

**Shared Waters Year Three:
An Upstream-Downstream Collaborative**

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Millersville University of Pennsylvania (MU), Virginia Wesleyan University (VWU), Penn Manor School District, and Norfolk Collegiate School created a three-year upstream, downstream collaborative for the systemic implementation of Meaningful Watershed Educational Experiences (MWEE) in elementary schools that focused on protecting our shared Chesapeake Bay watershed. This project highlighted this shared responsibility by bringing together schools in central PA (upstream) and coastal VA (downstream) to learn about local watershed issues and how local actions impact the overall health of the watershed. The health and future of the Chesapeake Bay Watershed depend on this generation of students cultivating a connection to local waters, gaining an understanding of how their choices impact the larger watershed, and learning how to be good watershed neighbors.

From 2021 to 2024, this three-year project systematically impacted students through teacher professional development and classroom MWEE implementation, while simultaneously training the next generation of teachers by embedding MWEE instruction into undergraduate teacher education programs at MU and VWU. The Shared Waters project embeds MWEE professional development training and classroom implementation into existing university/school partnerships where teacher candidates (undergraduate teacher education students) work alongside classroom teachers in the implementation of the MWEE in the elementary classroom. This approach ensures the long-term sustainability of the project and its ability to institutionalize MWEEs at both the K-12 and university levels.

The following pages provide a summary of the findings for Year Three: 2023-2024 of the project. The reader may find it helpful to read the Year One Summary and the Year Two Summary in the NOAA repository before reading this third year summary.

The Year One Summary is entitled *Shared Waters Year One: An Upstream-Downstream Collaborative* and the Year Two Summary is entitled *Shared Waters Year Two: An Upstream-Downstream Collaborative*.

For more information about the project or if you would like to implement this project in your university or school, please contact us.

Sincerely,

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Findings and Results from Teachers

In year one of the project, a multi-day professional development session was held for all teachers and administrators to acquaint them with MWEE. In year two, as the principals had attended the Year One training, only the returning teachers and new teachers to the project attended a day-long session. Some of the returning teachers served as mentors for the new teachers. In year three, teachers requested to only attend a few monthly professional development sessions.

Monthly Professional Development Session Survey Results

Teachers gathered monthly by Zoom for check-in and MWEE support. Pennsylvania and Virginia teachers were sent a survey that had five (5) prompts, two close-ended prompts, which teachers rated on a Likert scale of strongly agree, agree, and disagree, and three open-ended which teachers could provide comments. Overall, teachers felt that these meetings helped them provide clarifying information surrounding the project and gain confidence about implementing the MWEE. They learned about MWEE and MWEE implementation and how to teach students about MWEE.

Interviews and School Visits

In addition to these surveys, the grant evaluator conducted site visits to all elementary schools involved with this grant. Pennsylvania site visits occurred during the fall of 2023 and Virginia site visits occurred during the spring of 2024. During these visits, the grant evaluator met with administrators and teachers involved with the grant, toured the facilities, and observed classes of elementary students engaging in MWEE learning and activities. Additionally, the grant evaluator conducted in-person interviews with principals and teachers at each elementary school.

These interviews and site visits revealed valuable information about the locations. Discussion prompts for the administrators included:

- 1-How does environmental education exist now in your school?
- 2-Describe current teacher attitudes towards environmental literacy.
- 3-Describe current student attitudes towards environmental literacy.
- 4-How and when do classes about the environment include outdoor lessons and activities?
- 5-How does the outdoor environment at your school not support environmental literacy education?
- 6-How has environmental education changed as a result of this grant?

Findings of the interviews and site visits reveal that:

- Involvement in the grant has increased enthusiasm, participation, instruction, and study about MWEE among administrators, teachers, and students.
- Elementary students in all elementary schools had participated in field trips or worked outside investigating the watershed. Fifth grade students in Norfolk experienced the added project of oyster cleaning.
- Students in 4th and 5th grade expressed interest to their teachers throughout the school year about their grade level project. From the start of the school year, they were asking about their projects. They provided leadership of their own learning!
- New science textbooks are being chosen with interest to how they portray environmental topics.
- Teacher approaches to science education overall have become more innovative and relevant to current topics.

- Fifth grade students, who have now been involved with MWEE learning for three years, are described by their teachers as “so very knowledgeable” and “motivated to be stewards of the environment.” They “understand how a single organism can have a ripple effect on other organisms and the environment.”
- 5th graders are sharing with their 4th and 3rd grade siblings about their learning and what the younger siblings can look forward to doing with this project. In this way, the older siblings are motivating younger siblings about environmental education.
- The field trip to VWU and having student teachers intricately involved in learning at the elementary schools was cited by all teachers and administrators as “highly beneficial” and “motivating” for the younger children. All want for this to continue in the future.
- One teacher summarized the feelings of the group stating, “Having the grant opened a lot of doors for realizing what should have already been in our curriculum and we’re so thankful it is now.”
- School administrators and teachers expressed gratitude to NOAA and Millersville University, and Virginia Wesleyan University for making the funding and opportunities possible.

Findings and Results from Parents

A five-question electronic survey was distributed to parents/guardians of students who participated in the MWEE. After providing informed consent, parents were asked their state of residence (PA or VA) and if their child had shared with them or others their learning about water and the environment. The final prompt asked parents how their child had shared with them or others what they had learned about the environment and water. There were 10 possible choices

and parents could choose as many as they liked, including an ‘other’ response where they could provide comments.

Thirty-six parents completed the survey including 19 PA parents, 15 Virginia parents, and two parents who did not identify their state of residence. Thirty-one parents indicated that their child had shared with them or others what they had learned about water and the environment, three had not, and two did not respond to the prompt.

Thirty parents responded to the prompt asking how their students shared about their MWEE learning. All 30 students discussed activities and field trips: 18 with their family and six with others outside their family. Nine students completed related assignments at home, two developed projects at home or in the community, and three completed projects outside of school, while 12 performed stewardship or environmentally conscience activities outside of school. Finally, seven students showed an increased interest in attending school when learning about water and the environment. There was not a significant difference in the response items or quantity of response items chosen from the VA compared with PA parents. The table below provides the number of students and how they shared about their MWEE learning.

Table 1

Parent Survey Responses about How Students Shared Learning

How Students Shared About Their MWEE Learning	Number of Students
Discussed activities or field trips	30
Discussed concepts with family members	18
Discussed concepts to others outside of family	6
Completed related assignments at home	9
Performed stewardship/environmentally conscious activities outside of school	12
Developed projects at home or in the community	2
Learned and completed projects outside of school	3
Expressed an interest in learning more	12
Showed an increased interest in attending school when learning about water and the environment	7
Other	0

These results demonstrate that students are taking ideas they have learned about MWEE outside of school, especially discussing activities and field trips and discussing them with a family member. This was true across both states as well as across private and public schools. Forty percent of students went a significant step further in initiating and performing stewardship/environmentally conscious activities outside of school. Finally, 23% of students showed increased interest in school attendance overall, demonstrating the power that MWEE has to influence student engagement overall and beyond just this project.

Findings and Results from Preservice Teachers

In April 2024, a 12-question survey was administered to pre-service student teachers at Virginia Wesleyan University (VWU) who participated in MWEE training during their coursework. The same survey was sent to Millersville University pre-service teachers in the fall when their course met. Their courses took place primarily in a face-to-face format, with some occurring in hybrid or online format. Nineteen surveys were distributed, and 19 responses were

received for an overall response rate of 100%. Students completing the survey were mostly sophomores who will graduate in 2026.

Result #1:

Pre-service teachers rated their current knowledge in the areas of Issue Definition, Synthesis and Conclusion, Outdoor Field Experiences, Stewardship and Civic Action, Active Teacher Support, Classroom Integration, Local Context, and Sustained Activity on a Likert Scale as Very Knowledgeable, Knowledgeable, Somewhat Knowledgeable, a Little Knowledgeable and Not at All Knowledgeable. Almost all students rated themselves as Very Knowledgeable and Knowledgeable in all areas as a result of their course.

Result #2:

Pre-service teachers utilized a variety of MWEE essential elements with their elementary students and were given the opportunity to indicate all through the survey. The most frequently cited element was 'Issue Definition' (13 responses), followed by a tie with 'Outdoor Field Experiences' (12 responses) and 'Synthesis and Conclusion' (10 responses), and the fewest with 'Stewardship and Civic Action' (4 responses). These results are shown in Table 1 below.

Table 2

MWEE Essential Elements Used with Pre-Service Teachers

Element	Number of Responses
Issue Definition	13
Outdoor Field Experiences	12
Synthesis and Conclusion	10
Stewardship and Civic Action	4

Additionally, in their narrative responses, Pre-Service Teachers cited specific course activities as well as teaching the elementary students as the most memorable aspects of the

course. Most Pre-Service Teachers mentioned the following specific activities: all experiences working in-person with the elementary students, the Enviroscape, and thermal imaging of roof materials.

Result #3:

Pre-Service Teachers utilized a variety of materials that they received during their course with their elementary students. In their narrative responses, students cited specific materials such as those in the seed lesson. Some students interpreted this prompt more broadly and responded that they learned “student-centered exploration”, importance of “classroom set up”, classroom management, and “the opportunity to interact with students and receive feedback has helped me immeasurably.”

Result #4:

Pre-Service Teachers' students used various MWEE activities in their elementary classes. Many Pre-Service Teachers responded that they used or observed the use of the Enviroscape® with their classes, the seed lesson, greenroof experiments and thermotechnology, and oyster cleaning. One student explained, “The oyster lesson was an issue-definition example where we taught students about different parts of a food chain and the role oysters play in oceanic settings. The simulation activity was a good outdoor field experience where I was able to watch students get hands on with the material and play a game that actually represents the course topic we focused on. The water testing field experience was a good example of a synthesis-conclusion experience because we were able to test and synthesize information that allowed us to come to conclusions about water quality.”

Result #5:

Overwhelmingly, Pre-Service Teachers responded that they would implement MWEE in their classroom someday. Pre-Service Teachers mentioned most frequently the importance of children learning about environmental protection through hands-on learning as being essential. The thoughtfulness of the Pre-Service Teachers' comments is best expressed in these quotations directly from them:

- “It is a good way to describe an issue, then go out and solve it.”
- Implementing MWEE “can foster a greater understanding and appreciation of the environment.”
- “To ensure my students are getting the best possible hands-on opportunities to explore what environmental experiences are like and how they can impact the world around them. These opportunities get students excited about learning.”

Result #6:

Overwhelmingly, Pre-Service Teachers felt that their work on MWEEs helped them to develop technology skills and classroom management skills. The thoughtfulness of their comments is best expressed in their own words:

- “It impacted my learning by being more thorough with lesson planning and really thinking about what would impact teaching in a beneficial way.”
- “The work helped me to visualize what a classroom looks like when students feel they’re doing something important or when they get to interact with the material in a way that goes beyond the classroom.”
- “I realized I could do lessons outside without it being too hard.”

Result #7:

When asked, "What other types of environmental literacy and sustainability-related courses, trainings, and workshops have you attended?" All replied "none"

In contrast, when asked, "What other types of environmental literacy and sustainability-related courses, trainings, and workshops would you like the university to offer?" students had many suggestions, including "classes where students can travel to different watersheds and do hands-on work", "LEED certification training", and "more focused environmental literacy courses."

Conclusion

In conclusion, the third and final year of the project has been very successful in improving knowledge, skills, and teaching behaviors surrounding MWEE for those teachers and administrators who are new to the project while solidifying the same for returning principals and teachers. All observed teachers were more confident enacting classroom activities. Without exception, administrators and teachers discussed in detail how MWEE would continue after the end of the grant. Responses included that schools will implement new science textbooks that include watershed education units, continue to provide lessons provided through this grant, and continue grade level projects such as the 5th grade oyster cleaning. Finally, one elementary school was named Winner Of 2022 PA Meaningful Watershed Educational Experience Award.

Similarly, Pre-Service Teachers are gaining skills and knowledge on how to incorporate MWEE into the curriculum and classroom. This is the third year for Pre-Service Teachers to partake in this project and also to indicate their enthusiasm and desire to continue to learn about and implement MWEE in their classrooms. They see the benefit of elementary students learning about the environment and how to protect it in this very hands-on way.

Course-level data analysis for the VWU management course shows that VWU students are improving their results on a culminating behavior management project. Prior to the Shared Waters Project, students in this course had difficulty providing authentic examples of strategies based on behavior management theory learned in the text and through lectures. Through Shared Waters, students experienced multiple opportunities to observe, apply, and debrief about real strategies of behavior management that happen during their work with elementary students. This project is providing positive impacts on the preparedness of our pre-service teachers.

The most significant benefits cited by teachers, administrators, and Pre-Service Teachers collectively are that elementary students gain hands-on, real-world experience learning and interacting with their environment to learn about MWEE.

The results of the parent survey were significant with all parent respondents indicating that their students are discussing MWEE activities with them. Additionally, 40% are enacting environmental stewardship activities outside of school as a result of the MWEE learning, and 23% are demonstrating an increased interest in attending school when they knew they would get to learn and participate in MWEE activities. These results held true across both states, public and private school and firmly demonstrate the tremendous impact MWEE has on elementary children. Increased student interest in attending school was not an expected outcome of this project. However, we are pleased to see it. We believe it holds value for students as attendance impacts positively learning in all subjects and school experiences.

Word of the success of the Shared Waters Curriculum has been finding its way through Virginia as well. Suffolk Public Schools, Isle of Wight County Public Schools and three independent schools hoping to use the curriculum have reviewed the curriculum and want to

implement it within their institutions. In the next several years, this curriculum will positively impact thousands more elementary students.