information presented at the program. This could be accomplished through an introduction to the topics in classrooms ahead of time, a follow up lesson after the program, minimizing transition times, or lowering the number of booths students visit. Overall, the basis of this program is supported by education research. Supporting partnerships between schools and communities can boost student achievement and critical thinking skills (Powers, 2004). Field trips have been shown to foster positive interest and attitudes towards learning that can lead to a deeper engagement of the material (Adams et al., 2012). Providing local examples of lessons outlined by standards encourages students to examine problems or phenomena from different approaches and appreciate other perspectives (Coker, 2017). The theoretical foundations of River Quest are relevant, and it is achieving its mission of educating local youth about the local ecology and industry, as well as safe recreation practices around water.

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Appendix A: Logic Model

Mission

River Quest provides students with hands-on learning experiences that enhance awareness and understanding of the St. Louis River ecosystem and interrelated commercial, industrial, and recreational activities.

Situation

Hands on learning opportunities have been demonstrated to be effective learning tools. The St. Louis River Quest program has been educating local youth on the river estuary for over 28 years. There are over a dozen learning stations that fit under the three main subjects of the program: the St. Louis River estuary ecosystem, commercial and industrial activities, and water safety and recreation.

Inputs

1. Human Resources: River Quest Board of Directors, a multitude volunteers to run booths and schedule the event
2. Financial Resources: Local sponsors and private donors
3. Space: The Vista Star and the DECC
4. Educational Materials
5. Media (e.g., videos with further information)
6. Schools – teachers agreeing to participate

Outputs

1. A four-day long program that provides a three-hour long educational program for each group of 6th grade students (every student attends a three-hour program comprised of multiple ten-minute learning stations)
2. Take home booklet for students

Learning Outcomes

The following learning outcomes were taken directly from the River Quest mission statement

1. Enhance awareness and safety behaviors of **recreational activities** related to the St. Louis River ecosystem
2. Enhance awareness and understanding of the St. Louis River **ecosystem**
3. Enhance awareness and understanding of the **commercial and industrial activities** in the St. Louis River ecosystem

Learning outcomes from the three chosen learning stations

Break the Grip of the Rip

1. Be able the describe what a rip current is
2. Describe an effective way to escape a rip current

3. Understand how to find out the risk of rip currents at the beach by looking at resources such as parkpointbeach.org or the flags posted along the point

Get Habitattitude!

1. Understand that the release or escape of unwanted aquarium fish, plants, reptiles, as well as study specimens can harm Minnesota waters and native species.
2. Understand that releasing alien species into Minnesota waters is illegal

Great Lakes Cargo Capital

1. The port of Duluth-Superior supports local jobs and is a major economic contributor to the area
2. Waterborne shipping allows for the movement of massive amounts of cargo
3. Shipping by water is efficient and can be more environmentally friendly than cargo movement by rail or truck

Appendix B: Survey Instrument

UNIVERSITY OF MINNESOTA
DULUTH

Default Question Block

Hello,

My name is Ellen Munshower.

I am conducting an evaluation on the St. Louis River Quest Program. The purpose of this survey is to find out about the quality of the River Quest program. Because you attended River Quest in the past, I am inviting you to share your thoughts by taking this survey.

This information will be used to inform future changes to the River Quest program to make it even better.

If you choose to take this survey you will be asked questions about your experience when you attended River Quest. Some of the questions will be about specific lessons that were taught at the program. The survey should take approximately 20 minutes from start to finish.

Your participation in this research is completely voluntary. You have the right to quit at any time, for any reason. There will be no consequences towards you for whether or not you choose to participate. Also, your responses will be kept **anonymous** and are not linked to your information. That is, no one, including myself, will be able to identify you in any way by your participation in this survey.

If you would like to contact the Principal Investigator in the study to discuss this research, please contact me at my e-mail Ellen Munshower: munsh097@d.umn.edu or the IRB office at: irb@umn.edu. You may also contact my graduate advisor, Dr. Ken Gilbertson at kgilbert@d.umn.edu if you have any questions or concerns about this study.

Your responses are voluntary and will be entirely anonymous. By clicking the button below, you acknowledge that your participation in the study is voluntary and that you are aware that you may choose to end your participation in the study at any time and for any reason. Thank you so much, Ellen Munshower Graduate student Master of Environmental Education Program University of Minnesota Duluth munsh097@d.umn.edu

○ I do not consent, I do not wish to participate

- ○ I consent. I have participated in the River Quest program and I understand my participation in this study is voluntary and I have the right to withdraw at any point during the study. I understand I will receive no negative repercussions for withdrawing, as well as that there will be no benefits (e.g. pay of favors) given to me whether or not I choose to participate. I understand that my responses are completely anonymous and I will not be able to be identified from my participation in this survey.
- ○ I did not participate in the River Quest program

Please rate how you feel about each of these statements

	Disagree	Neither agree nor disagree	Agree
I enjoyed River Quest	○	○	○
I learned new information about the ecology of the St. Louis estuary because of attending River Quest	○	○	○
I learned new information about the industry in the St. Louis estuary because of attending River Quest	○	○	○
I learned new information about water safety of the St. Louis estuary because of attending River Quest	○	○	○
I would like to do another River Quest program	○	○	○

What aspects of River Quest were **MOST** fun for you? *(Select ALL that apply)*

- ☐ The hands-on activities
- ☐ Other: _____
- ☐ The subjects being taught
- ☐ Being aboard the Vista Star
- ☐ Being at the DECC
- ☐ Using the learning passport

What aspects of River Quest were **LEAST** fun for you? *(Select ALL that apply)*

- ☐ Other: _____
- ☐ Not enough hands-on activites
- ☐ Did not being in the DECC
- ☐ Did not like being aboard the Vista Star
- ☐ Too many hands-on activities
- ☐ Did not like the subjects being taught
- ☐ Did not like using the learning passport

What are some things you learned at River Quest?

How much do you feel RQ improved your understanding of...

	None at all 0	1	2	A little 3	4	A moderate amount 5	6	Quite a bit 7	8	A Great Deal 9	10
Rip Currents											
Industrial / commercial activity in the St. Louis River system											
Water Safety											
The St. Louis River ecosystem											

The next set of questions will ask you about some of the specific things taught at River Quest. There is no penalty for wrong answers, just answer each to the best of your ability.

How do you know it's a good day to go to the beach? *(Select ALL that apply)*

- ☐ When you see red flags at the beach
- ☐ When you see blue flags at the beach
- ☐ By checking MNPoint.org
- ☐ By checking ParkPointBeach.org
- ☐ By checking the weather channel
- ☐ When you see green flags at the beach
- ☐ By looking out your window
- ☐ By going to the beach and jumping in

If you were caught in a rip current, how effective do you think each of the following strategies would be for escaping?

	Extremely effective	Moderately effective	Not effective at all
Floating/treading water and waving for help	○	○	○
Swimming directly to shore, against the current	○	○	○
Swimming sideways until out of the current, then swimming to shore	○	○	○
Diving down under the current and swimming to shore	○	○	○

	Extremely effective	Moderately effective	Not effective at all
Floating out with the current, then swimming back to shore after the current fades away	○	○	○

What are aquatic invasive species?

- ○ Plants and animals that live in water, are not from that area, and cause environmental / economic harm
- ○ Plants and animals that live in water that didn't live there last year
- ○ Don' know
- ○ Plants and animals that live in water and reproduce quickly
- ○ Plants and animals that live in water and help the environment

What are some ways aquatic invasives arrive to the St. Louis estuary?

- ☐ They get released by aquarium owners or students and teachers
- ☐ Anglers dumping leftover bait
- ☐ Released by people on purpose in order to cause harm
- ☐ On ships they attached to, or in the water ships use for stability and dump out when they arrive
- ☐ Dropped into the water by migrating birds

What did you learn the most about industry in the St. Louis River harbor?

What are some advantages of shipping by water?

- ☐ Ships use less fuel than the the total number of trains or trucks moving the same amount of goods
- ☐ Ships transport goods faster than trains or trucks
- ☐ There is less traffic in the Great Lakes than on roads or in rail yards
- ☐ Ships are cheaper to build than trains or trucks
- ☐ Ships can hold more cargo than trains or trucks

Any additional information about the River Quest program that you would like to share:

Appendix C: Focus Group

River Quest Focus Group Prompting Questions

Welcome and thank you for being here today.

My name is Ellen Munshower. I am evaluating the quality of the River Quest program.

The purpose of this focus group is to get your feedback about how the River Quest program can better serve attending students. More specifically I want to understand what aspects of the program have been successful and/or need improvement in your experiences.

Your feedback will be used to inform future changes to the River Quest program. Your firsthand experience provides you with a unique perspective of the program, both during the event as well as any lasting impacts.

The format I am using is a focus group. The way this will work is:

- We will have a conversation focused on a specific topic
- It is guided by prewritten questions,
- It's important for this to be a safe and environment. Meaning, all of your interactions here will be kept **confidential**. I am asking you to maintain confidentiality as well after this meeting.
- I will facilitate this meeting so that all of your voices are heard. Please don't take offense if I redirect a response to another person if you have had your chance to respond. Of course, you can respond multiple times.
- I will ask questions you may each respond to, in order to guide the discussion. There are no correct answers, or answers I am specially looking for, I just ask each of you to be honest. In other words, please don't tell me what you think I want to hear.

- You are not required to respond to any questions you do not wish to answer. Just respond as “pass” so I don’t inadvertently overlook you.
- It is my job to make sure that everyone here gets to participate and that we stay on track. During the discussion I will take notes in order to record and summarize any comments you make during this time. The information you provide will be compiled into an evaluation of River Quest, including a summary of your comments and any recommendations made from them.
- This focus group is confidential. I will not be recording your names for this report, and you will not be identifiable as a participant in this study. Any comments made by people in this room should not be restated after the end of the focus group, to maintain confidentiality. I ask that each person here respect each other’s privacy and not repeat anything said by others in this group. While I hope that everyone here abides by this, I am not in a position to enforce this policy. Because of this please remember that what you say here today could be repeated by another focus group member. Anything that absolutely needs to remain private should not be said at this time.

With all that said, we can start the discussions with each person here introducing themselves.

Please state your name and what your teaching position was/is during the River Quest program.

1. How is the River Quest program useful for your students to learn about the St. Louis River estuary?
    a. Please explain why.
2. What parts of the RQ program are least effective for your students?
    a. Please explain why
3. What do you think about the effectiveness of the following program components?
    a. Water safety around large bodies of water, this might include understanding of rip currents and how to avoid them, awareness of the dangers of hypothermia, and an understanding of the importance of wearing PFDs

   b. Industry in the estuary
   c. The ecology of the estuary
4. Do you have any suggestions for River Quest to increase the engagement of students?
   a. This could be through working with you prior to the program, having different experiential learning opportunities, or suggestions for topics
5. How important is it for you that RQ identifies specific academic standards?
   a. What Specific standards do you feel are being met? Which ones are not being met?
   b. Should RQ be concerned about the standards? (Should we leave that up to you in your classroom?)
   c. Are there ways that this could be improved/enhanced?
6. When I approached two different volunteers that are in charge of booths and asked them to give me questions and desired answers that represent what they believe students are learning at their booth, they sent me several options to ask students to see what they have learned. Do you believe these questions are appropriate for your students?

   Q: As part of St. Louis River Quest, you learned about some significant industries in the region (e.g., shipping through the Port of Duluth-Superior). What are the main contributions of industry to the region?

   A: Job creation (more than 7,000 jobs related to the port) and economic contribution ($1.4 billion in business revenue generated by port activity). Going a level deeper, industrial contributions to the region would include providing/moving the goods and raw materials of everyday life, e.g., iron ore, limestone, grain, or things like fuel, etc.

   Q: What makes maritime shipping (shipping by water) the most economically and environmentally efficient form of bulk cargo transport?

   A: Waterborne shipping allows for the movement of massive amounts of cargo, e.g., almost 70,000 tons of iron ore in a single shipload, with a comparatively small amount of fuel, not to mention less greenhouse gas emissions than cargo movement by truck or rail. And it reduces road congestion.

7. Is there any other feedback about the RQ program that you want to share with me today so that we can provide the best program for you and your students?