

The NOAA Meaningful Watershed Educational Experience

The NOAA Bay Watershed Education and Training (B-WET) program is an environmental education program that promotes locally-relevant, authentic experiential learning focused on K–12 audiences. The primary delivery of B-WET is through competitive funding that promotes Meaningful Watershed Educational Experiences (MWEEs).

MWEEs are learner-centered experiences that focus on investigations into local environmental issues that lead to informed stewardship actions. They are composed of multiple elements that include learning both outdoors and in the classroom, and are designed to increase the environmental literacy of all student participants. All students, regardless of where they live or their social or economic status, should have the opportunity to participate in and benefit from MWEEs.

The MWEE model applies multidisciplinary practices in order for students to understand how the environmental systems they are investigating relate to their community’s social or cultural systems. MWEEs help connect students with their local environment and enable them to take actions and make decisions that contribute to stronger, sustainable, and equitable communities. These experiences, grounded in best practices for learning, academic standards, and the context of the local watershed and community, help increase student interest and engagement for learning, support student achievement, promote 21st Century skills, and achieve environmental stewardship.

The MWEE consists of four essential elements and four supporting practices that build upon each other to create this comprehensive learning experience for students. This process should be tailored to each audience and be age appropriate with practices growing in complexity and sophistication across the grades, starting with teacher-guided investigations and progressing to student-led inquiry. Teachers should support and assist students in their inquiry and investigations of local environmental issues that are of interest to them throughout the MWEE. To support teacher implementation of MWEEs, B-WET has also included five practices that are recommended to be in place for teacher professional development activities.

NOAA adopted this definition of the MWEE to assist with the development of effective projects founded in best practices determined through environmental education evaluation and research. This definition builds on the work of the Chesapeake Bay Program Education Workgroup and is further informed by over a decade of B-WET project implementation and evaluation work across the country. While these criteria represent standard national guidelines, each B-WET regional program will continue to craft and refine its own priorities that build on this MWEE definition and are tailored to the local population, geography, culture, and natural, financial, and human resources.

MWEE Essential Elements

The MWEE consists of four essential elements that describe “what students do.” These elements promote a learner-centered approach that emphasizes the role of the student in actively constructing meaning from the learning experiences. The order of the elements depends on project design and is not always linear. For example, some elements, such as Synthesis and conclusions, should occur repeatedly throughout the MWEE.

Issue definition

Teachers and students work together to define a locally relevant environmental issue or phenomenon affecting watershed, coastal, or ocean ecosystems. Throughout the MWEE, students focus on a driving question that

guides their inquiry and investigations of the defined issue and leads to stewardship actions. During Issue Definition, students learn about the issue through classroom instruction and are actively involved in planning and conducting background research and investigations focused on understanding the driving question (e.g., making observations and/or measurements; carrying out investigations; talking to experts or relevant stakeholders; reviewing credible resources; reviewing current environmental policies or community practices; exploring models; using tools). Students also reflect on personal and public values and perspectives related to the driving question. Teachers should ensure that the driving question is open-ended, relevant to the students' lives, and meets their learning objectives.

Outdoor field experiences

Students participate in multiple outdoor field experiences sufficient to investigate the driving question. Within appropriate safety guidelines, students are actively involved in planning and conducting the field investigations, including developing supporting questions to explore the driving question in the field. During field experiences, students use their senses to make first-hand observations, gain experience using equipment or technology to collect data or measurements, and conduct experiments necessary to answer their supporting questions and inform student stewardship actions.

Outdoor field experiences can take place on school grounds or at locations in close proximity to schools, such as streams or city parks. They can also take place at offsite locations such as state parks, wildlife refuges, or education centers that are staffed by experts and have access to field education materials and facilities. A range of individuals, including teachers, environmental educators, natural resource professionals, or trained volunteers, can help facilitate field experiences and ensure a safe outdoor learning environment. However, facilitators should co-develop and co-teach instruction with teachers so that field experiences are supportive of their learning objectives and/or academic standards.

Outdoor field experiences allow students to interact with their local environment and contribute to learning in ways that traditional classroom or laboratory settings may not. Projects should employ methodologies used in fieldwork so students learn how to work in a natural uncontrolled environment. Students who have opportunities to learn in, thrive in, and appreciate the outdoors can become informed and engaged champions for our natural resources.

Synthesis and conclusions

Students identify, synthesize, and apply evidence from their investigations to draw conclusions about the defined issue or phenomenon. They demonstrate understanding of their investigations and conclusions through communication to a variety of audiences such as other classrooms, schools, parents, or the community.

Synthesis and conclusions is an iterative process and should happen regularly throughout the MWEE. Throughout the process, teachers dedicate time for students to reflect on their experiences and investigations in relation to the defined issue or phenomenon. Teachers should facilitate students sharing their conclusions with each other. Students' conclusions should be used to help develop stewardship actions.

Stewardship actions

Students identify and implement a stewardship action as a solution that directly addresses the defined issue or phenomenon within their school, town, neighborhood, or community. Students are actively engaged and, to the extent possible, drive the decision-making, planning, and implementation of the stewardship action while

teachers play a facilitation role by forming groups, moderating, and answering questions. Students reflect on the action and determine the extent to which the action successfully addressed the issue or phenomenon.

This element allows students to understand that they personally have the power to bring about change to environmental issues, take action to address these issues at the personal or societal level, and understand the value of that action. This can instill confidence in students and can contribute to students becoming environmental stewards in their communities.

Stewardship actions can take many forms and may fall into the following categories:

- **Watershed Restoration or Protection:** actions that assist in the recovery or preservation of a watershed or related ecosystem that has been degraded, damaged, or destroyed (e.g., plant or restore protective vegetation/trees; restore a local habitat; remove invasive plants; clean up litter at local beaches, parks, or school grounds; develop a school garden, natural history area, community garden, or other sustainable green space; install rain gardens to help manage stormwater).
- **Everyday Choices:** actions that reduce human impacts on watersheds and related ecosystems and offer ways to live more sustainably (e.g., reduce/reuse/recycle/upcycle; monitor and save water in the face of potential drought or reduction in water availability; compost food or yard waste; research and implement energy efficient strategies or energy alternatives at school and/or at home).
- **Community Engagement:** actions that inform others about how to address community-level environmental issues (e.g., give presentation to local organizations; organize community events; record or broadcast public service announcements; share information on social media; post flyers in community; share posters at community events/fairs/festivals; mentoring).
- **Civic Action:** actions that identify and address issues of public concern. Students acting alone or together to protect public values or make a change or difference in a student's school, town, neighborhood, or community (e.g., present to school board or school principal; attend, speak, or present at town meetings; write or meet with decision makers/elected officials of a students' school, town, neighborhood, or community).

MWEE Supporting Practices

The MWEE also includes four supporting practices that describe “what teachers do.” B-WET recommends that these supporting practices be in place to ensure successful MWEE implementation with students.

Active teacher support

MWEEs depend on teachers facilitating and supporting student learning for the duration of the MWEE. Teachers help students make connections and draw on past lessons, serve as environmental role models, and ensure that the essential elements of the MWEE come together to support goals for learning. Even when environmental educators or other professionals are leading elements of the MWEE, the teacher should be actively engaged in answering questions and relating the experience back to the full arc of the MWEE.

To support this level of engagement, teachers should have access to professional development opportunities that support their content knowledge, understanding of the MWEE framework, and confidence and intention to implement MWEEs independently (see Teacher Professional Development for MWEEs for specifics).

Classroom integration

To be effective, MWEEs need to be embedded into what is already occurring in the classroom. MWEEs should be anchored to state and national academic standards and support goals for learning and/or student achievement. They are not meant to be something extra, but rather an educational approach that helps teachers meet their learning objectives. They can provide authentic, engaging interdisciplinary learning that crosses traditional boundaries between disciplines. Out-of-school activities (e.g., after-school clubs; summer camps) may provide MWEEs, or complement and enrich traditional classroom-based MWEEs.

Local context

MWEEs use the local environment and community as a context for learning. Situating the MWEE within local contexts promotes learning that is rooted in the unique culture, history, environment, economy, literature, and art of a students' school, neighborhood, town, or community. To enrich MWEEs, local resources (e.g., partners; expertise; field sites) should be incorporated. Partnerships, such as those with local community-based organizations, allow students to engage with members of their community of diverse cultures, values, and expertise for a more equitable and inclusive experience.

Emphasizing local contexts enables students and teachers to develop stronger connections and appreciation for their local environments and communities. This also enables students and teachers to explore how their individual and collective decisions affect their immediate surroundings and how their immediate surroundings affect larger ecosystems and watersheds.

Sustained learning experience

MWEEs have multiple experiences that engage students from beginning to end. While a lesson may focus more heavily on one essential element, it does not stand in isolation from the others. Each essential element builds upon and reinforces the others to provide rich learning opportunities spread over the course of a unit or multiple units. All students should have the opportunity to participate in and benefit from each essential element.

Teacher MWEE Professional Development Practices

Professional development should empower teachers to confidently and competently use the MWEE approach to support standards-based learning that aligns with local education agency initiatives. In order to gain and maintain environmental education competencies, teachers benefit from sustained, high quality professional development that includes ongoing support and feedback. Teachers should gain confidence in the value of MWEEs and strategies for conducting them so that they will be able to implement MWEEs after the professional development has ended. Specifically, the following practices are recommended for professional development to support teachers implementing MWEEs.

Increases teachers' knowledge and awareness of environmental issues

Teachers must have an adequate level of content knowledge for their MWEE topic area specific to their grade level and discipline, including an understanding of their local watersheds, interactions between natural systems and social systems, and human impacts on local watersheds and larger Earth systems. Recognizing that environmental issues often include different perspectives and opinions, teachers must also have a deep understanding of the facts related to environmental issues, along with an understanding of the various stakeholder values. In addition, teachers who demonstrate environmentally responsible attitudes and behaviors

may be role models for their students and increase their ability to guide students in stewardship actions to address complex environmental issues.

Models MWEE framework

Facilitators should utilize the same techniques and experiences in professional development that teachers are expected to use with their students, such as hands-on outdoor field experiences, critical thinking about environmental issues, and stewardship actions. Professional development should also provide opportunities for teachers to understand the goals and rationale behind the MWEE as an approach to learning and stewardship. Professional development should deliver workshops on both MWEE content and instruction, include ongoing support for teachers, and include time for teachers to plan for how the student MWEEs will be implemented.

Allows for adequate instructional time

Professional development should be multi-day, occurring consecutively or over the course of several weeks or months. Professional development should include ample opportunity for teachers to reflect on their own teaching practices and plan for how to use knowledge and skills gained from professional development in the classroom. Opportunities to share ideas and challenges with colleagues in a cohort creates space for dialogue that can provide teachers with additional support and inspiration.

Provides ongoing teacher support and appropriate incentives

Even in cases where teachers participate in robust multi-day workshops, such as summer or weekend courses, it is still essential that professional development providers have a structure in place for on-going teacher support and enrichment. This can take the form of follow up meetings, creating web-based forums for communication and feedback, establishing mentor teachers who can serve as points of contact, or including teams of teachers from one particular school. Continuing education credits and stipends can be used to encourage participation in on-going professional development opportunities. Outreach and training opportunities for school administrators may help increase high level support for both environmental education and continuing teacher professional development for teachers.

Meets jurisdictional guidelines for effective teacher professional development

Each jurisdiction has established guidance and recommendations relevant to all forms of teacher professional development. When possible, professional development opportunities for MWEEs should adhere to these general guidelines set forth by local education agencies.