KIDS for the BAY

Storm Drain Rangers Program 2008-09
Evaluation Report

Introduction

KIDS for the BAY (KftB) successfully provided the Storm Drain Rangers Program (SDR Program) to twenty third-fifth grade classes in the 2008-09 school year, reaching 510 students and twenty classroom teachers. The SDR Program consisted of three classroom lessons that focused on watersheds, storm water pollution, and pollution prevention strategies:

1. Watersheds and Water
2. Taking Action for Our Neighborhood, and
3. Becoming a Storm Drain Ranger

(*For a more detailed description of the lesson activities and objectives, please refer to the SDR Program Overview enclosed with this report.)

Five-hundred-ten students and their families throughout Alameda County have become more aware of storm water pollution and have become empowered to take action to prevent pollution in their communities. Twenty teachers have been trained to incorporate environmental education into their science curriculum, and eleven schools have committed to continue to make storm water pollution prevention a component of their educational programs.

For the 2008-09 program evaluation process, KftB selected the following program lesson objectives to assess whether they have been met:

- Students will be able to describe their local watershed and how their local watershed is connected to the larger San Francisco Bay Area Watershed.
- Students will be able to define an estuary and the sources of water flowing into an estuary.
- Students will be able to compare the amount of fresh water to the amount of salt water on Earth.
- Students will be able to describe the connections between the school neighborhood, the storm drain system, the local creek, and the San Francisco Bay.
- Students will be able to make connections between community environmental issues and being part of the solution.

In addition, the evaluation process intended to assess whether teacher participants received professional development in environmental science education and felt prepared and confident to teach the SDR Program themselves to future class of students after receiving training (via in-class modeling of the program), a comprehensive curriculum guide, access to program equipment, and support from KftB staff.

In this evaluation report you will find a description of our evaluation process, the results of the analyzed evaluation data from teachers and students, and an assessment of the impact of the program on its participants and attainment of the projected outcomes.

Methods

Quantitative and qualitative evaluation tools were administered to student and teacher participants between September 2008 and June 2009. The methodology behind each evaluation tool varies and is described separately for each tool below.

Student Pre- and Post-Program Surveys

KIDS for the BAY administered a survey to a sample of students from the twenty SDR Programs we implemented in the 2008-09 school year. This survey consisted of ten items and tested for knowledge around all of the major concepts covered within the SDR Program.

Students completed a pre-survey before the first classroom lesson, and completed an identical survey within one month of the completion of the final classroom lesson. Out of the twenty SDR Programs, we randomly selected four classes of third and fourth grade students to complete the surveys, with a total sample size of ninety-nine students. Eleven of these students, or 11% of the student sample, were reported to be English Language Learners by their classroom teachers.

Each survey item stood alone and was not relative to the other items in the survey. Most items were worth one point, although a few items had higher total point values because they contained multiple questions within one item. Each multiple choice question contained the response "I don't know" to allow students the option to give this response instead of having to choose from a list of potential valid responses to the item question.

The educational objectives for and concepts covered in each classroom lesson were used as the basis for developing each question on the survey. The surveys were designed to show whether the lesson objectives were met and whether there were any changes in students' knowledge as a result of participating in the SDR Program. The surveys contained mostly multiple choice items and a few fill-in-the-blank items that are appropriate and suitable for the age of the student participants (9-11 year olds). Pictures and graphics were incorporated into the items as much as possible to further help students understand the item questions. A variety of questioning strategies were used. Some questions simply checked for knowledge while others required critical thinking strategies and/or more depth of knowledge.

Teacher Post-Program Surveys

Teachers participating in the SDR Program completed a post-program survey that contained nine items with standard Likert-scale response options. The survey asked teachers to mark the response that best matched their feelings about program-related statements, including the impact of the program on their students, how the resources and the program structure prepared them to teach the program themselves, and their overall enjoyment of the program. The response options were: "strongly disagree", "disagree", "neutral", "agree", and "strongly agree". The survey was administered at the completion of all program activities. Seventeen of the twenty teachers participating in the SDR Program completed the post-program survey.

Data Analysis

Student Pre- and Post-Program Surveys

Each student within each class that completed the surveys was given a unique student identification number. We then compiled the pre-program and post-program surveys for each student using their identification numbers and discarded any surveys that did not have both a pre- and a post-match. Each pair of surveys was then given a new identification code. This code was recorded on both the surveys and on a Microsoft Excel spreadsheet. The pre-surveys were graded and the results for each question were recorded in an Excel spreadsheet. The post-surveys were graded and the results were entered into a separate Excel spreadsheet. We also calculated the total point score for each student on the pre- and post-surveys and put this information in a separate column. Using the software program XLSTAT by Addinsoft, we compared the pre-survey results to the post-survey results using a paired t-test. The survey results were compared to see if there was a significant increase in students' knowledge due to participation in the SDR Program.

Teacher Post-Program Surveys

The post-program survey responses from each teacher were compiled into a table along with the statement for each item. The results from these statements are shown in Table 1 (p. 5).

Results

Student Pre- and Post-Program Survey Results

Whole Test Results

The SDR Program survey tested for changes in knowledge around the following concepts: watersheds and watershed health; San Francisco Bay geography; the storm drain system and its connection to local creeks, the San Francisco Bay, and the Pacific Ocean; estuarine habitats; urban runoff pollution; and the amount of fresh and salt water on earth.

Results Summary: Paired t-test results from 99 students determined that there was a statistically significant increase in knowledge after experiencing the SDR Program intervention ($t_{(98)}$ =12.59, p<0.0001). The total possible score for the entire test, consisting of ten items, was 12 and the mean score increase between pre- and post-tests was 3.26 points.

Pre-Test Mean Score	Post-Test Mean Score	Mean Score Increase
6.43	9.69	3.26

Individual Question Results

Questions 1, 2, and 9 asked students to name their local creek watershed, define the term "watershed", and identify why a healthy watershed is important.

Results Summary: Results show a significant increase in knowledge about watersheds.

Question	Total Possible Score	Paired t-test Results	Mean Score Increase
1	1	$t_{(98)}$ = 14.68, p<0.0001	0.71
2	1	$t_{(98)}$ = 4.79, p<0.0001	0.30
9	1	$t_{(98)}$ = 3.42, p<0.001	0.14

Questions 3, 5 and 6 checked students' knowledge about estuarine environments and how water flows into the San Francisco Bay to create an estuary.
Results Summary: Results show a significant increase in knowledge about estuaries and the San Francisco Bay estuary. Item #5 did not show a statistically significant change in knowledge between the pre- and post-test. Pre-tests results show an already high level of knowledge about the location of fresh and salt water within San Francisco Bay geography; therefore, although the change in knowledge was not significant, the knowledge was already present within the student population.

Question	Total Possible Score	Paired t-test Results	Mean Score Increase
3	1	$t_{(98)} = 7.00$, $p<0.0001$	0.33
5	2	$t_{(98)} = 0.52$, $p=0.603$	0.05
6	2	$t_{(98)} = 3.16$, $p=0.002$	0.36

Questions 4 and 8 checked students' knowledge about the storm drain system. Question 4 tested if students knew that storm drains connect to a local body of water. Question 8 asked students to identify, from a list of illustrated actions, which actions could cause storm drain pollution.
Results Summary: Results show a significant increase in knowledge about the storm drain system and potential pollutants.

Question	Total Possible Score	Paired t-test Results	Mean Score Increase
4	1	$t_{(98)} = 6.16$, $p<0.0001$	0.39
8	1	$t_{(98)} = 4.92$, $p<0.0001$	0.28

Question 7 checked to see if students knew about how toxins such as pesticides from people's gardens, can wash into the San Francisco Bay and harm people through consuming polluted Bay fish.
Results Summary: Results show a significant increase in knowledge about how urban run-off pollution can enter the Bay and harm humans through the food chain.

Question	Total Possible Score	Paired t-test Results	Mean Score Increase
7	1	$t_{(98)} = 4.92$, $p<0.0001$	0.23

Question 10 tested for changes in knowledge about the amount of fresh and salt water located on Earth.
Results Summary: Results show a significant increase in knowledge about the relative amounts of fresh water and salt water on Earth.

Question	Total Possible Score	Paired t-test Results	Mean Score Increase
10	1	$t_{(98)} = 8.69$, $p<0.0001$	0.46

Teacher Post-Program Survey Results

Table 1. N = 17

Statement	Post Program Survey Response				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I feel confident using the local watershed environment as a learning resource.				**13 76%**	4 24%
I feel confident teaching environmental science concepts.			3 18%	6 35%	**8 47%**
I think environmental stewardship is important for my students.				1 6%	**16 94%**
Participation in the Storm Drain Rangers Program has increased my students' concern for the health of their watershed.				2 12%	**15 88%**
I feel that the curriculum guide provided to me enables me to teach the Storm Drain Rangers Program.			1 6%	4 24%	**12 71%**
The in-class modeling of the Storm Drain Rangers Program increases my confidence in teaching the program myself.			1 6%	4 24%	**12 71%**
Having access to program equipment will enable me to teach the Storm Drain Rangers Program in years to come.			1 6%	4 24%	**12 71%**
In the future, I plan on teaching the Storm Drain Rangers Program in my classroom.				**10 59%**	7 41%
I would recommend the Storm Drain Rangers Program to other classroom teachers.				2 12%	**15 88%**

Table 1. Post-Program Survey Results Summary

Results from the post-program survey were extremely positive in all areas. All teachers feel confident using the local environment as a learning resource. Eighty-two percent of teachers feel confident teaching environmental science concepts after participating in the SDR Program. All teachers felt that the program increased their students' concern for the health of their watershed. All but one teacher agreed that the curriculum guide, in-class modeling of the program, and access to program equipment is helpful in continuing to teach the program themselves next year, with the majority of teachers

marking "strongly agree". At the end of the school year, every teacher marked that they plan to teach the SDR Program in the next school year. All teachers would recommend the program to other classroom teachers, with 88% strongly agreeing with this statement.

Discussion and Conclusions

Overall, results from the 2008-09 school year evaluation process indicate that the measured objectives of the SDR Program were achieved. Student participants increased their knowledge of watershed science, the storm drain system, and urban run-off pollution prevention. Teachers feel confident using the local watershed environment as an educational resource and in teaching the SDR Program in future years.

Program Impact on Students

One hundred percent of teachers agreed that participation in the SDR Program has increased their students' concern for the health of their watershed. These survey results show that teachers perceive the program to have had an extremely positive impact on their students' awareness and attitude towards the environment.

Students showed a statistically significant overall increase in knowledge of the program content through results from the pre- and post-program surveys. The individual survey item results reveal that students did learn about their local watershed and its connection to the larger bay and ocean watersheds. Students also learned how salt water and fresh water enter the San Francisco Bay to create an estuarine environment. Survey results showed that students understood the relatively small amount of fresh water on earth compared to salt water. In the SDR Program, students take this information and complete fresh water usage surveys to learn about how much water their household uses in one day and how they can reduce their water usage.

Students also learned about their neighborhood's connection to their local creek, the San Francisco Bay, and the ocean through the storm drain system. Students increased their awareness about potential pollutants that can enter the storm drain system and affect the local creek, the bay, and the ocean. They also showed knowledge about how toxins, such as pesticides, can enter the San Francisco Bay through the storm drain system and negatively impact the health of top predators such as humans through the food chain.

Program Impact on Teachers

Survey results from teachers participating in the SDR Program show that the program had an extremely positive impact on teachers in many different areas. Overall, teachers enjoyed the SDR Program and received adequate training, resources, and support to feel confident teaching the program themselves. All teachers felt confident using the local environment as a learning resource and plan to teach the SDR Program in future school years. One hundred percent of teachers would recommend the program to other classroom teachers, indicating a high level of enjoyment of the program and a feeling that the program was worthwhile.