

Evaluation of MCPS' Our Neighborhood, Our Watershed Grant Project, Final Report

Office of Shared Accountability

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Executive Summary

The Office of Shared Accountability in Montgomery County Public Schools (MCPS) conducted an evaluation of the implementation and outcomes of a science professional development initiative for Grade 4 teachers called Our Neighborhood, Our Watershed (ONOW). The three-year initiative (2014–2015 through 2016–2017) is funded by the National Oceanic and Atmospheric Administration’s B-WET Chesapeake Program. The evaluation was requested by the Outdoor Environmental Education Programs, Office of Curriculum and Instructional Programs. This report will provide comprehensive information on the implementation of ONOW throughout the three-year initiative.

The objective of ONOW is to engage all MCPS Grade 4 students in a Meaningful Watershed Educational Experience that teaches environmental concepts in authentic ways. During the implementation, ONOW worked to build the capacity of Grade 4 teachers to use their own schoolyards and local waterways as laboratories for learning and action while teaching basic environmental science concepts. ONOW is a Problem Based Learning module where students begin by accepting a request to help restore the Chesapeake Bay. Through these lessons, students analyze how water flows and impacts their own schoolyard and the Chesapeake Bay; the lessons culminate in students making recommendations for improving their schoolyard site.

Beginning in the 2014–2015 school year, a cohort of Grade 4 teachers across MCPS began participating in an ONOW professional development workshop session during the summer, followed by a Water Walk at their school in the fall, and receiving on-site follow-up coaching and support through the year. Schools were assigned to one of three cohorts and their respective teachers were invited to attend the workshop during the summer of 2014, 2015, or 2016. This evaluation was designed to assess the implementation of the ONOW curriculum, specifically: the delivery of the professional development; teacher perceptions of the professional development; the development and delivery of the ONOW lessons; the extent to which the ONOW lessons were implemented; teacher perceptions of the ONOW curriculum and lessons; and the outdoor experiences, attitudes and comfort level of teachers.

Summary of Methodology

A nonexperimental design was used to examine teachers’ perceptions of the summer workshops and implementation of the ONOW curriculum. A pre- and post-survey design was used to examine teachers’ knowledge and instructional practices before and after the summer workshop as well as one year after the workshop. The pre-survey response rate was 96% for cohort 1 and 100% for cohort 2; the post-survey response rate was 97% for cohort 1 and 98% for cohort 2. Furthermore, 61% of cohort 1 and 52% of cohort 2 participants completed a 2-year follow up survey after the initial workshop. Data was not collected for cohort 3.

Summary of Key Findings

To what extent was the ONOW professional development delivered as intended?

A six-hour summer workshop was held during each of the three years of the project; 110 teachers attended in summer 2014 (cohort 1), 60 teachers attended in summer 2015 (cohort 2), and 89 attended in summer 2016 (cohort 3). Seventy-seven percent of the elementary schools in MCPS had at least one teacher who participated in an ONOW workshop. Each workshop included: an introduction to the grant;

an overview of the curriculum; hands on experience of several of the lessons; a review of best strategies for outdoor instruction and ideas for environmental action projects. In addition, Cohort 1 teachers were invited to attend a two-hour Model Watershed Workshop in November, which was funded through a Department of Natural Resources grant.

During the fall after the workshop, each school was visited by a coach who conducted an on-site Water Walk to help determine the best way to teach about water on and around the schoolyard. Participation in the summer workshop was not required in order to participate in the Water Walk. Coaches also were available throughout the school year for ongoing support as needed. Thirty-four of 37 cohort 1 schools and 20 of 27 cohort 2 schools participated in the Water Walk (coach visits for cohort 3 will occur after the time of this report).

What were teachers' perceptions of the professional development?

Teachers responded in post-training surveys with positive perceptions about the workshops, especially that the trainers were knowledgeable and well-prepared, and workshop objectives were met. Most agreed that the professional development provided a relevant connection to their classroom, a comfortable environment, that opportunities to process and reflect were provided, that opportunities to practice were provided, that expectations were clear, and that questions were answered adequately. Similarly, they reported that various aspects of the workshop were helpful—specifically, practicing engineering design, reviewing best strategies for outdoor instruction, discussing ideas for projects, and experiencing ONOW lessons. The most important aspect reported was an understanding of the ONOW lessons and expectations, learning how ONOW fits with the curriculum, ideas and tips, and experiencing a lesson. A majority of workshop participants gave an overall rating of excellent or good to the summer workshop they attended.

Survey respondents from both cohorts who participated in the Water Walk reported positive experiences and found it to be helpful. A slightly lower percentage of respondents agreed that that the Water Walk gave them a good understanding of how to implement ONOW.

To what extent were materials for ONOW developed and integrated into the elementary science curriculum? The ONOW curriculum comprised 10¹ lessons that teachers were able to access through the district's online instructional center and a shared Google Site. The ONOW lesson sequence is presented in Appendix A. The ONOW curriculum was designed to be integrated within the science curriculum 2.0 and MCPS staff created an alignment document for teachers, which showed the science indicator(s) and objective(s) each ONOW lessons fulfills. Teachers were encouraged to substitute a science lesson with an ONOW lesson which meets the same indicator and objective. Each year, materials to test water quality were sent in October to workshop participants. Additionally, each school received a site map of their school grounds and other teacher materials were available online.

To what extent were ONOW lessons implemented by Grade 4 teachers? What were teachers' perceptions of implementing the ONOW lessons? The majority of respondents reported implementing the first three lessons. The percentage who reported implementing the remaining lessons slowly decreased, with less than 20% indicating that they implemented the final Lesson 10. Overwhelmingly, the top reported reason for not implementing ONOW lessons was lack of time. However, more than half of participants reported they would implement all or most of ONOW in the following year.

¹ The ONOW curriculum originally comprised 11 lessons but after the first year 2 lessons were combined.

The vast majority of survey respondents rated the lessons either very or somewhat successful; however, the proportion of the highest ratings varied by lesson and cohort, with the beginning lessons getting the highest ratings. About half of workshop participants gave their experience a rating of excellent or good.

Feedback elicited from cohort 2, and from the 2-year follow-up of cohort 1, indicated that the majority shared what they learned about ONOW with other Grade 4 teachers at their school. Most respondents reported that implementing ONOW either greatly added to their planning time or somewhat added to their planning time. The majority of respondents reported that they added ONOW lessons, rather than replaced an Elementary Integrated Curriculum lesson. And finally, half of the respondents reported that they were not aware of ONOW materials posted to a shared Google drive.

Although respondents reported that they liked the real-life connection of the ONOW curriculum, they also suggested integrating ONOW with the science curriculum. Other suggestions were: offer more guidance on integrating the curriculum; provide materials or funding for materials; and provide more frequent communication to teachers (e.g. ONOW updates and best practices).

What are the experiences and attitudes of grade 4 teachers toward teaching outdoors and to what extent did teachers in the cohorts increase their comfort with teaching science lessons outdoors?

Overall, teachers' reported feeling comfortable with teaching aspects of outdoor education lessons (i.e. watershed, runoff, creating maps, engineering design and actions to improve environmental and water quality) increased from the pre-training survey to the post-training survey, but then declined somewhat in the follow-up survey. Teachers reported they went outside more often after attending the workshop than before the workshop.

Future Plans and Recommendations

The following recommendations are intended to provide feedback for the program's improvement and ongoing development.

1. In order to maximize and sustain implementation of the ONOW curriculum, continue to follow up and support teachers who participated in prior workshops. If feasible beyond the end of this grant cycle, offer additional professional development sessions to Grade 4 teachers who did not attend the prior workshops, and especially target schools that did not send a teacher to any of the workshops, so that the number of schools with a trained teacher will increase.
2. Provide more direction and support to teachers on how they incorporate the ONOW lessons into the current science curriculum and complete the final water impact project. Since the completion of the study, the MCPS Grade 4 science curriculum is being revised, and the ONOW lessons are being integrated into the new curriculum.
3. Increase and extend the reach of communication about the ONOW shared resources and best practices on approaches to implementation of the ONOW lessons to all teachers. Notify teachers of any future changes to the curriculum or guidelines for implementation.
4. Investigate ways in which teachers can receive free materials or funding for needed materials.

Evaluation of MCPS' Our Neighborhood, Our Watershed Grant Project, Final Report

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The Office of Shared Accountability (OSA) in Montgomery County Public Schools (MCPS) conducted a multiyear evaluation of the implementation and outcomes of a science professional development (PD) initiative for Grade 4 teachers called Our Neighborhood, Our Watershed (ONOW). The implementation and evaluation of this three-year initiative (2014–2015 through 2016–2017) are funded by the National Oceanic and Atmospheric Administration's (NOAA) B-WET Chesapeake Program. The evaluation was requested by the Outdoor Environmental Education Programs, Office of Curriculum and Instructional Programs (OCIP). This final report will provide comprehensive information on the implementation of ONOW throughout the three-year initiative. Interim reports containing feedback on the program have been given to program staff at various intervals during the initiative, for the program's improvement as well as its ongoing development.

Background

The goal of ONOW is to provide an educational experience that addresses the core content of the Grade 4 science curriculum and becomes an integral and permanent part of the instructional program. ONOW aims to build the capacity of teachers to use their school site or nearby local area as an outdoor classroom for teaching and learning. The ONOW project responds to the need to provide a high-quality and equitable education experience that develops critical thinking, research skills, and lifelong commitments to environmental stewardship.

The ONOW project provides access for every MCPS Grade 4 student to a rigorous curriculum and authentic environmental experience. Content on ecology, local ecosystems, the Chesapeake Bay watershed, and the hydrologic cycle is introduced at a grade-appropriate level. The ONOW curriculum is based on the belief that outdoor environmental investigation is one of the best strategies for the integration and application of scientific concepts and practices.

With the release of the new Next Generation Science Standards (NGSS) in spring 2013, integrating NGSS and the Common Core State Standards (CCSS) is now a pressing task. The ONOW project aims to provide a relevant and engaging curriculum, and rigorous instructional strategies for teachers that will facilitate the integration of the NGSS and the CCSS.

Overview of the ONOW Project

The main objective of ONOW is to engage all MCPS Grade 4 students in outdoor environmental learning experiences that teach environmental concepts in authentic ways. The program aims to help meet state standards for environmental literacy and build a strong commitment to excellence in urban education by connecting children to nature in their own neighborhoods. ONOW supports students' growth in the three areas of competency outlined in the MCPS Strategic Planning Framework—academic excellence, creative problem solving, and social emotional learning. Implementation of this project in all MCPS elementary schools with fourth grade classes provides a platform for a variety of lessons that may be adapted for schools in urban, suburban, and rural areas.

All MCPS Grade 4 teachers (approximately 459²) had the opportunity to receive high-quality professional development to assist them to use the outdoors as a classroom, to utilize the local environment as a link to the larger global environment, and to employ the skills of inquiry in engaging students in this and other Meaningful Watershed Educational Experience (MWEE) projects. Teachers participated in a professional development session conducted at the Lathrop E. Smith Environmental Education Center (Smith Center) and received ongoing job-embedded collaboration and support.

For delivery of professional development in a meaningful way, project administrators divided elementary schools into three cohorts, with cohorts assigned to implement the ONOW curriculum in year one, two, or three. Principals in each elementary school were notified with a memorandum from project administrators describing the ONOW project and their school's cohort assignment. The majority of schools in the first cohort were chosen because they had already exhibited some interest in outdoor education (i.e. already working with the Audubon Society). Cohort 1 and cohort 2 schools who did not have a teacher participate in the summer workshop were moved to cohort 3.

In the first year of ONOW (2014–2015), the ONOW curriculum was developed by the project administrators at Outdoor Environmental Education Programs (OEEP). Lesson materials for all phases of the ONOW project were planned in collaboration with the Elementary Integrated Curriculum team and were intended to be integrated into the Grade 4 science curriculum by teachers. The ONOW curriculum used a project-based learning model, incorporating student inquiry. Lessons were written for outdoor learning at all schools, with differentiated instruction provided to schools that have the ability to utilize a stream.

The following professional development activities were provided to all three cohorts:

1. *Summer Professional Development Sessions.* The first professional development workshop was delivered in summer, 2014; workshops for cohorts 2 and 3 were held in summer 2015 and 2016, respectively. Teachers in each cohort received an invitation from the OEEP in OCIP and were encouraged to register for the summer workshop. These professional development sessions were conducted at the Smith Center, and aimed to prepare teachers to implement all aspects of ONOW, from preparation to reflection, using

² Based on MCPS website staff directories of Grade 4 teachers

the outdoors. During the workshop, teachers explored the local watershed, and discussed and determined which questions may be answered through observation, analysis, and use of scientific measurement tools (including clarity, pH, and temperature of water samples). The training was designed to allow teachers to experience outdoor investigation in the role of a student and reflect on that experience as an educator. The outdoor experience included a focus on mastery objectives, hooks to engage students in learning, an outline of the inquiry framework for the lesson, differentiation strategies for large and small group work, and assessment of student learning (see summer workshop agendas in Appendix B). NOAA resources were introduced to Grade 4 teachers as resources for building their capacity to lead a successful watershed educational experience, as well as providing opportunities to extend student learning.

2. *On-site Water Walk: Assessment of Elementary Schoolyards and Streams.* With assistance from staff members of the Audubon Naturalist Society GreenKids program and teachers from OEEP, all schools in each cohort of the ONOW project were provided a coach visit to determine the best way of teaching about water on and around their schoolyard; this visit was also referred to as the Water Walk session. Additionally, each school received a master file of location maps, photos, permits, park manager contact information, and other information related to the individual school. Each Cohort of teachers received their on-site Water Walk session during the fall after their summer workshop. Each teacher within a cohort was provided with the name of their Water Walk coach at the summer session; the school team and coach determined the date of their individualized Water Walk session.
3. *On-site Follow-up Coaching, and Support.* In addition to the on-site Water Walk mentioned above, each participating school had the opportunity to receive additional follow-up support from their coach upon request. Additionally, cohort 1 teachers also were invited to attend a Model Workshop after school on November 27, 2014, funded by a Department of Natural Resources Grant. The purpose of this training was threefold: (1) to construct and experience the use of watershed models for instruction; (2) to increase background knowledge about the local watershed; and (3) to collaborate with other cohort 1 ONOW teachers (see agenda in Appendix B). Professional development for cohorts 1 and 2 did not offer this separate training, but instead, incorporated it into the summer workshop and on-site coach visit.

Evaluation Scope and Questions

The evaluation was designed to assess teachers' experience with the ONOW project, including the ONOW curriculum and lessons, and the PD provided for the project. The evaluation of the PD components of the project used Guskey's (2000) model as a framework. Guskey describes five sequential levels to be addressed in an evaluation of PD. The five levels of the model are described below.

Level 1: Participants' reactions. Did they like it? Was it useful? Was the leader knowledgeable and helpful?

Level 2: Participants' learning. Did participants acquire the intended knowledge and skills?

Level 3: Organization support and change. Was implementation advocated, accommodated, facilitated, and supported?

Level 4: Participants' use of new knowledge and skills. Did participants effectively apply the new knowledge and skills?

Level 5: Student learning outcomes. What was the impact on students?

This evaluation addressed levels 1-4 of Guskey's model for Grade 4 teachers in the cohort 1 and cohort 2 schools who participated in the ONOW summer workshop; cohort 3 was not studied in this evaluation. See Table C1, Appendix C which displays each level of Guskey's framework, the data instrument used and the corresponding evaluation question.

This evaluation addressed the following questions:

1. To what extent was the summer professional development delivered as intended?
2. What were cohort teachers' perceptions of the professional development after participation?
3. To what extent were materials for ONOW developed and integrated into the elementary science curriculum?
4. To what extent were ONOW lessons implemented by Grade 4 teachers? What were teachers' perceptions of implementing the ONOW lessons?
5. What are the experiences and attitudes of Grade 4 teachers toward teaching outdoors and to what extent did teachers in the cohorts increase their comfort level with teaching science lessons outdoors?

Methodology

A nonexperimental design was used; schools were not randomly assigned to cohorts, and each school with a Grade 4 class was included in one of three cohorts. Data collection methods included surveys and review of program documents and records. A pre-post survey design was used to examine teachers' knowledge and instructional practices through survey questions before and after the summer workshop as well as one year after the workshop. Finally, a two-year follow up survey was administered to cohort 1 summer workshop participants to examine longer term changes in the implementation of the ONOW curriculum. This report includes survey findings for cohorts 1 and 2; a third cohort of teachers participated in a summer workshop, but they were not administered surveys as part of this evaluation.

Study Samples

There are a total of 130 MCPS schools included in this study: 127 are elementary schools and 3 are special education schools. Three MCPS elementary schools were not part of this study because they did not have Grade 4 classrooms. In each of the three cohorts, all Grade 4 teachers in each school were invited to attend the ONOW summer workshop. Schools from cohort 1 and cohort 2 that did not have a teacher who attended one of the first two summer workshops were invited to participate with cohort 3 (see Appendix D for a list of cohort schools).

Cohort 1

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- Thirty-seven schools were selected to participate in cohort 1 of ONOW. All Grade 4 classroom teachers (approximately 142) from the 37 schools were invited to attend the 2014 summer workshop session; 110 of the targeted 142 attended the workshop.
 - *Summer 2014 Workshop Participants:* One hundred ten Grade 4 classroom teachers from cohort 1 schools attended the ONOW summer workshop and were invited to take a pre- and post-training survey, plus a follow-up survey at the end of the 2014–2015 school year. Additionally, 32 Grade 4 teachers from cohort 1 schools who did not attend the summer workshop were also invited to take a follow-up survey. Also, cohort 1 workshop participants were invited to take a two-year follow-up survey in spring 2016.

Cohort 2

- Twenty-seven schools were selected to participate in cohort 2 of ONOW. All Grade 4 classroom teachers (approximately 102) from the 27 schools were invited to attend the 2015 summer workshop session; 60 of the targeted 102 attended the workshop.
- *Summer 2015 Workshop Participants:* Sixty Grade 4 classroom teachers attended the ONOW summer workshop and were invited to take a pre- and post-training survey, plus a follow-up survey at the end of the following school year in spring 2016.

Cohort 3

- The remaining 66 schools were selected to participate in cohort 3 of ONOW. All Grade 4 classroom teachers (approximately 215) from the 66 schools were invited to attend the 2016 summer workshop session; 89 of the targeted 215 attended the workshop.
- *Summer 2016 Workshop Participants:* Eighty-nine Grade 4 classroom teachers attended the final cohort 3 ONOW summer workshop. Cohort 3 teachers were not administered surveys as part of this evaluation.

In total, 100 of 130 schools (77%) and 259 teachers out of 459 invited teachers (56%) attended the ONOW workshops across the 3 years.

Data Collection Activities

Review of Training Session Documents and Attendance Data

Program documents, such as workshop and professional development agendas, and training attendance records were reviewed to determine the content of the program and the extent to which it was implemented as planned.

Surveys

Based on program goals and objectives and PD materials and curricula, survey instruments were developed by OSA evaluators, in collaboration with staff from OCIP. The following instruments

were developed and administered to cohort 1 and cohort 2 teachers during the span of the evaluation:

Pre and Post Summer Workshop Surveys

Pre-training survey of workshop participants. Pre-training surveys, utilizing likert-scale and multiple-choice questions, were administered at the beginning of the workshop to collect baseline data on current science teaching practices, knowledge of environmental science, use of outdoors and experience and comfort with teaching outdoors. The survey also included questions about skills and knowledge of teaching outdoors about the watershed for comparison with later survey results. Of the 110 cohort 1 workshop participants, 106 completed a pre-training survey (96% response rate). Of the 60 cohort 2 workshop participants, 60 completed a pre-training survey (100% response rate).

Post-training survey of workshop participants. At the end of the workshop, a post-training survey was administered which included participants' perceptions of the workshop, support needs related to ONOW, and projected use of the training. Likert-scale, multiple-choice, and open-ended questions were utilized. Of the 110 cohort 1 workshop participants, 107 of the participants completed a post-training survey (97% response rate). Of the 60 cohort 2 workshop participants, 59 of the participants completed a post-training survey (98% response rate).

Follow-up Surveys

Follow-up survey of summer workshop attendees. Follow-up surveys were administered online to summer workshop attendees the following school year after teachers had the opportunity to implement the ONOW curriculum (May, 2015 for cohort 1 and May, 2016 for cohort 2). The surveys elicited teachers' perceptions of on-site support, status or extent of implementation of ONOW lessons and materials, and perception of ONOW lessons. The survey also followed up pre-training survey questions with questions about science teaching practices, use of outdoors, and experience and comfort with teaching outdoors. Likert-scale, multiple-choice, and open-ended questions were utilized. Sixty-seven of the 110 cohort 1 workshop participants completed a follow-up survey (61% response rate) and 31 of the 60 cohort 2 workshop participants completed a follow-up survey (52% response rate).

Findings reported for Cohort 1 also included:

Follow-up survey of Grade 4 teachers who were not workshop attendees. Surveys were also administered online to Grade 4 teachers of cohort 1 schools who did not attend the first summer workshop. This survey was administered at the same time as the follow-up survey of workshop participants in May, 2015. Twenty-six of the 32 Grade 4 teachers who did not participate in the summer workshop responded to the survey (81% response rate).

Two-year follow-up survey of cohort 1 workshop participants. An online survey was also sent to cohort 1 teachers in May, 2016, two years after they attended the summer workshop. Although there were 110 cohort 1 workshop participants, a follow-up survey link was sent to 99 teachers because some were either no longer with MCPS or were not a Grade 4 teacher and thus would not be able to answer implementation questions. Twenty-four of the 99 teachers responded (24% response rate).

A summary of the data collection activities by cohort is displayed below in Table 1.

Table 1
Summary of Data Collection Activities by Cohort

Cohort	Data Collection Activity and Response Rate			
Cohort 1 (2014-2015)	Pre-training Survey (Summer 2014) 96% response rate	Post-training Survey (Summer 2014) 97% response rate	Follow-up Survey ^a (Spring 2015) 61% response rate of attendees 81% response rate of non-attendees	2-year Follow-up Survey (Spring 2016) 24% response rate
Cohort 2 (2015-2016)	Pre-training Survey (Summer 2015) 100% response rate	Post-training Survey (Summer 2015) 98% response rate	Follow-up Survey (Spring 2016)	
Cohort 3 (2016-2017)	No data collection			

Note. Training agendas, documents and attendance to summer workshops were reviewed for all three cohorts and attendance to the fall water walk session for cohort 1 and cohort 2.

^aSurvey also sent to respondents from cohort 1 schools who did not attend the summer workshop

Summary of Data Analysis Procedures

Attendance data from training records were summarized to report the number of workshop and Water Walk attendees in each cohort. Teachers' survey responses were analyzed descriptively to report the teaching experience of the participants. Data from multiple-choice and likert-scale survey questions were summarized using descriptive statistics. Paired t-tests were used to compare means between pre-training and follow-up survey ratings and a test of proportions was used to compare some cohort 1 workshop and non-workshop responses. Qualitative data collected from open-ended survey questions were analyzed using categories of responses and frequency of comments; examples of illustrative responses were presented.

Strengths and Limitations

A strength of this study is that almost all of the summer workshop participants completed a pre- and post-training survey. Another strength of this study is that evaluators worked collaboratively with program staff in the development of the surveys. Because cohort 1 survey findings were provided to program administrators for use in program improvement, adjustments were made to the cohort 2 and 3 workshops and curriculum based on the feedback from participants.

A limitation of the study is the relatively low response rate for the follow-up surveys (61% for cohort 1, 52% for cohort 2, and 24% for the 2-year follow-up of cohort 1). Therefore, findings may not be generalizable to all ONOW participants, especially with the 2-year follow-up survey where there is a high proportion of non-responses.

Findings

Findings are organized under each evaluation question and include all cohorts as applicable.

Question 1: To what extent was the ONOW professional development delivered as intended?

Summer Professional Development (cohorts 1, 2, and 3). For each cohort, a six-hour summer workshop was held as planned at the Lathrop E. Smith Environmental Education Center (Smith Center). Cohorts 2 and 3 were offered two session times during the summer to give teachers more scheduling flexibility and to reduce the number of participants in one session. The workshops included: an introduction to ONOW and NOAA Grant and the Meaningful Watershed Educational Experience (MWEE); an overview of the ONOW curriculum; hands on experience of several of the ONOW lessons; a review of best strategies for outdoor instruction and ideas for environmental action projects. Summer PD for cohorts 2 and 3 also included descriptions of all the lessons, a model watershed component (instead of a separate workshop in the fall), best practices, and more time for teacher discussion. Facilitators included staff from MCPS OEEP, Audubon Naturalist Society, and Montgomery County Department of Parks. The sessions for cohorts 2 and 3 also included presentations from teachers with experience implementing ONOW; agendas can be found in Appendix A.

Participation in Summer Professional Development. A total of 110 cohort 1 teachers participated in the first year's summer workshop. At least one teacher from each of the 37 cohort 1 schools attended. Some participants did not teach Grade 4 but were a support teacher, specialist, or Grade 5 teacher. A total of 60 teachers from 27 cohort 2 schools participated in one of the cohort 2 ONOW summer workshops held in June and August. Any school that did not have a teacher participating in any of the prior years' workshops were invited to participate in cohort 3, which resulted in a total of 66 cohort 3 schools. Thirty-seven of the 66 schools had a teacher participate in the workshop; a total of 89 Grade 4 classroom teachers attended one of the cohort 3 summer workshops held in June and August.

Model Watershed Workshop. Cohort 1 teachers (regardless if they attended the summer training) were invited to attend a two hour Model Watershed Workshop on November 27, 2014, which was funded through a Department of Natural Resources grant. This learning session mainly focused on the ONOW Lesson 7: Our Role in the Local Watershed. The session provided information about the Chesapeake Bay, using demonstrations and presentations, followed by a hands-on experience building and testing a model of the watershed. According to program records, a total of 32 teachers from 13 schools attended this workshop.

On-site Water Walk Session. According to program documents, 5 coaches visited 34 cohort 1 schools between September and November, with all but 2 visits in September and October, 2014. A total of 108 teachers participated in the first year Water Walk; the majority of the teachers who participated in the Water Walk had also participated in the summer workshop training.

In the second year Water Walk session, 5 coaches visited 20 of the 27 cohort 2 schools between September and October, 2015 with a total of 63 teachers participating; the majority of the teachers who participated in the Water Walk had also participated in the summer workshop training. Additionally, two cohort 1 schools also requested, and were provided, a repeat Water Walk session.

Finally, each cohort 3 school will also be provided a visit from a coach to conduct an on-site Water Walk and determine the best way to teach about water on and around their school yard. At the time

of this report, not all the Water Walk sessions had been completed and participation data were not available.

Total ONOW workshop participants.

In all, at least 1 teacher from 100 of the 130 qualifying schools (77%) participated in an ONOW workshop during 1 of the 3 years, with a total of 259 participating teachers (56% of all Grade 4 teachers. Furthermore, 34 of the 37 cohort 1 schools (92%) and 20 of 27 cohort 2 schools (74%) participated in the fall Water Walk, with a total of 171 Grade 4 teachers in cohorts 1 and 2 participating in the Water Walks. The cohort 3 Water Walk had not been completed at the time of this report. A summary of overall participation and by cohort is shown below in Table 2.

Table 2
Number of Schools and Teachers by Cohort

Number of...	Total Workshop (N)	Cohort 1 Workshop (n)	Cohort 2 Workshop (n)	Cohort 3 Workshop (n)
Schools				
Number of Schools Invited	130	37	27	66
Summer Workshop Participating Schools	100	37	26	37
Water Walk Participating Schools	54	34	20	TBD
Teachers				
Grade 4 Invited Teachers in Schools	459	142	102	215
Summer Workshop Participating Teachers	259	110	60	89
Water Walk Participating Teachers	171	108	63	TBD

Characteristics of Workshop Participants

According to the responses to the workshop survey, most of the participants in both cohort 1 and cohort 2 had five or more years of teaching experience with MCPS, and 43% of cohort 1 and 37% of cohort 2 participants had been teaching Grade 4 for 5 years or more (Table 3).

Table 3
Characteristics of Summer Workshop Participants by Cohort

Characteristic	Cohort 1 (<i>N</i> = 110)		Cohort 2 (<i>N</i> = 60)	
Total years teaching MCPS	<i>n</i>	%	<i>n</i>	%
1 year (last year 1 st year)	6	5.5	4	6.7
2 years	8	7.3	2	3.3
3–4 years	10	9.1	8	13.3
5–7 years	21	19.1	10	16.7
8–10 years	20	18.2	6	10.0
More than 10 years	40	36.4	30	50.0
No response	5	4.5	0	0.0
Total years teaching Grade 4				
Next year will be 1 st year	7	6.4	13	21.7
1 year (last year 1 st year)	14	12.7	8	13.3
2 years	15	13.6	7	11.7
3–4 years	23	20.9	10	16.7
5–7 years	23	20.9	7	11.7
8–10 years	12	10.9	5	8.3
More than 10 years	12	10.9	10	16.7
No response	4	3.6	0	0.0

Question 2: What were the teachers' perceptions of the ONOW professional development?

Summer Professional Development Workshop

Perceptions of workshop. Teachers from both cohorts were positive about the summer workshop they attended, with most of them strongly agreeing or agreeing with the survey statements (see Figure 1). An even higher percent of cohort 2 participants strongly agreed with the statements. For example, 71% of cohort 1 teachers strongly agreed that trainers were knowledgeable and well-prepared and 67% strongly agreed that workshop objectives were met; 90% of cohort 2 teachers strongly agreed with each of these statements. Additionally, 45 – 55% of cohort 1 teachers and 70 – 75% of cohort 2 participants strongly agreed that they saw a relevant connection to their classroom, that the workshop provided a comfortable environment, that opportunities to process and reflect were provided, that opportunities to practice were provided, that expectations were clear, and that questions were answered adequately. The two aspects with the lowest ratings were: 'given appropriate tools and knowledge for implementation' (39% among cohort 1 and 66% among cohort 2 strongly agreed), and 'had a good understanding of how to implement' (38% among cohort 1 and 56% among cohort 2 strongly agreed).

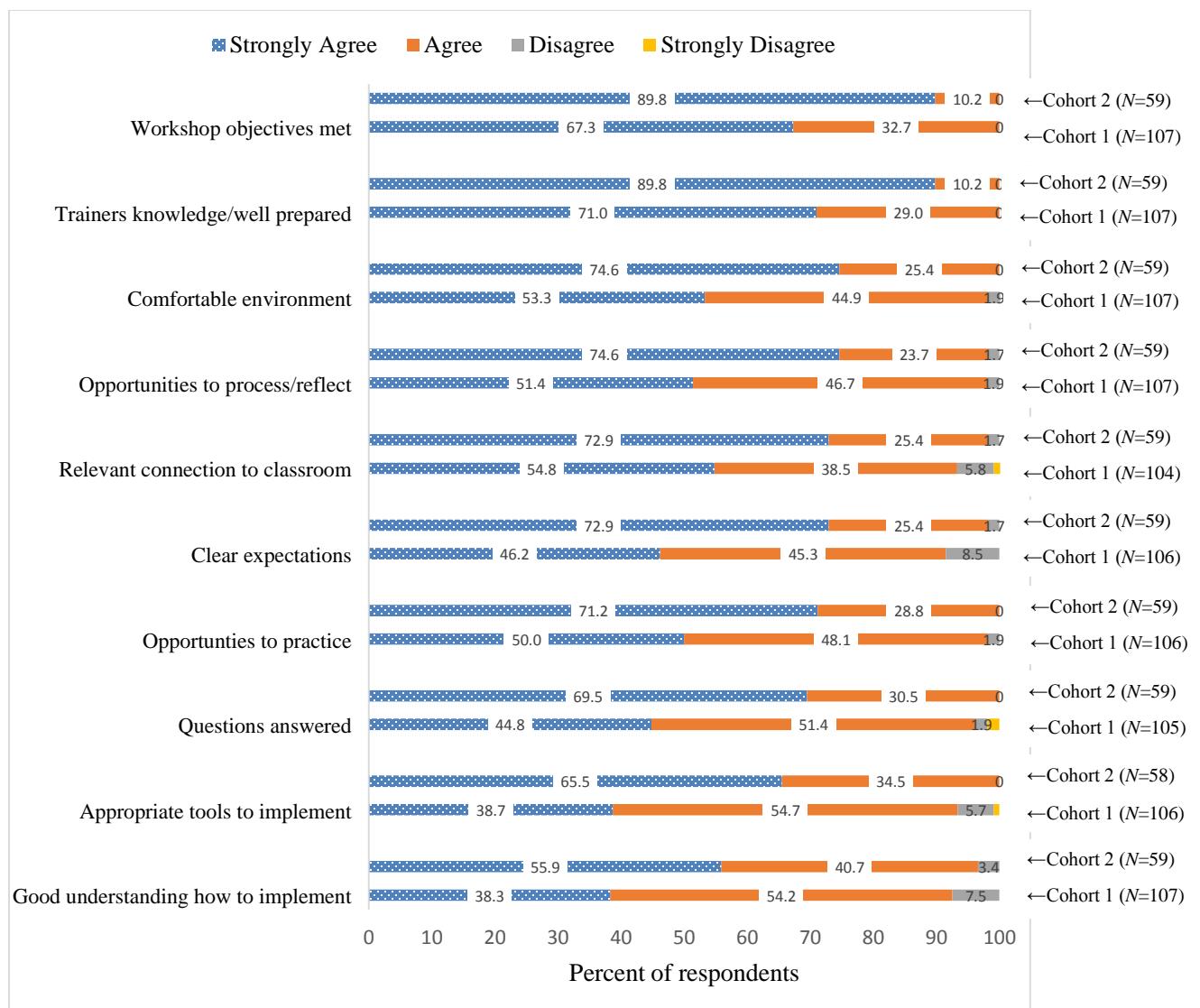


Figure 1. Summer Workshop Post-Training Feedback Among Cohort 1 and Cohort 2 Survey Respondents.

Similarly, most all cohort 1 and cohort 2 participants reported that various aspects of the workshop were very helpful or somewhat helpful (Figure 2). A higher percentage of cohort 2 than cohort 1 participants rated the four aspects very helpful: practicing the engineering design (81% vs. 56%), reviewing best strategies for outdoor instruction (73% vs. 61%), discussing ideas for environmental action projects (78% vs. 64%), and experiencing several ONOW lessons (86% vs. 69%). A small portion (9%) of cohort 1 and cohort 2 teachers gave a rating of not very helpful for the topic/aspect of reviewing best strategies for outdoor instruction.

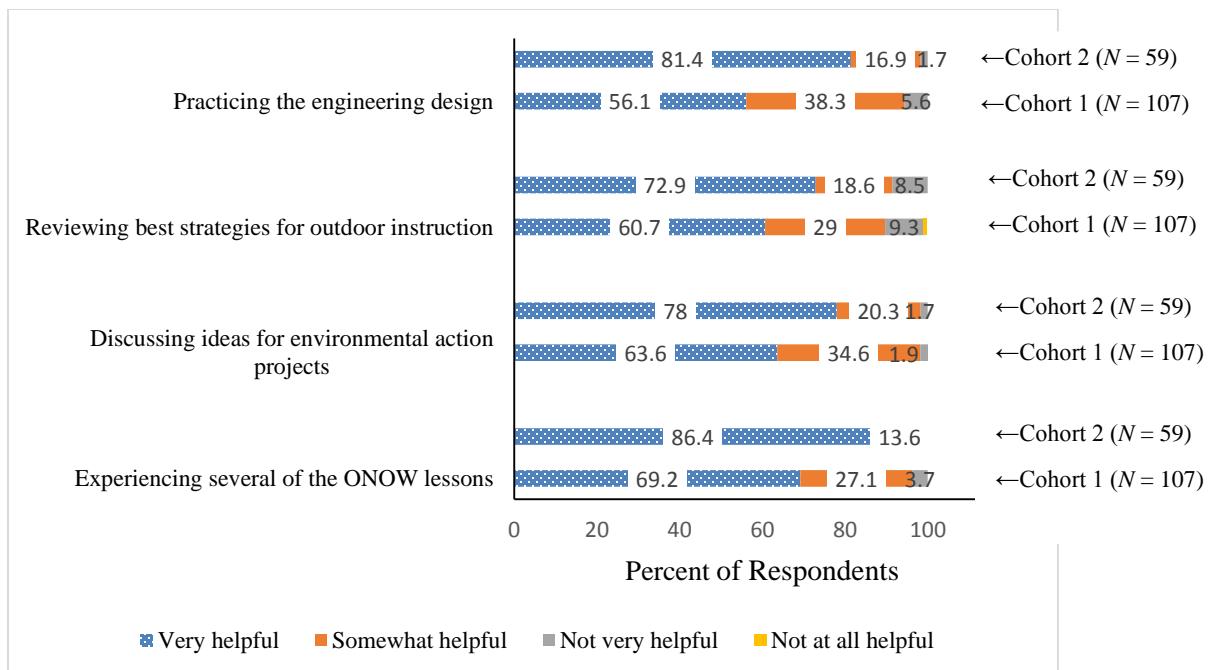


Figure 2. Helpfulness of Summer Workshop Aspects Among ONOW Post-Training Survey Respondents

Participants were asked to rate their overall experience with the workshop using a 5 point scale where 1 = very poor and 5 = excellent. After the cohort 1 workshop, the majority (81%) rated their overall experience excellent or good. After the cohort 2 workshop, 75% rated their overall experience excellent and an additional 15% rated it good. The mean rating was 4.23 ($SD = .823$) among cohort 1 participants and 4.64 ($SD = .663$) among cohort 2 participants. A summary of their ratings is shown in Table 4.

Table 4
Number and Percent ONOW Participants Indicating their Overall Experience with ONOW Workshop

Rating	Cohort 1 (n = 105)		Cohort 2 (n = 59)	
	n	%	n	%
Excellent	47	44.8	44	74.6
Good	38	36.2	9	15.3
Average	17	16.2	6	10.2
Poor	3	2.9	0	0.0
Very Poor	0	0.0	0	0.0

Important aspects of workshop. Participants were asked in open-ended survey questions to indicate the most important aspect of the workshop. Among the 149 responses from both cohorts, the most frequent responses were: an understanding of the ONOW lessons and expectations ($n = 45$, 30%), learning how ONOW fits with the curriculum ($n = 25$, 17%), ideas and tips ($n = 23$, 15%), and experiencing a lesson ($n = 27$, 18%). Also mentioned among cohort 1 comments were content knowledge, the importance of using the schoolyard, and hands on activities. Cohort 2 teachers also mentioned that learning about resources was as an important

aspect. A table with examples of these open-ended responses can be found in Table E1, Appendix E.

Suggestions for improving the workshop. Participants were asked in an open-ended question if there was anything about the workshop that would have been more effective if it were done differently; 55 of the 107 (51%) cohort 1 respondents gave a suggestion. Overwhelmingly, the most frequent comment of those responding, was that it was too hot and there should be air conditioning ($n = 21$, 38%). It should be mentioned that after that first workshop, air conditioning was installed in the Smith Center, thus this was not a problem for subsequent cohorts. Other suggestions made by cohort 1 participants included: create smaller learning groups, offer more ideas or more information, create ways to hear and see presentations more easily, condense or schedule workshop differently, have more opportunities for discussion, make more resources available and have less teacher talk/more hands on activities. Compared with Cohort 1, fewer cohort 2 teachers gave a suggestion; 18 of the 59 participants (31%). Suggestions for improving the workshop elicited from cohort 2 teachers included having less talk and more hands-on or more movement. Several others thought the training could have been condensed into a shorter time period and a few had a suggestion for a different location or time for the training. A table with examples of these responses to the open- ended question from both cohorts can be found in Table E2, Appendix E.

Support or resources needed. Also in an open-ended question, about three quarters (80 of 107 participants) of the cohort 1 teachers, and almost one third (18 of 59 participants) of cohort 2 teachers named a support or resource they would need to successfully implement the ONOW curriculum with their class. The majority of those who responded to the post-training survey named materials needed to implement the lesson (e.g., flip charts, water testing, and engineering supplies). Cohort 2 teachers also suggested that they would need additional support from the ONOW staff, time to plan and organize materials, and funding for supplies.

Water Walk

Experiences with the Water Walk. Teachers who participated in the school on-site Water Walk were asked about their experiences. Responses from both cohort 1 and cohort 2 teachers were favorable. All of the respondents from both cohorts strongly agreed or agreed that: 1) the coach was knowledgeable and well-prepared, 2) a comfortable environment was created, and 3) their questions were answered adequately (Table 5). Although the majority of cohort 1and cohort 2 teachers strongly agreed or agreed that the Water Walk session gave them a good understanding of how to implement ONOW, almost one-fifth (18%) of cohort 1 teachers disagreed or strongly disagreed with this statement; only two cohort 2 teachers (11%) disagreed with this statement. Ratings among all cohort 1 participants (i.e. including teachers who did not participant in the summer workshop) were examined separately, and findings were similar to findings for just those who participated in the summer workshop.

Table 5
Number and Percent of ONOW Water Walk Participants
Indicating Agreement with Statements on Survey

Survey statement/ Cohort	N	Strongly Agree		Agree		Disagree		Strongly Disagree	
		n	%	n	%	n	%	n	%
The coach was knowledgeable and well-prepared									
Cohort 1	48	33	68.8	15	31.3	0	0.0	0	0.0
Cohort 2	19	15	78.9	4	21.1	0	0.0	0	0.0
An environment was created in which I felt comfortable taking risks (i.e., asking questions, expressing my ideas, working with unfamiliar content)									
Cohort 1	50	37	74.0	13	26.0	0	0.0	0	0.0
Cohort 2	19	13	68.4	6	31.6	0	0.0	0	0.0
My questions during the session were answered adequately									
Cohort 1	50	35	70.0	15	30.0	0	0.0	0	0.0
Cohort 2	18	13	68.4	5	26.3	0	0.0	0	0.0
The session gave me a good understanding on how to implement the ONOW curriculum									
Cohort 1	50	17	34.0	24	48.0	7	14.0	2	4.0
Cohort 2	19	9	47.4	8	42.1	2	10.5	0	0.0

Note. Only respondents who also participated in the summer workshop are included in above table to be comparable with cohort 2 respondents.

Most of the follow-up survey respondents found the Water Walk session to be very or somewhat helpful with 66% of cohort 1 and 74% of cohort 2 reporting it to be very helpful (Table 6). Just over one half of cohort 1 water walk participants, and only several cohort 2 water walk participants, reported following up the coach; almost all rated the coach follow-up very or somewhat helpful.

Table 6
Helpfulness of Water Walk Session Among Follow-up Survey Respondents
who Participated in the ONOW Water Walk

Survey statement/ Cohort	N	Very Helpful		Somewhat Helpful		Not Very Helpful		Not at all helpful	
		n	%	n	%	n	%	n	%
The water walk coaching session									
Cohort 1	50	33	66.0	17	34.0	0	0.0	0	0.0
Cohort 2	19	14	73.7	3	15.8	2	10.5	0	0.0
Any follow up with coach (if applicable)									
Cohort 1	27	14	51.9	12	44.4	1	3.7	0	0.0
Cohort 2	4	3	75.0	1	25.0	0	0.0	0	0.0

Question 3: To what extent were materials for ONOW developed and integrated into the elementary science curriculum?

ONOW Lessons. At the start of the ONOW grant, 11 lessons were created as part of the ONOW curriculum. For Cohort 1, Lessons 1–4 were available at the start of the school year and Lessons 5–11 were available after a professional development workshop held in November. After year 1, two of the lessons were combined, resulting in a total of 10 ONOW lessons available for

cohort 2 and cohort 3 trainings. For these two cohorts, all the lessons were available to teachers before the start of the school year (see Appendix A for the list of ONOW lessons). Lessons were posted on the district's online instructional center and on a shared Google site after the first year. The original recommendation to cohort 1 teachers was to use the entire school year to implement the lessons at the teachers' pace and weather availability. However, based on teacher feedback and data showing a decline in implementation throughout the school year, this timeline was adjusted for cohort 2 and cohort 3. It was suggested to cohort 2 and cohort 3 teachers, that they complete all 10 lessons within the first semester of the school year, although this was just a guideline.

The ONOW curriculum was written to exist within Curriculum 2.0 and to address the Maryland State Department of Education (MSDE) standards for environmental education, as well as many of the Grade 4 science and social studies content indicators. ONOW is a Problem Based Learning module where students begin by accepting a request to help restore the Chesapeake Bay (see Project Request letter in Appendix F). The curriculum is designed so that students have the opportunity to analyze how water flows and impacts their own school yard and the Chesapeake Bay; the lessons culminate in an opportunity for students to make recommendations and take action for improving their site.

Because the ONOW curriculum is designed to be integrated within the science curriculum 2.0, MCPS staff created an alignment document for teachers, which shows the science indicator(s) and objective(s) that each ONOW lesson fulfills. Teachers were encouraged to substitute a science lesson with an ONOW lesson which meets the same indicator and objective. Each year, materials to test water quality (i.e. ph paper, thermometers, secchi disk), were sent in October to those who attended the summer workshop. Other materials such as caption sheets and guided checklists were available online for teachers to access.

School Site Maps. Each school received a site map of their school grounds at the summer workshop or water walk session. Additionally, when the ONOW coach conducted the on-site water walk, they took pictures of the school grounds to incorporate into an individual school profile, which was subsequently made available to the Grade 4 team.

Question 4. To what extent were ONOW lessons implemented by Grade 4 teachers? What were teachers' perceptions of implementing the ONOW lessons?

Extent of Implementation of Individual ONOW Lessons

Overall Implementation. Table 7 shows the percentage of teacher respondents from the cohort 1, cohort 2 and cohort 1: 2-year follow-up surveys who implemented each of the lessons. The percentage of implementation was derived from the proportion of teachers who rated a lesson. (vs. skipped the rating or indicated they did not implement).

The frequency of implementation of the ONOW lessons declined the farther the lesson was into the curriculum (Table 7). Approximately three fourths of the cohort 1 respondents, who attended the workshop, reported they implemented the first two lessons and 61% reported implementing the third lesson. The percentage who reported implementing the remaining lessons slowly decreased, with 27% of cohort 1 teachers implementing Lesson 9 (planning a solution) and 10%

or less implementing Lessons 10 (taking action) and 11 (communicating findings). Although the percentage implementing the final lessons were also low among cohort 2 teachers (26% for Lesson 9 and 19% for Lesson 10), there seemed to be a lull in the implementation of Lessons 5 and 6. Reported implementation was slightly higher among cohort 2 respondents for six of the lessons and slightly lower for 4 of the lessons.

Finally, in the cohort 1: 2-year follow-up survey, teachers also had a drop off in implementation of the later lessons (Table 7). The overall reported percentage who implemented Lessons 5 – 8 was somewhat higher than the first year follow-up of Cohort 1. However, it should be noted that only 24 cohort 1 teachers responded to the 2-year follow-up survey, and there may be a selection bias in that these responding teachers may be more likely to implement the lessons.

Table 7
Number and Percent of Follow-up Survey Respondents Indicating
Implementation of ONOW Lessons

Lesson	Cohort 1 ^a Follow-up <i>N</i> = 67		Cohort 2 Follow-up <i>N</i> = 31		Cohort 1: 2-Year Follow-up <i>N</i> = 24	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Lesson 1: ONOW Introduction	50	74.6	25	80.6	16	66.7
Lesson 2: Mapping the Schoolyard	49	73.1	21	67.7	16	66.7
Lesson 3: Water Walk	41	61.2	21	67.7	16	66.7
Lesson 4: Engineering a Water Collection Tool	35	52.2	18	58.1	10	41.7
Lesson 5: Water Quality	28	41.8	12	38.7	13	54.2
Lesson 6: Testing our Water	24	35.8	10	32.3	13	54.2
Lesson 7: Our Role in the Local Watershed	26	38.8	16	51.6	13	54.2
Lesson 8: Schoolyard Environment Impact	19	28.4	13	41.9	7	29.2
Lesson 9: Planning a Solution to Improve our Schoolyard	18	26.9	8	25.8	2	8.3
Lesson 10: Taking Action to Improve Our Watershed	7	10.4	6	19.4	4	16.7
Lesson 11: Communicating our Findings	6	9.0				

Note. Implementation was derived by whether respondents rated the success of a lesson or whether they indicated n/a or skipped the rating. In cohort 2 and 2-year follow-up surveys, n/a was changed to “did not implement”.

^aIncludes workshop participants only

Implementation of lessons was also examined among cohort 1 teachers who did not participate in the summer workshop (see Table G1, Appendix G). As expected, most of the lessons were implemented more often by teachers who attended the summer workshop than by those who did not, although none of the differences were found to be significant.

Examples of Lesson 9: Planning a Solution. Teachers in the cohort 2 follow-up survey and cohort 1: 2-year follow-up survey, were asked to identify the solution their class created for Lesson 9 and whether or not they actually implemented that solution. Nine teachers gave examples of their solutions to improve their school yard (see Table 8). Three of the nine reported they implemented the solution, two reported they planned to implement it in the future, and four did not implement.

Table 8
Responses to Lesson 9: Planning a Solution to Improve Our Schoolyard Among Cohort 2 and Cohort 1: 2-Year Follow-up Survey Respondents

Lesson 9 Examples from Respondents (<i>N</i> = 9)	Implemented (<i>N</i> = 9)
<i>"My students created a plan to stop erosion on the front hill. They talked about different things we could use to stop erosion. We are currently working on putting our plan into action. We bought rocks, plants, bushes, soil and mulch to help stop erosion."</i>	Yes
<i>"We landscaped the back area where runoff was eroding the ground."</i>	Yes
<i>"We determined that a landscaping project was needed to reduce erosion and we followed through with the process. It was expensive and required money from our school and PTA."</i>	Yes
<i>"Planting trees as a buffer zone."</i>	Not yet but plan to
<i>"Pick up trash, plant grass/trees in erosion areas, rain garden, etc."</i>	Not yet but plan to
<i>"My students generated solutions to improve the flow of water in one of our courtyards - however all of their solutions were pricey and we were not able to implement them: install more drains, add a fish pond, take out the concrete sidewalk and add a gravel sidewalk."</i>	No
<i>"We are working on plan."</i>	No
<i>"On our water quality testing we did not see any acidity problems with the water except there was lots of sediment. So in addition to pollution control, my students are recommending more grass growth to control transportation of sediments through the drainage system."</i>	No
<i>"We wanted to try to reduce the number of bare spots at our school. Students wrote a letter to the principal, made an announcement to all students, and put up signs [details not specified]."</i>	No

Reasons for not implementing lessons. Teacher respondents were asked to give reasons for not implementing ONOW lessons. Overwhelmingly, the top reason (69% among cohort 1, 61% cohort 2, 79% cohort 1: 2-year follow-up) was that they did not have enough time (Table 9). Over two fifths of cohort 1 teachers indicated (at the time of this survey in May) that they still planned on implementing more lessons before the end of the school year. Approximately one fifth gave other reasons; examples of other reasons can be found in Table G2, Appendix G.

Table 9
Reasons for Not Implementing ONOW Lessons Among Follow-up Survey Respondents

Response	Cohort 1		Cohort 2		Cohort 1: 2-Year Follow-up (N = 24)	
	n	%	n	%	n	%
Not enough time/ran out of time	40	69.0	19	61.3	19	79.2
Not comfortable with a lesson(s)	7	12.1	4	12.9	1	4.2
Lack of materials	7	12.1	5	16.1	1	4.2
Too complicated	9	15.5	2	6.5	3	12.5
Still plan on implementing more lessons this year	25	43.1	5	16.1	5	20.8
Other reason(s)	9	15.5	9	29.0	6	25.0

Note. More than one response can be given, therefore percents may not add to 100%

^aIncludes workshop participants only

Future Implementation of ONOW Curriculum. More than half (53%) of the cohort 1 workshop participants reported that they planned to implement all or most of the ONOW curriculum next year (Table 10). More than one half (56%) of cohort 2 teachers and 63% of cohort 1: 2-year follow-up respondents reported they would implement all or most of the curriculum next year. Less than one fifth (14%–19%) of each cohort group reported they would not implement any of the lessons.

Table 10
Number and Percent of Respondents Indicating their Plans to Implement ONOW Lessons in the Future
Among Follow-up Survey Respondents

Response	Cohort 1 (N = 63) ^a		Cohort 2 (N = 27)		Cohort 1, 2-Year Follow-up (N = 24)	
	n	%	n	%	n	%
All of it	13	20.6	8	29.6	4	16.7
Most of it	20	31.7	7	25.9	11	45.8
Some of it	11	17.5	6	22.2	3	12.5
A little of it	10	15.9	1	3.7	2	8.3
None	9	14.3	5	18.5	4	16.7

^aIncludes workshop participants only

Respondents who did not indicate that they plan to implement “all” of the ONOW curriculum next year were asked to give their reasons. Among the workshop attendees who responded ($N = 36$), the most frequent reason given, by more than half of the responses, was that there was insufficient time given their other demands (Appendix G).

Teacher Perceptions of ONOW Lessons

Perceptions of ONOW Lessons. Using a 3-point scale, (very successful, somewhat successful, or not at all successful), teachers who implemented an ONOW lesson rated the success of each of the lessons. The vast majority of respondents in each cohort rated the lessons either ‘very’ or ‘somewhat’ successful; however, the proportion of the highest ratings varied by lesson and cohort (Figure 3). Lesson 1, the ONOW introduction, had the highest proportion of cohort 2 teachers and teachers from the cohort 1: 2-year follow-up survey who rated it ‘very successful’ (64% and 81% respectively). Among cohort 1 teachers, the highest rated lesson was Lesson 3: Water Walk, with 57% of respondents who rated it ‘very successful’.

The lessons rated ‘very successful’ by the smallest proportion of cohort 1 participants was Lesson 10 (17%); this lesson did not have a large enough sample to report among the other cohorts. Among cohort 2 participants, the lowest rating was for Lesson 5 (25%) and from the cohort 1: 2-year follow-up was Lesson 7 (23%).

The cohort 1 survey also was sent to teachers who did not attend the summer workshop. In some lessons, ratings were higher among workshop participants and some other lessons were higher among non-workshop participants. Comparisons between workshop and non-workshop participant ratings can be seen in Table H1, Appendix H.

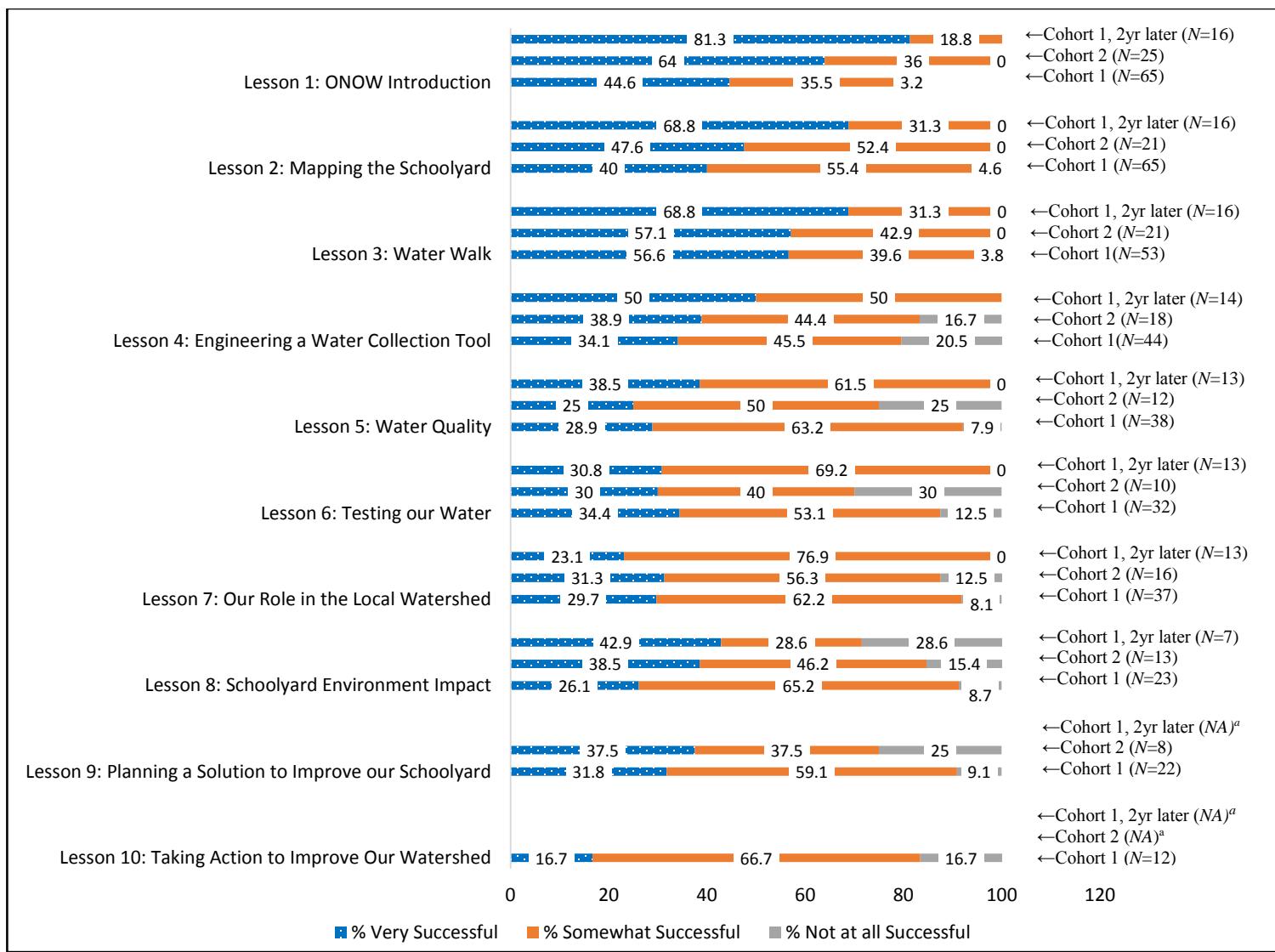


Figure 3. Level of Success of ONOW Lessons Reported by Follow-up Survey Respondents by Cohort.

Helpfulness of ONOW lesson materials for Cohort 1 participants. More than one half (56%–63%) of the cohort 1 respondents (workshop and non-workshop) found the materials for Lessons 1–2 very helpful. Additionally, 62%–64% of workshop respondents rated materials for Lessons 5–6 very helpful and 50%–67% of non-workshop respondents rated materials for Lessons 3–4 very helpful (Table H3, Appendix H). Lesson materials were not addressed in the cohort 2 or cohort 1: 2-year follow-up surveys.

Overall experience with ONOW. As seen in Table 11, just under half (46%) of the cohort 1 workshop participants rated their overall experience with the ONOW curriculum excellent or good; just over half (54%) of cohort 2 and 42% of respondents to the cohort 1: 2 year follow-up survey gave a rating of excellent or good. The mean rating for overall experience with the ONOW curriculum, using a 5-point scale, was 3.16 ($SD = 1.07$) among cohort 1 teachers, 3.31 ($SD = 1.05$) among cohort 2 teacher, and 2.96 ($SD = 1.23$) among cohort 1 respondents who responded to the 2-year follow up survey.

Table 11
Overall Experience with ONOW Curriculum Among Follow-up Survey Respondents
who Attended the Summer Workshop

Rating	Cohort 1 (N = 61) ^a		Cohort 2 (N = 26)		Cohort 1: 2-Year Follow-up (N = 24)	
	n	%	n	%	n	%
Excellent	5	8.1	2	7.7	1	4.2
Good	23	37.1	12	46.2	9	37.5
Average	14	22.6	5	19.2	7	29.2
Poor	17	27.4	6	23.1	2	8.3
Very Poor	3	4.8	1	3.8	5	20.8

^aIncludes workshop participants only

Integrating and Sharing ONOW Knowledge

Sharing ONOW knowledge: Cohort 2 only. Cohort 2 teachers were asked in the follow-up survey if, and with whom, they shared what they learned from the summer ONOW workshop. Table 12 shows that of the 31 respondents, 65% reported they shared with other Grade 4 teachers at their school. A few reported they shared with their administrator, other staff members, or didn't share at all.

Table 12
Number and Percent of Cohort 2 Follow-up Survey Respondents
Indicating How they Shared ONOW Knowledge with Other Staff

Staff with whom participants shared	Cohort 2 Follow-up (N = 31)	
	n	%
Other Grade 4 teachers at my school	20	64.5
Administrator	4	12.9
Did not share	4	12.9
Staff Development Teacher	1	3.2
Other: specify (Stem Teacher – 2, Grade 5 team – 1)	3	9.7

Note. Respondents could choose more than one response, so percentages do not add to 100%.

Integrating into instructional planning. Cohort 2 teachers and respondents to the 2-year follow-up of cohort 1 were asked how integrating the ONOW curriculum changed their planning time. Cohort 2 respondents were divided in their responses, with one half reporting it greatly added to their planning time and one half reporting it somewhat added to their planning time (Table 13). No one reported that it did not change their planning time. In the Cohort 1: 2-year follow-up survey, almost three fourths (71%) reported that it somewhat added to their planning time. Only two cohort 2 respondents reported it greatly added to their planning time and three reported it did not change their planning time.

Table 13
Number and Percent of Follow-up Survey Respondents Indicating
How ONOW Affected their Planning Time

Effect on planning time	Cohort 2 Follow-up (N = 22)		Cohort 1: 2-Year Follow-up (N = 17)	
	n	%	n	%
Greatly added to my planning time	11	50.0	2	11.8
Somewhat added to my planning time	11	50.0	12	70.6
Did not change planning time	0	0.0	3	17.6

Note. Respondents who reported “N/A did not plan any lessons” were not included.

Teachers were asked how they incorporated ONOW into their instructional planning. As shown in Table 14, more than one half (62%) of the cohort 2 respondents reported that they planned the ONOW lessons with their team and one half reported they did so by themselves (they could select both). In the Cohort 1: 2-year follow-up survey, more than three fourths (77%) reported they implemented lessons themselves and more than two fifths (41%) implemented the lessons with their grade level team.

Table 14
 Number and Percent of Follow-up Survey Respondents Indicating
 How ONOW Lessons were Planned

Planning	Cohort 2 Follow-up (N = 26)		Cohort 1: 2-Year Follow-up (N = 17)	
	n	%	n	%
With my grade level team	16	61.5	7	41.2
With some of my grade level team	3	11.5	0	0.0
Implemented myself	13	50.0	13	76.5

Note: Respondents may choose more than one response, so percentages do not add to 100%.

Cohort 2 teachers were asked whether they replaced an Elementary Integrated Curriculum (EIC) lesson with an ONOW lesson or if they added an ONOW lesson to the science curriculum. Prior feedback had indicated that teachers were concerned about the additional time needed to add ONOW lessons to the science curriculum, and starting with cohort 2 professional development, teachers were encouraged to replace an EIC lesson with an ONOW lesson (not add). More than one half (58%) of cohort 2 teachers reported they added the ONOW lessons and 38% replaced an EIC lesson (Table 15). The same question was asked in the Cohort 1: 2-year follow-up survey and almost three fourths (71%) reported they added the lessons and 29% reported they replaced the lessons.

Table 15
 Number and Percent Reporting How they Planned the Integration
 of ONOW Lessons in their Classrooms

Type of integration	Cohort 2 Follow-up (N = 24)		Cohort 1: 2-Year Follow-up (N = 17)	
	n	%	n	%
Yes, I replaced an EIC with an ONOW lesson seed	9	37.5	5	29.4
No, I only added an ONOW lesson(s)	14	58.3	12	70.6
Other	1	4.2	0	0.0

Use of shared resources. ONOW materials were placed on a shared Google Drive for all Grade 4 teachers to access. Cohort 2 teachers were asked in the follow-up survey if they used any of these shared materials; more than one half (56%) reported they were not aware of this resource (Table 16). Just over one fourth (26%) reported they did not use this resource and under one fifth (19%) reported they did. Cohort 1 teachers were asked the same question in the 2-year follow-up survey. Again, one half of the respondents were not aware of this resource. Under one third (29%) did not use this resource and one fifth (21%) reported they did use this resource.

Table 16
 Number and Percent of Follow-up Survey Respondents
 Indicating Level of Use of ONOW Shared Resources

Usage	Cohort 2 Follow-up (N = 27)		Cohort 1: 2-Year Follow-up (N = 24)	
	n	%		
Yes, I did use shared resources	5	18.5	5	20.8
No I did not use shared resources	7	25.9	7	29.2
No, I was not aware of any shared resources	15	55.6	12	50.0

Participants' Feedback on ONOW Curriculum

Positive feedback. Cohort 1 teacher respondents were asked in an open-ended question, what they liked about the ONOW curriculum; 61 of 93 provided responses. One half indicated that they liked ONOW curriculum because it was a real world connection which makes an impact (31 of 61 responses) and about one third liked that it was hands-on (20 of 61 responses). Respondents also said they enjoyed going outside, it ties in with the curriculum, it was engaging, and the content was important (see Table H4, Appendix H).

Suggestions for increasing implementation of ONOW. Teacher respondents in all follow-up surveys were asked to offer suggestions for increasing implementation of the ONOW curriculum. Among cohort 1 teachers, 55 of 93 respondents (59%) left a suggestion in the first follow-up survey. The most common suggestions were to integrate ONOW with the science curriculum or to swap parts of the science curriculum with ONOW (29% of those responding). Other suggestions offered by teacher respondents were to provide materials or money for materials and to provide additional support, such as more staff visits to schools or a webinar. Some respondents reiterated that they need more time to implement (see Appendix H, Table H5a). Several respondents from cohort 1 gave suggestions in the two-year follow up such as: provide money to implement, map out before winter arrives, continue partnership with Audubon and make it an after school club. Suggestions were given by 10 cohort 2 teachers, which included: provide more directions on what lessons to replace, add lessons to the online instructional center, provide more communication, and provide more materials (see Table H5b, Appendix H).

Support needed to increase implementation of ONOW. Cohort 1 teacher respondents were asked in their first follow-up survey to indicate any other further support they needed to successfully implement ONOW. Comments from 33 out of the 93 teacher respondents mentioned that teachers needed: help with how to incorporate or fit ONOW with the science curriculum, provide materials (i.e. for water collection tool and for final project), funds for materials, and more school visits or someone to teach a lesson (see Table H6, Appendix H).

Question 5: What are the experiences and attitudes of Grade 4 teachers toward teaching outdoors and to what extent did teachers in the cohorts increase their comfort with teaching science lessons outdoors?

Findings from the pre-training survey as well as the one year follow-up survey are presented for participating cohort 1 and cohort 2 teachers. Only teachers who completed both surveys were included.

Time Spent Teaching Science Outdoors

Time spent teaching outdoors. Comparison of findings from pre-workshop survey and follow-up surveys showed an increase in the number of times teachers took their class outside for science instruction. Teacher respondents were asked in the pre-survey, before the summer workshop began, “How many times did you take your class outside for teaching science during the school year?” Teachers were asked the same question again in the follow-up survey administered the following spring. Findings from the pre-survey were compared to the follow up survey (see Table 17); only respondents with both surveys were included. Almost three fourths (72%) of cohort 1 teachers reported going outside three or more times during the school year following the summer workshop; this compared to just over one half (53%) of the same teachers reporting they went outside three or more times the previous year. A similar trend was observed among cohort 2 respondents. More than three fourths (79%) of cohort 2 teachers reported going outside three or more times during the school year after the summer workshop compared to 54% reporting they went outside 3 or more times in the year before the workshop.

Table 17
Reported Number of Times Class Went Outside for Science Instruction
Before and After ONOW Participation

Number of times	Cohort 1 N = 58				Cohort 2 N = 28			
	Pre		Follow-up		Pre		Follow-up	
	n	%	n	%	n	%	n	%
Not at all	5	8.6	3	5.2	3	10.7	2	7.1
1 time	10	17.2	3	5.2	7	25.0	0	0.0
2 times	12	20.7	10	17.2	3	10.7	4	14.3
3-4 times	24	41.4	25	43.1	7	25.0	12	42.9
5-6 times	2	3.4	10	17.2	4	14.3	6	21.4
More than 6 times	5	8.6	7	12.1	4	14.3	4	14.3

Comparison of workshop participants and non-participants in the Cohort 1 follow-up survey revealed that a higher percentage of workshop participants (71%) spent three hours or more teaching about water and watersheds compared to non-workshop participants (55%) which can be seen in Table I1, Appendix I. Similarly, about 72% of the workshop participants reported going outside three or more times compared to 64% of non-workshop participants (Table I2, Appendix I).

Location of Outdoor Activities

Outdoor activities before the summer workshop and after implementation of ONOW. In the follow-up survey one year after participating in a summer workshop, a higher percentage of cohort 1 teacher respondents reported going to their schoolyard or walking to an outdoor destination for a lesson compared to before the workshop (Table 18). Among cohort 2 respondents, the pre-training findings were similar to the follow-up findings.

Table 18
Most Frequently Reported Destinations for Outdoor Activities
Before and After ONOW Participation

Destination	Cohort 1 N = 58				Cohort 2 N = 28			
	Pre		Follow-up		Pre		Follow-up	
	n	%	n	%	n	%	n	%
Our Schoolyard	44	77.2	54	93.1	25	89.3	26	92.9
Walked to an off-campus outdoor area	4	6.9	11	19.0	2	7.1	1	3.6
Walked to a stream or other water body	3	5.2	10	17.2	2	7.1	1	3.6
Traveled to an outdoor area by bus	19	32.8	18	31.0	11	39.3	8	28.6
N/A	4	6.9	1	1.7	2	7.1	2	7.1

Note. More than one response can be given, therefore percents may not add to 100%

Reasons for Not Doing More Outdoor Activities

Reasons for not doing more outdoor activities for Cohort 1. Respondents were given a multiple response question in the pre-survey and the follow-up survey, which asked the reasons for not doing more outdoor activities. Among cohort 1 teachers, many of the reasons given at the pre-survey (before the summer workshop) were not chosen as often in the follow-up survey (see Figure 4). For example, 77% of teachers in the pre-workshop survey said there was not enough time, but this percent decreased to 65% in the follow-up survey. The reason “no lesson plan or supplies” decreased from 34% to 19% and “no space” decreased from 25% to 20%. Additionally, a higher proportion of respondents to the follow up survey cited student behavior concerns (39%) as a hindrance to conducting more outdoor activities compared with 28% in the pre-survey

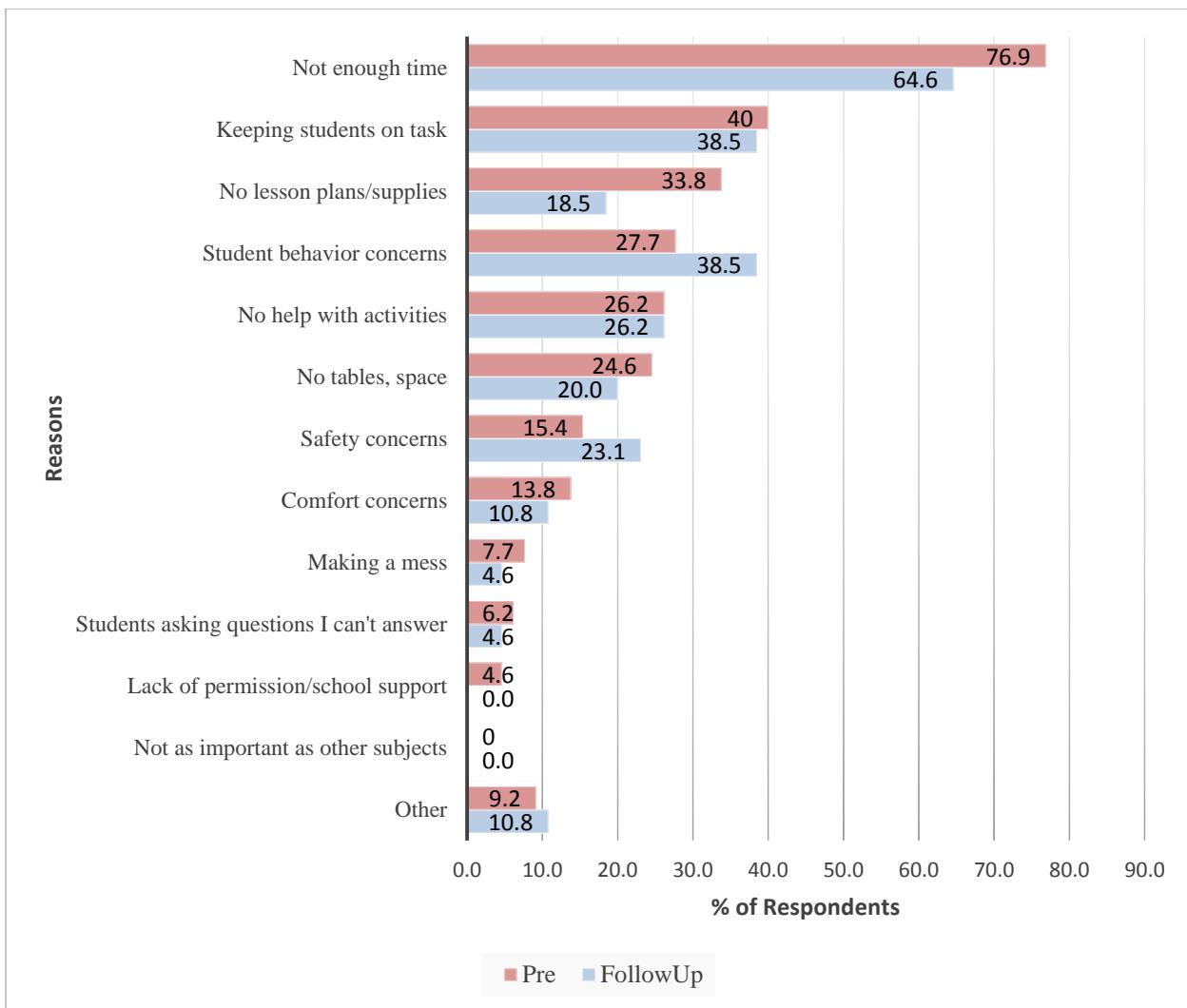


Figure 4. Reasons for Not Doing More Outdoor Activities from Cohort 1 Pre-Training Survey and Follow-up Survey.

Reasons for not doing more outdoor activities for Cohort 2. The reasons for not doing more outdoor activities among cohort 2 teachers were somewhat different than those of cohort 1 teachers. Not having lesson plans or supplies was the most frequently chosen reason among 46% of the 28 teachers in the pre-survey (Figure 5). This reason was followed by not enough time, which was chosen by 43% in the pre-survey and 50% in the follow-up survey. More than one third indicated student behavior concerns in the pre-survey (39%) and more than one half reported student behavior as a reason for not doing more outdoor activities in the follow-up survey (57%).

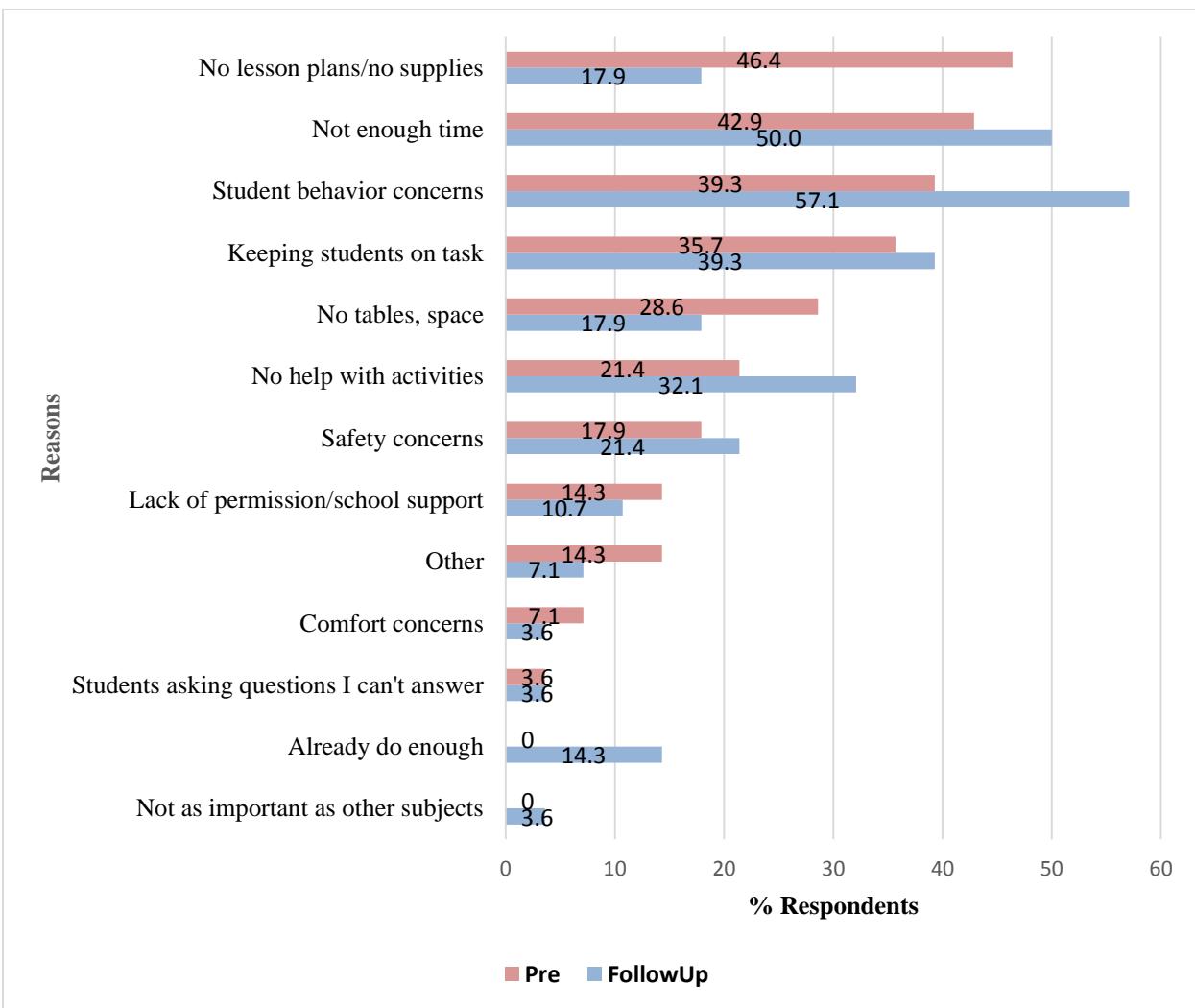


Figure 5. Reasons for Not Doing More Outdoor Activities from Cohort 2 Pre-training Survey and Follow-up Survey.

Comfort with Outdoor Education Lesson

Level of teachers' comfort with outdoor education lesson reported in pre-training survey, post-training survey and at follow-up. Teachers were asked to rate their comfort level with six types of lessons at the beginning of the summer training (pre-training survey), at the end of the workshop (post-training survey) and the following spring after implementing the ONOW lessons (follow-up survey). These lesson types included a lesson about a) watershed, b) runoff, c) creating maps, d) engineering design, e) actions to improve the environment and water quality and, f) outdoors in the schoolyard. Table 19 is a comparison of the percentage who gave a rating of very or somewhat comfortable (i.e. comfortable) and not very or not at all comfortable (i.e. uncomfortable) from each of these surveys from cohort 1 and cohort 2 teachers. Only respondents who gave a rating for all three surveys were included. In all lesson types, there was an increase in the percent of teachers who gave a rating of 'very' or 'somewhat comfortable' from the pre-training survey to the post-training survey, typically followed by a slight decrease in the follow-up survey; the comfort level, however, was still higher in the follow-up than in the pre-training survey.

Table 19

Level of Teachers' Comfort with Outdoor Lessons Before Summer Workshop, Immediately After Summer Workshop, and in Follow-up Surveys

Lesson/ Cohort	N	Pre-Training				Post-Training				Follow-up			
		Comfort- able		Uncomfort- able		Comfort- able		Uncomfort- able		Comfort- able		Uncomfort- able	
		n	%	n	%	n	%	n	%	n	%	n	%
Lesson about Watershed													
Cohort 1	55	43	78.2	12	21.8	55	100.0	0	0.0	54	98.2	1	1.8
Cohort 2	23	14	60.9	9	39.1	22	95.7	1	4.3	19	82.6	4	17.4
Lesson about Runoff													
Cohort 1	55	47	85.5	8	14.5	54	98.2	1	1.8	54	98.2	1	1.8
Cohort 2	23	19	82.6	4	17.4	22	95.7	1	4.3	21	91.3	2	8.7
Lesson about Creating Maps													
Cohort 1	56	46	82.1	10	17.9	55	98.2	1	1.8	51	91.1	5	8.9
Cohort 2	23	16	69.6	7	30.4	22	95.7	1	4.3	18	78.3	5	21.7
Lesson involving Engineering Design													
Cohort 1	57	38	66.7	19	33.3	57	100.0	0	0.0	50	87.7	7	12.3
Cohort 2	23	16	69.6	7	30.4	23	100.0	0	0.0	18	78.3	5	21.7
Lesson involving Actions to improve environmental and water quality													
Cohort 1	56	45	80.4	11	19.6	54	96.4	2	3.6	51	91.1	5	8.9
Cohort 2	23	18	78.3	5	21.7	22	95.7	1	4.3	20	87.0	3	13.0
Lesson outdoors in your schoolyard													
Cohort 1	56	51	91.1	5	8.9	56	100.0	0	0.0	54	96.4	2	3.6
Cohort 2	23	22	95.7	1	4.3	23	100.0	0	0.0	22	95.7	1	4.3

Mean ratings between the pre-training survey and follow-up survey were compared for each type of lesson among each cohort (see Table I4, Appendix I). The mean ratings for both cohorts were significantly higher in the follow-up survey for a lesson about watersheds, runoffs, creating maps, and engineering design. They were also higher among cohort 1 for a lesson outdoors. Although the follow-up survey had higher mean ratings among both cohorts for a lesson on actions to improve environmental and water quality, they were not statistically significant.

Teachers who did not participate in the summer trainings but were part of the cohort 1 schools were asked their comfort level in the follow-up survey. These non-workshop teachers had similar ratings regarding their comfort level with teaching outdoor education lessons compared to those who attended the workshop (see Table I3, Appendix I).

Comfort with Instruction of Four Subject Areas

Teachers' comfort with science before summer workshop and at follow-up. Respondents were asked to rate their level of comfort with four subject areas using a 4-point scale where 4 = very comfortable and 1 = very uncomfortable. The percent of cohort 1 teachers who gave a rating of 'very comfortable' increased from the pre-survey to the follow-up survey for all subject areas. In reading, 54% vs. 75%; in math, 66% vs. 85%; in social studies, 48% vs. 58%; and in science, 54% vs. 75% gave a rating of 'very comfortable' in the pre-survey and follow-up survey, respectively (Table 20). Among cohort 2 teachers, the differences only increased for one subject (math). The percent of respondents in cohort 2 who rated 'very comfortable' in reading was 89%

in the pre-survey and 81% in the follow-up survey; in math, 77% and 81%; in social studies, 62% for both surveys; and in science, 58% and 50%.

Table 20
Number and Percent of ONOW Participants Reporting Their Level of Comfort Teaching
Various Subjects Before and After ONOW Participation

Cohort	Subject	N	Very Comfortable		Somewhat Comfortable		Somewhat Uncomfortable		Very Uncomfortable		
			n	%	n	%	n	%	n	%	
Cohort 1	Reading	Pre-	59	32	54.2	25	42.4	1	1.7	1	1.7
		Follow-up	59	44	74.6	15	25.4	0	0.0	0	0.0
	Math	Pre-	58	38	65.5	17	29.3	1	1.7	2	3.4
		Follow-up	58	49	84.5	6	10.3	2	3.4	1	1.7
	Social Studies	Pre-	59	28	47.5	26	44.1	3	5.1	2	3.4
		Follow-up	59	34	57.6	24	40.7	0	0.0	1	1.7
	Science	Pre-	59	32	54.2	21	35.6	5	8.5	1	1.7
		Follow-up	59	44	74.6	13	22.0	1	1.7	1	1.7
Cohort 2	Reading	Pre-	26	23	88.5	2	7.7	1	3.8	0	0.0
		Follow-up	26	21	80.8	3	11.5	0	0.0	2	7.7
	Math	Pre-	26	20	76.9	6	23.1	0	0.0	0	0.0
		Follow-up	26	21	80.8	3	11.5	0	0.0	2	7.7
	Social Studies	Pre-	26	16	61.5	9	34.6	1	3.8	0	0.0
		Follow-up	26	16	61.5	7	26.9	0	0.0	3	11.5
	Science	Pre-	26	15	57.7	9	34.6	2	7.7	0	0.0
		Follow-up	26	13	50.0	10	38.5	2	7.7	1	3.8

Changes in the level of comfort reported by the survey respondents were tested by comparing the mean level of comfort reported in the pre-training and follow-up surveys, using paired t-tests. For each of the subjects, the mean comfort rating was statistically significantly higher on the follow-up survey than on the pre-workshop survey among cohort 1 teachers (Table I5, Appendix I). Among cohort 2 respondents, differences in the mean ratings from the pre-survey and follow-up survey were not statistically significant.

Summary

Findings from the evaluation provided evidence that the professional development for the ONOW project was implemented as designed, and that teachers from more than three quarters of MCPS elementary school have participated. Findings also indicated that the curriculum has been implemented in part, but there is room to improve the level of the ONOW curriculum implementation. The majority of respondents reported implementation of the first three lessons and less implementation was reported for the remaining lessons, including the final water impact project.

Professional Development. The professional development on ONOW was delivered as planned with a summer workshop offered to three cohorts of Grade 4 teachers followed by an on-site Water Walk session with an ONOW coach and optional follow-up and support as needed. More than three-fourths (77%) of the invited qualifying schools (elementary schools with Grade 4 and three special education schools) participated in ONOW by sending at least one teacher to one of the three summer workshops. This resulted in a total of 100 schools and 56% of all Grade 4 teachers ($n = 259$) who participated. Cohort 1 and cohort 2 participants gave positive feedback about the summer workshops. Cohort 2 gave higher ratings on varying aspects of the workshops when compared to ratings of cohort 1 participants. In the follow-up survey among cohort 2 participants, 65% reported they shared their ONOW knowledge with other Grade 4 teachers at their school. Most schools (86%), from cohort 1 and 2 combined, had at least one staff member attend the on-site Water Walk, and among those who completed a survey, most were positive about their experience.

ONOW Lessons. Although the proportion of participants who implemented each of the 10 ONOW lessons declined after the first few lessons among each of the cohorts, a slightly higher percentage of cohort 2 teachers reported implementing the lessons. Among all cohort survey respondents, the top reason for not implementing more lessons was a lack of time. Furthermore, 58% of cohort 2 respondents and 71% of cohort 1: 2-year follow-up respondents reported that they added ONOW lessons to the curriculum rather than replacing an EIC lesson.

The vast majority of respondents in each cohort who implemented a lesson rated the lesson either ‘very’ or ‘somewhat successful’; however, responses varied by lesson and cohort. There were some lessons which showed higher ratings by cohort 2 (e.g. Lessons 1 and 2, which also were the highest rated lessons). Teachers from cohort 1 reported they liked the real world connection and hands-on features of the lessons. Suggestions offered across the cohorts of teachers were: that the ONOW curriculum be integrated with the current curriculum, more materials be provided or funding for materials be provided, more guidance on which EIC lessons to replace with ONOW, and more communication. Just under or just over half of each of the cohort participants rated their overall experience excellent or good. More than one half of all cohort 1 respondents reported they would implement all or most of the ONOW curriculum next year, while just under a fifth reported they would not be implementing the lessons at all. Reasons for not planning to implement all the lessons were primarily time and other demands. More than half (56%) of cohort 2 respondents and 50% of cohort 1: 2-year follow-up respondents reported they were not aware of the shared resources posted for teachers to access.

Outdoor Lessons. Overall, teachers’ comfort level with teaching aspects of outdoor education lessons (i.e. watershed, runoff, creating maps, and engineering design) increased from the pre-training survey to the follow-up survey. However, there was a decline from the post-training survey to the follow-up survey, which may indicate more ongoing support is needed. There was also a slight increase among cohort 1 respondents with comfort level for teaching a lesson outdoors; cohort 2 remained steady with a high comfort level. Teachers reported that they went outside more often after attending the workshop than before the workshop, and some of their reasons for not going outside declined after the summer training (e.g. time, for cohort 1 only; no lesson plans; no space) and some increased (e.g. student behavior concerns).

Discussion

The majority of schools participated in ONOW by sending at least 1 Grade 4 teacher to participate in the summer workshop and on-site Water Walk. However, according to cohort 2 survey respondents, only 65% shared with their Grade 4 team. Given that the overall goal is to impact all Grade 4 students with a rich outdoor education curriculum, this falls short, especially considering that elementary teachers frequently change their teaching roles and many may not continue to teach Grade 4 the following year.

Concerns about instructional time and how to integrate the lessons into the science curriculum continue to be obstacles in fully implementing the ONOW curriculum as intended. This can be evidenced by the fact that half reported they add ONOW lessons rather than replace EIC lessons. The majority rated the lessons very or somewhat successful; however, after the first few lessons, the implementation and ratings declined. Also, communication about resources or changes to the curriculum as well as ongoing support to teachers after the PD is needed in order to help sustain the implementation of the ONOW curriculum. Although the program may not have completely reached its ultimate goal of impacting all Grade 4 students with this curriculum, it did touch a large sample of teachers who gave positive feedback on the PD and the lessons, and now have the experience and knowledge of using the outdoors for their science instruction.

Future Plans and Recommendations

The following recommendations are informed by the findings and intended to provide feedback for the program's improvement and ongoing development.

1. In order to maximize and sustain implementation of the ONOW curriculum, continue to follow up and support teachers who participated in prior workshops. If feasible beyond the end of this grant cycle, offer additional professional development sessions to Grade 4 teachers who did not attend the prior workshops, and especially target schools who did not send a teacher to any of the workshops, so that the number of schools with a trained teacher will increase.
2. Provide more direction and support to teachers on how they incorporate the ONOW lessons into the current science curriculum and complete the final water impact project. Since the completion of the study, the MCPS Grade 4 science curriculum is being revised, and the ONOW lessons are being integrated into the new curriculum.
3. Increase and extend the reach of communication about the ONOW shared resources and best practices on approaches to implementation of the ONOW lessons to all teachers. Notify teachers of any future changes to the curriculum or guidelines for implementation.
4. Investigate ways in which teachers can receive free materials or funding for needed materials.

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Appendix A

ONOW Lesson Sequence

Lesson 1: Our Neighborhood, Our Watershed: Introduction	Students are introduced to the project and learn briefly about their place in the Chesapeake Bay Watershed.
Lesson 2: Mapping the Schoolyard	Students create maps of their own schoolyard and identify natural and human-made physical features.
Lesson 3: Water Walk	Students use their schoolyard map to analyze how water flows and impacts the land, and then select one water-impacted area to investigate over the next several months.
Lesson 4: Engineering a Water Collection Tool	Students discover a need to collect water to study at their selected area; they engineer a water collection tool using recycled items.
Lesson 5: Water Quality	Students learn three simple tests for assessing water quality and learn about issues that are currently affecting the Bay.
Lesson 6: Testing our Water	Students use their water collection tools and implementation of water quality tests to collect data about their study site.
Lesson 7: Our Role in the Local Watershed	Students dig deeper into the ecosystems of the local watershed and the Chesapeake Bay watershed, make connections between their schoolyard and the Bay, and discuss current Bay issues.
Lesson 8: Schoolyard Environmental Impact	Students analyze their site data and make recommendations for improving their site.
Lesson 9: Planning a Solution to Improve Our Schoolyard	Class reviews the recommendations from all of the groups and chooses one to implement.
Lesson 10: Taking Action to Improve our Watershed	As a class, students implement the action to improve the environment at their school.
Lesson 11: Our Neighborhood, Our Watershed: Communicating Our Findings	Students prepare the final report to NOAA.

Appendix B

ONOW Professional Learning Workshop for Cohort 1 June 17, 2014 9:00 – 3:00

Desired Outcomes:

By the end of the meeting, participants will have:

- Received an introduction to ONOW and NOAA Grant, MWEE, current state of ELit
- Received an overview of the ONOW PBL curriculum
- Experienced several of the ONOW lessons, from the student and teacher perspective
- Reviewed best strategies in providing instruction in the outdoors
- Discussed ideas for environmental action projects on the schoolyard

Time	Content
9:00 am	Registration, OSA Survey, Engage Questions Welcome, Introductions, Review Agenda Tour of WHO, breaks as needed Introduction to ONOW, NOAA Grant, MWEE, ELit Overview of ONOW PBL Curriculum and connections to 2.0
9:45	ONOW – The hook! – Lesson 1 ONOW Lesson 2 – Mapping the Schoolyard ONOW Lesson 3 – Water Walk to identify areas of water impact
12:00	Introduce Lesson 4 – engineer a collection tool Working lunch – planning and building water collection tool Sign up for on-site support – by cluster
12:45	Test models
1:00	Water quality testing Mini teacher lesson on why these pollutants are a problem – run off and anything that can be in it. – lecture burst Lesson 5 – WQ testing – have teachers test the water, how to create water samples Lesson 6 – discuss testing procedure: 3 trials, weather, etc.
2:00	Lesson 7 – Our place in watershed
2:10	Lesson 8, 9, 10 – give them more ideas of action projects
2:20	Lesson 11 – connect to introductory hook letter, final report, personal reflection
2:30	Summarize – back to outcomes What to expect in future: -OSA follow up survey about implementation -SharePoint -MyMCPS and how to find lessons Questions
2:45	Survey



Our Watershed Professional Learning Workshop

August 16, 2016
9:00am - 3:30pm

Ground Rules:

- Respect each other's opinions and knowledge
- Honor time limits
- Avoid sidebar conversations
- Keep an open mind
- Phones on silent
- Manage table folder appropriately

Desired Outcomes:

By the end of this workshop, participants will have:

- Received an introduction to the ONOW and the NOAA grant
- Received an overview of the ONOW Project Based Learning curriculum
- Experienced several of the ONOW lessons from the student and teacher perspective
- Reviewed best strategies in providing instruction in the outdoors
- Discussed ideas for environmental action projects on the schoolyard

Time	Content	Process	Facilitator
9:00	Registration	Present	All
9:10	Welcome, Introductions Review agenda and ground rules	Present Discuss	Laurie Jenkins
9:20	Introduction to ONOW ONOW Program Overview	Present	Laurie
9:35	Connections to Curriculum 2.0	Present/Discuss	Tamisha Sampson James Schneider Kelly Jiron Dana Troup
9:45	ONOW Lesson 1: Our Neighborhood, Our Watershed: Introduction	Present Experience	Kate Wardle
10:00	Best Practices for Teaching in the Outdoors	Present Discuss	Kate Dana
10:10	ONOW Lesson 2: Mapping the Schoolyard	Present Experience	Laurie/Kate
11:00	ONOW Lesson 3: Water Walk	Present Experience	Kate, Mark Granger
11:45	Issues Affecting the Chesapeake Bay	Present	Kate
12:00	Break for Lunch		
12:30	ONOW Lesson 4: Engineering a Water Collection Tool - Design, Build, Test	Present Experience	Laurie/Kate Present All Facilitate
1:15	ONOW Lessons 5 and 6: Water Quality	Present Experience	Laurie/Kate
2:00	ONOW Lesson 7: Our Role in the Watershed and Using Models	Present Experience	Kate

2:45	ONOW Lesson 8, 9, 10: Solutions and Communicate Results	Present	Kate
3:15	Summary, Survey, Timesheets	Present	Laurie/Kate

Neighborhood, Our Watershed Cohort 1 Professional Learning Workshop – Watershed Content and Pedagogy with Models

November 24, 2014

4:15-6:15pm

Desired Outcomes:

By the end of this workshop, participants will have:

- Received ONOW Program updates
- Collaborated with other Cohort 1 ONOW teachers and schools
- Constructed and experienced the use of watershed models for instruction
- Increased background knowledge about our local watershed

Ground Rules:

- ✓ Respect each other's opinions and knowledge
- ✓ Honor time limits
- ✓ Avoid sidebar conversations
- ✓ Keep an open mind
- ✓ Phones on silent

Time	Content	Process	Facilitator
4:15	Sign In		All
4:20	Welcome, Introductions Review agenda and ground rules	Present	Laurie Jenkins
4:25	ONOW Program Updates	Present/Discuss	Laurie, James
4:30	Engage: Water, Water, Everywhere demonstration	Experience	Kate
4:50	Explain: Why is the Bay important? Understanding watershed science	Present/Discuss	Laurie and Kate
5:05	Explore: Teaching with watershed models	Experience	Jen and Cathy
5:30	Extend: Gallery Walk of other watershed model options	Experience	All
5:45	Process: how can you use the information from this workshop in your classroom?	Discuss	Teachers
6:00	Evaluate: Review feedback so far – successes, challenges, questions	Discuss	All
6:10	Wrap Up: Evaluation, Stipend Paperwork, Pass out watershed model materials		Laurie, Kate



Appendix C

Table C1
Evaluation Activities Using Guskey's Model for Evaluating Professional Development

Level of evaluation	Instrument/activity	Evaluation Question
1. Participants' reactions	Surveys of cohort 1 and cohort 2 participants (administered after summer workshop)	Q3 What were cohort teachers' perceptions of the professional development after participation?
2. Participants' learning	Surveys of cohort 1 and cohort 2 participants (administered before and after summer workshop and in a follow-up survey the following spring)	Q3 What were cohort teachers' perceptions of the professional development after participation? Q5 What are the experiences and attitudes of grade 4 teachers towards teaching outdoors and to what extent did teachers in the cohorts increase their comfort level with teaching science lessons outdoors?
3. Organization support and change	Review of program records, documents and materials.	Q1 To what extent were materials for ONOW developed and integrated into the elementary science curriculum? Q2 To what extent was the summer professional development delivered as intended?
4. Participants' use of new knowledge and skills	Surveys of cohort 1 and cohort 2 participants (administered in a follow up survey the following spring)	Q4 To what extent were ONOW lessons implemented by Grade 4 teachers?

Appendix D

ONOW Final Elementary School Cohorts

Note: This reflects the final school list of cohorts. Although schools were originally assigned a cohort, if a school was not able to send a representative to the summer workshop, they were moved to a subsequent cohort.

Cohort 1 - 2014

Arcola	East Silver Spring	Judith A. Resnik
Ashburton	Forest Knolls	Rock View
Bethesda	Gaithersburg	Seven Locks
Beverly Farms	Garrett Park	Somerset
Burning Tree	Harmony Hills	Stonegate
Rachel Carson	Highland View	Summit Hall
Cashell	Jackson Road	Washington Grove
Cedar Grove	Lakewood	Westbrook
Chevy Chase	Meadow Hall	Whetstone
Clarksburg	North Chevy Chase	Wilson Wims
Cloverly	Oak View	Wood Acres
Cold Spring	Olney	
College Gardens	Piney Branch	

Cohort 2 - 2015

Bannockburn	Spark M. Matsunaga	Travilah
Lucy V. Barnsley	Mill Creek Towne	Viers Mill
Bells Mill	Pine Crest	Weller Road
Burtonsville	Sequoyah	Westover
Cannon Road	Sherwood	Wheaton Woods
Clearspring	Sargent Shriver	
Darnestown	Flora M. Singer	
Diamond	Sligo Creek	
Georgian Forest	South Lake	
Gleanallan	Stedwick	
Lake Seneca	Stephen Knolls	

Cohort 3 – 2016

Beall	Great Seneca Creek	Rosemont
Belmont	Greencastle	Carl Sandburg
Bradley Hills	Greenwood	Stone Mill
Brooke Grove	Highland	Strathmore
Brookhaven	Jones Lane	Strawberry Knoll
Brown Station	Kemp Mill	Twinbrook
Burnt Mills	Kensington Parkwood	Waters Landing
Candlewood	Laytonsville	Watkins Mill
Carderock Springs	Leleck (formally B.Acres)	Wayside
Copper Mill	Little Bennett	Woodfield
Cresthaven	Longview	Woodlin
Damascus	Luxmanor	Wyngate
Dr. Charles R. Drew	Thurgood Marshall	
Capt. James E. Daly	Maryvale	
DuFief	S. Christa McAuliffe	
Fallsmead	Ronald McNair	
Fairland	Monocacy	
Farmland	Oakland Terrace	
Fields Road	William Tyler Page	
Flower Hill	Poolesville	
Flower Valley	Potomac	
Fox Chapel	Dr. Sally K. Ride	
Galway	Ritchie Park	
Germantown	Rock Creek Forest	
William B. Gibbs, Jr.	Rock Creek Valley	
Glen Haven	Lois P. Rockwell	
Goshen	Rolling Terrace	

Appendix E

Table E1

Most Important Aspect of Summer Workshop Reported by Teacher Participants

Categories	Example Comments
Cohort 1 (<i>N</i> = 94)	<ul style="list-style-type: none"> • Overview • How to implement lessons • A look at all the lessons in sequence. Background knowledge on Chesapeake Bay watershed
	<ul style="list-style-type: none"> • Information on how fits with curriculum 2.0 • Ties with science curriculum
	<ul style="list-style-type: none"> • Collaborating with colleagues • What to point out to students • Ideas for project or field trip
	<ul style="list-style-type: none"> • Experiencing a lesson • Going through a water walk • Walking the grounds
	<ul style="list-style-type: none"> • Local watersheds • Runoffs • Background knowledge
	<ul style="list-style-type: none"> • That can implement in own schoolyard • Let students do hands on activities • Problem based experiences • It is important for students to make connections outside the classroom. ONOW will support, encourage and enhance student enthusiasm plus thinking about Science • How to find everything, understanding that science kit materials are often subpar • Collaborating w/colleagues from different schools
Cohort 2 (<i>N</i> = 55)	<ul style="list-style-type: none"> • The overall concept of the 10 lessons • New lessons to make curriculum more relevant for students • Lesson plans. Seeing how to implement them • Just the entire process of determining a problem and actually taking action
	<ul style="list-style-type: none"> • Models watershed - to see the steps in constructing it. The water walk tour. The Hook!-Great way to get us started

<p>Ideas and tips for teaching outdoors (n = 9)</p>	<ul style="list-style-type: none"> • All the insight on how to run the lessons. It was great to do things hands on! • Importance and ideas for teaching environmental Watershed in real life experience activities • Practical tips for implementing the lessons
<p>Learning how ONOW fits with curriculum (n = 7)</p>	<ul style="list-style-type: none"> • How the lessons align w/already existing curriculum. It's not something extra • Ways to implement ONOW with what we already do - My team and I already have a vision
<p>Resources and supports (n = 6)</p>	<ul style="list-style-type: none"> • There is support if you know who, how, and where to ask • Lessons to take back to my classroom • Peer to peer discussion • Understanding causes and solutions to improve environment conditions • The knowledge of the content as exhibited by the staff
<p>Miscellaneous (n = 8)</p>	

Note. Respondents' comments could appear in more than one category.

Table E2
Suggestions from Summer Workshop Reported by Teacher Participants

Categories	Examples
Air conditioning/heat (<i>n</i> = 21)	<ul style="list-style-type: none"> • Need air conditioning • Too hot
Smaller groups (<i>n</i> = 7)	<ul style="list-style-type: none"> • Smaller groups
More ideas and information (<i>n</i> = 7)	<ul style="list-style-type: none"> • More ideas for project solution • More explanation
Hard to see/hard to hear (<i>n</i> = 6)	<ul style="list-style-type: none"> • Difficult to hear – sound system • Difficult to see – bigger or multiple boards
Cohort 1 (<i>N</i> = 55)	
Condense/shorten workshop (<i>n</i> = 6)	<ul style="list-style-type: none"> • Could have been condensed • Too much time for some of activities
More collaboration and discussion (<i>n</i> = 5)	<ul style="list-style-type: none"> • More time to discuss • Would like papers and materials pre-prepared
More resources or information on resources (<i>n</i> = 5)	<ul style="list-style-type: none"> • Make some information available online
More hands on/less talking (<i>n</i> = 4)	<ul style="list-style-type: none"> • More time outside • Less talking • Lesson plans for all 11 lessons so that we could better see the entire sequence • Another training summer 2015 for upgrades/reflections • This unit needs to be implemented into the curriculum wheel on MCPS to make it make sense to us.
Miscellaneous (<i>n</i> = 6)	
Less talk/more hands on and movement (<i>n</i> = 7)	<ul style="list-style-type: none"> • More hands-on/Less lecture time before doing a project • Get us up moving a little faster and too much sitting in the beginning • It got a little long after lunch. More movement would have been helpful • I think some of the information could've been compacted into a smaller chunk of time
Cohort 2 (<i>N</i> = 18)	
Cover material in less time (<i>n</i> = 5)	

Different location/timing ($n = 3$)

- This could have been a half day training of just experiencing the lesson creating. It seemed forced into an all-day program
- Maybe have it right before the school year or before the year is over so teams can plan. It might be tricky to remember by the end of August
- Done at our own schools, so that we could find "water damaged" areas and know exactly where to have our students look
- To have some of each presentation be more concise - did not need every aspect to be model (vocabulary review, etc.)
- Explanation of how to integrate curriculum 2.0 Science lessons with ONOW

Miscellaneous ($n = 3$)

Note. Respondents' comments could appear in more than one category.

Appendix F



CHESAPEAKE BAY OFFICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



410 Severn Avenue
Suite 207-A
Annapolis, MD 21403

[date]

Dear Grade 4 Students at _____ Elementary School,

You may have heard that the health of the Chesapeake Bay has been improving a little, but is still not good. In fact, in 2012 the Chesapeake Bay Foundation (CBF) gave it a grade of 32 out of 100 points. The goal is to get the Bay to a 70 - so we still have a lot of work to do.

Our NOAA Chesapeake Bay Office helps take care of the Bay. We study the ecosystems and protect the resources in the Bay and in the watershed. We also teach people about the Chesapeake Bay and help them do things to improve the environment. However, we don't have a lot of scientists or time to study all of the parts of the Chesapeake Bay watershed. We need you to help us study our watershed!

Since you live in the Chesapeake Bay watershed, the water from your schoolyard will eventually get to the Bay. If we can get information about the land and the water from all of the MCPS elementary schools, we will have a more complete understanding of what the land in the watershed is like. After all, what happens on the land can harm the health of the water in the rivers and in the Bay. We also want to know what citizens like you are doing to protect the Bay.

During this school year, please prepare a report that describes the water problems in your schoolyard. Your report should include:

- A map of your schoolyard that shows which areas have problems with water flow
- Water quality data to show how healthy or unhealthy the water is
- A description of what action you plan to take to improve your schoolyard

I appreciate your time and efforts to help us – together we can all “protect and restore the Bay.”

Sincerely,

Your friends in science at the NOAA Chesapeake Bay Office

<http://chesapeakebay.noaa.gov/>

Appendix G

Table G1
Implementation of Lessons Among Cohort 1 Follow-up Survey Respondents,
Workshop and Non-Workshop Participants

	Cohort 1 Total <i>N</i> = 93		Cohort 1 Workshop <i>N</i> = 67		Cohort 1 Non workshop <i>N</i> = 26	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Lesson 1: ONOW Introduction	65	69.9	50	74.6	15	57.7
Lesson 2: Mapping the Schoolyard	65	69.9	49	73.1	16	61.5
Lesson 3: Water Walk	53	57.0	41	61.2	12	46.2
Lesson 4: Engineering a Water Collection Tool	44	47.3	35	52.2	9	34.6
Lesson 5: Water Quality	38	40.9	28	41.8	10	38.5
Lesson 6: Testing our Water	32	34.4	24	35.8	8	30.8
Lesson 7: Our Role in the Local Watershed	37	39.8	26	38.8	11	42.3
Lesson 8: Schoolyard Environment Impact	23	24.7	19	28.4	4	15.4
Lesson 9: Planning a Solution to Improve our Schoolyard	22	23.7	18	26.9	4	15.4
Lesson 10: Taking Action to Improve Our Watershed	12	12.9	7	10.4	5	19.2
Lesson 11: Communicating our Findings	10	10.8	6	9.0	4	15.4

Note. Implementation was derived by whether respondents rated the success of a lesson or whether they indicated n/a or skipped the rating

Note. No significant differences were found using test of proportions

Table G2
Other Reasons for Not Implementing Lessons Among Follow-up Survey Respondents

	Examples of Other Reasons
Cohort 1	Other (i.e. weather; PYP school and did not fit with inquiry; school under construction/not our land/temporary location; lessons delivered late; not enough planning time; piloting a reading program)
Cohort 2	Other (i.e. on leave; does not fit into curriculum, boring, other teacher did not receive training or materials upon request, not a good location, lessons did not show up in instructional center to remind us when to do, no water walk done, specialist taught)
Cohort 1: 2-Year Follow-up	Other (i.e. didn't care for lesson; many lessons overlap – have combined some ONOW ideas to other lessons; already have implemented numerous solutions; gave to science lab teacher; weather)

Table G3a

Cohort 1: Open-Ended Responses Explaining Reasons for Not Planning to Implement All of ONOW Next Year Among Workshop Participants

Theme	Total Respondents by Workshop Attendees (N = 36)
	Example comments
Not enough time/Too much to do ONOW + science curriculum (n = 20)	<ul style="list-style-type: none"> <i>There is not time to implement more science lessons in addition to what we already do. The ONOW lessons require time to create flipcharts for and to plan for. And then weather is a factor on how and when to implement lessons.</i> <i>Honestly, I cannot even find enough time in the current curriculum for the current science, social studies or writing curriculum. I am completely mystified as to how any teacher in MCPS would have time to implement ONOW.</i> <i>We simply run out of time to cover the curriculum and everything else that we have to cover. Designing and redesigning our water collection tools has taken four science periods.</i> <i>ONOW is a great concept. We found it difficult to plan for adding it to our current curriculum. It is already difficult to plan for the Science C 2.0 lessons. We rarely get to the lessons in C 2.0. Adding MORE to our teaching list is difficult. I would love to have ONLY ONOW if that was possibly. Both C 2.0 and ONOW isn't possible.</i> <i>This is too much time. Already 2.0 has more science, social studies, and writing lessons listed for every week than can actually be taught in a week. Adding "just a few more lessons" without taking away from the current load is ridiculous. The concepts behind the lessons are important, but there is simply not enough time. This was created to add on to what we already have to do without regard for our ability to actually do it.</i> <i>If ONOW was linked with the measurement topics and indicators we receive from MCPS and are obligated to teach, it may have been more successful. Unfortunately, it's just another thing to do. I think ONOW could replace at least one quarter of the MCPS science curriculum and you would see much better results.</i>
Not linked to what we have to teach (n = 3)	<ul style="list-style-type: none"> <i>It was difficult to find a location impacted by water, and actually collect water without it being interrupted or disruptive by passersby. Our schoolyard is very public.</i> <i>Our situation does not lend itself to us improving the playground because it is open to the neighborhood. Past experiences include vandalism and theft of plantings.</i>
Do not have good outdoor conditions (n = 3)	
Lessons are too scattered across year/need to pace better/plan better (n = 3)	
Miscellaneous (n = 7)	

Table G3b
 Cohort 1: Open-Ended Responses Explaining Reasons for Not Planning to Implement All of ONOW Next Year Among Non-Workshop Participants

Theme	Total Respondents by Non-Workshop Attendees (<i>N</i> = 14)
	Example comments
Not enough time/Too much to do ONOW + science curriculum (n = 9)	<ul style="list-style-type: none"> • <i>It has been hard to try and align it since it is separate from the curriculum we've been given. In theory the lessons go hand in hand but they are not integrated into one another so it is more work on our part to try and make them gel and figure out when to do what lesson.</i> • <i>The lessons are well done and meld very well w/ Q1 and Q2 study of ecosystems and living things. But, the lessons in our Science curriculum are very dense to so it's just a question of time and how much can realistically be done</i> • <i>Way too much to add to an already overloaded curriculum.</i>
Not linked to what we have to teach (n = 2)	<ul style="list-style-type: none"> • <i>Not aligned completely with what already required which means something has to be left undone</i>
Miscellaneous (n = 3)	

Table G4
 Cohort 2: Open-Ended Responses Explaining Reasons for Not Planning to Implement
 All of ONOW Next Year

Theme	Example comment (<i>N</i> = 17 respondents)
Not enough time/Too much to do ONOW + science curriculum (n = 7)	<ul style="list-style-type: none"> • <i>Due to timing</i> • <i>IF time allows I would like to implement more of the curriculum.</i> • <i>It took away from the regular lesson seeds, it was boring and took up too much time</i> • <i>Time as a factor.</i> • <i>I found it difficult to manage teaching all of the curriculum 2.0 science objectives for grade 4 in addition to the ONOW lessons and social studies, reading, math, and writing. My goal was to make sure that I had enough grades for each science measurement topic. For some marking periods there were 3 science measurement topics in which I had to report grades on. This was challenging with balancing the other 4 subjects.</i> • <i>I understand that the ONOW curriculum is not supposed to include any added time to the curriculum or to planning, but the activities do take up a lot of time during the day and often times math, reading, and writing end up taking up the bulk of our day.</i> • <i>Based on my experience this year and the time constraints inherent in our schedule, I anticipate that it may take a couple of years to "get there" in terms of implementing all of it. I do intend to make it a priority.</i>
Plans to implement (n = 5)	<ul style="list-style-type: none"> • <i>Since I will be able to be with my students from the beginning of the year with more consistency, I want to implement as many of the lessons as I have time for.</i> • <i>Now that I know I am on my own to figure out when to teach the ONOW lessons, I will be able to make them fit my schedule and know that I need to set aside additional time for them.</i> • <i>The teachers who were on the 4th grade team last year were very familiar with the original science curriculum, so mostly that was planned during planning time. We planned the first 3 lessons of ONOW together.</i> • <i>I'm hoping to fine tune my instruction and implementation next year.</i> • <i>I will modify the entire thing to suit my needs and my class/school</i>
Connections to curriculum (n = 2)	<ul style="list-style-type: none"> • <i>They need to fit together with the EIC to really make it more successful.</i> • <i>I need to identify lesson seeds that I can eliminate before I can plan to implement the ONOW lessons.</i>
Other (n = 2)	<ul style="list-style-type: none"> • <i>I only got one lesson in this year. I hope to remember to implement more of them next year.</i> • <i>If we will be departmentalized or not, materials available</i>
Not teaching Grade 4 next year (n = 2)	

Table G5

Cohort 1: 2-Year Follow-up: Open-Ended Responses Explaining Reasons for Not Planning to Implement All of ONOW Next Year

Theme	Example comment (N = 14 respondents)
Not enough time/Too much to do ONOW + science curriculum (n = 10)	<ul style="list-style-type: none"> • <i>I really don't know until I find out what the county demands on my time will be for next year. As long as we continue to be required to do more and more, I won't have time to implement ONOW.</i> • <i>We barely have any time for science or social studies each day at all. There is only 25 minutes set aside.... Thus, it is impossible to even teach the regular science and social studies objectives, let alone attempt to implement ONOW too.</i> • <i>I plan to teach all the lesson but it is always a challenge to integrate lesson throughout the year.</i> • <i>Will try to implement all of it, but not sure if it is possible with all the other curriculum requirements.</i> • <i>All depends on time pressure.</i> • <i>Time</i> • <i>There is so much to accomplish in the 2.0 curriculum. There isn't enough time to implement every ONOW lesson, but we keep on trying!</i> • <i>I absolutely love the ONOW curriculum, as it is very relevant to my students. However, it is extremely hard to work on other Science and Social Studies lessons and ONOW. It would be wonderful if ONOW was the only curriculum for a marking period or two.</i> • <i>Again, ability to fully implement any plan.</i> • <i>It depends on timing and weather. We ran out of time to recreate our collection tools and collect another sample.</i>
Other (n = 2)	<ul style="list-style-type: none"> • <i>I had to adapt some lessons. I didn't like the lesson with the paint pan.</i> • <i>Circumstances vary from year to year. I can't honestly say I'm going to implement all of the lessons</i>
Not teaching Grade 4 next year (n = 2)	

Appendix H

Table H1
Success of Implementation of Lessons Among Cohort 1 Follow-Up Survey Respondents

	N	Very Successful		Somewhat Successful		Not at all Successful	
		n	%	n	%	n	%
Cohort 1 Lessons							
Lesson 1: ONOW Introduction							
Workshop	50	21	42.0	26	52.0	3	6.0
Non Workshop	15	8	53.3	7	46.7	0	0.0
Lesson 2: Mapping the Schoolyard							
Workshop	49	21	42.9	26	53.1	2	4.1
Non Workshop	16	5	31.3	10	62.5	1	6.3
Lesson 3: Water Walk							
Workshop	41	24	58.5	15	36.6	2	4.9
Non Workshop	12	6	50.0	6	50.0	0	0.0
Lesson 4: Engineering a Water Collection Tool							
Workshop	35	11	31.4	18	51.4	6	17.1
Non Workshop	9	4	44.4	2	22.2	3	33.3
Lesson 5: Water Quality							
Workshop	28	6	21.4	21	75.0	1	3.6
Non Workshop	10	5	50.0	3	30.0	2	20.0
Lesson 6: Testing our Water							
Workshop	24	8	33.3	14	58.3	2	8.3
Non Workshop	8	3	37.5	3	37.5	2	25.0
Lesson 7: Our Role in the Local Watershed							
Workshop	26	6	23.1	18	69.2	2	7.7
Non Workshop	11	5	45.5	5	45.5	1	9.1
Lesson 8: Schoolyard Environment Impact							
Workshop	19	3	15.8	15	78.9	1	5.3
Non Workshop*	4	3	75.0	0	0.0	1	25.0
Lesson 9: Planning a Solution to Improve our Schoolyard							
Workshop	18	6	33.3	11	61.1	1	5.6
Non Workshop	4	1	25.0	2	50.0	1	25.0
Lesson 10: Taking Action to Improve Our Watershed							
Workshop	7	1	14.3	5	71.4	1	14.3
Non Workshop	5	1	20.0	3	60.0	1	20.0
Lesson 11: Communicating our Findings							
Workshop	6	1	16.7	5	83.3	0	0.0
Non Workshop	4	1	25.0	2	50.0	1	25.0

*p < .05

Table H2
Helpfulness of Lesson Materials Among Cohort 1 Follow-up Survey Respondents

Cohort 1 Materials	Very Helpful		Somewhat Helpful		Not at all Helpful		
	N	n	%	n	%	n	%
Lesson 1: ONOW Introduction (materials: project request letter)	65	41	63.1	22	33.8	2	3.1
Lesson 2: Mapping the Schoolyard (materials: satellite view and schoolyard outline)	64	39	60.9	22	34.4	3	4.7
Lesson 3: Water Walk (materials: schoolyard outline)	58	29	50.0	26	44.8	3	5.2
Lesson 4: Engineering a Water Collection Tool (materials: n/a, self-provided)	25	8	32.0	11	44.0	6	24.0
Lesson 5: Water Quality (materials: jars, ph paper, secchi disk)	38	22	57.9	12	31.6	4	10.5
Lesson 6: Testing our Water (materials: secchi disk, ph paper, thermometers)	34	20	58.8	10	29.4	4	11.8
Lesson 7: Our Role in the Local Watershed (materials: quiz, student resource)	29	5	17.2	19	65.5	5	17.2
Lesson 8: Schoolyard Environment Impact (materials: guided questions, design process)	24	6	25.0	12	50.0	6	25.0
Lesson 9: Planning a Solution to Improve our Schoolyard (materials: capture sheet)	22	5	22.7	12	54.5	5	22.7
Lesson 10: Taking Action to Improve Our Watershed (n/a, self-provided)	10	2	20.0	5	50.0	3	30.0
Lesson 11: Communicating our Findings (materials: NOAA report checklist)	11	2	18.2	6	54.5	3	27.3

Table H3
Helpfulness of Materials Among Cohort 1 Follow-up Survey Respondents

	N	Very Helpful		Somewhat Helpful		Not at all Helpful	
		n	%	n	%	n	%
Cohort 1 Materials							
Lesson 1: ONOW Introduction (materials: project request letter)							
Workshop	49	32	65.3	15	30.6	2	4.1
Non Workshop	16	9	56.3	7	43.8	0	0.0
Lesson 2: Mapping the Schoolyard (materials: satellite view and schoolyard outline)							
Workshop	48	29	60.4	16	33.3	3	6.3
Non Workshop	16	10	62.5	6	37.5	0	0.0
Lesson 3: Water Walk (materials: schoolyard outline)							
Workshop	46	21	45.7	22	47.8	3	6.5
Non Workshop	12	8	66.7	4	33.3	0	0.0
Lesson 4: Engineering a Water Collection Tool (materials: n/a, self-provided)							
Workshop	19	5	26.3	9	47.4	5	26.3
Non Workshop	6	3	50.0	2	33.3	1	16.7
Lesson 5: Water Quality (materials: jars, ph paper, secchi disk)							
Workshop	29	18	62.1	8	27.6	3	10.3
Non Workshop	9	4	44.4	4	44.4	1	11.1
Lesson 6: Testing our Water (materials: secchi disk, ph paper, thermometers)							
Workshop	25	16	64.0	6	24.0	3	12.0
Non Workshop	9	4	44.4	4	44.4	1	11.1
Lesson 7: Our Role in the Local Watershed (materials: quiz, student resource)							
Workshop	21	3	14.3	15	71.4	3	14.3
Non Workshop	8	2	25.0	4	50.0	2	25.0
Lesson 8: Schoolyard Environment Impact (materials: guided questions, design process)							
Workshop	6	2	33.3	2	33.3	2	33.3
Non Workshop	18	4	22.2	10	55.6	4	22.2
Lesson 9: Planning a Solution to Improve our Schoolyard (materials: capture sheet)							
Workshop	17	3	17.6	11	64.7	3	17.6
Non Workshop	5	2	40.0	1	20.0	2	40.0
Lesson 10: Taking Action to Improve Our Watershed (n/a, self-provided)							
Workshop	5	0	0.0	4	80.0	1	20.0
Non Workshop	5	2	40.0	1	20.0	2	40.0
Lesson 11: Communicating our Findings (materials: NOAA report checklist)							
Workshop	6	0	0.0	5	83.3	1	16.7
Non Workshop	5	2	40.0	1	20.0	2	40.0

Note. No significant differences were found using test of proportions

Table H4
Open-Ended Responses among Cohort 1 Follow-up Respondents:
What They Like about ONOW

Theme	Example Comment (<i>N</i> = 61 respondents)
Real World Connections/Message of making an impact (n = 31)	<ul style="list-style-type: none"> • I like that it was directly related to our school and how we make the impact. • Directly connected to our community and real world problems. • Connected to the students and their local environment, made learning more meaningful and more powerful. They could see exactly how they are impacted in the watershed
Hands On (n = 20)	<ul style="list-style-type: none"> • Loved the hands on aspects like collecting the water and doing the samples. • Hands-on walking, building, experimenting, collaborating for students
Going Outside (n = 8)	<ul style="list-style-type: none"> • Being able to go outside to make observations. • We got to be outside which was great.
Ties in with Curriculum (n = 6)	<ul style="list-style-type: none"> • It fit nicely with our Ecosystem curriculum in the first and second quarters. • It was relevant and connected with our Ecosystems unit.
Engaging (n = 5)	<ul style="list-style-type: none"> • I found that the students were very engaged in the lessons and would make observations on non-lesson days. • Really appreciate the engagement level of the lessons.
Content/Importance of Content (n = 5)	<ul style="list-style-type: none"> • I think it is a great idea to teach how important the watershed is. • I think it is important for students to understand about the watershed and the Chesapeake.
Materials provided (n = 4)	<ul style="list-style-type: none"> • I liked the map that my school was given • Most materials were provided for us and the only thing I really had to spend time doing was integrating the provided lessons/materials in flipcharts.
How it's broken down (n = 3)	<ul style="list-style-type: none"> • I like that it breaks down the project into teachable units
Support given (n = 2)	<ul style="list-style-type: none"> • Having a representative come to our school to do the walk was fantastic.

Table H5a
Open-Ended Responses of Cohort 1 Follow-up Respondents: Suggestions for ONOW

Theme	Example comments (<i>N</i> = 55 Respondents)
Integrate/swap with Science Curriculum (n = 16)	<ul style="list-style-type: none"> • Find a way that takes an ONOW lesson and replaces it for an existing seed in the MCPS Curriculum. • Integrate them into the 2.0 lesson seeds we already have mapped out for each quarter • Find a way to seamlessly integrate it - it is a fantastic program and our students definitely need to learn about the Chesapeake Bay Watershed, but unfortunately it just had to be pushed to the side due to time • Also if MCPS expects us to implement things into our children's lives they need to provide funds to do so.
Provide money for materials or materials (n = 9)	<ul style="list-style-type: none"> • Provide the plants or materials for improvement - do not rely on low-income families or teachers to supply them • Provide schools with money so they can really implement these projects to improve the school yard.
More time/There's just not enough time (n = 7)	<ul style="list-style-type: none"> • No suggestions for improving ONOW, it's just the challenge of time. Because of the needs of my students, it is difficult to have adequate time for the science and social studies curriculum as it already exists, so adding something more is so challenging. • More time to implement and plan.
Provide additional support (n = 6)	<ul style="list-style-type: none"> • It would be great to have someone check in with us and work a bit more closely to guide our work. • Video or webinar the trainings- really important to understanding how the program works so if you miss it, it is hard to be invested in the big picture. • Guest speakers to teach some of the lessons
Condense Curriculum (n = 4)	<ul style="list-style-type: none"> • Make the curriculum into two condensed weeks so that students and teachers don't lose focus or interest. • It sometimes seemed very spaced out during the year. I don't know how to fix it. We would do a chunk of 'ONOW' stuff, and then would move on to another topic. Then, we would go back to 'ONOW' later, and sometimes had to really review with students where we last left off.
More specific instructions on how to fit/swap lessons with curriculum (n = 3)	<ul style="list-style-type: none"> • Tell us which lessons we can replace from the original curriculum with the ONOW lessons.
Provide more background knowledge for students (n = 2)	
Give examples/suggestions for tools (n = 2)	
Miscellaneous (n = 6)	<ul style="list-style-type: none"> • Too high of a reading comprehension level • Connect to more global issue vs just local • Difficult for 4 different classes to provide problems and solutions • Didn't like that we had to pick up our materials • Send out a time line reminder

Table H5b
Open-Ended Responses of Cohort 2 Follow-up Respondents: Suggestions for ONOW

Theme	Example comments (<i>N</i> = 10 Respondents)
More Direction on Which Lessons to Replace/Replace for Us (<i>n</i> = 4)	<ul style="list-style-type: none"> • We need to know what we can cut out of our regular science curriculum so we have more time to implement ONOW. • Find opportunities to replace some of the ONOW lessons with ones that are comparable to those in the MCPS Science Grade 4 curriculum. • Maybe the original curriculum could be taken off completely and replaced with ONOW. • Automatically replace EIC seeds with ONOW lessons so it's already built into the curriculum

Add to Instructional Center/More communication (n = 3)	<ul style="list-style-type: none"> Additional communication about water walkthroughs or reminders about when may be a good opportunity to use the lessons. Posting example projects would be great as well Add them into the weeks that they should be implemented on the instructional center...if ONOW were put into our quarterly/weekly lessons per quarter and got along with that quarters measurement topics we could implement them more smoothly. Add them to the lesson seeds in the instructional center for teachers to stay on track. Otherwise, it becomes a big question of...when do I teach this?
Provide More Materials (n = 2)	<ul style="list-style-type: none"> The materials that were provided was not sufficient enough for the teachers. Providing more scaffolded flipcharts and student materials (i.e. vocabulary activities, student-friendly videos, etc.)
Other (n = 1)	<ul style="list-style-type: none"> I would suggest to teachers to do it from start to finish in a few week period in the spring when there is rain. My team is looking at a marking period where there are more than nine weeks and dropping everything to ONOW all day for a week. We are also looking at taking a week out of health instruction and using that time since health is repeated and regularly taught in middle school

Table H6
Open-Ended Responses of Cohort 1 Follow-up Respondents: Further Support Needs

Theme	Example comments (<i>N</i> = 33 respondents)
Help with how to incorporate ONOW/Align/Fit (n = 7)	<ul style="list-style-type: none"> • Yes, it would be useful to have someone help us see where we could implement each of the lessons throughout our units of inquiry that we currently teach our students. • The 4th grade teachers will need to understand which lessons the ONOW lessons will replace. We have so much put upon us, that to create new lessons and fit them into the curriculum is more than we can handle--it's just "one more thing" again
Materials (n = 5)	<ul style="list-style-type: none"> • We would like a better school map for our water walk • Translating worksheets/letters. Providing a bit more materials for water collection tools.
Funds for materials/project (n = 4)	<ul style="list-style-type: none"> • A list of materials and a pre-authorized and paid requisition form for the needed materials that could be covered by the school or handed to the PTA for help; • We do not have money to do big improvements to our school to help with the implementation process. This really makes a downer on some of the great improvements that could be done.
A water walk (n = 3)	
More visits/maybe to teach a class (n = 3)	
Training (n = 3)	
Suggestions on school improvements and water collection tools (n = 2)	
Miscellaneous (n = 2) - More info on ph, acids and bases; everything	

Appendix I

Frequency of Outdoor Activities

Table I1
Time Spent Teaching about Water and Watersheds
Among Cohort 1 Follow-up Survey Respondents

Time Spent	Workshop (N = 59)		Non Workshop (N = 22)	
	n	%	n	%
Not at all	1	1.7	3	13.6
Less than 1 hour	6	10.2	3	13.6
1-2 hours	10	16.9	4	18.2
3-4 hours	11	18.6	1	4.5
5-6 hours	13	22.0	5	22.7
More than 6 hours	18	30.5	6	27.3

Table I2
Number of Times Class Went Outside for Learning about Water and
Watersheds Among Cohort 1 Follow-up Survey Respondents

Number of Times	Total Follow-up (N = 82)		Workshop (N = 60)		Non Workshop (N = 22)	
	n	%	n	%	n	%
Not at all	5	6.1	3	5.0	2	9.1
1 time	6	7.3	3	5.0	3	13.6
2 times	14	17.1	11	18.3	3	13.6
3-4 times	31	37.8	26	43.3	5	22.7
5-6 times	17	20.7	10	16.7	7	31.8
More than 6 times	9	11.0	7	11.7	2	9.1

Table I3
Comfort with Outdoor Lessons Among Cohort 1 Follow-up Survey Respondents

	Attended Workshop	N	Very Comfortable		Somewhat Comfortable		Somewhat Uncomfortable		Very Uncomfortable	
			n	%	n	%	n	%	n	%
Lesson about watersheds	Yes ^a	58	28	48.3	29	50.0	1	1.7	0	0.0
	No	22	11	50.0	9	40.9	2	9.1	0	0.0
Lesson about Runoffs	Yes	59	29	49.2	29	49.2	1	1.7	0	0.0
	No	22	12	54.5	9	40.9	1	4.5	0	0.0
Lesson about Creating Maps	Yes	59	27	45.8	27	45.8	5	8.5	0	0.0
	No ^b	21	9	42.9	10	47.6	2	9.5	0	0.0
Lesson Involving Engineering Design	Yes	59	20	33.9	32	54.2	7	11.9	0	0.0
	No	22	7	31.8	11	50.0	4	18.2	0	0.0
Lesson on Actions to Improve Environment and Water Quality	Yes	59	18	30.5	36	61.0	5	8.5	0	0.0
	No ^b	21	8	38.1	10	47.6	2	9.5	1	4.8

Note. "Yes" means respondents attended Summer 2014 Workshop; "No" means they did not attend Summer 2014 Workshop

Note. No significant differences were found using test of proportions

Table I4
Comfort with Outdoor Lessons Among Pre-Training and Follow-up Survey Respondents

	N	Pre-Training Survey		Follow-up Survey	
		Mean	SD	Mean	SD
Lesson about watersheds					
Cohort 1	55	2.98	.707	3.44***	.536
Cohort 2	25	2.76	.879	3.32***	.758
Lesson about runoffs					
Cohort 1	56	3.25	.745	3.46*	.538
Cohort 2	25	3.04	.841	3.52**	.653
Lesson about creating maps					
Cohort 1	56	2.93	.657	3.36***	.645
Cohort 2	25	3.04	1.06	3.32*	.900
Lesson Involving engineering design					
Cohort 1	56	2.79	.756	3.20***	.644
Cohort 2	25	2.92	.997	3.24*	.789
Lesson on actions to improve environmental and water quality					
Cohort 1	56	3.00	.739	3.21	.079
Cohort 2	25	3.08	.909	3.24	.789
Lesson outdoors in your schoolyard					
Cohort 1	56	3.23	.660	3.57***	.568
Cohort 2	25	3.32	.690	3.64	.569

*p<.05, **p<.01, ***p<.001, paired t-test

Note. A scale of 1 to 4 was used where 1 = Not very comfortable and 4 = Very comfortable.

Table I5
Comfort with Subject Areas Among Pre-Training
and Follow-up Survey Respondents

	N	Pre-Training Survey		Follow-up Survey	
		Mean	SD	Mean	SD
Mathematics					
Cohort 1	58	3.57*	.704	3.78	.594
Cohort 2	26	3.77	.320	3.65	.846
Science					
Cohort 1	59	3.42*	.724	3.69	.595
Cohort 2	26	3.50	.648	3.35	.797
Reading/Language Arts					
Cohort 1	59	3.49*	.626	3.75	.439
Cohort 2	26	3.85	.464	3.65	.846
Social Studies					
Cohort 1	59	3.36*	.737	3.54	.597
Cohort 2	26	3.58	.578	3.38	.983

*p<.05, **p<.01, ***p<.001, paired t-test

Note: A scale of 1 to 4 was used where 1 = Not very comfortable and 4 = Very comfortable.