

Focus Group Findings

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Chesapeake Bay Program
Science. Restoration. Partnership.



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Abstract

State departments of education in the Mid-Atlantic region are increasingly relying on evidence-based practices to support decision-making. For environmental literacy to be prioritized, it has become necessary to demonstrate how environmental literacy programming (Meaningful Watershed Educational Experiences or MWEEs) supports school district priorities with an emphasis on goals for student learning (student achievement, 21st century skills, social emotional learning, etc.). We reviewed existing research to determine what evidence exists in peer-reviewed studies that demonstrates the MWEE framework and its individual essential elements and supporting practices directly address school district priorities, including curricular integration and student performance. Ultimately, this project will result in outreach materials and tool(s) that partners can use to increase school district adoption of outdoor education and MWEEs in Mid-Atlantic states (i.e., Delaware, Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia). This includes the development of a tool/rubric that environmental education providers can use to objectively demonstrate that their programs will be able to improve student learning and other school district priorities.

Background and Literature Review

Educational practices have changed dramatically over the last 100 years. Gone is the stand and deliver lecture and notes that led education for decades. Teaching and learning science has evolved over time. “The new era of education requires the sharpening of the 21st century skills, the 7C’s, to wit: Critical thinking and problem solving; Creativity and innovation; Collaboration, teamwork, and leadership; Cross-cultural understanding; Communications, information, and media literacy; Computing and ICT literacy; and Career and learning self-reliance. These sets of skills help prepare students to grow with confidence, to succeed in this rapid transition, and to compete globally in the future” (Funa & Prudente, 2021, p. 70). The I do, we do, you do methodology is also starting to be pushed aside as an outdated practice. The new push in STEM based environmental education is place based, project based, and problem-based learning. These pedagogies allow students to engage with experiences that are local,

diverse, relevant, and rigorous. This kind of learning aligns with our changing educational landscape by meeting students where they are, meeting their diverse learning needs, all while drawing from their own community, personal experiences, and engaging the community of stakeholders both in and out of the school building (Dupuis, Juliann. EDST 504: STEM Curriculum Development. Notre Dame of Maryland University, 2018). As these pedagogies gain momentum in 21st century education, evidence is needed to demonstrate the efficacy of these modern practices.

Project, problem, and place-based learning has been occurring in science education in other countries: including China, Turkey, South Africa, and Jordan, where it has been examined for its effectiveness, while here in the United States it is a developing pedagogy. At first glance these three types of teaching may appear to be similar in basic approach, each has its intricacies which cater to different contents. While the goal would be for a teacher to switch most of their instruction to these styles of teaching, that is not always possible, but there are many benefits to incorporating aspects of these methodologies throughout their instructional regime. Problem, project, and place-based learning encourages students to think critically and holistically about content, gives them a chance to apply the content to both a local and global perspective, allows them to collaborate in academic discourse, and assume ownership of their own learning.

Place-Based Learning

In essence place-based education is “learning that focuses on bringing more attention to place and community (Smith & Williams, 1999; Smith, 2002; Gruenewald & Smith, 2008; Smith & Sobel, 2010). What distinguishes the

approach from others is the focus on cultivating a deepening connection between students and their homes, neighborhoods, and regions. In addition to nurturing connections, teachers also strive to develop in their students the capacity to make contributions to the solution of problems that are close at hand” (Smith, 2011, p. 60).

When students arrive at school, often there is an immediate disconnect from the world outside of the classroom, and inversely when they leave the building, they also leave the content inside. Although students bring their diverse backgrounds and experiences with them when they walk into a classroom, they all have a common connection to the community in which they live. Place based learning increases student retention and achievement by providing students a way to connect the content to the world; so when students go home, they are not just leaving the information behind when they leave the building (Smith, 2011). Rather, they are leaving with a content literacy that they can connect to the tangible experiences that are encountered in their homes, school yard, and community.

“The primary value of place - based education lies in the way that it serves to strengthen children's connections to others and to the regions in which they live. It enhances achievement, but, more importantly, it helps overcome the alienation and isolation of individuals that have become the hallmarks of modernity. By reconnecting rather than separating children from the world, place-based education serves both individuals and communities, helping individuals to experience the values they hold for others and allowing communities to benefit from the commitment and contributions of their members” (Smith, 2002, p. 11).

Place based learning:

“Is broad and can be organized into categories. Karrow and Fazio (2010) suggest three categories: natural, cultural, and ontological. The natural may be described as physical spaces that are occupied (a southern lowland swamp for example), while the cultural conception of place recognizes social constructs of class, gender, race, and power. These are the conceptions of place used by Gruenewald (2003) in advocating for a critical pedagogy of place, a pedagogy that is both “socially and ecologically critical” (p. 9). As further advocated by Karrow and Fazio (2010), the ontological category of place may inform the moral ideals of the natural and cultural categories. The ontological category defines a sense of self or objects coming into being, the sense of experience” (Gautreau & Binns, 2012, p.169).

This methodology helps bridge the gap between what's going on in school and what's going on in their lives. When students are taking content out the door with them, they are inherently going to retain more of the information.

As the educational world is advancing differentiated learning to meet the diverse learning needs of students with various backgrounds, and an increasing focus on equitable education, place-based learning is an ideal place to start that process within STEM and environmental instruction. Whether it be in a community garden, local park, museum, or parking lot. It is important for teachers to start including ways to connect the curriculum with the experiences of diverse students.

“Teachers need to use engaging curriculum and pedagogical approaches to promote active student acquisition of knowledge and cultural competencies. It is the

transformative change embedded in social experiences that provide foundational knowledge for teachers to connect their pedagogical approaches to the needs of a multicultural diverse classroom. We do so many things well, each and every day, in classrooms across America. Incredible learning takes place in school. I was given an opportunity few teachers get to witness; to move the place of learning into the community arena. The power of learning when the community becomes the classroom is beyond compare” (Sloan, 2013, p. 27).

When teachers can connect the community, student backgrounds, and curriculum, it can create a much more enriching and welcoming environment for the students (Smith, 2011, p. 11). Students who come from diverse backgrounds that don’t fit the “norm” of many of their peers, often feel a sense of disconnect from their peers and the classroom. This disconnect from their peers can lead to disengagement with learning, and puts these students at risk for dropping out. Place based instruction, which at its core, is about connecting all students to one another, and the community, actively works against the disconnect that these diverse learners are feeling. “The place-based learning community examined here demonstrably improved students’ sense of belonging, academic performance, and first-year persistence, and it narrowed equity gaps in multiple measures” (Johnson, et al., 2020, p. 525).

Educators have the responsibility of engaging students not only with the content, but with one another. Achievement is not always a tangible number that can be calculated by the success of students on a test; but rather a collective assessment of their growth through the year. At the conclusion of the academic year, retention of the content is important, but so are the students’ sense of belonging and connection to the content. Students are not going to

remember every piece of content they are taught, but they may remember the experiences they were afforded. Place based education helps students make these connections to the community outside of the physical school building. Keeping this in mind,

“Community sensibilities must help design the blueprint. What seems essential for place-based education is that each teaching unit is designed with community learning opportunities and issues vitally in mind. Benefits are assured when there is a focused period with a well-defined community purpose. Tremendous resources exist in our communities and neighborhoods. Once tapped into, they often lead to new resources that impact the evolving place-based curriculum” (Lewicki, 2000, p. 11).

As Lewicki focuses on, it is important for educators and curriculum developers to include community members and resources like education centers, local businesses, the local government, and green spaces within the community when making curricular decisions. Incorporating these resources into lessons and the development of curricula will enrich the learning for the students while engaging the community in the school. This collaboration of stakeholders will make the process of place-based instruction easier, and more meaningful for all involved.

Problem based learning

It is not always possible, safe, or appropriate for all topics based on where your “place” is. Problem based learning allows for students to think critically about content, increase the overall rigor of their learning, and engage with the content within the walls of a classroom. According to Funa (2021), problem-based learning uses content to solve real world relevant

problems that require students to dig deep into the content and take ownership of their learning.

” It has been implemented for almost five decades now and still remains as one of the most innovative constructivist pedagogical approaches used worldwide. It prepares students for the real-life challenges that they may encounter in the future. These real-life problems activate students’ prior knowledge, elaborate initial discussion, and eventually elicit their interest of the situation. Thus, the use of PBL helps teachers to unveil students’ previous knowledge through stimulating problems. Further, when a certain problem exhausts the ideas of students, it triggers their curiosity and initiates their information seeking behavior. As they seek and organize relevant information, they close their own knowledge gaps that lead to understanding” (Funa, 2021, p. 70).

As teachers work to integrate problem-based learning into their classroom there are some important points to keep in mind. First, not all problems are relevant to students; if the goal is to foster engagement and increase achievement, it is essential to choose problems that are close to the students and relevant to their lives. Problem based learning is not something that students are generally familiar with and will often cause some discomfort. When implementing this method of instruction, it is important that the teacher put in place some scaffolds initially. These scaffolds should allow students to grapple with the content without feeling overwhelmed and shutting down, as the teacher provides the basic resources and skills needed to guide the student towards solving the problem (Ernawat, et al., 2022, p.3)

One of the key components of problem-based learning and its overall success is the autonomy students have over their own learning, as well as the ability to collaborate in academic discourse with their peers.

“Data indicated strong student preference for both the autonomy and collaboration inherent in PBL (problem-based learning) and PjBL (project-based learning). With regard to practices that support autonomy, PBL and PjBL provide opportunities for student choice, self-regulated learning, and independent learning in every stage of the learning process...data also indicated a student preference for collaboration. Having the opportunity to talk with and socialize with their peers and feeling a sense of community are important aspects of school for many students. PBL and PjBL allow teachers to take advantage of the power of social interaction enhanced by the pursuit of a common goal. With a sense that they are valued and respected members of a learning community, students are ready to learn, more likely to enjoy school” (Dole, et al., 2017, p. 9).

As discussed previously, not all achievement can be measured with test scores, but also by the attitudes towards school, and critical thinking skills that are successfully developed by incorporating problem, place based, and project-based pedagogies where appropriate in the classroom.

Project based learning

An offshoot of both place-based and problem-based learning is project-based learning. Project based learning can incorporate aspects of both place and problem-based learning, while students work to complete the “project”. This kind of learning can be tied into any content and easily facilitates an opportunity to implement transdisciplinary STEM education into an

instructional unit. “Problem- and Project-Based learning (PBL) refer to an active learning style that shifts the educational focus from finding the “right” answers, to asking questions and exploring an avenue of study that will further knowledge around complex issues” (Huysken, et al., 2019, p. 8). Simply put, project-based learning takes the content that is being taught and turns it into an authentic learning experience for the students.

Project based learning has several key pedagogical aspects including authentic project options, student choice, inquiry, collaborative discourse, reflection, and meaningful teacher feedback throughout the project. When done correctly project based learning can take any content and make it rigorous, authentic, and relevant for all learners in the classroom.

“PBL allows learners to develop understanding by engaging with a complex problem that may not have one single correct or ideal answer. These problems are most effective when they have relevance beyond an assigned task for the course grade. They should foster learner ownership over the problem and any potential solutions. The problem should seek to highlight rather than minimize complexity as it is reflected in authentic problems” (Huysken, et al., 2019, p. 8).

As students progress through their lives, and move into the ever-changing career landscape, it is essential that they are leaving traditional K-12 education with skills that were not necessarily essential in the early days of education. Now students entering the workforce need a diverse set of content knowledge and skills for them to succeed.

“A critically important skill is the ability for workers to problem-solve. Children are naturally curious about their surroundings, each other, the world, and beyond.

Educators have a unique responsibility to expand, while at the same time ground, this

curiosity by developing activities that foster learning of various concepts, ideas, and ultimately prepare students to apply these experiences in real-world situations” (Euefueno, 2019, p.12).

Cervantes claims that for teachers to be successful in the implementation of PBL in their classrooms, it requires multiple stakeholders to be invested in the process including administrators, curriculum writers, and community members. While a teacher can create the PBL lessons for their classes, it is important for those who are writing curriculum, as well as administrators to be engaged in the process. “In order to prepare the learners for the real-world, PBL calls for teachers and administrators to redesign instruction and assessments by giving students real-world problems to solve. The restructuring of educational reform now targets career and college readiness that spotlights a student’s future beyond the classroom and K-12 experiences” (Cervantes, et al., 2015, p.64). The successful implementation of PBL in a classroom does more than just prepare students for the needs of the 21st century workplace. It is a way to make the learning authentic and reach the diverse learning needs of the students in today's classrooms.

“PBL can promote student learning and may be more effective than traditional instruction in social studies, science, mathematics, and literacy. The 20 studies reviewed in this brief show that PBL can promote student learning in social studies and science; and, to a more limited degree, in mathematics and literacy. The continued emergence of research findings to support PBL as a valid instructional method for all students, including those who are furthest from opportunity” (Kingston, 2018, p. 2).

Using PBL to engage and promote the success of all students across the subject areas should be a guiding principle of the modern educational setting.

MWEE

One prime example of a learning experience that incorporates project, problem, and place-based learning is a Meaningful Watershed Educational Experience (MWEE). This is an experiential learning opportunity that is essential to the teaching of environmental literacy, environmental stewardship, can take place anywhere in the world; and can generate engagement with even the most diverse learners (Char, 2014). “There is an inherent need for informal education opportunities to provide a well-rounded environmental education experience that expands classroom instruction into the real world. Scientific concepts taught in a classroom setting may sometimes be abstract or potentially difficult for students to conceptualize. When integrated with a hands-on outdoor educational experience, such as a MWEE field investigation, these complex topics may be easier to comprehend. Research has proven that hands-on environmental education strengthens the academic performance of students” (Char, 2014, p. 3)

Like Cervantes said about project-based learning, in order for MWEE’s to be effective and successful for students, it is important that the MWEE coordinator involves the school leadership in addition to other community stakeholders like businesses, and community organizations.

“Ideally, these experiences should increase ecological knowledge, pro-environmental attitudes and environmentally responsible behavior in students and teachers. Significant relationships identified here between some school-site specific environmental factors

and completion of MWEE components have profound implications for improving MWEE implementation at the campus level, school district level and across the country” (Kinne, 2014, p. 71).

MWEE’s tie closely to the pedagogy of both place-based, and project-based education; both of which not only aim to engage students in the learning, enhance content retention, and build problem solving skills, but also to engage other stakeholders and members of the community without which neither would be successful.

With place-based learning, it is all about how well students can make the connections between where they live, and the content that is being taught at school. Fostering these connections can not only alter retention of information, but also impact the sense of value students have in their school and community (Gautreau, et al., 2012, P. 4).

“How connected students are to where they live affectst how they learn. Therefore, a basis of environmental education is understanding and forging a connection with students’ local community. Using place-based education is essential in developing generations of citizens who are environmentally literate stewards. What Lives in the Harbor focuses on the connection our students have with the Chesapeake Bay. However, all of us live in a watershed and thus meaningful watershed education experiences are relevant to all students” (Haines, et al., 2019, Consider your local context)

When content becomes relevant and local for students, they are more likely to engage and retain the information they are learning. Making the content available to them in a way that traditional science instruction does not always allow for. “Studies suggested that in the

classroom setting, students typically make few connections between the content and their decisions, but this study's results provide evidence that MWEE aligned curricula help move students from isolated content learning to interest and knowledge to carry out civic and environmental action" (Marcum-Dietrich, et al., 2021, p.10). Within the world of science, there are many opportunities to make learning more relevant to students, even more so with environmental education. While some environmental concepts may be out of reach for students to conceptually grasp within a traditional classroom, these can be brought to life by real world place-based learning through a MWEE. MWEEs are involved, and time intensive for the teacher and community members, but the long-term success and impact it will have on students is far reaching. "Research is frequently conducted regarding the impact of outdoor education on student well-being, academic achievement, and stewardship within the environment and their communities. There is substantial evidence to suggest that outdoor education consistently has a positive impact on all of these" (Compher, 2019, p.11).

As Compher stated above when teachers are able to bring content to a place that is meaningful to students, achievement is going to inherently increase. Place, project, and problem-based learning should become synonymous with STEM based education and student achievement. Mounting evidence is present to support how these pedagogies not only increase student engagement and success for all students but help build a stronger school community both in and out of the building.

The goal of this project is to determine how environmental literacy programming (Meaningful Watershed Educational Experiences or MWEEs) supports school district priorities with an emphasis on goals for student learning (student achievement, 21st century skills, social

emotional learning, etc.). Our goal is to produce outreach materials and tool(s) that partners can use to increase school district adoption of outdoor education and MWEEs in the Mid-Atlantic states (i.e., Delaware, Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia). This includes the development of a tool/rubric that environmental education providers can use to objectively demonstrate that their programs will be able to improve student learning and other school district priorities. In order to create these products, we gathered data from school district personnel- both administrators and K-12 teachers- to ascertain key elements of place-based, problem based, and project-based education and the MWEE, in particular that directly address student goals for learning. Our research methodology and results are detailed below.

Methodology

Pre-Interview Survey

Two pieces of data were collected from participants in the form of a pre-interview survey and focus group interviews. The pre-interview survey was developed by the researchers and the project team members. This survey included questions focusing on the needs of the school district personnel regarding engaging in activities with non-formal environmental education partners. Participants were asked to complete this survey prior to their participation in the focus group, to elicit information that would be expanded upon during the focus group sessions. (See Appendix A for survey instrument). The pre-interview survey was developed using Google forms. There was a total of four survey questions including open response and multiple choice type questions.

Interview Protocol Development

Qualitative data from school district personnel including administrators and teachers, was collected during a series of focus group sessions. The purpose of these sessions was to gain insight into what the school systems within the watershed are considering as priorities for their students, and to ask participants how the findings could be incorporated into a tool or materials that could be effectively utilized by non-formal educators and ultimately increase the number of students who are participating in outdoor education throughout the watershed. Taking a multidisciplinary approach, we include school district personnel from a variety of subject areas. School personnel from four Mid-Atlantic states were included in the study. Eight focus group meetings were held at various times to accommodate the schedules of the participants. Three of these included participants who were administrators and five included K-12 educators. These meetings were held online to reduce travel costs. The number of participants in each session was limited to seven. Participants were offered a stipend of \$50.00 for participating.

The interview protocol was developed by the researchers with input provided by project team member representatives from NOAA and CBT as well as two leaders from state departments of education. The questions were designed to elicit responses that would provide information regarding school and district level use of the MWEE instructional model, barriers to implementation, and additional resources requested of non-formal partners. The intention was to determine the gap in MWEE educational practice implementation and how non-formal educators can best support and increase the efforts of K-12 educators in the teaching and implementation of MWEE instructional strategies. See Appendix B for interview protocols.

Participants

Administrator participants (N=9) represented three states (DE, MD, VA) and nine different school systems. They included a curriculum specialist, an elementary level science coordinator, two secondary level science supervisors, two assistant principals, two science instructional specialists, and the director of a public charter school. Classroom teacher participants represented three states (MD, DE, VA) and eleven school systems. They included science teachers representing 3rd, 4th, 5th, 6th, and 7th grade; high school teachers representing environmental science, biology, environmental literacy, and mathematics; elementary level STEM, and kindergarten teachers (N=14). See below for a full list of focus group participants.

Administrators

Delaware K-12 Curriculum and PD for the Department of Education
Baltimore County Public Schools (MD) Elementary Science Coordinator
Assistant Principal from Baltimore City
Science Instructional Specialist (Caroline County VA)
Assistant Principal Clark County Public Schools VA
Director of Public Charter School Baltimore County MD
Educational Specialist for Environmental Science Henrico County Public Schools VA
Secondary Science Supervisor, Newport News Public Schools VA
Secondary Science Supervisor, Frederick County Public Schools VA

K-12 Educators

6th Grade School Science Teacher, Caroline County MD
4th Grade Richmond public schools
7th grade science Baltimore city (19yrs)
HS Env science VA
(2) Kindergarten Baltimore City
Env Sci and Bio High school VA
Bio high school VA
3rd grade science VA

HS Math Anne Arundel County MD
5th grade science DE
HS Env Literacy Anne Arundel County MD
PK-8 STEM/Library Harford County MD
5th grade science coach Richmond VA

Data Analysis

The pre-interview survey was analyzed using Excel to aggregate the data. Common responses provided insight into the concerns of K-12 school personnel related to MWEE instruction and interactions with non-formal environmental education programs. The results of this survey are presented below.

Eight focus group interviews were recorded using Zoom. Interviews were transcribed into Word documents which were then assigned codes to derive themes and patterns for further analysis. Using inductive coding, the researchers identified commonalities across all interviews, leading to the development of the code book (Appendix C) which delineates 19 different themes. Inter-rater reliability was established by the researchers jointly coding the first two transcripts. Two additional transcripts were also scored independently by each researcher and then compared for similarity in scoring. A 95% inter-rater reliability was determined.

To analyze the data, the number of occurrences of each code was recorded and aggregated. The totals for each code for Administrators are found in Table 1. Table 2 provides examples of items from each category.

Table 1***Aggregated Data from Administrator Interviews: Percentage and Instances of Codes Mentioned***

Codes	Percentage of Instances Mentioned	Number of Instances Mentioned
Positive Attitudes towards MWEE Model	7	19
Lack of use MWEE model	3	8
Planning Desire to implement	6	16
Grade level implementation	2.5	7
Student outcomes	4	12
Administrative Support	0.7	2
Teacher Outcomes	0.7	2
Project/Problem/Place Based	4	10
Professional Development	6.5	18
Barriers	18	50
Funding	7	19
Types of Experiences	8	22
Internal Support	3	9
External Support	2	5
Local Partners	16	45
Local provider services	3	9
Lack of incentive for implementation	1	3
Accommodations for Learning	5	14
Requested of partners	1.5	4

Nineteen total codes were identified as part of the qualitative data analysis. Of the 19 codes, the number of times each code was mentioned ranged from 3 to 50. This illustrates the importance that administrators placed on several categories. The most prominent category was barriers. This code was highlighted 50 different times, thus providing clear evidence for reasons that MWEEs are not being included as part of the curriculum. Specific barriers are listed in Table 2. Another frequently (45 occurrences) mentioned code was local partners. This referred to the

local partners that each school district worked with directly at various levels. Additional categories which ranked near the top of the most frequently mentioned were types of experiences (22 occurrences), professional development (18 occurrences), planning desire to implement (16 occurrences), and accommodations for learning (14 occurrences). The data provides insight into which areas school system administrators see the need for development as well as areas in which the school personnel are including MWEE based learning effectively.

Table 2

Example responses from Administrator Interviews

Codes	Example Responses	
Lack of use MWEE model	Perceived lack of time Only “teacher champions” Only doing part of MWEE, not full-blown (DE)	
Grade level implementation	4th, 6th, high school (unspecified grades) - administrators in Virginia 3rd, 4th, 5th (VA) K,1,2,3,5,6 (MD) 3-8 mini MWEEs (VA) 5-8 (MD) 6,7,8 (VA) High school electives	
Student outcomes	Improved test scores in reading and writing (VA) Increased student engagement (MD, VA) More connection to community (MD) Seeing environmental impact (MD) Learning by doing (MD) State assessment improvement- reading and writing (DE)	Engaged with the standards (MD) Students exploring and explaining (VA) Exploring science phenomena (DE) Students thrive when in environment where standard classroom practices are not used (VA)- 2 Students create products- real life Students better able to describe why they are learning/doing the content
Administrative Support	Fully supportive (VA) Administrators go on field trips with teachers and cover classes (VA)	

Teacher Outcomes	Positive shift in thinking (MD) Getting teachers more familiar with the communities they teach in (MD)	
Professional Development	Recognize need for teacher PD Related to Green Schools certification (MD) Embedded in curriculum; videos, etc (MD) PD for administrators so they 'get it" (DE) Supporting ELL learners during MWEE instruction (MD) PD in science phenomena (VA)	WET/WILD/PLT (VA) No value in PD if optional (VA) Weeklong workshops in summer with CBF (VA, MD) Professional Learning Communities of teachers (VA) PD is not appropriate/does not meet needs
Barriers	Teacher turnover (2) New teacher support Time to plan (9) Teacher buy-in (2) Teacher comfort level teaching outdoors (3) Teachers lack content knowledge. Classroom management-(4) Funding (7) Lack of materials Other subject areas not onboard with integrating. Perceived Danger/safety issues	Lack of substitutes for PD (2) Science teaching time is too short (6) Too much emphasis on other math and reading. Science teachers not certified for their subject. Difficulty finding grade level appropriate reading material. Administrators have no background in E-Lit Lack of assistance from community partners Non-controlled environment hesitation Lack of integration with course curricula Transportation (2) Emphasis on standardized test scores
Funding	NOAA BWET (13) Other available grants (3) MD DNR EPA SEVVY grant	

Types of Experiences	Paddles (2) Trout in the Classroom (3) Integrating science with ELA (3) Integrating science with math 3) Long term water quality monitoring Recycling programs in schools Art integration- posters, paintings, with environmental themes	Using GIS to examine local environmental data. Mini field investigations (2) Field experiences- water based/water investigations/stations (2) Growing SAV and planting in water STEM based lessons integrated with county curricula. Using field data in classrooms for analysis (VA)
Internal Support	Veteran teachers leading local field trips. Principals who support outdoor teaching and learning Internal databases with lessons and field trip information (2) Science specialists in central offices STEAM lead specialist in the school Onsite MWEEs (2) Substitute Coverage	
External Support	Virginia Department of Education online modules NOAA MWEE 101 NOAA MWEE 102 External partners come to schools and help write curricula	
Local Partners	Blandy experimental Farm (5) Marymont Foundation James River Association (2) VA Department of Wildlife Local extension agencies Trout in the Classroom Keep Virginia Beautiful VA Soil and Water Conservation District Chesapeake Bay Foundation(4) Alliance for the Chesapeake Bay County Nature Conservancy officer MD DNR Irvine Nature Center National Aquarium (2) Bluewater Baltimore CityScape Engineering (VA)	Friends of the Rappahannock (2) Living Classrooms 4H NOAA Delaware State Parks Delaware Nature Society DE Department of Agriculture Baltimore County Parks Maryland State Parks University of DE Sea Grant VA Living Museum (2) Cool Springs (2) Mariner Museum (VA) (3) Old Dominion University Shenandoah University

Local provider services	Parks personnel/other informal partners doing direct instruction of curricular lessons (3) Developing lesson plans for teachers (3) Designing curricular units Meeting with teachers before and after field trips Informal partners meet regularly with teachers to plan, write, implement	
Accommodations for Learning	Making sure students have proper clothing. Ability to provide services in a safe, controlled environment (2) Accommodations for physically disabled (2) Accommodations for ELL learners (3) Matching pictures with vocabulary words for ELL learners	Headsets for listening in other languages. Understanding the roles that many parks played in history (slave owners) Modify documents to meet reading levels of students. Step-by Step directions Manageable check-in points
Requested of partners	Planning activities that are student centered; not “talking at” students. Limiting sitting time Off-site field trips Communicate ahead of time to plan for accommodations	

Table 2 includes specific examples of each of the 19 codes that were elicited from the administrator interviews. Some of the most prominent responses include the barriers of time, focus on ELA and math, and lack of funding/transportation as reasons for why MWEEs are not being implemented. Additionally, there were quite a few mentions of the need for professional development to be mandated by the district instead of being voluntary or having to be sought out by the individual teacher. The lack of understanding by teachers of what a MWEE entails, is mainly due to the lack of exposure that teachers have had to the model and their feelings of lack of experience and not being able to implement it fully. Some of the comments from administrators regarding what types of support could be put in place by non-formal education partners, focused on the need for help with developing and delivering activities both on and off site. Figures 1 and 2 provide a visual representation of the frequency of the responses by category of the administrators. It is clear from both, that while there is a positive view towards

the MWEE model, the barriers and dependence on local partners to collaborate with schools is necessary for successful implementation.

Figure 1
Percentage of Responses from Administrator Interviews

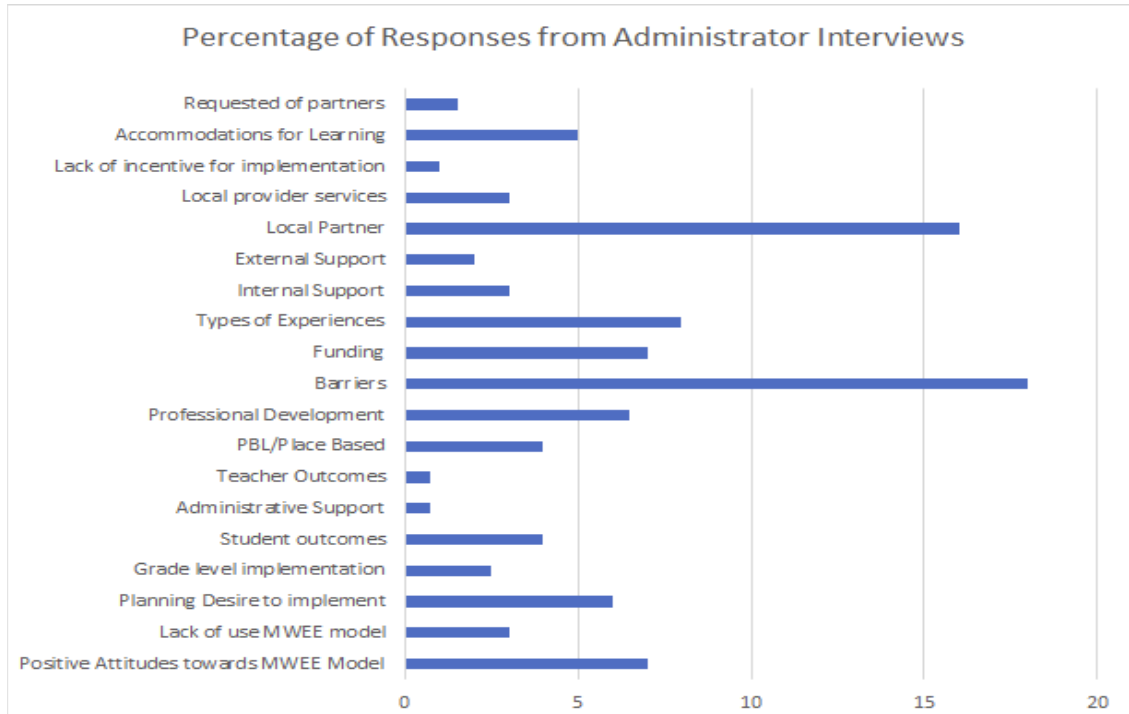
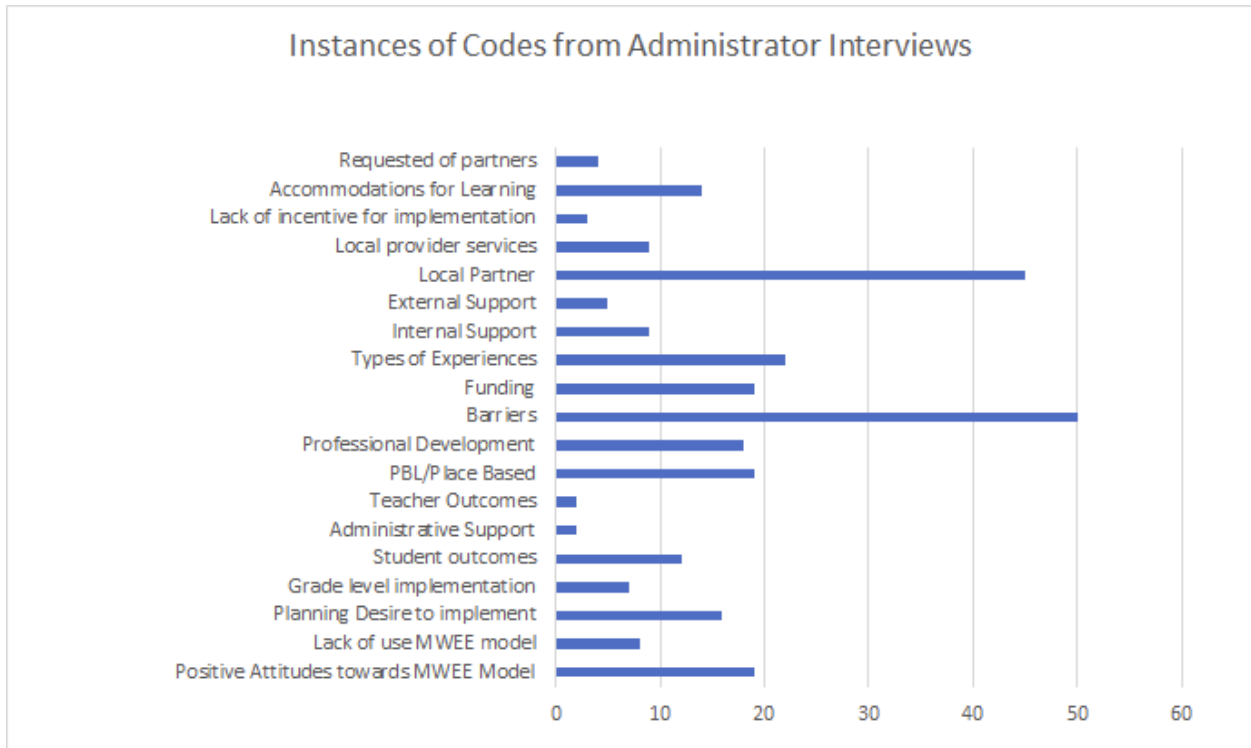


Figure 2
Instances of Codes from Administrator Interviews



Tables 3 and 4 and figures 3 and 4 focus on the results from the teacher interviews. Table three provides data for the number of times a code was mentioned during the interviews.

Table 3***Aggregated Data from Administrator Interviews: Percentage and Instances of Codes Mentioned***

Codes	Percentage of Instances Mentioned	Number of Instances Mentioned
Positive Attitudes towards MWEE Model	5	13
Lack of use MWEE model	2	4
Planning Desire to implement	2	6
Grade level implementation	1	3
Student outcomes	10	24
Administrative Support	0	0
Teacher Outcomes	.4	1
PBL/Place Based	2	6
Professional Development	7	17
Barriers	33	80
Funding	0	0
Types of Experiences	7	18
Internal Support	2	5
External Support	2	6
Local Partners	10	25
Local provider services	1	3
Lack of incentive for implementation	5	12
Accommodations for Learning	1	3
Requested of partners	7	17

Nineteen total codes were identified as part of the qualitative data analysis. The number of times each code was mentioned ranged from 0 to 80. Of the 19 codes, two of the codes, funding and administrative support did not emerge in any of the interviews with the teachers. The lack of these topics emerging illustrates that teachers might not have support through funding and through their administrators. Teachers placed the greatest importance on barriers,

local partners, student outcomes, types of experiences and requests of partners. The most prominent category was barriers. This code was highlighted 80 different times, thus providing clear evidence for reasons that MWEEs are not being included as part of the curriculum. Specific barriers as identified by teachers are listed in Table 4. Local partners were mentioned 25 times, indicating that teachers relied heavily on their non-formal education partners. Student outcomes was the third most mentioned category on the list. Given the high frequency that this topic was mentioned is a good indication that teachers are focusing on ways in which to motivate their students to learn. The outcomes focus on the skills and practices associated with hands-on learning experiences. The data provides insight into which areas teachers see a need for development as well as areas in which MWEE based learning is being effectively integrated into the curriculum.

Table 4

Example responses from Teacher Interviews

Codes	Example Responses	
Lack of use MWEE model	Teachers don't know what a MWEE is (VA) Administrators don't know what a MWEE is (VA)	
Student outcomes	Creates student interest and motivation (4) Better student engagement (8) More active learning Outdoor learning creates better background knowledge (4) Students can connect authentic learning to questions asked on assessments. Students create/participate in final products/action projects	Students learn how to use technology. Relevance to student's lives. Better academic achievement Increased knowledge of watershed Can relate independent and dependent variables
Teacher Outcomes	More fun to go to work	
Professional Development	Need for more teacher PD (4) Need administrator PD (2) Teachers need school system funding for PD. Teachers want PD providers to model the MWEE (3)	

	<p>PD should be engaging and hands-on, just as teaching should be. PD that is offered is not helpful (2) Nat Geo workshops MWEE 101 CBF classes (2)</p>	
Barriers	<p>Set curriculum dictated by school system/pacing (6) Not enough time to teach science (10) Not enough time to plan (10) Lack of materials (2) Lack of administrator support Student lack of content knowledge (5) Teacher lack of content knowledge (2) Only science teachers are aware of MWEE. Administrator lack of knowledge of MWEE Too much emphasis on standardized testing (2) Lack of substitutes or time off for PD Lack of PD (2) Job security linked to student performance on tests. Too many other responsibilities for teachers (2) No buy-in from teachers who don't teach science. Class sizes too large Too much emphasis on math and reading (2) Students unaccustomed to learning this way</p>	<p>Transportation issues (5) Behavior management (4) Lack of funding (4) Too much bureaucracy to take kids off site (2) ELL students/ language barriers Fear of bees/vermin being attracted to schoolyard. Field trip blackout dates Teacher comfort level (2) No place on schoolyard to do it No partners to help (3) Too overwhelming to plan entire MWEE. Not directly stated in standards (2) High teacher turnover (2)</p>
Types of Experiences	<p>Jamestown- tying into watershed and Native American studies. CBF field trips (1) Virtual reality programs (ice melting) Outdoor classroom construction Composting Studying rain/water flow on schoolyard (2) Pollution studies</p>	<p>Water quality studies (4) Outdoor labs (2) Integration with math Integration with ELA Rain gardens Butterfly gardens</p>
Internal Support	<p>Aids are needed in the classroom to implement MWEEs (VA) Supportive PTA (2) Purchase curricular materials, but no support in using them (2)</p>	
External Support	<p>Community partners come into classrooms (4) Chesapeake Bay Foundation has helped teachers. YouTube videos</p>	

Local Partners	Tennessee River Roundtable Local soil and water districts State Park systems Trout in the Classroom Great Kids Farm (2) Fort McHenry National Aquarium Blue Sky Fund Echo Hill Sultana Ingenuity Project Carrie Murray Nature Center	Shore Riverkeepers NOAA CBF USDA Save Our Trees Four Rivers Gardening Club VA Department of Wildlife TVA North Bay James River Association North Bay Harford Glen
Local provider services	Providers need to better tie their activities back to standards and what is asked on state tests (2) Providers come to school to deliver programs/content	
Lack of incentive for implementation	No selling point for teachers (3) Teachers must want to do it on their own (4) Thankless job (3) Have received pushback from administration or other teachers (2)	
Accommodations for Learning	Must be ADA accessible (2) Talk with teachers ahead of time to plan for accommodations	
Requested of partners	Need to be better trained in behavior management (3) Training for working with ELL students. More collaborative planning of outdoor experiences between non-formal and K-12 Better trained in how to include accommodations. A place to go that is already 'set up" for MWEEs and program is already written (2) Give us small steps- not huge projects that are over the top- CBF examples not practical (3)	Mentors or facilitators to help. Need to have training in 5E and inquiry. Need to make it relevant to the students. Provide alternatives to reading and writing. Need to be trained in ways to motivate students. Need to make students feel safe

Table 4 includes specific examples of 13 of the 19 codes that were elicited from the teacher interviews. Six of the codes were not included as no examples were provided by the teachers.

Some of the most prominent responses include the barriers of time to plan and implement, lack of professional development, lack of funding/transportation, behavior management and lack of

incentive as reasons for why MWEEs are not being implemented. Some of the support could be put in place by non-formal education partners, focused on the need for help with developing and delivering activities both on and off site in addition to greater alignment with state assessments and standards. Figures 3 and 4 provide a visual representation of the frequency of the responses by category of the administrators. It is clear from both, that while there is a positive view towards the MWEE model, the barriers and dependence on local partners to collaborate with schools is necessary for successful implementation.

Figure 3

Percentage of Responses from Teacher Interviews

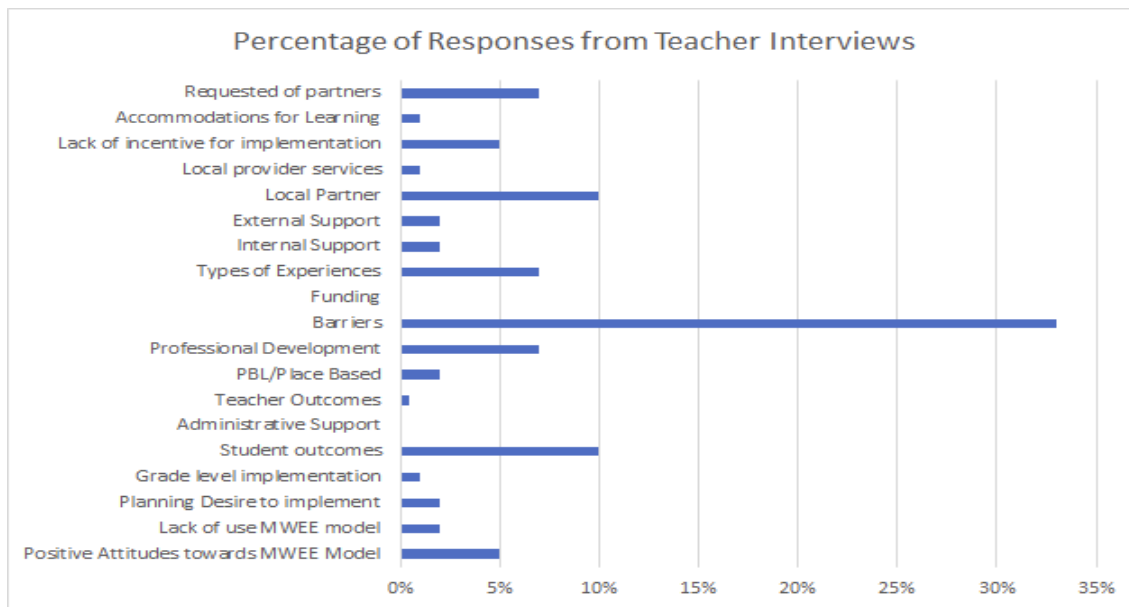
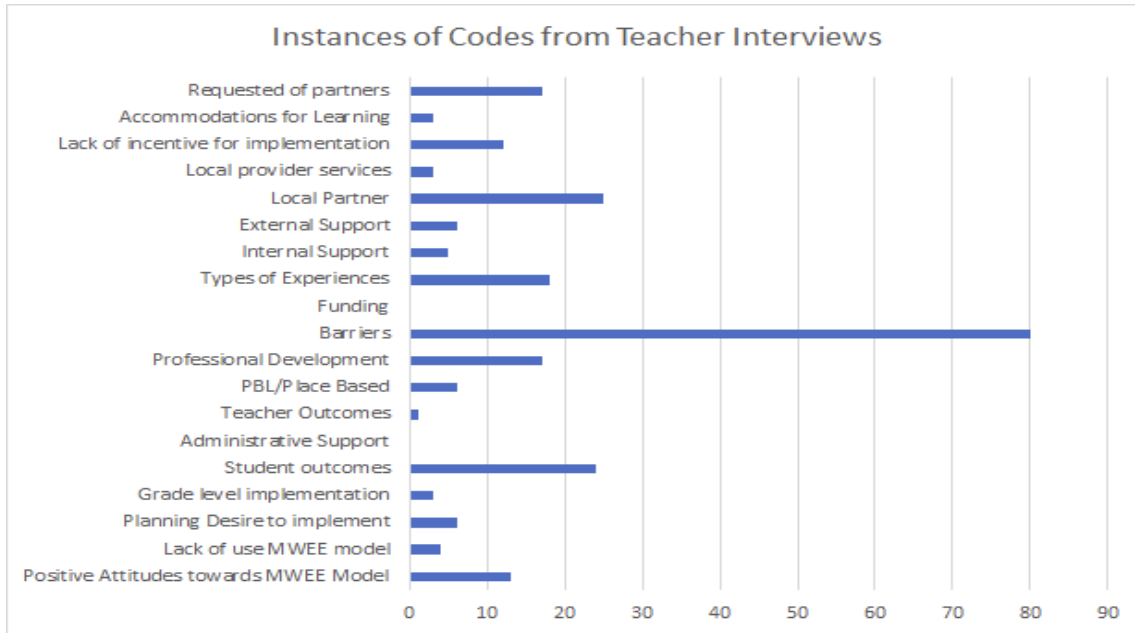


Figure 4

Instances of Codes from Teacher Interviews



Results

Pre-Survey Findings

It was evident from both the pre-survey responses and the focus group interviews that most districts are currently working with non-formal partners. When choosing a non-formal partner, the most important aspects mentioned by both teachers and administrators were accessibility (cost, proximity), whether the non-formal partner’s programming is standards-based, and whether the programming can support the curriculum. Both teachers and administrators also agreed that the most important considerations when planning a field experience with a non-formal partner were alignment to standards, cost, and logistics/scheduling.

Teachers and administrators mentioned several barriers to implementing field experiences with non-formal partners, including logistics, access to bus transportation, funding, and the capacity of offsite programs or organizations to take all students in a grade level at the same day or time. Both agreed that the topmost barriers to implementing field experiences with non-formal partners are logistics (this includes getting buses back in time to do their routes, substitute plans, and having something for students to do who are not participating in the experience) and transportation.

When asked about the importance of having non-formal partners provide classroom activities before and after the field experience, both teachers and administrators found it important for partners to provide pre-activities before programs. However, teachers found it important to be provided classroom materials for follow-up after the programs, but administrators did not feel this was important.

Both groups agreed that place-based education is not emphasized in their school districts. Field trips are encouraged if they are aligned to the curriculum. Project based or problem-based learning has some localized emphasis. There are some schools in the mid-Atlantic that are based on this instructional model, while others are not using it at all. Other schools or districts use the model in certain courses or units. There were a few teachers and administrators who mentioned that their school or district tried using the model, but the idea was abandoned during the covid pandemic. Others adopted the model, but provided no training for the teachers, so the implementation was not successful.

Participants mentioned “buzz words” that are being prioritized in their schools or districts: rigor, STEM, inquiry, real-world/authentic, cross curricular. They mentioned that they

would be motivated to work with non-formal partners who also prioritized these things.

Additionally, they stated that they would be encouraged to work with non-formal partners who could do the following: integrate math and ELA into programming; provide funding for the experience and for buses; help with Green Ribbon/Green Schools applications.

When asked about their top priority when considering field experiences for students, administrators ranked “aligned with curriculum” their top priority, but teachers ranked that very low. Teachers ranked “standards-based programming” highest. non-formal partner programs that integrated MWEE elements or experiential education were not important for either group. In this ranking, proximity of the non-formal partner site was ranked in the middle by both groups, but during the focus group interviews, it was mentioned frequently.

Focus Groups

Administrators

Administrators made many positive comments about the MWEE instructional model. None of them seemed to have a negative attitude towards its components or its use in the classroom. Many expressed a desire to implement the model in their districts, even if they are not implementing it currently. Participants mentioned many positive student outcomes that can arise from this instructional method: engagement, motivation, learning by doing, better performance in reading and writing, and greater connection to environment and community. In districts that are using the MWEE model, it is mainly implemented at the elementary and middle school levels; there is much less use at the high school level.

Administrators mentioned many barriers to implementation, including the need for more and better quality professional development for both teachers and administrators, lack of

time for teachers to plan, lack of time to teach science (this was an interesting comment that occurred several times, since the MWEE model is not meant to only be used in science classes), teacher turnover, lack of funding, lack of substitutes, classroom management issues, especially during the outdoor component, teacher comfort level taking students outdoors and/or teaching outdoors, administrators who have no training in environmental literacy, transportation, and lack of incentive on behalf of both teachers and administrators to implement the MWEE model. NOAA BWET was mentioned overwhelmingly as a funding source for MWEE projects.

Administrators mentioned that it is helpful if external partners come to school sites to assist with MWEE implementation and training and writing curricula. They also stated that having nonformal partners meet with teachers before and after field trips is helpful as well.

When asked what accommodations nonformal partners should provide to students, administrators mentioned making modifications in reading and writing activities for ELL students or students not reading on grade level, planning for accommodations for physically disabled students; ensuring that the environment is safe for students; avoiding activities that have students sitting inactive for long periods of time.

Teachers

As with the administrators, teachers made several positive comments regarding the MWEE instructional model. Some expressed a desire to implement it even if they aren't currently using it in their classrooms. They recognized many of the positive student outcomes that can be reached through the MWEE model, such as engagement, motivation, learning by doing,

better performance in reading and writing, and a greater connection to the environment and the local community.

Despite the general positive views towards the MWEE model, the teachers pointed out many barriers to its use. By far, the barrier to MWEE implementation that was mentioned most often was time. Teachers explained that they had no time to either plan or teach a MWEE in its full form; curriculum and pacing guides prevent it. Another barrier that was mentioned is that many teachers and administrators do not know what a MWEE is. There is a need for more professional development and training for both teachers and administrators. Teachers told us that MWEE components need to be modeled at professional development experiences. A few also stated that MWEE examples given at professional development experiences should be realistic, not “super star” projects that require large amounts of funding. They expressed the need to see small, more “doable” projects. Additionally, many teachers complained that oftentimes, they must pay for their professional development experiences, and that these experiences often must occur “off the clock”- on weekends or in the evening, due to a lack of substitutes for their classrooms. Other barriers stated by focus group participants included transportation/busing issues for the outdoor component, behavior management issues, a lack of funding- especially for the outdoor component, a lack of local partners to assist with implementation, and no school district incentive to implement a MWEE.

When we asked teachers to describe things that a non-formal partner could assist them with to make MWEE implementation easier, several stated that they would like for the non-formal partners to come into their classrooms to help with the other MWEE components, not just the outdoor experience. Many stated that the partners must better align their programs

with state assessment content and the standards used by the local K-12 districts. Several teachers expressed a desire to have a non-formal partner conduct the entire MWEE on the field site over multiple visits.

Finally, when asked about non-formal partners and what they could do to make the outdoor component of the MWEE more efficient and effective, teachers stated that partners need to make sure the study areas will be accessible to all students. They expressed that they would like for non-formal partners to meet with them ahead of time to plan for any accommodations their students might require. Teachers also stated that the non-formal partners need training that they do not seem to be receiving in a variety of areas regarding working with K-12 students. These include training in behavior management, ELL teaching, differentiation, and accommodations, the 5E model and inquiry, motivating and engaging students, and providing alternatives to reading and writing.

Conclusions

Several conclusions were drawn from this study. The largest and overarching theme that emerged was the lack of support from district level administration. The focus of the districts from all states was on the reading and math curriculum. There was very little time for teachers to implement science, social studies, and other content areas. As we realize that this was not the direct focus of this study, we present concluding remarks focused on the perceived needs of both administrators and teachers as related to their local non-formal education partners.

Based upon our interview and survey data, it has become apparent that teachers and administrators value the partnerships that they have established with local non-formal education organizations, and they seek to build on these relationships in several different ways.

1. Ensure that partners can support environmental literacy programming and MWEE experiences that are directly aligned with state and national standards as well as local curricula. Programming and experiences should not only be situated in the subject area of science, but should be directly supportive of multiple content standards, with an emphasis on English Language Arts (ELA) and Mathematics.
2. Develop ways in which to collaboratively plan and implement outdoor experiences, especially using school grounds, to build the confidence and knowledge of formal educators and to address barriers related to transportation.
3. Ensure partners provide experiences both on and off-school grounds. Walkable locations are optimal. This strategy will help to alleviate transportation issues.
4. Encourage the professional development of non-formal educators to include training in: classroom and behavior management and practices, accommodations for learning (English language learners, students with disabilities, etc.), as well as Universal design for Learning, 5E lesson planning, and student-driven inquiry.
5. Professional development for both teachers and administrators should be offered by partners in a variety of formats and timeframes to allow for participation. Professional development should engage teachers in all aspects of MWEE implementation, model realistic rather than model programs, and provide time for teachers to plan what it will look like in their classroom. If possible, there should be no monetary requirements or, alternatively, nominal fees associated with the professional development. Grant funded

professional development which offers a stipend for participation is also greatly encouraged.

Limitations

While this study reveals important aspects of MWEE instructional model use in the Mid-Atlantic states as well as aspects of partnerships between school districts and nonformal environmental educators that school administrators and faculty deem important, there are limitations to our findings that we wish to point out. First, the number of study participants was relatively low compared to the total numbers of K-12 teachers and administrators in the Mid-Atlantic region. Participants were not representative of every state in the Mid-Atlantic, or the Chesapeake Bay watershed. Additionally, participants did not represent all school districts in the Mid-Atlantic region.

Appendix A: pre-survey

Appendix B: Interview Protocol

Appendix C: Codebook

Appendix D- Raw data

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Appendix A. Pre-Interview survey questions

These were put into a Google Form and sent to all participants prior to their interview session.

Please answer the following questions in preparation for focus group meetings. This information will help to inform our discussions. Thank you for your time.

For the purposes of this survey, we are considering “**non formal environmental education partners**” to be inclusive of any type of organization or agency that supports direct environmental education instruction in support of classroom-based learning. Other terms used in this survey are defined as such:

Place-based education is the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science and other concepts across the curriculum. Emphasizing hands-on, real-world learning experiences, this approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students’ appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens. Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school. (*Place-based Education: Connecting Classrooms & Communities* by David Sobel, 2004).

Project-Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period to investigate and respond to an authentic, engaging, and complex question, problem, or challenge. (Buck Institute for Education)

Problem-Based Learning (PBL) is a teaching method in which complex real-world problems are used as the vehicle to promote student learning of concepts and principles as opposed to direct presentation of facts and concepts. In addition to course content, PBL can promote the development of critical thinking skills, problem-solving abilities, and communication skills. It can also provide opportunities for working in groups, finding and evaluating research materials, and life-long learning (Duch et al, 2001).

The Meaningful Watershed Educational Experience (MWEE) is a learner-centered framework that focuses on investigations into local environmental issues and leads to informed action. MWEEs are made up of multiple components that include learning both outdoors and, in the classroom, and are designed to increase environmental literacy by actively engaging students in building knowledge and meaning through hands-on experiences. In these experiences, the core ideas and practices of multiple disciplines are applied to make sense of the relationships between the natural world and society. MWEEs help connect students with their local environment and equip them to make decisions and take actions that contribute to stronger, sustainable, and equitable communities.

1. (For teachers) Do you currently include any nonformal environmental education partners in your classroom activities/curriculum?

(For administrators) Are nonformal environmental education partners included in your school district curriculum or classroom activities?

2. When considering a nonformal environmental education partner to include in school activities/curriculum, what is the most important aspect that you consider?
3. What would you say are the three most important factors to consider when planning an environmental education experience for your students within your school or district?
4. Please rank the following items in order of importance when considering an environmental education experience for students within your school or district. Each number may only be used once, with 1 being the most important.
 - a. Standards based (e.g., NGSS, Common Core, SOLs, STEELS)
 - b. Proximity to school
 - c. Amenities at location
 - d. Provides an experiential education experience.
 - e. Is aligned with district curriculum.
 - f. Fulfills one or more elements of the MWEE (Meaningful Watershed Educational Experience)
5. What barriers do you and your school district have to working with non-formal environmental education partners?
6. What part of the process of working with non-formal environmental education partners do you find most difficult (paperwork, arranging transportation, meal availability, etc.)?
7. When working with a non-formal environmental education partner, how important is it to you to have supplemental activities or resources provided prior to the experience? Rate on a scale of 1-5 with 1 being most important. After the experience?
8. How does your school district prioritize project-based learning? Problem-based learning? Place-based learning?
9. Are there any other pedagogical approaches that are particularly relevant to your school or district? Are there any specific terms or “buzzwords” that you often hear within your school or district?
10. What school or district initiatives can you think of that might encourage you to work with nonformal environmental education partners?

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Appendix B. Interview Protocol



Focus Group Interview Protocol

Institutions represented: _____

Interviewees (Title and Name): _____

Interviewers: _____

Introductory Protocol

To facilitate our data collection, we would like to video record our conversations today. For your information, only researchers on the project will be privy to the recordings which will be eventually destroyed after they are transcribed. Thank you for agreeing to participate.

We have planned this interview to last no longer than two hours. During this time, we have several questions that we would like to cover. If time begins to run short, it may be necessary to interrupt you in order to push ahead and complete this line of questioning.

Introduction

You have been selected to speak with us today because you have been identified as someone who has a great deal to share about the use of teaching and learning using placed-based instructional strategies, including project/problem-based learning, and the MWEE model. Our research project focuses on pinpointing elements of the MWEE that lead to higher student achievement, finding areas of need in Chesapeake Bay watershed school districts with respect to MWEE based learning, and the development of a tool/rubric that nonformal environmental education providers can use to objectively demonstrate that their programs will be able to improve student learning and address other school district priorities. Our study does not aim to evaluate your techniques or experiences. Rather, we are trying to learn more about MWEE-based teaching and learning, and hopefully learn about classroom teacher practices and non-formal educator practices that help improve student learning.

A. Interviewee Background

How long have you been ...

_____ in your present position?

_____ at this institution?

What subject area/grade level do you teach? _____

For this interview, we are defining the following terms as such:

Place-based education is the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science, and other concepts across the curriculum. Emphasizing hands-on, real-world learning experiences, this approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens. Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school. (*Place-based Education: Connecting Classrooms & Communities* by David Sobel, 2004).

Project-Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period to investigate and respond to an authentic, engaging, and complex question, problem, or challenge. (Buck Institute for Education)

Problem-Based Learning (PBL) is a teaching method in which complex real-world problems are used as the vehicle to promote student learning of concepts and principles as opposed to direct presentation of facts and concepts. In addition to course content, PBL can promote the development of critical thinking skills, problem-solving abilities, and communication skills. It can also provide opportunities for working in groups, finding, and evaluating research materials, and life-long learning (Duch et al, 2001).

The Meaningful Watershed Educational Experience (MWEE) is a learner-centered framework that focuses on investigations into local environmental issues and leads to informed action. MWEEs are made up of multiple components that include learning both outdoors and, in the classroom, and are designed to increase environmental literacy by actively engaging students in building knowledge and meaning through hands-on experiences. In these experiences, the core ideas and practices of multiple disciplines are applied to make sense of the relationships between the natural world and society. MWEEs help connect students with their local environment and equip them to make decisions and take actions that contribute to stronger, sustainable, and equitable communities.

In addition to the questions below, we will focus our line of questioning based upon what information the initial survey provides. This could include a specific inquiry into why the participants highlight certain items of concern and why this was important to them.

1. How would you describe your attitude toward the MWEE model regarding its role in education as an instructional tool? Probe: PBL includes students constructing a hands-on solution to a problem and in the MWEE we call this an “environmental action project.” How do you see this playing out in the classroom and share any thoughts you have on the value of students engaging in action in the classroom? Probe: Share any thoughts you have on the value of outdoor field experiences for students.
2. Do you feel the MWEE instructional model can engage students more so than other instructional methods? (Why or why not?) What evidence have you seen related to this?
3. For classroom teachers: Do you use any MWEE instructional strategies in your classroom? If not, why not? If so, what motivates you to use these techniques in your classroom?
4. What do you do with your students that represents the MWEE model? What does that look like?
5. For administrators: How much/how often are MWEE instructional strategies used in your school or district?
6. What resources are available to teachers for learning about or improving on their MWEE instructional strategies?
7. Describe the local support you have for the use of MWEE instructional methods. Probe: Are there any nonformal educational institutions that offer programming or other support? Probe: what could the nonformal educational institutions offer or do differently to help you with MWEE instruction?
8. For teachers: What experiences contribute to your confidence in implementing a MWEE based unit or series of lessons?
9. What incentives do teachers receive from the district for engaging in MWEE instructional strategies? Probe: Do you see increased adoption of MWEE instructional strategies among your school district colleagues?
10. Have you or your colleagues encountered resistance to implementing MWEEs in your school or district?

11. For teachers: How do you go about assessing whether students grasp the material you present in class when using a MWEE-based model? Probe: Do you use evidence of student learning in your assessment of MWEE-based classroom strategies?
12. What are some of the major challenges your school/district faces in attempting to change teaching and learning practices to make them more MWEE-based? What are the major opportunities? Probes: How can barriers be overcome? How can opportunities be maximized?
13. What more can you tell me about your experiences with the use of MWEE instructional methods?
14. Can you provide examples of how cross curricular instruction is occurring in your school or classroom? Probe: What is your "dream" for that integration? Probe: Is there any MWEE instructional integration with mathematics and language arts in your school or district?
15. Thinking about the diverse needs of your student population, what are the necessary elements or accommodations you feel should be included in any type of problem/project/place-based instruction? What would you expect a nonformal environmental education partner to include?
16. What type of evidence would support the alignment of standards to the actual experience? (in other words, what would you need to see to prove this was happening?) What specific evidence would show how scientific and engineering practices (SEPs) are being integrated into the experience?

Appendix C. Codebook

Coding Colors

Positive attitudes towards MWEE model

Lack of use of MWEE model

Planning/desire to implement

Grade level implementation

Student outcomes

Administrative support

Teacher outcomes

PBL/Place Based

Professional development

Barriers

Funding

Types of experiences

Internal support

External support

Local partner

Local provider services

Lack of incentive for implementation

Accommodations for learning

Requested of partners