

Increasing Water Quality and Quantity through Watershed Experiential Education in Texas Estuaries
(WaterIQWet)

Project Title: Coastal Management Program – Cycle 18

GLO Contract # 14-083-000-7951

Award Period: October 2013 – March 2015

FINAL REPORT

PURPOSE:

The purpose of Increasing Water Quality and Quantity through Watershed Experiential Education in Texas Estuaries (WaterIQWet) was to engage 2,000 students, 80 classrooms, and 40 teachers in experiential learning that results in formal understanding of water quality and water quantity issues facing Texas estuaries. Water quality and quantity was placed in the context of a multitude of issues regarding human use and behaviors, which impact water quality. Our ultimate goal of WaterIQWet was that participants will not only learn more about water quality issues along Texas coasts, but that their experience will change their attitude and behaviors for the benefit of estuarine health.

WaterIQWet targeted middle school students and teachers from Galveston and Nueces Counties. For students, experiential learning was in the form of Eco-Art Workshops and Eco-Art Kayak Adventures, whereas teachers participated in the Coastal Waters Institute (CWI).

WATERIQWET ADVERTISEMENT, TEACHER SELECTION, AND SCHEDULE

TASK 1

To advertise and recruit for the program, we sent out press releases to schools and teachers in the Galveston and Corpus Christi area Independent School Districts that had, and had not previously participated in Artist Boat programs. We also met with principals and teachers from both school districts to promote the program. Teachers that were interested contacted the office and dates for the 2013-2014 and 2014-2015 school years were set up for Eco-Art Workshops and Eco-Art Kayak Adventures. Each participating school signed a program contract agreement indicating they would fully participate to ensure that we met our grant objectives. Teachers committed to completing pre and post surveys, participating in Eco-Art Workshops and Eco-Art Kayak Adventures, posting on our blogging website, and participating in the Coastal Waters Institute. In April 2014, the Galveston Daily News printed an article promoting the program and the Coastal Waters Institute to be held that July. During year 1 and year 2, we had a total of 25 teachers from 14 schools in four school districts participate in our program (Table 1).

Table 1. Summary of Eco-Art Workshops, Eco-Art Kayak Adventures, and Participants

	District	# of schools	# of teachers	# of Eco-Art Workshops	# of students	# of Eco-Art Kayak Adventures	# of students
Year 1	GISD	8	10	25	574	22	396
Year 1	CCISD	4	5	20	547	22	520
Year 1	ACISD	1	1	5	113	2	40
Year 2	GISD	6	11	19	409	16	337
Year 2	CCISD	4	5	19	480	16	374
Year 2	HIISD	1	1	1	34	1	27
Total	4	14*	26*	89	2,157	79	1,694

* Totals are based on the number of school and teacher participants, not a combined total for year 1 and year 2

DELIVER 80 ECO-ART WORKSHOPS AND 80 ECO-ART ADVENTURES, 40 IN EACH REGION

TASK 2 AND 4

Curricula Development

Eco-Art Workshop Curricula:

The Artist Boat developed curricula for Eco-Art Workshops specific for Galveston and the Coastal Bend. Eco-Art Workshops were two-hour in-class sessions that provided hands-on activities demonstrating the benefits of water quality and quantity to humans and ecosystems, multiple uses of estuarine systems, flora and fauna of local systems, and historical perspectives of estuarine systems. During the second portion of the workshop students were taught the basic techniques of plein-air water coloring and they painted a portrait of an animal native to Galveston and Corpus Christi Bay.

Students were taught about the following topics:

- Location of Galveston Bay and Corpus Christi Bay
- Definitions of brackish water and salinity
- Importance of freshwater inflow (quantity and quality) for estuarine ecology
- Economic and social value of estuaries
- The four functions of a salt marsh
- Difference between point source and non-point source pollution

- Watercolor techniques
- Contour line drawing

Eco-Art Adventure Curricula:

Similar to Eco-Art Workshops, we developed Eco-Art Kayak Adventures curricula specific to the coastal region. Eco-Art Kayak Adventures were four-hour field labs at the Galveston Island State Park (Figure 1; GISD), the Nature Conservancy-Cohn Preserve (Figure 2a: CCISD), and Lighthouse Lakes (Figure 2b; CCISD). Kayak adventures provided a hands-on opportunity for participants to learn about the current status of freshwater input to estuaries (quality and quantity), water quality testing, marsh restoration, and interpretation of observations using plein-air water coloring. Furthermore, the interpreters' discussion was designed to reinforce concepts such as the major functions of wetlands, multiple uses of estuaries, interpretation of water quality testing information, abiotic and biotic parameters, economic value of estuaries, and formation of vocabulary utilized by natural resource managers.



Figure 1: Galveston Island State Park paddling route

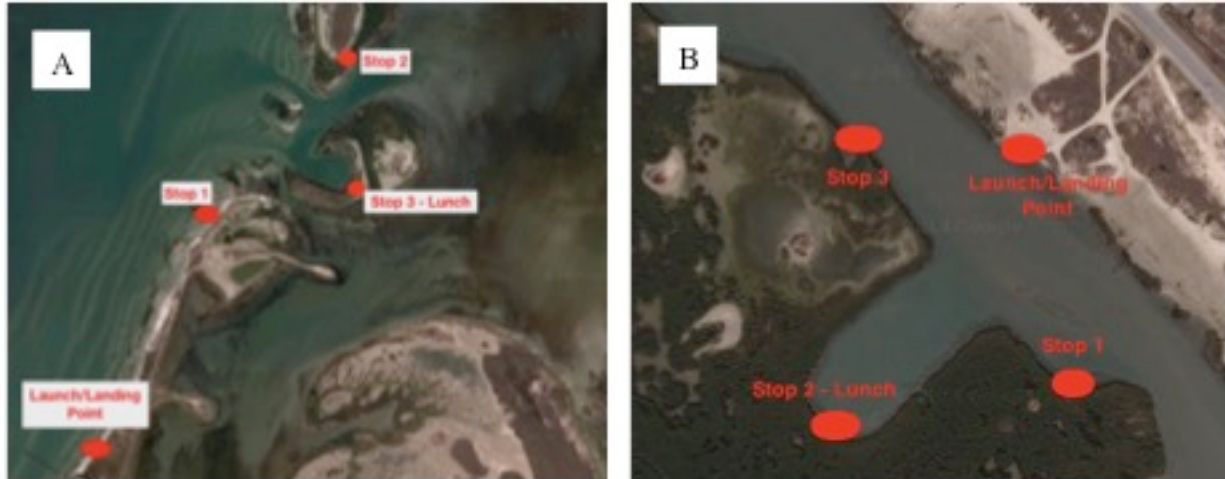


Figure 2. Cohn Preserve (a) and Lighthouse Lakes (b) paddling routes for students from CCISD

Program Evaluation

Student Pre and Post Surveys:

To evaluate the Eco-Art Workshop and Kayak Adventure we developed student surveys. Pre and post surveys were completed by students before their Eco-Art Workshop and after their Eco-Art Kayak Adventure. Surveys we used to measure students' knowledge and detect any changes in their attitude and behavior as a result of participating in the Artist Boat program. Artist Boat determined that Survey Monkey was the most efficient method for students to complete the surveys because students could go online and quickly take the survey. Teachers were provided a link to survey monkey, however, some teachers had difficulty completing surveys because of limited computer access in the classroom and time. For teachers who had difficulty with the Survey Monkey tool, we printed paper copies of the surveys and had students complete those before we began the workshop. All the teachers were asked to complete the post survey online.

Our goal was to compare how knowledge, behaviors, and attitudes changed *within a class* of students. However, several challenges eliminated this type of evaluation. First, our survey did not require students to provide information about their classroom teacher or class period, therefore, we can compare how students' knowledge, behaviors, and attitudes changed *within schools or school districts*. Second, for High Island, AIM, Austin MS, and Ball HS we were unsuccessful in our attempt for an acceptable completion of both pre and post surveys. On average, 70% of the students that went on the kayak adventure completed the survey, however, at High Island, AIM, Austin M.S. and Ball H.S., 0%, 0%, 35%, and 50% of students completed the survey, respectively. In addition, not all students that participated in the workshop also participated in the adventure. For example, at Austin M.S. 60% of students participated in both parts of the program. Therefore, for these schools we were unable to compare how students' knowledge, behaviors, and attitudes changed due to participation in the program. Third, we improperly downloaded and stored Survey Monkey data for Task 1 (Year 1). Survey data was stored on Survey Monkey until the end of the Year 1, at which time the data was 'evaluated' using the Survey Monkey tool and the evaluation summary was downloaded and stored. The raw data was subsequently cleared in Survey Monkey. The summary data, however, pooled the

results by school district. Therefore, for Year 1 we can evaluate and compare how knowledge, behavior, and attitudes changed *within school districts*, but not within individual schools or classrooms. At the end of Task 2 (Year 2), we had discovered this error and downloaded the raw survey data. For Year 2, we can evaluate how students' knowledge, behavior, and attitudes changed *within schools* as a result of participation in the Artist Boat Eco-Art Workshop and Adventure program.

Students' knowledge of estuarine ecology and the human effects to estuaries was assessed using questions 1-7 on the pre and post surveys (see attached). We scored each survey then calculated the percent of students from each school or district that answered each question correctly. To compare the change in knowledge as a result of participation in the Artist Boat program, we calculated the percent change in correctly answering questions 1-7 between the pre and post survey using the following equation:

$$\%Change = \frac{Answer_{post} - Answer_{pre}}{Answer_{pre}} \times 100$$

where $Answer_{pre}$ and $Answer_{post}$ are the percentage of students that answered the question correctly on the pre and post tests, respectively. A positive % Change would indicate that the students learned about Galveston Bay because more students answered a question correctly following participation in the program, relative to before participation. Positive % Change, would therefore indicate that we met our project goal.

Questions 8-14 evaluated students' behavior and attitude toward Galveston Bay. Students were asked to rate the frequency of: engaging in outdoor activities (Q8 and 9), learning about nature through various modes (Q10), and stewardship activities (Q11). In questions 8-11, frequency was on a scale of 1 to 5, where 1 indicates that they never participate in the activity and 5 indicates they always participate in the activity. They were also asked to indicate the degree to which they agreed or disagreed with statements such as: enjoying nature, art, and science (Q12), humans affect estuarine water quality (Q13), and the current state of water quality in the Bay and Ocean (Q14; see attached). Here, a score of 1 would indicate that they strongly disagreed with the statement and 5 would indicate they strongly agree with the statement. Because there are no wrong answers to these questions we calculated the average frequency for each question and the average agreement with the statements. We then compared how students' behaviors and attitudes toward the ocean environment changed following participation in the program using the %change formula above. Here, $Answer_{pre}$ and $Answer_{post}$ represent the average frequency or agreement for the group on the pre and post surveys, respectively. If the frequency of behaviors increased following program participation, the analysis would indicate that the experience increased the likelihood that students would engage in outdoor activities, and therefore are potentially more likely to want to protect natural places. Similarly, if students agreed more with statements (Q12-14) following the program, then students learned that humans have an effect on estuarine water quality. Increased frequency in behavioral questions and the degree to which they agreed with attitude questions indicate that the WaterIQWet program met the goal.

Teacher Evaluation:

Teachers also assessed the Eco-Art Workshop and Eco-Art Kayak Adventure programs with an additional evaluation that measured the value of the program on a scale of 1 (poor) to 5 (excellent). We calculated the average of the teacher evaluations overall to assess our program. The evaluation also provided demographic information about their students, and any comments or suggestions for improvement of the program.

Results

Year 1 (Task 2): Program Participation

During Year 1, Artist Boat delivered a total of 50 Eco-Art Workshops and 46 Eco-Art Kayak Adventures, which served 1,234 and 956 students, respectively. WaterIQWet programming reached students from 3 school districts, 13 schools and from 16 teachers classrooms’ (Table 1). Our goal was to deliver 40 Workshops and 40 Adventures, therefore, we exceeded our program goal for Eco-Art Workshops and Adventures in Year 1. The majority of students we served were Hispanic (56%), followed by Caucasian (28%), African American (13%), Asian (2%) and Other (1%) (Figure 3).

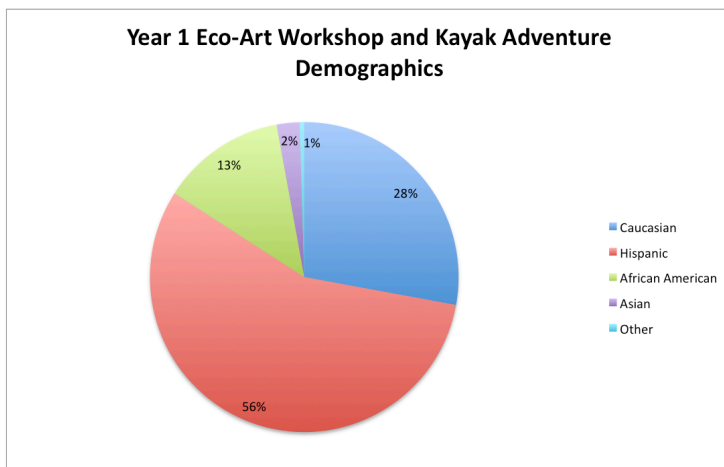


Figure 3. Year 1 Eco-Art Workshop and Kayak Adventure demographics for Galveston ISD, Corpus Christi ISD and Aransas County ISD

Year 1 (Task 2): Student Pre and Post Survey's

According to our analysis, where we calculated the % change in knowledge (Q1-7), students' knowledge of estuarine ecology increased an average of 13% in GISD and 84% in the CCISD, as a result of participation in the WaterIQWet program (Figure 4). The largest gain in knowledge was that students from CCISD (400% increase) and GISD (50% increase) learned that bay water is brackish. Students from both regions showed a 20% increase in correctly identifying the largest source of freshwater to their corresponding bay. There was a 19% increase (GISD) and 53% increase (CCISD) in the knowledge that estuaries are a place where rivers meet the sea, a nursery habitat, and are

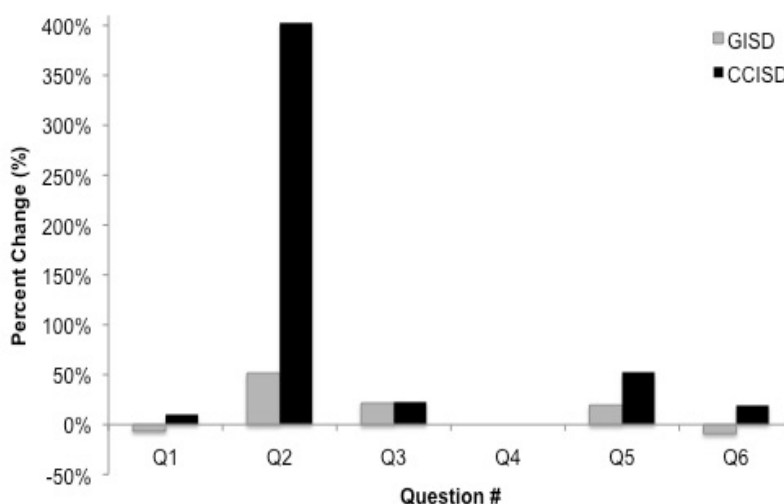


Figure 4. Percent change in the number of knowledge questions answered correctly for Year 1.

brackish. Questions 1 and 6 show similar patterns where the CCISD students' knowledge increased 10 and 19%, respectively, but the GISD students' knowledge decreased 6 and 9 %, respectively. Question 1 assessed understanding that throwing trash in a drain, fertilizing your lawn, and using pesticide are examples of non-point source pollution in Bays. Before the workshop, 58% (CCISD) and 60% (GISD) of all the students were able to identify that the pollution examples were all forms of non-point source pollution. Following the adventure, 65% (CCISD) and 57% (GISD) of the students properly identified the examples of pollution. Question 6 asked students to properly identify a biotic factor from a list of biotic and abiotic factors. Before the workshop, 57% (Coastal Bend) and 42% (GISD) of the students answered that animals were a biotic factor in ecosystems. Following the adventure, 68% (CCISD) and 38% (GISD) of students correctly identified the biotic factor. Question 7, evaluated students' understanding that wetlands filter impurities from the water, prevent erosion, provide habitat, and absorb flood waters. On average, there was a moderate increase in the proper identification of the functions of wetlands following the WaterIQWet program. Following the adventure, 89% of students knew that wetlands provide habitat for animals, 73% of students knew that wetlands absorb flood waters, 70% of students knew that wetlands act as filters, and 61% of students knew wetlands prevent erosion, which represents a increase in the ability to identify the functions of a wetland between 9 and 26%.

Behavioral or attitudinal changes were also evaluated by calculating the % change in the frequency to which students participated in given activities or the degree to which they agreed with statements. On average students indicated that they played sports outdoors 'sometimes' to 'most of the time', they went to the Bay and the Gulf of Mexico Beach 'once in awhile', and they walk/hiked or

biked 'sometimes'. Following participation in the WaterIQWet program we found that in GISD surveys there was a positive % change in the frequency of going to the bay (5%) and the Gulf of Mexico Beach (4%), while there was a negative % change for playing sports (-3%), walking/hiking (-2%), and biking (-8%). In CCISD schools, we measured a positive % change for all activities (2 to 11%). On average, students indicated that they went fishing, kayaking, birding, boating, and sunbathing 'once in awhile', where birding was slightly less than 'once in awhile' and fishing was slightly more than 'once in awhile.' Generally, students from both the CCISD and GISD also indicated that they more frequently fished (3% increase) and kayaked (11.5% increase) following the workshop and adventure than before, where the percent increase was slightly larger in the CCISD than GISD. Students from GISD were less likely to go birding, boating, or sunbathing following the program, whereas students from the CCISD were more likely to do the same activities. Students indicated that were most likely to learn about nature by spending time outdoors (slightly more than 'sometimes') and least likely to learn about nature by reading (slightly less than 'sometimes'). CCISD students were more likely to learn about nature (positive %change) by watching TV, reading, searching the internet, visiting nature, and spending time outdoors following the program compared to before the program. In contrast, GISD students were generally less likely to learn about nature following the program using any of the methods except reading. In both regions students, on average, 'agreed' that they enjoyed being in nature, making art and doing science activities. In GISD there was a negative percent change for all activities, whereas in the CCISD there was a positive percent change in all activities. Students generally 'agreed' that humans have an effect on water quality and water conservation was important to the bay, but we found minor changes in student attitude following participation in the program (-1% to +1%). The statement that the bay area has many recreational activities generated an average response between 'no opinion' and 'agree,' and there was only minor changes following program participation (-1% to +2.5% change). Question 13, had students state whether they engage in stewardship activities such as picking up litter, participating in community trash cleanups, planting events (trees, grasses, wetlands), and limiting water usage. On average,

students engaged in stewardship activities between ‘once in awhile’ and ‘sometimes,’ where limiting water usage was most frequently practiced stewardship activity. CCISD students indicated greater %change (4 to 20% change) in stewardship activities following the WaterIQWet program, whereas survey’s indicated that GISD students were less likely to engage in stewardship activities (-3 to 10% change). The last attitudinal question asked students to rate their opinion on whether the bay was beautiful, and whether the Bay and Gulf of Mexico was clean, swimmable, and the food derived from the Bay or Gulf was edible. On average, students had ‘no opinion’ on these statements, where the Bay is beautiful was slightly lower than ‘agree’ and the Bay and Gulf of Mexico are clean were both slightly lower than ‘no opinion.’ The CCISD student’s opinions’ of the Bay and Gulf generally improved following participation in the program between 2 and 12%, except for the opinion that the Bay was beautiful, which decreased 0.5%. Students from GISD were more likely (2% increase) to swim in the Gulf of Mexico and to eat seafood from the Bay (0.6% increase), but all other opinions

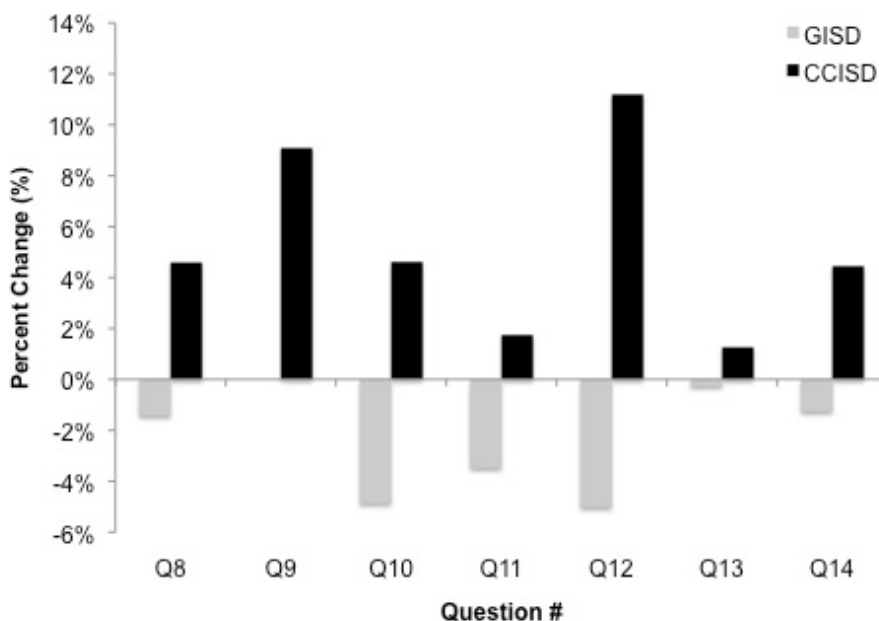


Figure 5. Percent change in attitudinal and behavioral questions in Year 1

decreased (-4% to -1%) following the workshop and adventure.

Year 1 (Task 2): Teacher Evaluations

Teachers in both areas completed an evaluation after each Eco-Art Workshop and Eco-Art Kayak Adventure. They were asked a series of questions and asked to rate their experience and their students’ experiences on a scale of 1 to 5. The average rating for Eco-Art Workshops was 4.92 and for Eco-Art Kayak Adventures was 4.94.

Year 2 (Task 4): Program participation

During year 2, Artist Boat served 1,661 students via Eco-Art Workshops and Eco-Art Kayak Adventures from 3 school districts, 11 schools, and 17 teachers (Table 1). Our goal was to deliver 40

workshops and 40 adventures in Year 2. We delivered 39 workshops and 33 adventures. In Year, 1 we exceeded our workshop and adventure goals, therefore we met our goal for workshops but due to a weather cancelation we were one adventure short of making our goal of 40 Adventures. During the 2014-2015 school year, a majority of students we delivered Eco-Art Kayak Adventures to were Hispanic (60%), followed by Caucasian (30%), African American (7%), Asian (2%), and Other (1%) (Figure 6).

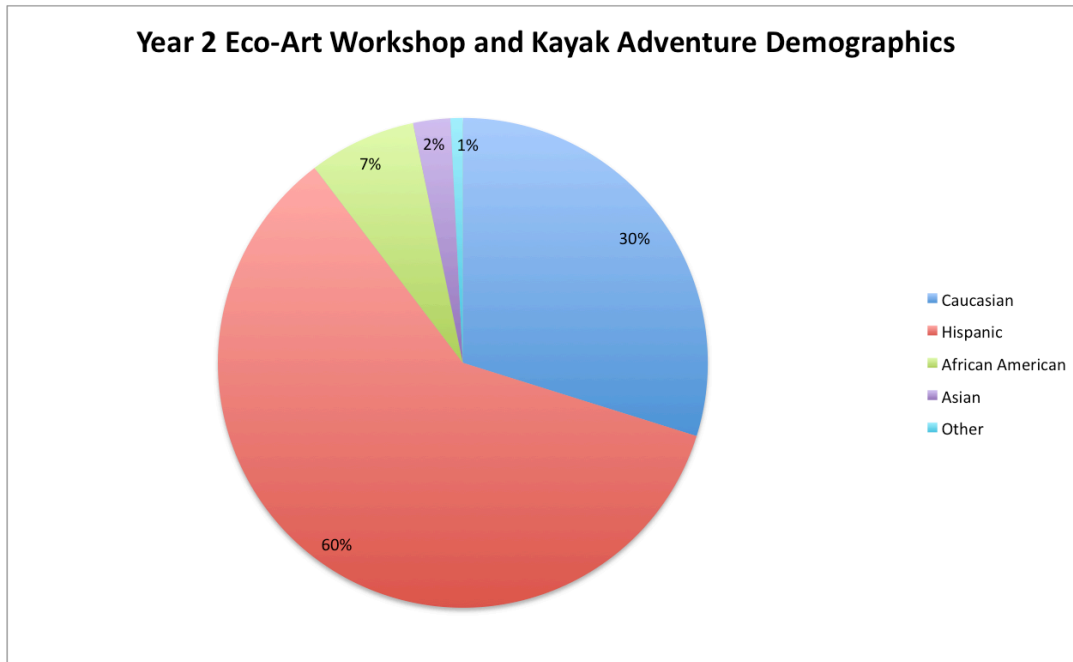


Figure 6. Year 2 Eco-Art Workshop demographics for Galveston ISD, Corpus Christi ISD and High Island ISD

Year 2 (Task 4): Student pre and post survey's

In Year 2, students' knowledge increased more than in Year 1. On average, the % Change in correct answers to the knowledge questions was 62%, indicating that we met our goal. We measured the greatest average increase in knowledge for Kaffie MS (156%) and Odyssey MS (146%), followed by Crenshaw MS (15%), Martin MS (-1%), and Innovation Academy (-5%). Similar to Year 1, the greatest gain in knowledge was in students' understanding that the Bay was brackish (10%-565% increase; Figure 7, Q2). In particular, no students from Innovation Academy answered that Bay water was brackish in the pre survey, but 66% of students answered the question correctly on the post survey. We also measured large increases in knowledge in correctly identifying the largest source of freshwater to the Bay (Figure 7, Q3). For the Galveston ISD students in particular, we measured a 108% and 385% increase for Crenshaw MS and Odyssey Academy, respectively. Students were also more successful (average 120% change) selecting the four functions of salt marsh after the WaterIQWet Program (Figure 7, Q7). Generally, the ability to correctly select the four functions of a salt marsh increased from 12% to 33% of the students, where Crenshaw MS and Innovation Academy increased from 0% to ~30%. We calculated smaller gains in the ability to define a watershed (average 26% change, Figure 7, Q4). Both Odyssey Academy and Kaffie MS showed a large % change (75% and 132%, respectively), however, the other three schools showed a moderate decline in the ability to

define a watershed (-12 to -41% change). We recorded more students selected “a shed to store water,” as their answer on the post survey, which we believe is an artifact of the students not taking the survey’s seriously. Students from Martin MS and Kaffie MS also were more likely to understand that an estuary is a place where rivers meet the sea, a nursery habitat, and contains brackish water after the WaterIQWet program (25 and 69% change, respectively; Figure 7, Q5), however we calculated a large decrease in the ability to define all three of these estuarine characteristics in Innovation Academy (-84%). In the pre survey, 94% of the students from Innovation selected all three characteristics but only 17% selected all three in the post survey. We were less successful teaching students the sources of non-point source pollution (-11% change, Figure 7, Q1), however, on average 48% of students understood that trash, and the use of fertilizer and pesticides were all forms of non-point source pollution to the Bay, following the WaterIQWet program. Similarly, we calculated a modest decline (-5%) in students’ ability to properly identify the biotic factor from a list (Figure 7, Q6). On average 42% of the students properly identified that animals were a biotic factor in ecosystems.

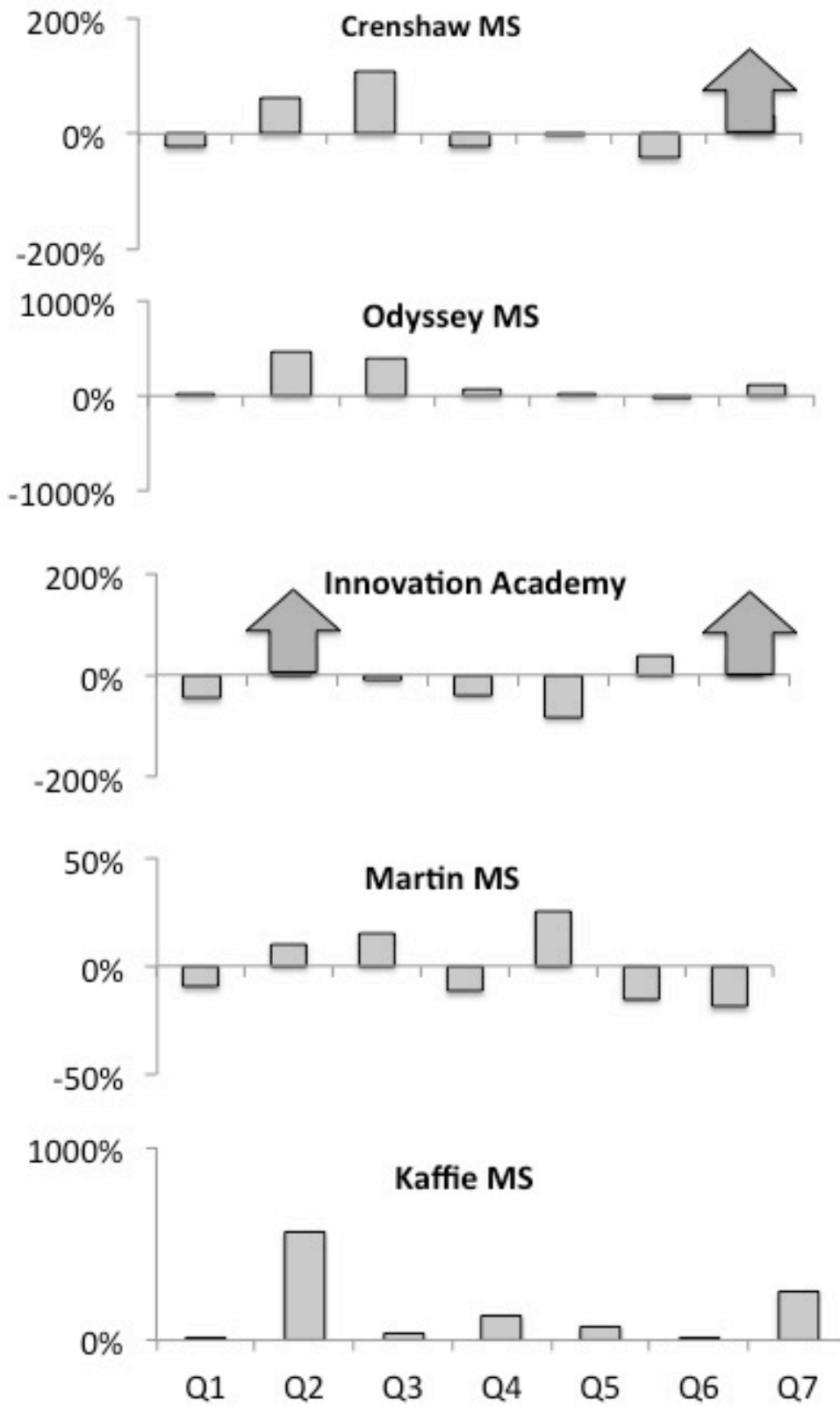


Figure 7. The percent change in knowledge questions answered correctly within the schools in Year 2.

Changes in students' attitudes toward stewardship and stewardship behaviors, following the WaterIQWet program, showed a similar magnitude of change in Year 2 (Figure 8), as in Year 1 (Figure 5). In Year 2, we calculated that on average there was 16% change for students who like to kayak, 6% change for sunbathing, 4% change for boating, and a -4% change for students who liked to go fishing compared to before the WaterIQWet program (Figure 8, Q9). This result indicates that participation in the program influenced students' choice of outdoor activities. We also calculated large changes in students' attitudes toward the cleanliness of Bay and Gulf of Mexico Water (Figure 8, Q14). For example, we calculated an increase in the attitudes that bay water was clean (13% change), that student's would swim in the bay (12% change), that Gulf of Mexico water was clean (9% change), and that seafood from the Bay was safe for consumption (2% change); however, we calculated minor declines in the attitudes that the Bay was beautiful (-0.7% change) and that seafood from the Gulf of Mexico was safe (-1% change). Again, we were successful at changing student's attitudes that Bay water was clean, safe to swim in, and to eat seafood caught in the Bay (2% change overall, Figure 8, Q14). We calculated negative % change for all other attitudinal/behavior questions (Figure 8). Overall, students from Martin MS were more likely to go participate in playing sports outside, going to the bay, going to the Gulf of Mexico beach, walking/hiking, or biking (Figure 8, Q8) following the WaterIQWet program, whereas participation in outdoor activities by students from the others did not show any consistent pattern. Students from Crenshaw MS indicated that they were more likely to learn about nature by visiting nature (21% change), while students from Martin MS and Innovation Academy were most likely to learn about nature by watching TV (14% and 2% change, respectively), and Kaffie MS students were most likely to learn about nature by reading (4% change) or searching the internet (4% change) (Figure 8, Q10). Overall, students from Innovation Academy and Martin MS were more likely to limit their use of water following the WaterIQWet program (23% change and 9% change, respectively, Figure 8, Q11). However, students were only likely to participate in stewardship activities (picking up litter, participating in trash cleanups, participating in planting events, and limiting water usage) from slightly greater than 'never' to slightly greater than 'sometimes'. There appears to be a need to engage middle school students in the importance of stewardship activities. Students indicated that they slightly less than 'agreed' to slightly more than 'agreed' with the statements that they enjoyed being in nature, making art, and doing science activities. Similar to previous questions, students from Martin MS generally enjoyed being in nature, making art, and doing science activities more after participation in the program (Figure 8, Q12), whereas, Crenshaw MS, Odyssey Academy, and Innovation Academy indicated a negative percent change for these activities. Lastly, the only school that overall learned that water conservation was important to the Bay was Innovation Academy (2% change), however, groups generally indicated that they 'agreed' that water conservation was important to the Bay. Martin MS, showed the greatest %change in understanding that human activities have an effect on water quality (10% change, Figure 8, Q13), and that the Bay area has many recreational activities (7% change).

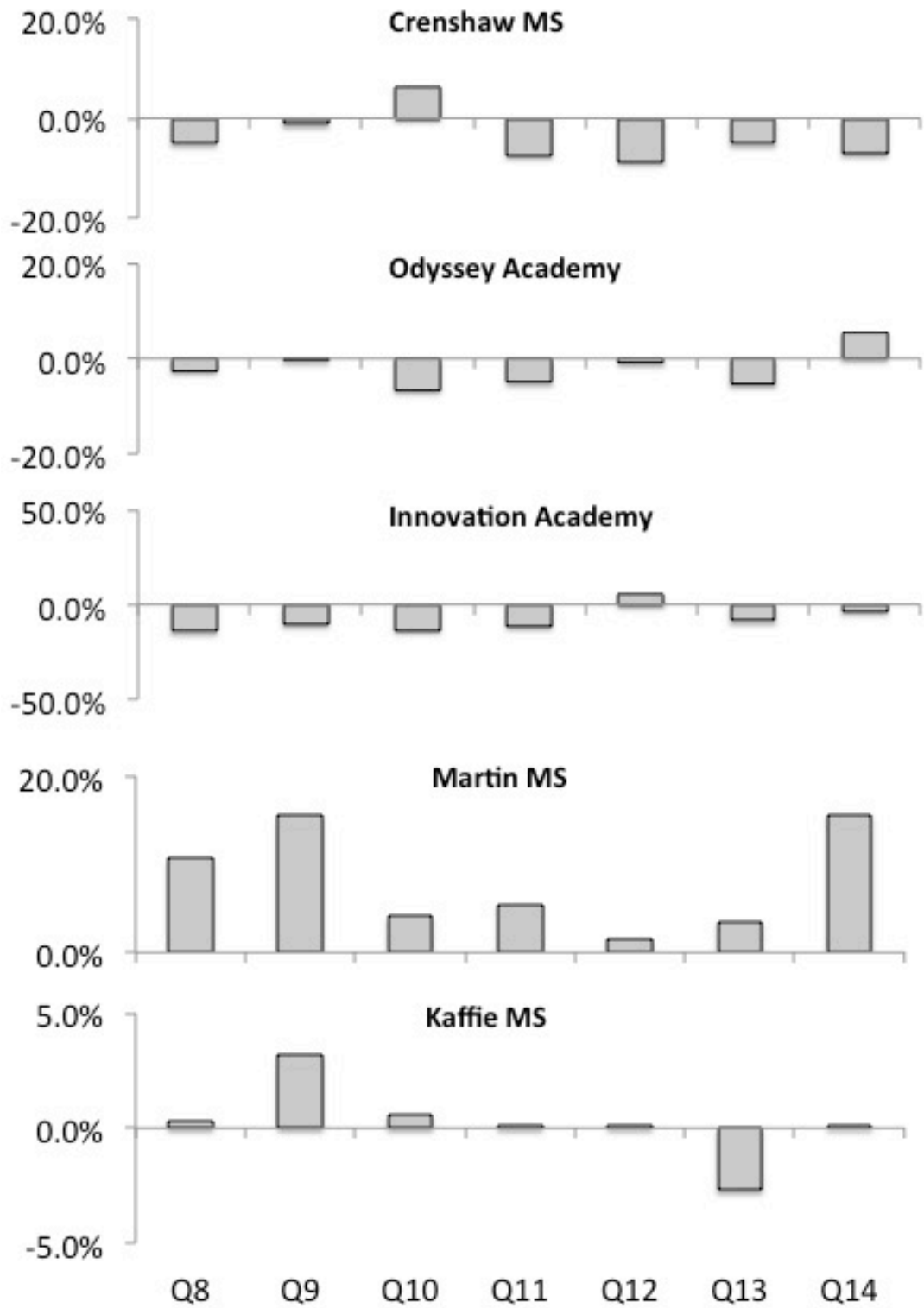


Figure 8. The percent change in attitude or behavior within the schools in Year 2.

Year 2 (Task 4): Teacher Evaluation

Teachers in both areas completed an evaluation after each Eco-Art Workshop and Eco-Art Kayak Adventure. They were asked a series of questions and asked to rate their experience and their students' experiences on a scale of 1 to 5. The average rating for Eco-Art Workshops was 4.84 and for Eco-Art Kayak Adventures was 4.99.

Task 2 and 4: Program Goals

Artist Boat met its goal to increase the knowledge of estuarine ecology of middle school students in the Galveston Bay and Coastal Bend regions. In particular, the WaterIQWet showed success at teaching students that water in the Bay was brackish, the major freshwater input to the Bay, and the four functions of a salt marsh. It is unclear whether we met our goal of changing students attitudes and behaviors for the benefit of water quality in the Bay. There are many factors that affect students' opinions including, but not limited to how frequently students encounter natural places and what their experience is while they are there. For example, one group may have had a beautiful sunny day with relatively little wind, whereas, another group may have had a cold, rainy, windy day. The conditions for the later group may negatively influence their opinions compared to the former.

PROFESSIONAL DEVELOPMENT TRAINING (CWI)

TASK 3

Our program provided educators with experiences and outreach tools via the Coastal Waters Institute (CWI) and Curriculum to promote attitudinal and behavioral changes among their community members. We scheduled two summer professional development sessions (Corpus Christi and Galveston area Independent School Districts) of four days in length for 40 teachers. The CWI for GISD was held at the Galveston Independent School District Annex and the NOAA Flower Garden Banks facility (Galveston, TX), whereas the CWI for CCISD was held at the University of Texas Marine Science Institute (Port Aransas, TX). The CWI professional development provided in-service credit for middle school faculty and trained middle school teachers to:

- Use experiential learning cycles
- Use Artist Boat's-CWI Environmental Curriculum (specifically written for the two regions)
- Gain access to current information and issues from natural resource managers
- Interpret water quality sampling and data
- Understand the interaction between abiotic and biotic factors in ecosystems
- Use place-based learning specific to students' local estuarine system

CWI content was aligned with: Galveston Bay Estuary Programs 17 priorities outlined in the "The State of the Bay: A Characterization of the Galveston Bay Ecosystem," The Coastal Bends and Bays

Program goals, and the National Oceanic Atmospheric Administration standards for Ocean Literacy. Teachers participated in pre and post survey's developed for the CWI to understand how knowledge and attitudes/behaviors toward stewardship activities changed as a result of the CWI. The content questions were the same for teacher and student survey's, however, the attitudinal and behavioral questions were slightly different. Teachers also received training in pre and post content assessment and attitudinal and behavioral change surveys that students completed. Teachers also had to opportunity to learn about the Galveston Island State Park (Figure 1; GISD), the Nature Conservancy-Cohn Preserve (Figure 2a: CCISD), and Lighthouse Lakes (Figure 2b; CCISD) from four different natural resource managers that presented at the CWI. In addition, teachers learned about water quality testing, the flora and fauna specific to their Bay, and received higher level content during thier Eco-Art Workshop and Adventures via kayak and vessel (to the open bay system).

Results:

Task 3: Program Participation

We had 31 teachers (2nd to 12th grade) enrolled in the CWI from 21 different campuses (see attachment). Initially we had 40 teacher recruited to fulfill our goal of serving 20 teachers in each district, however, 7 CCISD teachers were unable to attend due to conflicting in-services and one teacher was a no-show. Due to the short notice we were unable to fill these 8 spots for the Coastal Bend CWI. There was also a no-show at the Galveston CWI, bringing the total number of attendants to 19 in Galveston and 12 in the Coastal Bend.

Task 3: Teacher pre and post survey's

Teachers from GISD improved their total score on the content portion of the survey from 73% to 90%, whereas teachers from CCISD improved their average score from 85% to 91%. Similar to student survey's, we calculated % change in the ability to correctly answer content questions. We calculated 24% change for GISD teachers and 10% change for CCISD teachers, indicating that on average we met our goal for improving teachers' knowledge of estuarine ecology. The largest gain was in correctly identifying the four functions of a wetland (Figure 9, Q8). We also, calculated a large % change for GISD teachers on Q1 (35%), Q3 (Q43%), and Q6 (25%), which asked teachers to define an estuary, understand that the Bay contains brackish water, and select the biotic factor from a list of biotic and abiotic factors, respectively (Figure 9). We calculated smaller gains in knowledge for CCISD teachers on Questions 1, 2, 4, 6, and 7 (Figure 9), however, knowledge decreased on Questions 3 and 5. Smaller gains in knowledge for CCISD teachers, reflects higher pre survey scores than GISD teachers.

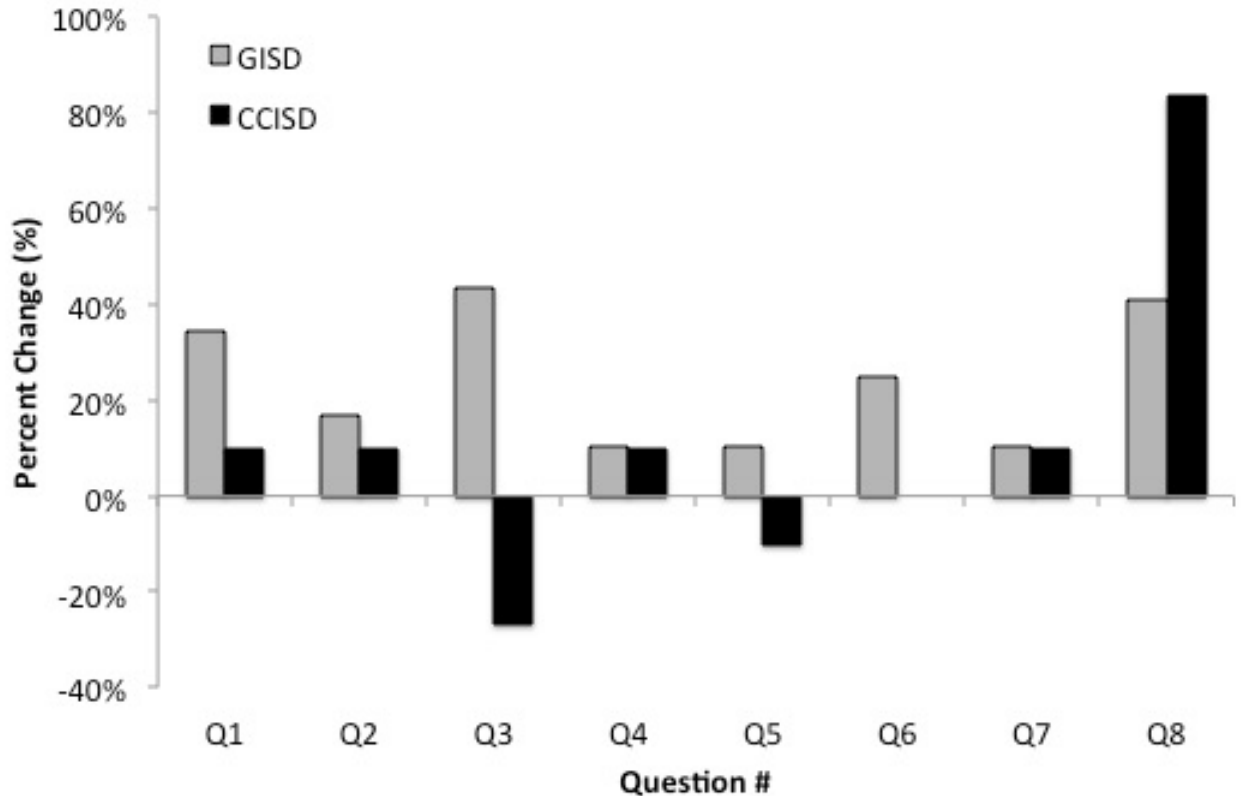


Figure 9. Percent change in the number of knowledge questions answered correctly for Galveston CWI and Coastal Bend CWI

The CWI had a positive effect on teachers' attitudes and behaviors, indicating we met our goal. Teachers were more concerned with environmental issues following the CWI (0 to 10% change, Figure 10, Q9). On average, teachers ranked environmental issues such as water quality, water conservation, loss of wetland and bay habitats, trash in waterways and estuaries, oil spills, health of seafood, and overfishing as 'important' to 'very important.' Question 10, asked participants to indicate their opinion on whether the Bay and Gulf were beautiful and clean and if they would swim and eat seafood from the same water bodies. We calculated a 3% change in the attitudes of GISD teachers, and 12% change for CCISD teachers (Figure 10, Q10). Teachers generally stated that they 'agreed' to 'strongly agreed,' that the Bay is beautiful, and the rest of the opinions as 'neutral' to 'agree.' Finally, participants were more likely to conserve water, limit chemical use in the home, recycle, and pick up litter following the CWI. We calculated a minor negative percent change for chemical usage on their yard, purchasing local produce and seafood, and participation in community trash clean ups.

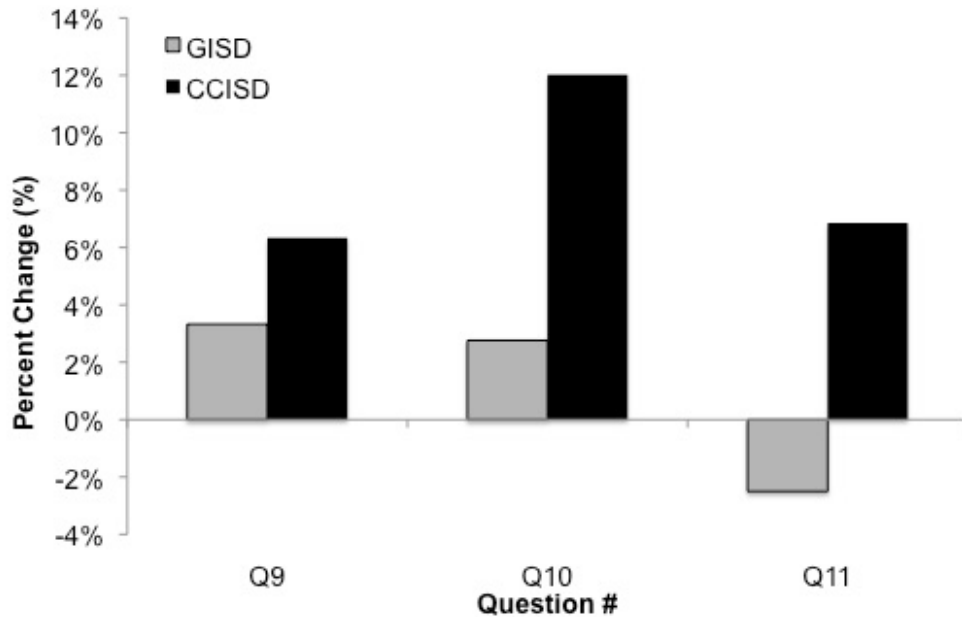


Figure 10. Percent change in the rating of attitudinal and behavioral questions Galveston CWI and Coastal Bend CWI

Task 3: Teacher Evaluations

Participants in both areas completed an evaluation after their CWI. They were asked a series of questions and asked to rate their experience on a scale of 1 to 5. The average rating was a 4.85.

STUDENT WATERIQWET STUDENT BLOG SITE

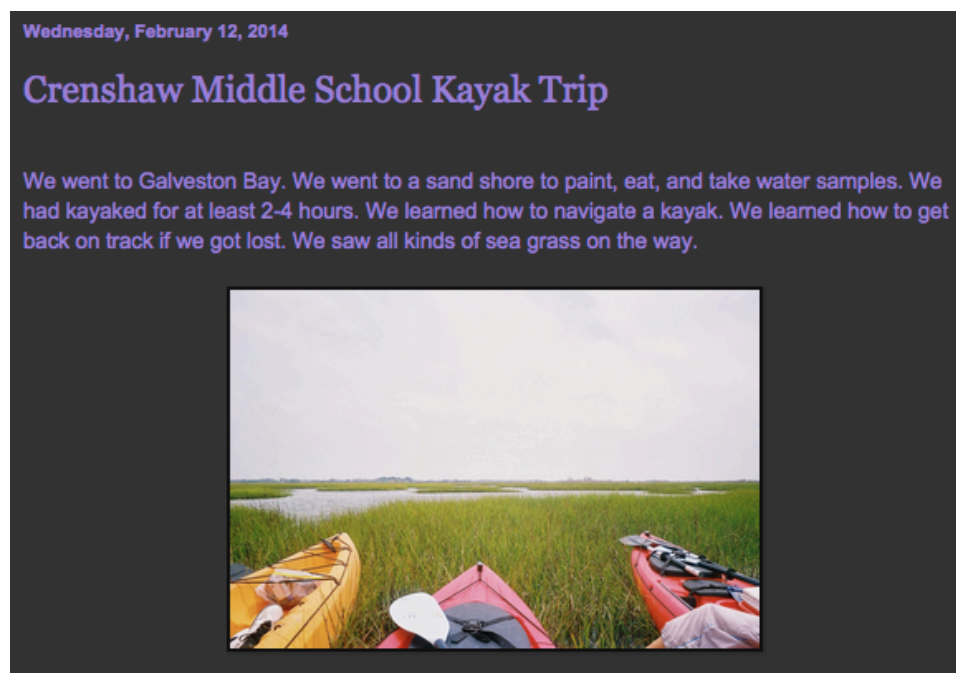
TASK 4

We developed an online resource for GISD and CCISD schools to share their research and experience following the Eco-Art Adventure. The Blog site (<http://wateriqwet.blogspot.com/>) is intended for students to share their individual experiences as they engage in the process of learning and engaging in the multiple experiences. Students could use the blog to post their water quality results, pictures from Eco-Art Workshops and Eco-Art Kayak Adventures, and what they learned or experienced. Each school was added as an author to the blog site and every teacher was sent their specific login information with an example post and dates that their students should blog by.

We encountered a few challenges to 100% participation in blogging. First, teachers in Galveston had difficulty finding time for students to blog. Many were limited to one or two computers per classroom and their teaching curriculum does not allow time for extra activities. Second, schools in both Galveston ISD and Corpus Christi ISD had issues with firewalls. To solve these problems we had students write about their experiences on notebook paper and Artist Boat staff entered them onto the Blog. We asked teachers to provide the passwords to their students so they could blog from their cell phones.

Results

Students participating in Eco-Art Workshops and Eco-Art Kayak Adventures blogged about their experiences. During year 1, there were 231 comments/posts from 956 kayak participants for a 24% student participation rate. Galveston ISD schools had 50% participation and Corpus Christi ISD schools had 20% participation. The following are examples of entries by students.



During year 2, there were 127 comments/posts from 738 kayak participants for a 17% student participation rate. Galveston ISD schools had 56% participation and Corpus Christi ISD schools had 75% participation. The total amount of participation by school was 71%, with a student participation of 21%. Overall, the number of posts and comments by schools and individual students decreased from year 1 to year 2, however the quality of posts and comments by schools continued to increase.

More students used vocabulary they learned either in the Eco-Art Workshop or Eco-Art Kayak Adventure when blogging about their experiences. The following are examples of entries by students.



WATERIQWET CONCLUSION

Through 18 months of Eco-Art Workshops and Eco-Art Kayak Adventures, we delivered 89 Eco-Art Workshops and 79 Eco-Art Kayak Adventures to 3,851 participants. We did not meet our goal of 80 Eco-Art Workshops and 80 Eco-Art Kayak Adventures, mainly due to weather during year 2. Overall, students were more successful correctly answering questions regarding the bay, habitat, and wetland functions after attending Eco-Art Workshops and Eco-Art Kayak Adventures. There was also a positive change in their attitude and behavior towards the bay, Gulf of Mexico, science, art, nature, and their participation in their community. We had 31 participants in two Coastal Waters Institute sessions, failing to meet our goal of 40 teachers. This was due to no-shows and the lack of adequate time to fill the spots. The pre and post surveys revealed that participants learned about the bay, habitat, and wetland functions by participating in the Coastal Waters Institute. We also calculated a positive change in attitude towards the bay and environmental issues facing the bay.

ATTACHMENTS (in Zipped folder):

- 1 Final Schedule Table.pdf
- 2 CMP demographics
- 3 WS Galveston Bay.doc
- 4 WS Coastal Bend.doc
- 5 CMP_GISDStudentTripCurriculum.docx
- 6 CMP_CB_StudentTripCurriculum.docx
- 7 CMP_GISD_PreSurvey.docx
- 8 CMP_GISD_PostSurvey.docx
- 9 CMP_CCISD_PreSurvey.docx
- 10 CMP_CCISD_PostSurvey.docx
- 15 WorkshopEvaluation.doc
- 16 Kayak Evaluation.doc
- 17 CWI GISD agenda 2014.doc
- 18 CWI CB agenda 2014.doc
- 19 CWI Galveston Pre Survey.docx
- 20 CWI Galveston Post Survey.docx
- 22 CWI CB Post Survey.docx
- 23 CWI CB Pre Survey.docx
- 24 CWI teacher evaluation.doc

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(WaterIQWet)

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The Artist Boat, Inc.

Photos of Workshops and Adventures











