Shared Waters Year One:

An Upstream-Downstream Collaborative

Ann Cancilla Gaudino, Ed.D.

Nanette Marcum-Dietrich, Ph.D.

William McConnell, Ph.D.

Abdulsalami Ibrahim, Ph.D.

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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 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 systemically impacted elementary 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 One: 2021-2022 of the project. For more information about this project or if you would like to implement this project in your university or school, please contact us.

Ann Cancilla Gaudino, Ed.D., Professor
Millersville University of Pennsylvania
Email: ann.gaudino@millersville.edu

Nanette Marcum-Dietrich, Ph.D., Professor
Millersville University of Pennsylvania
Email: Nanette.marcum-dietrich@millersville.edu

William McConnell, Ph.D., Associate Professor
Virginia Wesleyan University
Email: wmmcconnell@vwu.edu

Abdulsalami Ibrahim, Ph.D., Assistant Professor
Millersville University of Pennsylvania
Email: Abdulsalami.ibrahim@millersville.edu

Findings and Results from Teachers

An initial multi-day professional development session was attended by school administrators and teachers the week of August 2, 2021, and teachers attended subsequent monthly professional development sessions on September 30, October 28 and December 2, 2021. Participants completed a Post-Professional Development survey following the multi-day session and each individual session. Responses were indicated via a Likert scale with responses: strongly agree, agree, neutral, disagree, strongly disagree.

Multi-Day Training Survey Results

Two administrators and six teachers (n=8) participated in the training session and the subsequent survey. All responded either "strongly agree" or "agree" with all eight survey prompts including that they:

- Learned about the systemic implementation of Meaningful Watershed Educational Experiences (MWEE) in Chesapeake Bay.
- Learned how to integrate MWEE into the curriculum.
- Learned how to teach their students about things that contribute to the health or lack of health of our Chesapeake Bay watershed.
- Learned how to teach their students about local actions that impact the health of the Chesapeake Bay Watershed.
- Learned how MWEE connects to standards in science education.
- Learned how MWEE connects to standards across content areas.
- Learned how to create lesson plans about MWEE.
- Learned how to implement outdoor learning experiences to teach MWEE.

Comments

Written comments from participants were generally positive and indicated some areas for improvement. Specifically, participants felt that the university faculty who presented and guided the session were knowledgeable, provided strategies for implementation, and were "amazing," "top-notch," "full of enthusiasm," "a valuable resource," "generous with their time," and an "incredible mentor." Teachers expressed gratitude for the many supplies and resources received during the training, which they could utilize in their classrooms. One teacher's comment was illustrative of the group's sentiments, stating, "This week has been informative and enlightening. I have learned many things that I can pass on to my third graders. The hands-on experiences with science tools have been invaluable."

Teachers and administrators also indicated some areas of improvement for future professional development sessions. Specifically, three teachers requested more hands-on activities and guidance on implementing lessons in an elementary classroom. In addition, two teachers felt that some material presented by college professors was "over our students' heads" and that they, as teachers, needed to adjust the information so that it would be more age-appropriate for elementary students.

Monthly Professional Development Sessions Survey Results

Six teachers participated in the day’s professional development sessions, and the subsequent survey was given at the end of each session. The survey that was issued after each session had five (5) prompts; two close-ended prompts which teachers rated on a Likert scale of strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, and strongly disagree, and two open-ended which teachers could provide comments.

All teachers responded “strongly agree” or “agree” to the close-ended prompts:

- This meeting helped to provide clarifying information surrounding the project.
- I gained confidence about how to implement the MWEE from this meeting.

The first open-ended prompt was, "The greatest challenges I am facing with this project now are...". Three teachers responded that finding time to implement the activities is challenging given the other curriculum subjects they must implement, and complications caused by the COVID-19 pandemic. One teacher pointed out a need to narrow down the information.

The second open-ended prompt was, "The greatest benefits I see for my students with this project are...". Teachers cited that "hands-on activities" and "real-world learning" were the most significant benefits. Individual teachers also noted "problem-solving," "defining the problem," and "cooperative learning” as additional benefits.

The third open-ended prompt was, "In future meetings, I would like to...". All teachers responded that sharing information and implementing activities in their classrooms would be beneficial. Specifically, one teacher added "hearing from other teachers how they have incorporated other subjects like reading and writing into their MWEE lessons.”

Findings from School Visits, Administrator Interviews, Teacher Focus Groups

In addition to these surveys, the grant assessor did site visits of each elementary school (Norfolk Collegiate, Hambright Elementary, and Penn Manor Elementary) and Millersville and Virginia Wesleyan Universities. During these visits, the grant evaluator met with administrators and faculty involved with the grants, toured the facilities, and in one instance observed briefly a class of elementary students engaging in MWEE learning and activities. Additionally, the grant evaluator conducted one-hour interviews with principals at each of the three elementary schools

surrounding the implementation of the grant. 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?

Results of the interviews and site visits revealed that:

- Involvement in the grant increased enthusiasm, participation, instruction, and study about MWEE among faculty and students.
- While administrators felt that MWEE objectives had previously been "covered" in the science curriculum, they were now being implemented in more meaningful, hands-on, and engaging ways.
- Teachers were regularly implementing grant training into their teaching.
- Elementary students in all three elementary schoolsparticipated in field trips or worked outside investigating the watershed. These outdoor, hands-on experiences were new to students whose learning was previously limited to reading and in-classroom activities.

- The elementary students were readily engaged in MWEE activities, utilizing laptops and small group work to complete a task assigned by the teacher. The enthusiasm in the room was palpable as students were quick, attentive, and participatory. Students readily connected these classroom activities with the field trip activities they had. Without exception, every student was fully engaged in the classroom.
- School administrators and teachers expressed gratitude to NOAA and Millersville and Virginia Wesleyan Universities for making the funding and opportunities possible.

Results from Survey of Preservice/Student Teachers

In May 2022, a 12-question survey was administered to preservice student teachers at Millersville University (MU) and Virginia Wesleyan University (VWU) who participated in MWEE training during their coursework. Their courses took place primarily in face-to-face format, with some occurring in hybrid or online format. Fifty-nine responses were received from the university students. Results are summarized below.

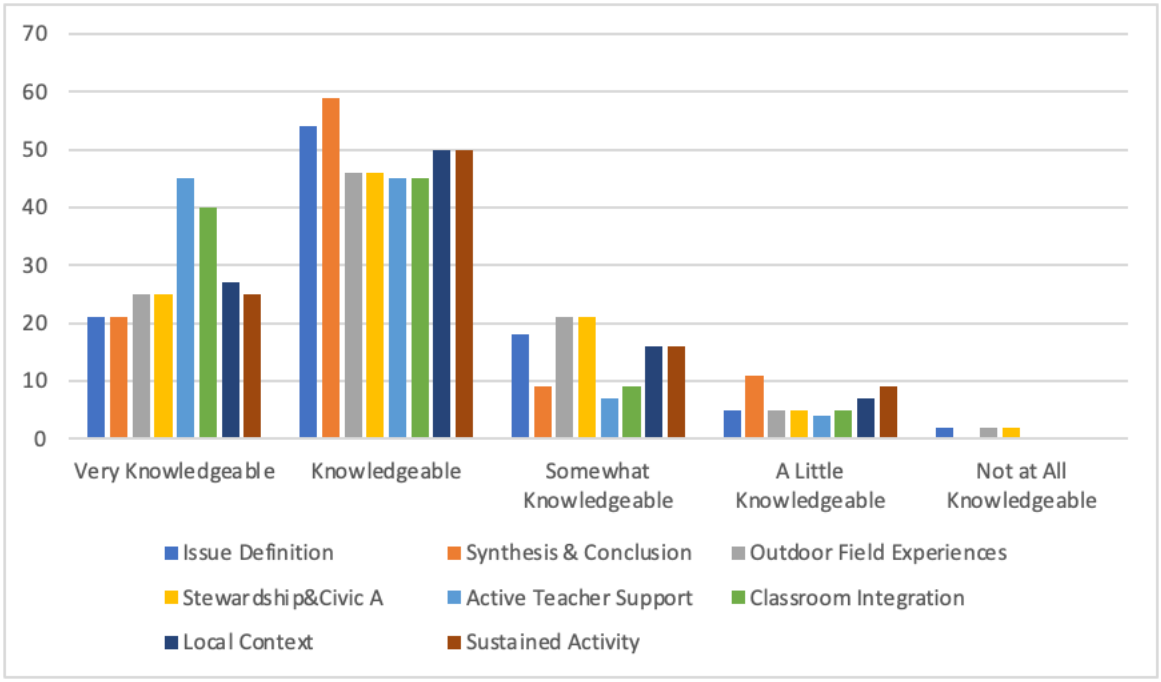
Result 1

Students 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. Fifty-seven responses were received to this question. The greatest quantity of responses was in the Knowledgeable range with all areas receiving between 25 and 33 responses. Students expressed the most knowledge (Very Knowledgeable) in the areas of Active Teacher Support (25 responses) and Classroom Integration (22 responses). All other areas measuring as Very Knowledgeable had only 12-15 out of the 57 total responses received. In the

Somewhat Knowledgeable mark, Issue Definition (10), Stewardship(12), and Outdoor Experiences (12) measured closely to the Very Knowledgeable mark with showed Issue Definition (12), Stewardship (14) and Outdoor Experiences (14). In the Not at All Knowledgeable mark, no area received more than one response. All results are depicted by percentage of student responses in Figure 1 below.

Figure 1

PreService Teacher Current Knowledge of MWEE Essential Elements Expressed in Percentage



Result 2

Students utilized a variety of MWEE essential elements with their elementary students. The most frequently cited element was 'Outdoor Field Experiences' (24 responses). Thirteen students selected 'Issue Definition', 12 selected 'Synthesis and Conclusion' and seven selected 'Stewardship and Civic Action.' These results are shown in Table 1 below.

Table 1

MWEE Essential Elements Used with Students

Element	Number of Responses
Outdoor Field Experiences	24
Issue Definition	13
Synthesis and Conclusion	12
Stewardship and Civic Action	7

Result 3

University students utilized a variety of materials that they received during their course with their elementary students. In their narrative responses, students cited specific materials received during the course which they used with students and, to a lesser extent, they also mentioned aspects of student/classroom management as resources that they implemented. The most frequently mentioned material was the Model My Watershed website. Other materials mentioned frequently included: handbook, lesson plans, ISTE standards, a physical model of a watershed, build a buoy materials, thermometers, rakes/shovels, building blocks, and containers. Additionally, students cited resources that helped them to manage the elementary classes in which they taught including "learning to keep students engaged by body gesture, tone and activities." Others mentioned that cooperating teachers assisted them with classroom management. One student characterized the assistance in that, "If we needed help, there were plenty of people around to help."

Result 4

University students used various MWEE activities in their elementary classes. Many students responded that they used Model My Watershed with their classes. Several mentioned that the area of focus in the Model My Watershed was the school playground and how runoff could be reduced and how much they appreciated helping the elementary children learn this

practical application in an area that was important to them (the school playground). Several students mentioned implementing a thermal pollution lesson, seed dispersal lesson, building buoys, testing water for pollution, and playing a food chain game.

Result 5

Overwhelmingly, students responded that they would implement MWEE in their classroom someday. Students mentioned most frequently the importance of children learning about environmental protection through hands-on learning as being essential. Only three students indicated that they would not be likely to implement MWEE as it is not of interest to them. The thoughtfulness of the student comments is best expressed in these sample quotations directly from them:

- "I am likely to implement MWEE into my future classroom because it gives students hands on experience. Students are able to implement what they learn in the classroom to a real-world issue."
- "I am definitely likely to implement MWEE in my classroom because I feel as though students learn better when they can connect their lessons to their surrounding environments."
- "I would use MWEE because it allows for hands on and better engagement for students. Regardless of age, experiences learning in an environment other than sitting at a desk helps with better memory and understanding for the children, but also provides a more fun and exciting classroom experience."
- "I think it's important that we teach kids about sustainability and serving their community. This is also good for developing creative thinking and collaboration skills."

Result 6

Overwhelmingly, students felt that their work on MWEEs helped them to develop classroom management skills and instructional technology skills. Many students commented on how their own technology skills broadened and developed as a result of the project, although some cited poor internet connection as a barrier. Again, the thoughtfulness of the student comments is best expressed in their own words:

- "I think MWEE has made me realize that kids like to do more of what they are interested in. If I, as a teacher, put things into the classroom that my students are interested in, they will, more likely, pay attention and do the work. This has also taught me that technology can help a lot with what students are learning in the classroom. It can also help with learning about the environment. If the students had a question, they can look it up. Instructional technology is great for in classroom use."
- "I learned how technology programs can aid in understanding runoff and watershed. When we used model my watershed, I had no clue that we could pull up the map of their school and see exactly where their issues may stem from. Therefore, technology was a huge part in this classroom visit, and lesson. I also could see that the 4th graders were excited to learn from us, and were thrilled to see that we cared about their playground."
- "It has helped me see how helpful instructional technology is for helping students visualize a complex topic. It also has shown me that classroom management is necessary during these activities due to high excitement."

Conclusion

In conclusion, the project was successful in its initial stages of improving participant knowledge, skills, and teaching behaviors surrounding MWEE. The most significant benefits cited by teachers and administrators were that students gained hands-on, real-world experience learning and interacting with their environment to learn about MWEE. Teachers and administrators were most grateful for the grant's supplies for their classrooms and felt that they "brought new learning opportunities" and "raised the level of learning" about MWEE. This increased teacher and student enthusiasm and prioritized learning about MWEE. Challenges for the grant implementation continued to be finding time to devote time to MWEE instruction and activities during the school day. Curricula focused on math and English/language arts as a state-tested subject, and complications from the COVID-19 pandemic were the two most significant factors influencing instructional time.

The structure of this project put great emphasis on establishing strong partnerships between K-12 schools and the Education Departments of MU and VWU. MU and VWU planned to develop and implement a static field experience for preservice teachers with partner schools, Penn Manor and Norfolk Collegiate School. In the fall, faculty began to institutionalize environmental education into the curriculum in their teacher education programs via a course on instructional technology (MU) and classroom management (VWU). By incorporating environmental education in MU's and VWU's teacher education curriculum, 59 preservice teachers were impacted by this project, with more to come in years two and three. Preliminary results from this evaluation suggest that participating principals and teachers welcomed and enjoyed the collaboration and visits from preservice teachers. Similarly, professors and

preservice teachers found the context of MWEEs to enhance their learning of content across the course.